DESCRIPTION OF FATAL CRASHES INVOLVING VARIOUS CAUSAL VARIABLES

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FEBRUARY 1993

REPORT NO. CR119

FEDERAL OFFICE OF ROAD SAFETY
REPORT DOCUMENT PAGE

REPORT NO.,	DATE	PAGES	ISBN	ISSN
CR119	Feb. 1993	127	0 642 51260 4	0810-770x

TITLE AND SUB TITLE

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ABSTRACT

This report comprises quantitative analyses of the 1988 FORS Fatality File and reviews of original documentation to provide descriptions of the role of the following causal variables in fatal crashes: fatigue, speeding, alcohol (>.05 and less than .15, >.15), young (17-20 and 21-25) and elderly roadusers (>65). The 1988 Fatality File, contains details of each of the 2560 fatal crashes, resulting in 2875 fatalities that occurred in Australia in that year.

KEYWORDS
CAR, SAFETY, ACCIDENT, DRIVER, VEHICLE OCCUPANTS, INJURY, FATALITY, ROADUSER, PEDESTRIAN, MOTORCYCLIST, CYCLIST, FATIGUE, SPEED, ALCOHOL, STATISTICS, AGE.

NOTES:

(i) FORS reports are disseminated in the interest of information exchange.

(ii) The views expressed are those of the authors and do not necessarily represent those of the Commonwealth Government.

(iii) The Federal Office of Road Safety publishes four series of reports:
(a) reports generated as a result of research done within FORS are published in the OR series
(b) reports of research conducted by other organisations on behalf of FORS are published in the CR series.
(c) reports based mainly on analysis of FORS statistical data bases are published in SR series.
(d) minor reports of research conducted by other organisations on behalf of FORS are published in the MR series.

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ACKNOWLEDGMENTS

The authors wish to thank the Federal Office of Road Safety, Commonwealth Department of Transport and Communications, for their sponsorship of and interest in this project.

The authors gratefully acknowledge the help with data analysis provided by the Research Assistants who worked on this project: Yee Ling Then, John Lim and Lyn Bowland. The advice and comments of other members of the Monash University Accident Research Centre - Dr Peter Vulcan, Max Cameron, Alan Drummond and Dr Brian Fildes is appreciated.

EXECUTIVE SUMMARY

The 1988 Fatality File is a comprehensive database, providing details on each of the 2560 fatal crashes resulting in 2875 fatalities, that occurred in Australia in that year. The database is of special interest and value as it is a national database coded from original police and coronial inquest data, and includes a large and more comprehensive set of variables than found in the State databases. As such the Fatality File is a particularly valuable resource for gaining a fuller understanding of the fatal crashes occurring in Australia and hence directions for further research for countermeasure development to reduce the toll. The Fatality File is compiled by the Federal Office of Road Safety.

The objectives of this project were:

1. To conduct quantitative analyses of the Fatality File to provide descriptions of the role of the following causal variables specified by FORS

- fatigue
- speeding
- alcohol (>.05 but <.15, >.15)
- crashes involving young drivers aged 17-20
- crashes involving young drivers aged 21-25
- crashes involving drivers over the age of 65

2. To review original documentation so as to provide brief quantitative and verbal descriptions of a subset of the causal variables examined under Objective 1.

Quantitative analyses of the role of selected causal variables

Fatigue

- 128 crashes in which "driver asleep or fatigued" was identified by the coders as the most important causal factor and at least one unit was responsible.
- 129 units classed as responsible, 150 people killed, 175 injured

As shown by past research, fatigue crashes were more likely than other crashes:

- to occur between midnight and 6 am but less likely to occur between noon and midnight
- to occur in rural areas, on highways and in the absence of street lighting
- to be single vehicle crashes and involve fewer vehicles on average than other crashes
- to be off path, on straight crashes and less often involve pedestrians or vehicles from adjacent directions

In contrast to the predictions of past research, fatigue crashes were not:

- more likely to involve the shoulder than other rural crashes
- more likely to involve articulated vehicles than cars or light commercial vehicles

In addition, fatigue crashes were characterised by:

- longer trip lengths
- low levels of alcohol
- higher car occupancy
- death or hospitalisation to younger persons

Speeding

- 482 crashes in which excessive speed was identified as the most important or second most important contributing factor
- 499 units, 573 deaths and 464 injured

In comparison with nonspeeding crashes, speeding crashes involved:
- loss of control on the gravel shoulder
- collision with objects or parked vehicles off road
- more 17-20 year old and fewer over 40 year old controllers responsible
- recreation as the purpose of the trip
- unemployed drivers and motorcyclists responsible

Speeding crashes involving alcohol showed the following characteristics
- occurrence at night and on weekends
- off path on curve crashes
- male drivers or motorcyclists (when BAC>.15)

Alcohol

- 731 crashes in which alcohol was coded as the most important or second most important contributing factor
- 832 killed, 352 persons hospitalised

In comparison with other fatal crashes, alcohol crashes were more likely to:

- occur at night and on weekends (more so if BAC>.15)
- occur in Northern Territory (BAC>.15 only)
- be single vehicle crashes (especially pedestrian crashes when BAC>.15)
- involve speeding
- involve male driver (more so when BAC>.15)
- involve motorcyclists (BAC>.15 only)
- involve non-elderly adult pedestrians
- result in more deaths among 21-40 year olds (also 17-20 year olds when BAC .05-.15)

Alcohol crashes were:

- less likely to occur on highways and more likely to occur on other rural roads
- less likely to occur at intersections
- more likely to involve drivers of light commercial vehicles (BAC>.15)
- more likely to involve older cars
- driver responsible more likely to be sole occupant (BAC>.15)
- driver responsible less likely to be wearing seat belt
- driver responsible less likely to be retired and (BAC>.15) more likely to be manual worker or unemployed
- trip purpose was more often recreation to home

Young roadusers

- 425 crashes, 478 people killed, 406 people injured in crashes in which person responsible was aged 17-20 years
- 490 crashes, 562 people killed, 514 people injured in crashes in which person responsible was aged 21-25 years

Compared with crashes for which 26-65 year olds were responsible:
- crashes of young people occurred more often at night
- crashes of young people were more common on the weekend (contribution of high alcohol crashes only)
- younger drivers responsible drove older cars
- cars driven by 17-20 year olds had more passengers
- were more likely to occur in urban areas and less likely to occur on highways
- were more likely to be single vehicle (17-20 year olds)
- young person responsible was more commonly driving a car
- young persons killed were more likely to be motorcyclists
- young people were less likely to be driving to or from work, more likely to be driving to or returning from recreation

In contrast to predictions from past research:
- 17-20 year olds did not have more crashes in states with lower licensing ages
- no over-representation of male drivers

Elderly roadusers

- 279 crashes in which the person responsible was aged over 65 years, 299 fatalities, 189 persons injured

Compared with crashes for which 26-65 year olds were responsible, crashes for which elderly persons were responsible had the following characteristics:

- more daytime crashes (because of more daytime driving?)
- more urban crashes (because of shorter distances driven?)
- more intersection crashes of older drivers, but not older pedestrians

- more multi-vehicle crashes, particularly involving vehicles from adjacent directions, not head-on
- relatively more female drivers and pedestrians responsible
- more common in mid-week
- more common in Victoria and less common in Western Australia
- cars had more occupants
- less likely to be speeding
- less likely to have BAC>.05 but more likely to have BAC unknown

More than 90% of the persons killed in crashes for which over 65 year olds were responsible belonged to this age group.

Review of original documentation

The review of original documentation provided valuable insight into patterns of involvement of causal variables in crashes. In addition, this material contained information which was not coded in the Fatality File. It provides a useful background for hypothesis generation for testing in the Fatality File or by special purpose studies.

Typical scenarios were developed for crashes for each of the seven causal variable categories of fatigue; speeding; alcohol (BAC 0.15, and BAC 0.05-0.15); young roadusers aged 17-20 years and 21-25 years; older roadusers aged over 65 years.

These scenarios particularly highlighted the pre trip activity and circumstance leading to the crash and actual crash details.
Particular aspects highlighted from the case scenarios are:

Fatigue:

Drivers overestimating their capacity to drive (and stay alert) following long bouts of alcohol consumption; or partying till late at night with little sleep; after long hours of work; or long hours of travel to holiday destinations.

Speeding

Overall speeding crashes may be characterised by the drivers not perceiving (or caring about?) the risk inherent in driving at a speed excessive for the road and driver capabilities, nor the possible consequences. If something perturbs the car's motion then the car's high speed and the driver's inexperience (lack of skill), compounded by the vehicle's age, result in loss of control with fatal consequences due to the high energy impact. The driver's skill levels, what ever they may be, are of course further reduced by alcohol and lack of experience. It would also appear that, the drivers in a number of cases do not appear to look at their speedometer regularly.

Alcohol (BAC 0.05-0.15)

Single vehicle crashes: Drivers of the vehicles were commonly noted to have been drinking at the pub, or had a few drinks with their mates. Subsequent driving of the vehicle exhibited factors ranging from sleepiness, inattentiveness to speeding, and to what could be regarded as "showing off" to mates in the car. The single vehicle crashes also exhibited a range of miscellaneous circumstances which could be regarded as consequences of careless and inattentive driving.

The other major group of crashes involved pedestrians. In some cases both the car driver and pedestrian involved had BAC > 0.05. These examples tend to suggest the need to focus beyond drink driving and to the problem of intoxicated people in general, managing themselves in the transport system.

Alcohol (BAC >0.15)

Overall these crashes are characterised by people drinking, usually socially, over a number of hours, moving from hotel to hotel or to other parties, resulting in a high level of BAC. However the degree of intoxication (and hence impairment of driving capacity) does not appear to be apparent to observers, or possibly the person himself. Once on the road the driver usually loses control of the vehicle, often with excess speed involved, resulting in impact with trees or poles, or roll-overs, and in some cases other vehicles.

1. INTRODUCTION

The 1988 Fatality File is a comprehensive database, providing details on each of the 2560 fatal crashes resulting in 2875 fatalities, that occurred in Australia in that year. The database is of special interest and value as it is a national database coded from original police and coronial inquest data, and includes a large and more comprehensive set of variables than found in the State databases. As such the Fatality File is a particularly valuable resource for gaining a fuller understanding of the fatal crashes occurring in Australia and hence directions for further research for countermeasure development to reduce the toll. The Fatality File is compiled by the Federal Office of Road Safety.

The first objective of this project was the quantitative analysis of the Fatality File to provide descriptions of various crashes, selected according to specific characteristics, termed *"causal variables"*. The particular causal variables were specified as:

1. Alcohol involvement (BAC>.05 and >.15)
2. Speeding
3. Driver fatigue
4. Young drivers:
  aged 17-20
  aged 21-25
5. Drivers over the age of 65

In addition the project included a review of original case documentation to provide a brief qualitative description in terms of cases scenarios, for each of the five causal variables examined. As information gained from the analysis of the data base is limited to the variables coded, the review of case material was also aimed at obtaining additional insights not able to be ascertained from the data base.

The third objective was to make recommendations on improving the Fatality File, in terms of completeness of coding, addition of certain variables or deletion of nonuseful variables.

Report Structure

The report is set out in two basic sections:

The results from the detailed analysis for each of the five causal variables are given in Chapters 2 to 6:

-Chapter 2 Fatigue crashes
-Chapter 3 Speeding crashes
-Chapter 4 Alcohol crashes
-Chapter 5 Crashes for which young roadusers were responsible
-Chapter 6 Crashes for which older roadusers were responsible

Chapter 7 provides the case scenarios developed from the samples of original case material for each crash

Each of the chapters are largely self contained and can be read separately, except for cross references to some figures and tables which are used in common.

2. FATIGUE CRASHES

Driver fatigue has been described as a state of drowsiness that ends in the driver falling asleep at the wheel (Näätänen and Summala, 1978). A general feeling of loss of attention, loss of interest and sometimes boredom accompanies the onset of fatigue.

There are 128 crashes in which "driver asleep or fatigued" was identified as the most important causal factor and at least one unit was judged to be responsible. These crashes involved 129 units classed as responsible. 150 people were killed and 175 injured in these crashes.

The first approach taken in this chapter is to examine crashes for which fatigue was identified by the coders as the most important causal factor. Because fatigue crashes are difficult to identify (particularly when the fatigued driver has been killed), it is likely that these crashes represent a subset only of all of the fatal crashes in which fatigue played a major role. For this reason, wherever appropriate, further analyses seek to determine how many other crashes in the Fatal File have the characteristics identified as likely to be fatigue-related.

Past studies have shown fatigue-related crashes to have a number of characteristics in terms of timing, location, crash pattern and characteristics of drivers involved. On the basis of past research one expects fatigue-related crashes to:

- occur more often at night than during the day
- occur more in rural areas than in urban areas
- often be single vehicle or involve a vehicle on the wrong side of the road, not overtaking
- involve the shoulder
- often involve long distance trucks (most of which are articulated)
- involve similar numbers of fatigued car and truck drivers in articulated truck crashes
- more often result in death to fatigued truck drivers than other truck crashes
- involve longer trip lengths
- involve low levels of alcohol
- involve intake of sedatives

Reading of the case material suggested that driver inexperience and higher vehicle occupancy were also characteristics of fatigue crashes. In this chapter, the role of these factors in fatigue crashes as a whole is examined and compared with other crashes.

2.1 TIMING

Research has shown that drivers are much more likely to fall asleep at the wheel during the night than during the day. This has been demonstrated for both car drivers (Hamelin, 1980, in McDonald, 1981 and Lisper, Eriksson, Fagerström and Lindholm, 1979) and truck drivers (Harris, 1977). The crucial period appears to be between 2 and 6 am. Drivers at this time of day not only are likely to fall asleep because it is a normal time for sleeping but often they have also been driving for an extended period.

In Figure 2.1, the time of day that fatigue crashes and other fatal crashes occurred is shown grouped into six hour blocks. More than a third of fatigue crashes occurred between midnight and 6 am. The time of day distributions of Fatigue and other crashes differed significantly, $\chi^2(3)=35.4$, $p<.05$. Relatively more Fatigue crashes occurred between midnight and 6 am and relatively fewer Fatigue crashes occurred between noon and midnight. These findings are in accord with past research.

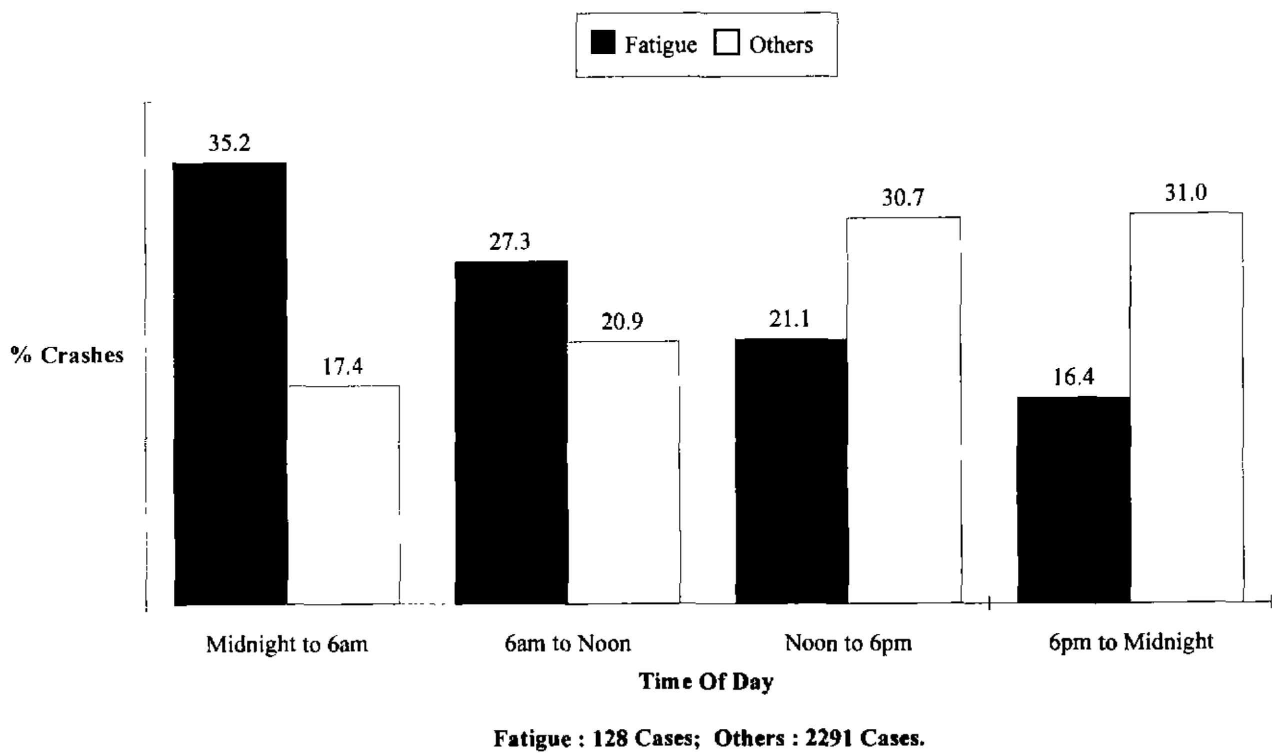


Figure 2.1. Time of day that fatigue and other crashes occurred.

2.2 LOCATION

Fatigue-related crashes have been found to be more common on rural highways than on urban roads. One reason for this is that average trip lengths are likely to be longer on these roads and inattention and drowsiness are brought on by the constant speeds and monotony. In addition, on such highways many other contributors to crashes - poor access control, presence of unprotected utility poles, sub-standard road geometry, etc. - have been removed (Haworth, 1990). Because rural speeds are generally high and because sleeping drivers do not take evasive action, fatigue-related crashes are often severe.

The proportion of Fatigue crashes occurring in rural areas was significantly greater than for other crashes (71.9% vs 40.6%, $z=6.98$, $p<.05$). Twice as many fatigue crashes occurred on rural highways as on other rural roads. Because of the rural nature of fatigue crashes, street lighting was more often missing for Fatigue crashes (71.0% vs 45.6%, $z=3.90$, $p<.05$).

The high proportion of fatigue crashes that occurred in rural areas and specifically on rural highways is in accord with earlier research. From this view, one might expect that a greater proportion of crashes occurring in Queensland, Western Australia, South Australia and Northern Territory were fatigue-related than in other states because of more rural driving in these four states. Table 2.1 below addresses this issue.

Table 2.1. Crashes which occurred in rural areas and proportions of crashes which involved fatigue in each State.

State	Crashes in rural areas	Crashes involving fatigue
NSW	329 (37.8)	35 (4.0)
VIC	238 (39.4)	30 (5.0)
QLD	209 (48.9)	31 (7.3)
SA	92 (46.7)	8 (4.1)
WA	85 (45.7)	15 (8.1)
TAS	35 (55.6)	3 (4.8)
NT	30 (71.4)	6 (14.3)
ACT	3 (9.7)	0 (0.0)

The proportion of crashes that occurred in rural areas and the proportion of crashes that involved fatigue were both highest in the Northern Territory (see highlighted numbers in table). In addition, the two States which had the lowest proportion of rural crashes had the lowest proportion of crashes which involved fatigue (ACT and NSW).

2.3 CRASH PATTERN

When a driver falls asleep at the wheel, he or she ceases steering. Depending on the initial vehicle heading, road camber and curvature, this may eventually result in leaving the carriageway to the left or crossing the centre line onto the wrong side of the road. The consequences of these actions then depend on whether the subject wakes up and the presence or absence of other vehicles. If the subject does not wake up, leaving the road to the left is likely to result in a single vehicle crash coded as off path, on straight or off path on curve. Crossing the centre line may result in a similar single vehicle crash or a multi-vehicle crash coded as head-on not overtaking if another vehicle is impacted on the wrong side of the road.

A recent study of rural single vehicle crashes in Victoria concluded that it was probable that the driver had fallen asleep in 27% of the crashes investigated (Armour, Carter, Cinquegrana and Griffith, 1988). The NSW Heavy Vehicle Crash Study (Sweatman, Ogden, Haworth, Vulcan and Pearson, 1990) found that 49% of the known fatal truck crashes on the Hume and Pacific Highways were coded head on, not overtaking.

Analysis of the Fatal File showed that, on average, Fatigue crashes involved fewer vehicles than non-Fatigue crashes (1.27 vs 1.55, $t(1823)=-5.45$, $p<.05$). This resulted from a larger proportion of Fatigue crashes involving only one vehicle (74.6% vs 48.2%). If single vehicle crashes involving pedestrians are removed, 71.9% of fatigue crashes were truly single vehicle compared with 35.5% of other crashes. This figure is very high, especially if one considers the problem of lack of witnesses to provide evidence of fatigue in single vehicle crashes.

As Figure 2.2 shows, almost a half of the Fatigue crashes involved a vehicle drifting off a straight road. In most of these crashes the vehicle then struck an object or a parked vehicle.

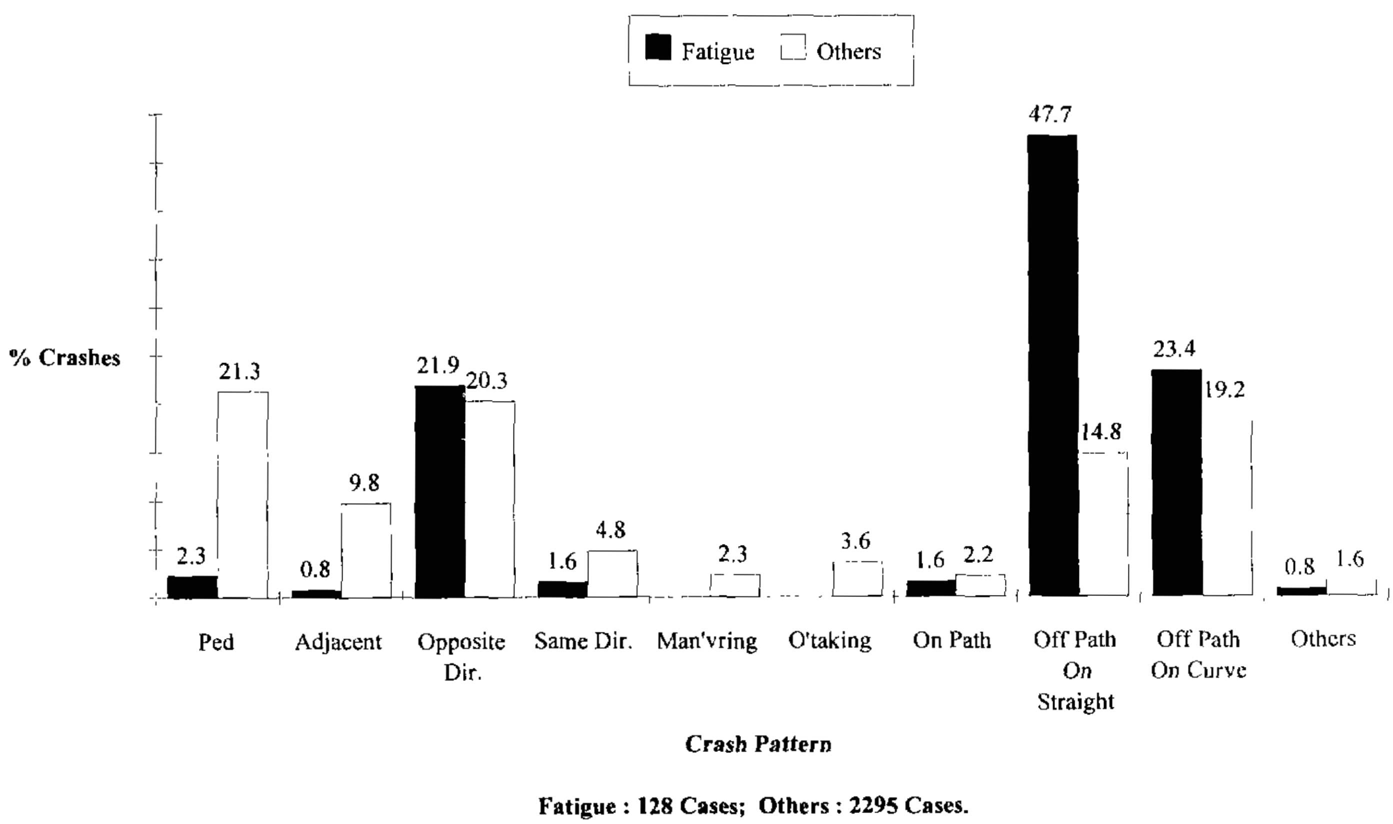


Figure 2.2. Crash patterns of fatigue and other crashes.

The other type of fatigue crash predicted by past research is head-on, not overtaking. 21.9% of fatigue crashes were of this pattern.

If the driver is awoken by drifting onto the shoulder, the result may be over-correction, particularly if the shoulder is soft or loose. For this reason, the shoulder is expected to play a role in fatigue crashes.

Fatigue crashes were more likely than nonfatigue crashes to occur on roads with loose or soft shoulders (see Table 2.2, $\chi^2(4)=53.6$, $p<.05$). However, the shoulder was involved for similar numbers of vehicles in fatigue and nonfatigue crashes (see Table 2.3, $\chi^2(4)=3.4$, $p>.05$).

Table 2.2. Type of shoulder in fatigue and nonfatigue-related crashes. Percentage of crashes is given in brackets.

Type of shoulder	Fatigue crashes	Nonfatigue crashes
Sealed	19 (14.8)	987 (43.0)
Loose	87 (68.0)	921 (40.1)
Soft	8 (6.3)	102 (4.4)
Narrow	2 (1.6)	6 (0.3)
Unknown	12 (9.4)	278 (12.1)

Table 2.3. Role of the shoulder in fatigue and nonfatigue-related crashes. Percentage of crashes is given in brackets.

Shoulder involvement	Vehicles in fatigue crashes	Vehicles in nonfatigue crashes
Off carriageway to left	3 (2.3)	36 (1.8)
Re-enter carriageway	12 (9.3)	113 (5.7)
No shoulder involved	108 (83.7)	1768 (88.4)
Unknown	6 (4.7)	82 (4.1)
Not applicable	0 (0.0)	1 (0.1)

The greater representation of roads with loose or soft shoulders in fatigue crashes could stem from their largely rural nature. When analysis was confined to only rural crashes, the mix of shoulder type did not differ for fatigue and other crashes: 78.3% of fatigue and 71.5% of other crashes occurred where there was a loose shoulder and 5.4% and 7.7% of crashes, respectively, occurred where there was a soft shoulder. Neither did shoulder involvement differ between fatigue and other crashes. About 3% of vehicles went off the carriageway to the left and about 11% re-entered the carriageway.

The lack of role of re-entering the carriageway in fatigue crashes is surprising in the light of past research (Ryan, Wright, Hinrichs and McLean, 1988).

2.4 CHARACTERISTICS OF FATIGUED DRIVERS

The persons responsible for fatigue-related crashes were all drivers or motorcyclists. As Table 2.4 shows, almost two-thirds were car drivers but these made up only a very small proportion of car drivers. In contrast, two of the 10 drivers of light buses were fatigued and 5.6% of drivers of light commercial vehicles were fatigued.

Table 2.4. Type of vehicle driven by person responsible for fatigue-related crash.

Type of vehicle driven	Number	Percent of fatigue crashes	Percent of vehicle type
Motor cycle	3	2.3	0.9
Passenger car	81	62.8	3.8
Forward control van	4	3.1	4.9
Off road vehicle	3	2.3	4.0
Light bus	2	1.6	20.0
Light commercial	22	17.1	5.6
Medium commercial	3	2.3	1.9
Heavy commercial	10	7.8	3.1
Unknown	1	0.8	2.9

2.5 FATIGUE AND TRUCK DRIVERS.

One of the major risk factors for fatigue crashes is driving too long. While this can occur for car drivers, it is more common in truck drivers. Haworth, Heffernan and Horne (1989) reported, however, that it was at least equally likely for the car driver as the truck driver to be fatigued in a crash involving an articulated vehicle. Fatigue crashes may have more severe consequences for truck drivers than other types of crashes (Leggett, 1988).

There were 17 fatigue-related crashes in which a heavy commercial vehicle (>12t GVM) was involved. The heavy commercial vehicles involved were 2 rigid trucks, 13 semi-trailers, one road train and one B-double. Table 2.5 shows the distribution by state of articulated vehicle crashes and those which involved fatigue. It is interesting to note that, according to the Fatal File, 4.1% of Victorian fatal articulated vehicle crashes involved fatigue. This is considerably lower than the estimates of 9.1% (based on Coroner's findings) or 19.9% (based on the authors' judgement) which were reported by Haworth et al. (1989) for 1984-1986.

Table 2.5. Articulated truck crashes and the role of fatigue for each state.

State	Articulated vehicle crashes	Fatigue-related articulated vehicle crashes	
		Number	Percentage of artic. crashes
NSW	128	6	4.7
VIC	49	2	4.1
QLD	55	5	9.1
SA	18	0	0.0
WA	11	1	9.1
TAS	4	0	0.0
NT	5	1	20.0
ACT	2	0	0.0
Australia	272	15	5.5

Of the 15 fatigue crashes in which an articulated vehicle was involved, 6 were single-vehicle, 8 involved two vehicles and 1 involved three vehicles. There were no pedestrians involved in these crashes.

In the nine multi-vehicle fatigue crashes involving articulated vehicles, it was the driver of the other vehicle, not the truck driver, who was fatigued in six crashes. The drivers considered responsible were 2 car drivers and 4 drivers of light commercial vehicles. Thus drivers of cars or light commercial vehicles were as likely as truck drivers to be fatigued in crashes involving an articulated vehicle crashes, in line with the findings of Haworth et al. (1989).

The Fatal File provides some evidence to support the view that crashes of fatigued truck drivers are more likely to be fatal to the driver than other truck crashes. 314 heavy commercial vehicles were involved in fatal crashes (25 rigid trucks, 271 articulated trucks and 18 other heavy commercial vehicles). While the number of heavy commercial vehicles involved in fatigue-related crashes is small, 7 of the 17 drivers were killed (41.2%) compared with 52 of the 297 drivers (17.5%) involved in nonfatigue-related crashes.

It has been speculated that overturning of articulated vehicles in fatigue-related crashes may be the cause of the high severity of these crashes to the driver of the truck. Of the 7 truck drivers killed in fatigue crashes, 6 were rollovers. All of these crashes involved only one vehicle.

2.6 TRIP PURPOSE AND LENGTH

The most common trip purposes for persons responsible for fatigue and other crashes are shown in Table 2.6. Pedestrians were excluded from this analysis because it was thought that their data would distort the comparison. The percentages are calculated only where trip purpose was known. About a third of the fatigue crashes occurred during trips from recreation to home (e.g. returning from a party, returning from holidays). In contrast, these trips made up only a quarter of nonfatigue crashes. This is in accord with a general tiredness involvement in these crashes.

Interestingly, about a quarter of fatigue crashes and other crashes could be classed as work-related (home to work, work to work, work to home, work to recreation etc). The case studies highlighted factors such as leaving night shift.

When the analysis was repeated focussing only on drivers very similar percentages and the same overall pattern were found.

Table 2.6. Percent of trips for each of the most common trip purposes. Note that both origin and destination of trip were unknown for 31.8% of fatigue crashes and 47.9% of other crashes.

Trip purpose	Fatigue crashes	Other crashes
Recreation to Home	36.4	24.0
Home to Recreation	13.6	8.3
Work to Home	11.4	4.8
Work to Work	10.3	14.2
Recreation to Recreation	10.3	14.4

In the Fatal File, trip purpose is coded as two variables, origin and destination. For fatigue crashes each of these variables had about one-third of the data missing. The data were missing for origin and destination for about half of the nonfatigue crashes, suggesting that fatigue is more likely to be coded as an important contributing factor if there is more evidence available about the purpose, length etc of the trip.

The Fatal File provides two types of information about trip length. Distance from the commencement of the trip is a direct measure. The Fatal File is one of the few mass crash data files which provides this information. However, as Table 2.7 shows, this information is unknown for more than a third of vehicles (note: Table 2.7 excludes pedestrians). As was noted in the examination of trip purpose, the proportion of vehicles for which distance from commencement was unknown was less for fatigue crashes than other crashes.

Distance from home is an indirect measure of trip length. It provides a better estimate when the origin of the trip is the driver's home than when the destination is the driver's home. As Table 2.8 shows, distance from home is unknown for only about 5% of vehicles responsible (excluding pedestrians).

Table 2.7. Distance from the commencement of the trip for vehicles responsible for fatigue crashes and other crashes (excludes pedestrians).

Distance from commencement of trip (km)	Fatigue crashes (%)	Other crashes (%)
<50	34.9	40.7
51-100	8.5	3.1
101-500	17.1	4.9
>500	4.7	0.4
Unknown	34.9	50.7

Table 2.8. Distance from home for controllers of vehicles responsible for fatigue crashes and other crashes (excluding pedestrians).

Distance from home (km)	Fatigue crashes (%)	Other crashes (%)
<1	3.1	4.9
1-5	10.9	24.9
6-10	14.7	16.5
11-50	18.6	24.8
51-100	7.8	5.9
101-500	22.5	12.0
>500	17.8	4.9
Unknown	4.7	5.6

Fatigue was over-represented when distance from the commencement of the trip was greater than 100 km and when distance from home was greater than 50 km (see Tables 2.7 and 2.8).

Distance from commencement of the trip was examined for different types of vehicles responsible for fatigue crashes (see Table 2.9). All three motorcyclists had travelled less than 50 km from the commencement of the trip. The extent of missing data made interpretation for other types of vehicle more difficult.

Table 2.9. Distance from commencement of the trip and distance from home as a function of type of vehicle - persons responsible for fatigue crashes only.

Type of vehicle	Over 100 km from commencement of trip			Over 100 km from home	
	Number	% of known	% of all	Number	% of all
Motorcycle	0	0.0	0.0	1	33.3
Car or derivative	20	33.9	22.7	40	45.5
Bus	0	-	0.0	1	50.0
Light Commercial	3	25.0	13.6	7	31.8
Medium Commercial	0	0.0	0.0	1	33.3
Heavy Commercial	5	62.5	50.0	7	70.0

Given that distance from commencement of the trip is unknown for a third of the vehicles responsible in fatigue crashes in the Fatal File and is not coded at all in most other files, it is of interest to examine how good an estimate is provided by the proxy measure, distance from home.

As Table 2.10 shows, distance from home was a good predictor of distance from place of commencement of trip when the latter was less than 50 km. It was a poorer predictor for longer trip distances. However, for about half of the trips of greater than 500 km, distance from home was coded as greater than 500 km. Thus distance from home was a reasonable estimate of trip distance in about half of the cases.

Table 2.10. Distance from home as a function of distance from place of commencement of trip.

Distance from home (km)	Distance from place of commencement of trip (km)				
	<50	51-100	101-500	>500	Unknown/not applicable
<50	**923**	23	20	2	848
51-100	31	**30**	16	1	67
101-500	31	11	**77**	3	164
>500	24	12	20	**8**	69
Unknown/not applicable	45	3	1	1	99

The risk of falling asleep is also higher if driving is undertaken after a full day's work, compared with driving after resting. Recent experimentation at MUARC has shown this to be particularly so for manual work. While the Fatal File does not code activity prior to driving, employment status is available and may be a possible proxy. Examination of the employment status variable showed large variability among fatigued drivers but suggested that tradespersons were more strongly represented among fatigued drivers than drivers responsible for other types of crashes (14.3% vs 8.4%). This is accord with the findings of our experimental research.

2.7 ALCOHOL AND OTHER DRUGS

Low levels of alcohol depresses the central nervous system and makes a driver more likely to fall asleep at the wheel (Ryder, Malin and Kinsley, 1981). At higher levels of alcohol, the disruptions to perceptual-motor coordination are probably more important in increasing crash risk than is the drowsiness-inducing effect of alcohol.

Certain medications such as some cough medicines, cold tablets, hay fever, allergy medications and sedatives can increase a driver's risk of falling asleep at the wheel.

The alcohol levels of drivers responsible for fatigue crashes and other crashes are shown in Figure 2.3. High BACs were less common in fatigue crashes but 7 drivers in fatigue crashes were found to have a BAC between .05 and .15.

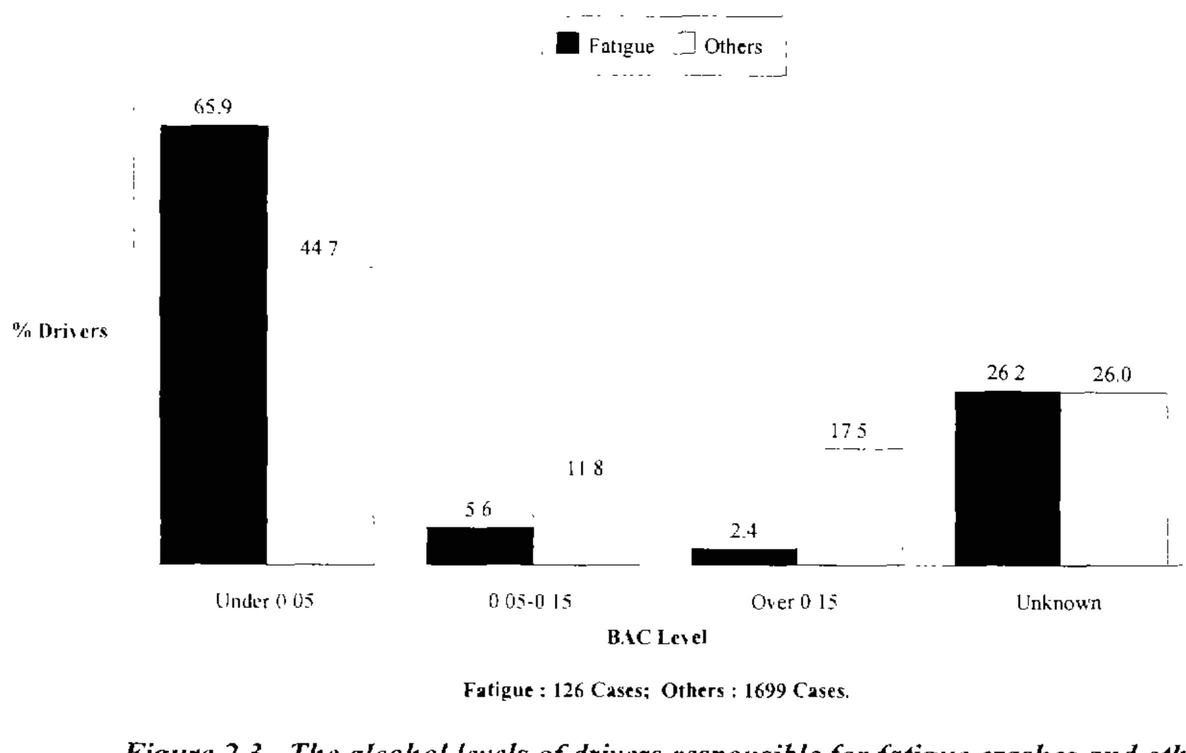


Figure 2.3. The alcohol levels of drivers responsible for fatigue crashes and other crashes.

Alcohol levels were unavailable for about 26% of drivers responsible for fatigue crashes and other crashes. The extent of missing BAC data for drivers did not appear to be affected by vehicle type or whether the crash occurred in an urban or a rural area. There was less missing data for drivers who had been killed. For both fatigue and nonfatigue crashes, data were missing for about half of the drivers responsible for crashes occurring in Queensland and missing data were less common in NSW.

Thirteen of the 126 drivers responsible in fatigue-related crashes were tested for drugs (10.3%). Drugs were detected in 12 of these drivers (9.5%). This compares with 101 drivers tested and 98 drivers positive in other crashes (5.9% and 5.8%, respectively). Anaesthetics (including pentothal, cannabinoids, marijuana and cocaine) were the most common drug type detected in either group (6 and 64 drivers, respectively). Sedatives or hypnotics were detected in only one fatigued driver. The high hit rates for drug testing probably results from testing only occurring when the presence of drugs is strongly suspected.

It is important to note that some of the drugs which are commonly thought to play a role in fatigue crashes were not tested for, e.g. the antihistamine group. This may have resulted from the testing being aimed at detection of illegal drugs rather than all drugs which can adversely affect driving.

Testing for drugs was not only uncommon but was affected by severity of injury to the driver. Table 2.11 shows that most drivers who were tested had been killed in the crash. For fatigue crashes, 12 of the 13 drivers tested had been killed (88 of 101 for nonfatigue crashes).

Table 2.11. Drug testing rates as a function of injury severity - drivers responsible for crashes only.

Injury severity	Fatigue crashes		Other crashes	
	Testing rate (%)	Total drivers	Testing rate (%)	Total drivers
Not injured	0.0	10	0.6	349
Injured, no medical attention	0.0	1	4.3	23
Injured, medical attention	0.0	6	2.6	156
Injured, hospitalised	4.8	21	2.1	285
Died	13.8	87	10.1	873
Unknown	0.0	1	0.0	15

2.8 ROLE OF INEXPERIENCE

Driver experience was analysed to assess whether the over-representation of inexperienced drivers suggested by the case material is typical of fatigue crashes. The case material and experimental studies of the development of driver fatigue suggest that it is inexperience in long distance driving, rather than time that a licence has been held that is the important factor. Unfortunately, the former is not available in the Fatal File or any other mass crash data file.

Driver experience was unavailable for more than half of the drivers in either type of crash. The proportion of drivers who had held a licence for less than five years was similar in fatigue and nonfatigue crashes (12.9% and 14.7%, respectively).

Because of the extent of missing data for driver experience, driver age was analysed as a proxy for driver experience. The analysis found that 30 (24.0%) of drivers responsible in fatigue crashes were under 21 years of age. While this proportion is sizeable, a similar proportion was found in other crashes (320, 19.1%).

Overall, the distributions of driver age and experience were similar in the two types of crashes. There was no evidence of a greater role of youth or inexperience in fatigue crashes compared with other crashes.

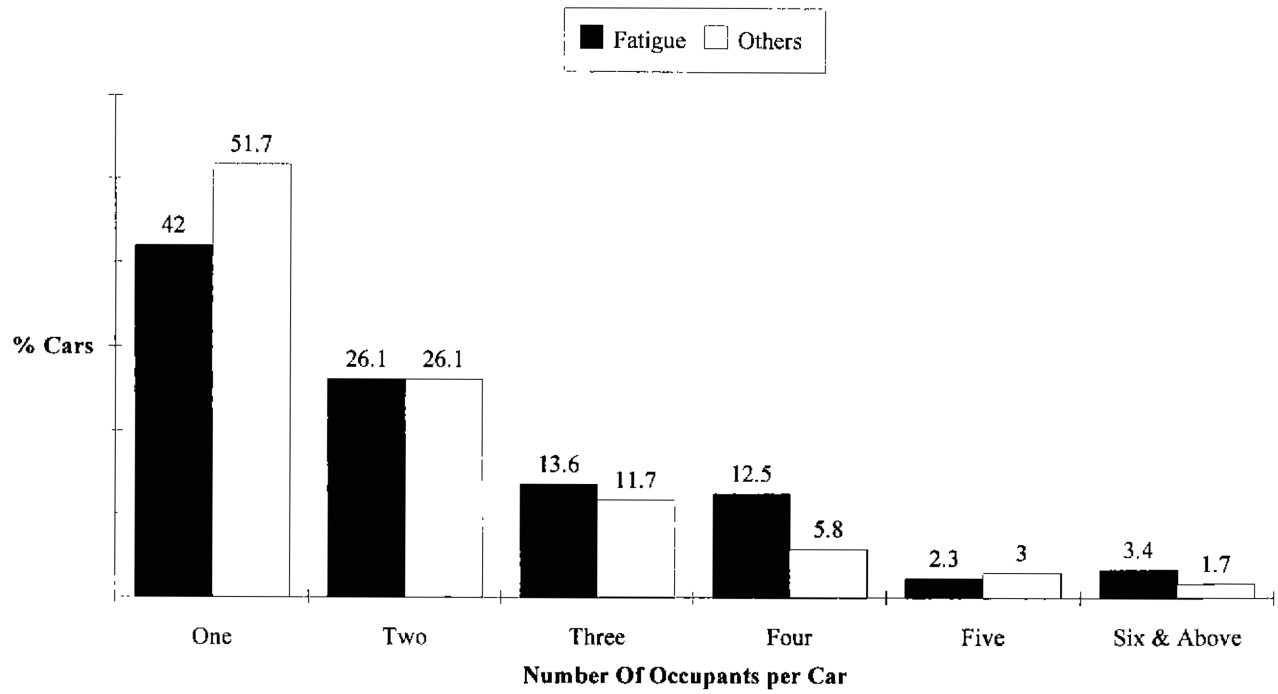
2.9 VEHICLE OCCUPANCY

From the case material it could be concluded that some cars involved in fatigue crashes had a high rate of occupancy. This was often because the whole family were returning from holidays.

The Fatal File was examined to find whether this pattern was characteristic of fatigue crashes as a whole. Because of the different vehicle mix for fatigue crashes (e.g. fewer motorcycles), vehicle occupancy was examined for cars only. The cars considered responsible had a higher occupancy rate in fatigue crashes than other crashes (2.17 vs 1.88 persons, $t(1647)=2.14$, $p<.05$). The numbers of occupants in fatigue and nonfatigue crashes are shown in Figure 2.4. Almost a third of cars responsible in fatigue crashes had more than two occupants compared with about a fifth of cars responsible in nonfatigue crashes. This may reflect higher occupancy in long distance travel or the increased probability of witnesses (passengers) being available to provide evidence of fatigue.

The occupancy of heavy vehicles was similar in fatigue and nonfatigue crashes (1.20 vs 1.41, $t(133)=-.81$, $p>.05$).

The mean ages of car drivers, motorcyclists and pedestrians responsible in Fatigue and non-Fatigue crashes did not differ (35.7 vs 36.0 years, $t(2525)=-.20$). However persons killed or hospitalised in Fatigue crashes were on average younger than in other crashes (32.5 vs 35.6 years, $t(4412)=-2.20$, $p<.05$).



Fatigue : 88 Cases; Others : 1561 Cases.

Figure 2.4. The numbers of occupants in fatigue and nonfatigue crashes.

2.10 SUMMARY

There are 128 crashes in which fatigue was identified as the most important causal factor and at least one unit was judged to be responsible. These crashes involved 129 units classed as responsible. 150 people were killed and 175 injured in these crashes.

The results of the analyses of the Fatal File agreed with past research in showing that fatigue crashes were more likely than other types of crashes:

- to occur between midnight and 6 am but less likely to occur between noon and midnight
- to occur in rural areas, on highways and in the absence of street lighting
- to be single vehicle crashes and involve fewer vehicles on average than other crashes
- to be off path, on straight crashes and less often involve pedestrians or vehicles from adjacent directions

In addition, fatigue crashes

- involved longer trip lengths
- involved low levels of alcohol

In contrast to the predictions of past research:

- fatigue crashes were no more likely to involve the shoulder than were other rural crashes
- the involvement of articulated vehicles (which are characterised by driving long distances) was no greater than that of cars or light commercial vehicles

Examination of the case material for fatigue crashes suggested that inexperienced drivers and high car occupancy were features of fatigue crashes. Analysis of the mass data showed that similar proportions of drivers were inexperienced in fatigue and other crashes. Car occupancy was found to be higher for fatigue crashes. This may have reflected higher occupancy in long distance travel or the increased probability of witnesses (passengers) being available to provide evidence that the driver was fatigued.

Analysis of the core variables showed that fatigue crashes were more likely to result in death or hospitalisation to younger persons.

The analyses of the role of fatigue used several variables from the Fatal File which are not available from other mass crash data files. These variables are trip purpose (coded as two variables, origin and destination) and trip length coded as distance from commencement of the trip. While data are missing for about one-third of cases for these variables, the remaining data are extremely useful. The latter variable allowed an assessment of the accuracy of using distance from home as a proxy for trip length. This proxy is the only information available (or able to be derived) from most mass crash data files.

It is important to note that some of the drugs which are commonly thought to play a role in fatigue crashes were not tested for, e.g. the antihistamine group. This may have resulted from the testing being aimed at detection of illegal drugs rather than all drugs which can adversely affect driving.

3. SPEEDING

Analysis of the Fatality File has identified 482 crashes in which excessive speed was identified as the most important or the second most important contributing factor. Thus excessive speed was considered important in 18.8% of all fatal crashes. These 'speeding' crashes resulted in 573 deaths and 464 people injured.

Initial analyses showed that 499 units were coded as at least partially responsible for the 482 crashes in which speeding was identified as the most important, or the second most important, contributing factor. There were 15 crashes in which two units were coded as responsible and one crash in which three units were coded as responsible. The data were then examined to identify which of the units had been speeding in these speeding crashes. After excluding units which were responsible but not speeding, 381 speeding drivers and 104 speeding motorcyclists were identified as responsible for speeding crashes. Speeding crashes accounted for about half of the crashes in which motorcyclists were considered to be responsible.

On the basis of earlier research, it was expected that speeding crashes would often involve alcohol. For this reason, speeding crashes were examined as a function of blood alcohol concentration (BAC) of person responsible (maximum BAC if more than one person responsible). The numbers and percentages of speeding and nonspeeding crashes at each maximum blood alcohol concentration (BAC) of persons responsible are shown in Table 3.1.

Since only drivers or motorcyclists could be responsible for speeding crashes, comparisons with other crashes in this chapter are restricted to other crashes for which drivers or motorcyclists were responsible.

Table 3.1. Numbers and percentages (in brackets) of speeding and nonspeeding crashes as a function of maximum blood alcohol level (BAC) of persons responsible. "Other crashes" are crashes in which speeding was not identified as the most important or second most important causal factor.

Maximum BAC	Speeding crashes	Other crashes
<.05	164 (34.1)	759 (49.9)
.05-.15	88 (18.3)	155 (10.2)
>.15	141 (29.3)	221 (14.5)
Unknown	88 (18.3)	386 (25.4)
Total	481 (100.0)	1521 (100.0)

Other predictions from earlier research were that speeding crashes would:

- occur at night and on weekends to the extent that alcohol is involved
- often occur on curves

- often involve loss of control on a gravel shoulder
- result in more rollover or collision with fixed object off the road
- involve more young drivers, fewer elderly drivers
- be more common among young drivers when there are others in the car
- involve male drivers

Reading of the case material suggested that speeding crashes often involve nonuse of seat belts. In this chapter, this will be investigated and its relationship to alcohol examined. In addition, the case material suggested that speeding crashes often involved offset impacts with fatal injuries incurred by the impact side occupant. This is examined for speeding crashes as a whole in this chapter.

Further characteristics which were examined include:

- socioeconomic status
- vehicle type
- trip purpose
- the interaction of vehicle age and driver age

3.1 TIMING

Overall, speeding crashes are more likely to occur at night than other crashes, 67.1% vs 44.0% ($z=9.06$, $p<.05$). When crashes are classified according to highest alcohol concentration of persons responsible, the pattern becomes somewhat more complicated (see Figure 3.1).

Sober speeding crashes (BAC<.05) are equally likely to occur during the day or at night (52.5% vs 47.6%). Relative to sober nonspeeding crashes, however, sober speeding crashes are still somewhat over-represented at night (see Figure 3.1).

When compared with sober speeding crashes, alcohol speeding crashes are more common during the night than during the day (BAC .05-.15 vs. BAC<.05: $z=5.77$, $p<.05$; BAC>.15 vs BAC<.05, $z=7.24$, $p<.05$). However, the extent of night-time over-representation is similar to that of alcohol nonspeeding crashes (BAC .05-.15 vs. BAC<.05: $z=10.62$, $p<.05$; BAC>.15 vs BAC<.05, $z=14.74$, $p<.05$). The temporal pattern of BAC unknown speeding crashes was similar to that of sober speeding crashes.

Thus, the finding that speeding crashes as a whole are more likely to occur at night reflects the role of alcohol in many of these crashes. However, nonalcohol speeding crashes are still more likely to occur at night than other nonalcohol crashes.

The distribution of speeding and other crashes by day of week is shown in Figure 3.2. The statistically significant difference between the distributions ($\chi^2(6)=30.1$, $p<.05$) appears to arise largely from more speeding crashes occurring on Friday, Saturday and Sunday.

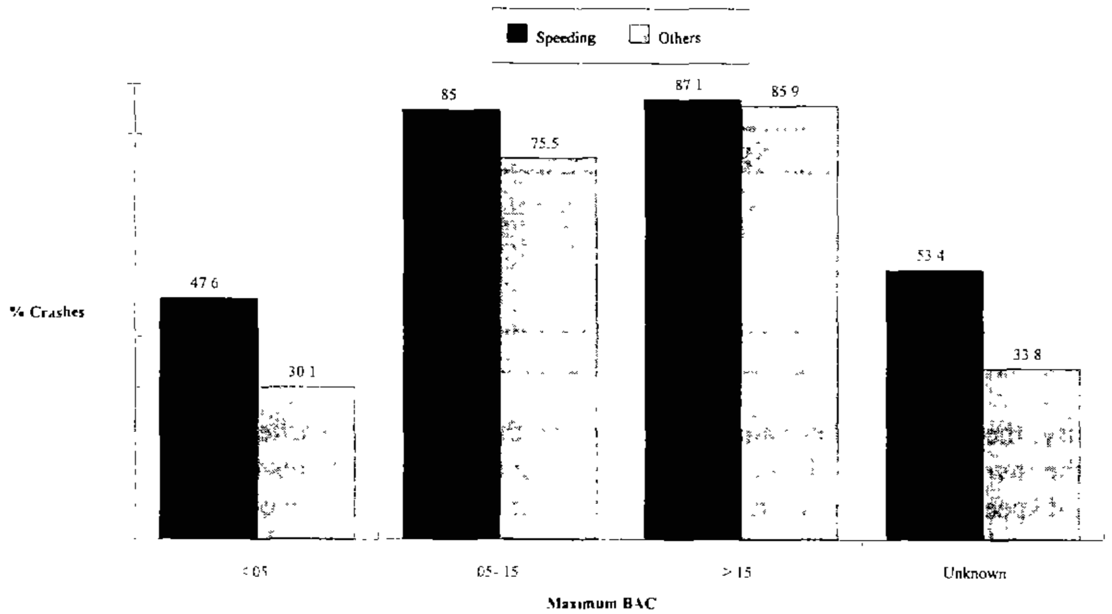


Figure 3.1. Percentages of speeding and nonspeeding crashes which occurred at night as a function of highest blood alcohol concentration (BAC) of the persons responsible.

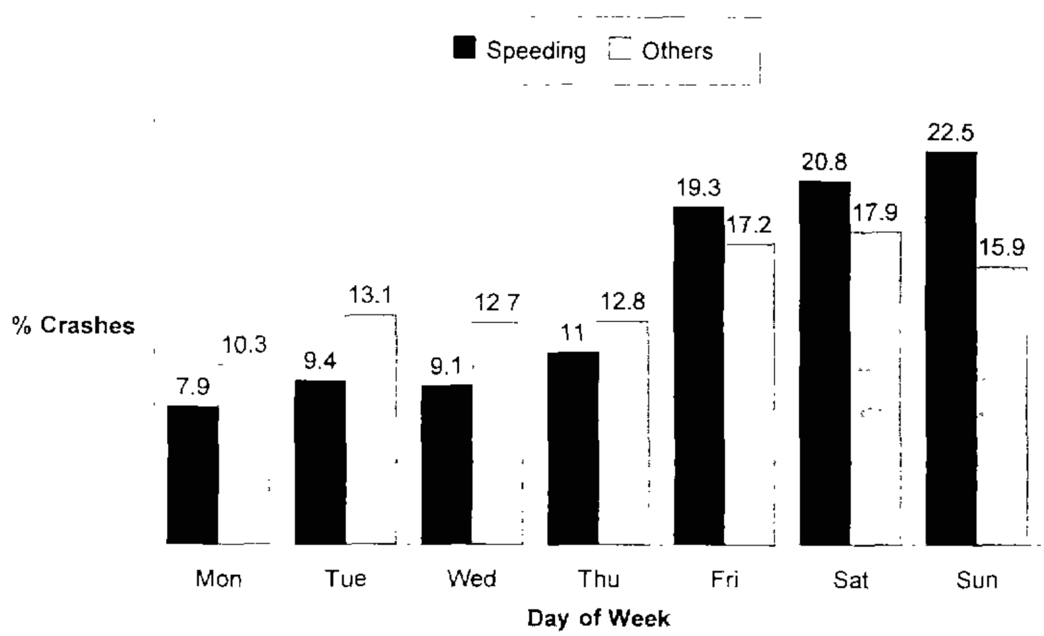


Figure 3.2. The distribution of speeding and other crashes by day of week.

Table 3.2 shows that the proportion of speeding crashes that occurred on Saturday or Sunday was greater when alcohol was involved (51.2% vs 34.2%, z=2.63, p<.05, 49.7% vs 34.2%, z=2.74, p<.05). The same was true for other (i.e. nonspeeding) crashes, however (44.5% vs 28.1%, z=4.03, p<.05, 50.2% vs 28.1%, z=6.13, p<.05).

Table 3.2. Numbers and percentages of speeding and other crashes that occurred on Saturday or Sunday as a function of maximum Blood Alcohol Concentration (BAC) of persons responsible.

BAC	Speeding crashes	Other crashes
<.05	56 (34.2)	213 (28.1)
.05-.15	**45 (51.2)**	**69 (44.5)**
>.15	**70 (49.7)**	**113 (50.2)**
Unknown	37 (42.0)	122 (31.6)
Total	208 (43.2)	517 (34.0)

In summary, the results of these analyses supported the findings of earlier research that it is the involvement of alcohol in speeding crashes that contributes to the overall pattern that speeding crashes are more likely to occur at night and on weekends. However, speeding crashes without alcohol involvement are also more likely to occur on weekends.

3.2 LOCATION

Do speeding crashes occur mainly on the open road, where the speed limit is 100 or 110 km/h? Or do more speeding crashes result from travelling at relatively high speed in urban areas where traffic densities are higher and there are more unprotected road users? These questions are addressed in this section.

As noted in the case studies, speeding crashes were more likely to occur in urban areas than were other crashes (61.9% vs.48.6%, z=4.93, p<.05). Table 3.3 shows that the proportion of speeding crashes that occurred in urban areas at each BAC level were similar.

Table 3.3. Numbers and percentages of speeding and other crashes that occurred in urban areas as a function of maximum BAC of persons responsible.

Maximum BAC	Speeding crashes	Other crashes
<.05	107 (65.2)	351 (46.2)
.05-.15	57 (64.8)	77 (49.7)
>.15	81 (57.4)	110 (50.0)
Unknown	48 (54.5)	190 (49.5)
Total	293 (60.9)	728 (48.0)

A greater proportion of motorcyclists than drivers were responsible for speeding crashes in urban areas (76.0% vs 57.2%, z=3.49, p<.05). A similar pattern was observed for nonspeeding crashes of motorcyclists, however (63.4% vs 47.1%, z=3.71, p<.05). Thus this finding might reflect greater urban than rural riding by motorcyclists or that motorcyclists as unprotected road users are killed at lower crash speeds than car occupants. Alternatively urban riding may be relatively more hazardous for motorcyclists than rural riding.

An alternative classification of crash location can be based on speed limits. Table 3.4 shows the range of posted speed limits at the crash locations. Almost a half of the speeding crashes occurred in 60 km/h speed zones and about a quarter occurred in 100 km/h speed zones. Compared with other crashes, speeding crashes more commonly occurred in 60 km/h speed zones (z=5.39, p<.05) and less commonly occurred in 100 km/h speed zones (z=-5.29, p<.05).

A comparison of posted speed limits and speed estimates can provide information about the magnitude of excessive speed. Unfortunately, estimated speed was missing for about half of the vehicles responsible for speeding crashes. Not all of the vehicles responsible for speeding crashes were estimated to be travelling above the speed limit: the speed of 7 of the 485 speeding vehicles was estimated to be below the posted speed limit. These vehicles, while not exceeding the speed limit, were considered to be travelling at an excessive speed for the conditions.

Table 3.4 showed that a large number of speeding crashes occurred in 60 km/h zones (both in absolute numbers and relative to other crash types). These vehicles were often travelling more than 30 km/h above the speed limit (more than half of the speeding vehicles for which an estimated speed was available). In 100 km/h speed zones, similar numbers of vehicles were travelling between 15 and 30 km/h as more than 30 km/h above the speed limit.

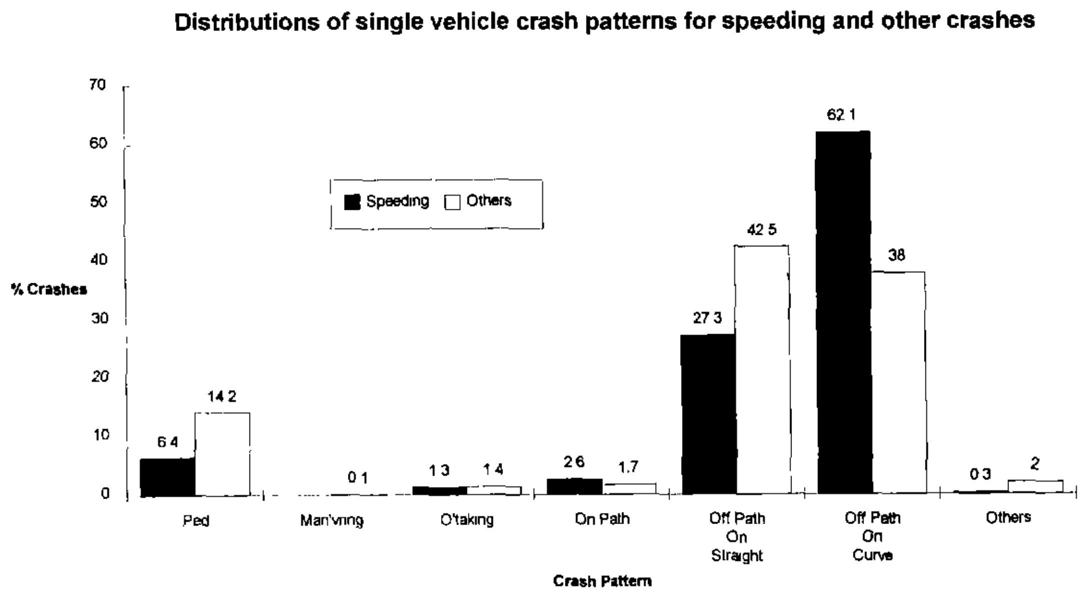
Table 3.4. Posted speed limits at crash locations. Number and percentage (in brackets) of crashes are presented.

Speed limit	Speeding crashes	Other crashes
<60	8 (1.7)	4 (0.3)
60	**226 (47.0)**	**508 (33.4)**
61-79	19 (4.0)	54 (3.6)
80	41 (8.5)	109 (7.2)
81-99	8 (1.7)	12 (0.8)
100	**132 (27.4)**	**620 (40.8)**
101-110	39 (8.1)	163 (10.7)
Unknown	8 (1.7)	51 (3.4)
Total	481 (100.1)	1521 (100.2)

3.3 CRASH PATTERN

Overall, 64.3% of speeding crashes were single vehicle crashes. This compares with 45.8% of other crashes (z=7.12, p<.05). For both speeding and other crashes, the proportion of crashes which were single vehicle appeared to be higher when a driver rather than a motorcyclist was responsible (speeding crashes: 65.9% vs 58.7%, other crashes: 46.3% vs 40.8%).

Figure 3.3 shows the different distributions of crash patterns observed for speeding and other crashes. Because only drivers and motorcyclists were coded as speeding, speeding crashes were compared with those other crashes for which only these two types of road users were responsible. The upper panel shows that off-path on curve crashes comprised over 60% of single vehicle speeding crashes, but less than 40% of single vehicle non-speeding crashes.



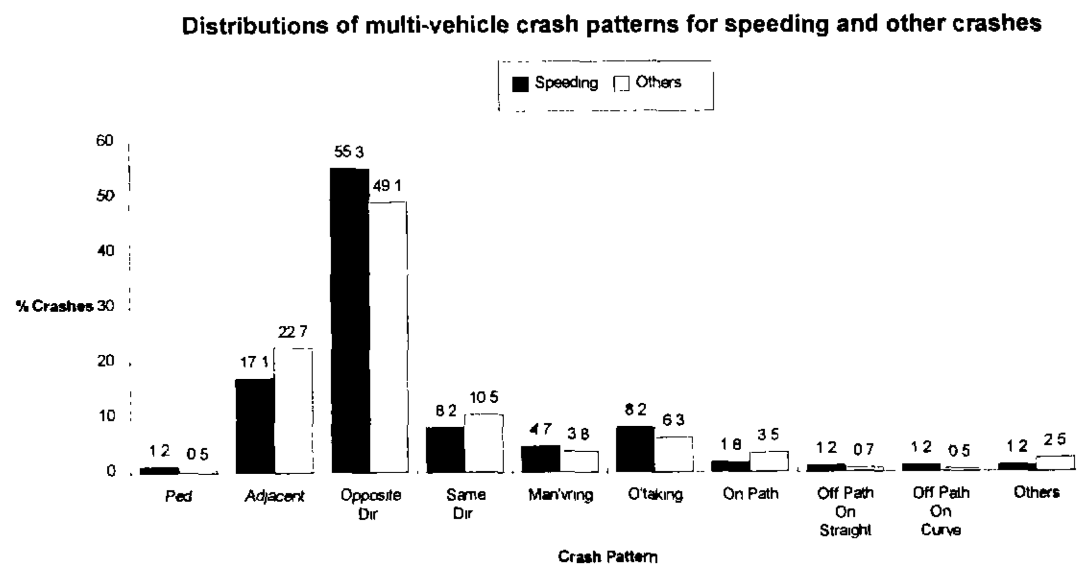


Figure 3.3. Distributions of crash patterns for single vehicle (upper chart) and multi-vehicle (lower chart) speeding and other crashes.

The distributions of multi-vehicle crash patterns for speeding and other crashes did not differ (χ^2 (9) =9.7, p>.05)

Table 3.5 shows that the percentages of both speeding and other crashes that were off-path on curve was greater when alcohol was involved (speeding crashes: BAC .05-.15 vs BAC<.05, z=3.15, p<.05; BAC >.15 vs BAC<.05, z=3.28, p<.05; other crashes: BAC .05-.15 vs BAC<.05, z=4.50, p<.05; BAC>.15 vs BAC<.05, z=6.19, p<.05).

Table 3.5. The numbers and percentages of speeding and other crashes that were off-path on curve as a function of maximum blood alcohol concentration (BAC) of the drivers responsible.

Maximum BAC	Speeding crashes	Other crashes
<.05	49 (29.9)	101 (13.3)
.05-.15	44 (50.0)	43 (27.7)
>.15	68 (48.2)	69 (31.2)
Unknown	34 (38.6)	61 (15.8)
Total	195 (40.5)	274 (18.0)

Rural speeding crashes were examined to see if loss of control on gravel shoulders indeed plays an important role. A loose shoulder was present in about three-quarters of all speeding or other crashes. When a loose shoulder was present, it was considered to have contributed to the crash in 20.5% of speeding crashes and 14.4% of other crashes.

Past research suggests that rollover and collision with objects off the road are more common in speeding crashes than other types of crashes. From the available data the proportions of vehicles (other than two-wheelers) responsible for speeding and other crashes which rolled over were similar (20.7% vs 18.8%, z=0.84, p>.05). When the analysis was restricted to rural crashes, the proportions were somewhat higher but remained similar (33.1% vs 27.9%, z=1.32, p>.05).

Speeding crashes were more likely to result in a collision with obstacles or parked vehicles off the carriageway than other crashes (49.1% vs 27.9%). Table 3.6 shows that collisions after running off the road on the straight were less common for speeding than other crashes whereas collisions after running off the road on a curve were more common for speeding crashes. The Table suggests that more of these crashes resulted from a failure to negotiate the bend than turning too tightly.

Table 3.6. Collisions with obstacles or parked vehicles off the carriageway. Number and percentage (in brackets) of crashes are presented. Crashes in which rollover but no collision occurred are not included.

Off carriageway into object or parked vehicle	Speeding crashes	Other crashes
Off path on straight		
Left	43 (18.1)	121 (27.6)
Right	29 (12.2)	105 (23.9)
Off path on curve or turning		
Left off carriageway on right hand bend	60 (25.2)	89 (20.3)
Right off carriageway on right hand bend	38 (16.0)	31 (7.1)
Right off carriageway on left hand bend	49 (20.6)	66 (15.0)
Left off carriageway on left hand bend	19 (8.0)	27 (6.2)
Total off path crashes	238 (100.1)	439 (100.1)

3.4 OFFSET IMPACTS

The case material suggested that speeding crashes often involved offset frontal impacts with fatal injuries incurred by the impact side occupant. Analysis of the speeding crashes as a whole failed to confirm this pattern. The largest number of drivers (52) and the largest number of front left passengers (17) were killed when the point of impact was coded as the whole of the front of the car (in about 90% of these cases the direction of impact was coded as front on). Next most commonly fatal for both categories of occupant was overturn (35 and 12, respectively).

Offset frontal impacts resulted in death to the driver in 22 speeding crashes (9.8% of drivers killed) and death to the front left passenger in 15 speeding crashes (16.9%). Similar percentages were found when other crashes were examined (12.6% and 12.2%).

Thus, the conclusion drawn from the case studies is not supported by the mass data as coded. The mass data highlight the role of impact spread across the entire front of the car rather than offset impacts. Perhaps crashes in which the point of impact was offset frontal but damage was extensive were coded as "whole of the front of the car".

3.5 VEHICLE CHARACTERISTICS

What types of vehicles were responsible for speeding crashes? Table 3.7 shows that about two-thirds of these vehicles were passenger cars, as would be expected from exposure. Motorcycles comprised more than a fifth of the vehicles responsible for speeding crashes and were twice as likely to be responsible for a speeding crash as another type of crash. No buses were responsible for speeding crashes. A small number of trucks were responsible for speeding crashes but they were less likely to be responsible for speeding crashes than other types of crashes.

Overall, there were no differences in the age distributions of vehicles responsible for speeding and other crashes. The age of the vehicle was unknown in about 35% of cases. About 38% of vehicles were less than 10 years old and about 27% of vehicles were between 10 and 20 years old.

Folklore suggests that young drivers driving older, customised vehicles are commonly responsible for speeding crashes. Table 3.8 shows the ages of vehicles driven by 17-25 year old and older drivers and motorcyclists. Young drivers and motorcyclists are no more likely to drive a vehicle more than 10 years old in speeding crashes than other crashes (34.8% vs 29.6%, $z=1.52$, $p>.05$). However, young drivers are more likely to drive older vehicles overall, regardless of whether they were responsible for a speeding crash or a nonspeeding crash (speeding: 34.8% vs. 19.5%, $z=3.67$, $p<.05$; other crashes: 29.6% vs 23.5%, $z=2.64$, $p<.05$).

Table 3.7. Types of vehicles responsible for speeding and other types of crashes.

Vehicle type	Speeding crashes	Other crashes
Motorcycle	104 (21.4)	139 (8.8)
Motorcycle and sidecar	0 (0.0)	3 (0.2)
Passenger car	326 (67.2)	975 (62.0)
Forward control van	5 (1.0)	32 (2.0)
Off road	0 (0.0)	37 (2.4)
Light bus	0 (0.0)	8 (0.5)
Heavy bus	0 (0.0)	11 (0.7)
Light commercial	34 (7.0)	200 (12.7)
Medium commercial	4 (0.8)	48 (3.1)
Heavy commercial	10 (2.1)	101 (6.4)
Heavy caravan	0 (0.0)	1 (0.1)
Other	0 (0.0)	3 (0.2)
Unknown	2 (0.4)	14 (0.9)
Total	485 (99.9)	1572 (100.0)

Table 3.8. The ages of vehicles driven by drivers and motorcyclists responsible for speeding and other crashes.

Vehicle age (years)	17-25 year olds		>25 year olds		Unknown age	
	Speeding crashes (%)	Other crashes (%)	Speeding crashes (%)	Other crashes (%)	Speeding crashes (%)	Other crashes (%)
<10	89 (33.3)	205 (35.3)	88 (42.9)	393 (41.2)	1 (33.3)	3 (15.0)
>10	93 (34.8)	172 (29.6)	40 (19.5)	224 (23.5)	1 (33.3)	2 (10.0)
Unknown	85 (31.8)	204 (35.1)	77 (37.6)	336 (35.3)	1 (33.3)	15 (75.0)
Total	267 (100.0)	581 (100.0)	205 (100.0)	953 (100.0)	3 (99.9)	20 (100.0)

3.6 PERSONS RESPONSIBLE FOR CRASHES

Overall, 92.1% of drivers and motorcyclists responsible for speeding crashes were male. In contrast, only 81.0% of drivers and motorcyclists responsible for other crashes were male (z=5.59, $p<.05$). The proportion of speeders who were male was higher when BAC>.15 (97.9%). The increase with BAC in proportion of males was also evident for other crashes and thus appears to be a characteristic of alcohol-involved crashes, rather than specifically a characteristic of speeding crashes.

The age distributions of drivers and motorcyclists responsible for speeding and other crashes are shown in Figure 3.4 ($\chi^2(5)=127.0$, $p<.05$). There are relatively more 17-20 year old controllers responsible for speeding than other crashes. The same can be said to a lesser extent about 21-25 and 26-40 year old drivers. Controllers aged 41-65 were under-represented in speeding crashes. As expected from the speed profiles of elderly drivers (Fildes et al., 1990), elderly controllers are very much under-represented in speeding crashes.

Speeding crashes where a young driver was responsible (aged less than 25) were more likely to occur at night than other types of young driver crashes (72.9% vs 54.3%, z=4.08, $p<.05$).

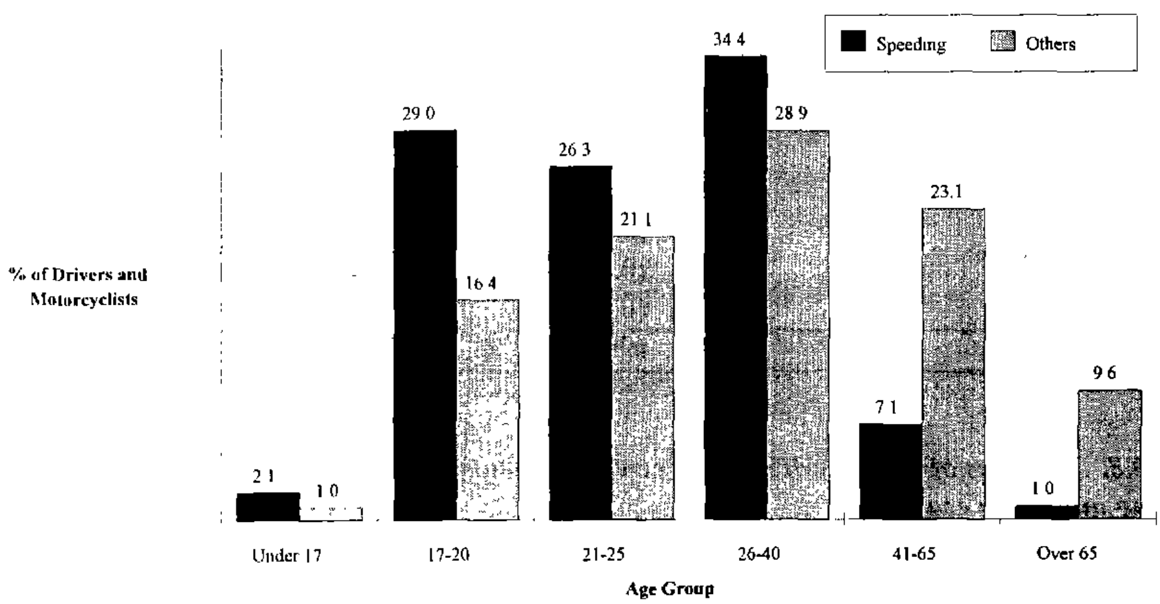


Figure 3.4. Ages of drivers and motorcyclists responsible for speeding and other crashes.

An additional issue is whether young drivers are more likely to be responsible for speeding crashes, given that they are involved in these crashes? Table 3.9 addresses this issue. It shows two major points. First, drivers or motorcyclists aged 17-25 are more likely to be responsible for speeding crashes in which they are involved than are older drivers. Secondly, drivers or motorcyclists aged 17-25 are more likely to be responsible for speeding crashes in which they are involved than other crashes.

Table 3.10 shows responsibility rates further disaggregated by blood alcohol concentration (BAC). Examination of crashes classified by alcohol involvement suggests that the over-representation of 17 to 25 year olds in speeding crashes is only marked when BAC<.05. At the higher alcohol levels, the proportion of speeding and other crashes which involves 26-40 year olds appears to increase.

Table 3.9. Involvement in speeding and other crashes and responsibility as a function of age of driver or motorcyclist.

Age group	Speeding crashes			Other crashes		
	No. involved	No. responsible	% responsible	No. involved	No. responsible	% responsible
<17	10	10	100.0	20	15	75.0
17-20	164	140	85.4	413	254	61.5
21-25	150	127	84.7	553	327	59.1
26-40	246	166	67.5	946	449	47.5
41-65	85	34	40.0	708	358	50.6
>65	9	5	55.6	195	149	76.4
Total	664	482	72.6	2835	1552	54.7

Table 3.10. Percent of crashes for which members of each age group were responsible (i.e. responsible/involved x 100) as a function of blood alcohol concentration (BAC). Values followed by an asterisk represent cells in which there were very small numbers of crashes.

Age group	BAC<.05		BAC .05-.15		BAC>.15		BAC unknown	
	Speeding	Other	Speeding	Other	Speeding	Other	Speeding	Other
<17	*	66.7	*	*	*	-	*	77.8
17-20	78.6	56.0	96.8	95.3	100.0	100.0	78.4	48.7
21-25	74.5	54.2	96.0	82.4	100.0	96.2	69.2	48.8
26-40	51.1	50.7	96.7	78.6	100.0	96.0	49.2	39.2
41-65	34.0	50.7	*	78.6	100.0	97.4	23.1	38.2
>65	*	76.1	*	85.7	-	*	*	75.0

3.7 EMPLOYMENT CHARACTERISTICS

The employment status of drivers and motorcyclists responsible for speeding and other crashes differed ($\chi^2(8)=60.2$, $p<.05$, see Table 3.11). The clearest differences are the seemingly larger proportion of unemployed (9.9% vs 4.5%) and the seemingly smaller proportion of retired persons (1.0% vs 7.8%) responsible for speeding crashes. It is likely that these findings reflect the over-representation of young drivers and motorcyclists as responsible for speeding crashes. There was some evidence that the higher proportion of unemployed persons as responsible for speeding rather than other crashes is more than a reflection of youth unemployment. The percentages of drivers or motorcyclists responsible for crashes who were unemployed appears to be higher for speeding crashes than other crashes at each age level.

Table 3.11. The employment status of drivers and motorcyclists responsible for speeding and other crashes.

Employment status	Speeding crashes	Other crashes
Manager/professional	35 (7.2)	132 (8.4)
Trades	69 (14.2)	160 (10.2)
Clerical/Sales	42 (8.7)	121 (7.7)
Plant/Labour	103 (21.2)	328 (20.9)
Other employed	19 (3.9)	52 (3.3)
Unemployed	48 (9.9)	70 (4.5)
Retired	5 (1.0)	123 (7.8)
Not in workforce	23 (4.7)	132 (8.4)
Unknown	141 (29.1)	454 (28.9)
Total	485 (99.9)	1572 (100.1)

3.8 TRIP PURPOSE

Reading of the case studies led to the conclusion that speeding leading to a fatality often takes place as part of recreational driving. For this reason, trip purpose was examined. Origin or destination data were missing for about half of the trips in the Fatality File (see Table 3.12). Despite this, the trip had as its origin recreation for more vehicles responsible for speeding crashes than other crashes (35.1% vs. 23.2%, $z=5.22$, $p<.05$). The destination was also recreation for more speeding vehicles than vehicles responsible for other crashes (16.3% vs. 11.5%, $z=2.78$, $p<.05$). Thus recreation is very common as a trip purpose for speeding vehicles and return from recreation (e.g. a party or hotel) is more strongly represented than travel to recreation. This is in accord with the role of alcohol in many of these crashes.

Table 3.12. Origin and destination of trips undertaken by vehicles responsible for speeding and other crashes.

	Origin		Destination	
	Speeding	**Other**	**Speeding**	**Other**
Home	42 (8.7)	201 (12.8)	92 (19.0)	300 (19.1)
Work	35 (7.2)	198 (12.6)	32 (6.6)	189 (12.0)
Recreation	170 (35.1)	365 (23.2)	79 (16.3)	181 (11.5)
Private business	5 (1.0)	22 (1.4)	13 (2.7)	51 (3.2)
Other	5 (1.0)	6 (0.4)	3 (0.6)	11 (0.7)
Unknown	228 (47.0)	780 (49.6)	266 (54.8)	840 (53.4)
Total	485 (100.0)	1572 (100.0)	485 (100.0)	1572 (99.9)

3.9 SEAT BELT WEARING

Seat belt wearing was examined for occupants of cars which were responsible for speeding crashes. The proportion of speeding crashes in which at least one occupant was not wearing a seat belt (although a seat belt was available) was greater for speeding crashes than other crashes (38.9% vs 30.6%, $z=2.71$, $p<.05$).

Analyses were conducted to test whether this finding reflected the role of alcohol in speeding crashes, rather than being common to all speeding crashes. Previous studies have demonstrated that nonuse of seat belts is more common in crashes of alcohol-affected drivers.

Alcohol data were not widely available for car occupants and so the analysis was restricted to car drivers only. Overall, nonuse of seat belts by the car driver responsible was more common in speeding crashes than other crashes (31.4% vs. 25.5%, $z=2.10$, $p<.05$). Table 3.13 shows that the greater extent of nonuse of seat belts in speeding than other crashes was only evident when BAC was unknown ($z=2.86$, $p<.05$). The reverse was true when BAC>.15 ($z=1.72$, $p<.05$, one-tailed).

In summary, nonuse of seat belts by drivers or occupants of cars responsible was more common in speeding crashes than other crashes. There was no evidence that this was an outcome of the role of alcohol in speeding crashes.

Table 3.13. Numbers and percentages of car drivers responsible for speeding and other crashes not wearing a seat belt when one was available as a function of blood alcohol concentration (BAC).

Blood alcohol concentration	Speeding crashes	Other crashes
<.05	20 (18.9)	97 (18.8)
.05-.15	25 (40.3)	40 (40.0)
>.15	35 (37.6)	71 (49.0)
Unknown	24 (34.3)	58 (20.6)
Total unbelted drivers	104 (31.4)	266 (25.5)

3.10 ROLE OF PASSENGERS

In the past, hypotheses have been put forward that the driver (particularly the young driver) is overtly or implicitly encouraged to speed by passengers. These hypotheses have been indirectly supported by analyses showing that the carriage of two or more passengers by inexperienced drivers is associated with an elevated risk of casualty crash involvement on a distance travelled basis (Drummond and Healy, 1986).

The numbers of occupants of cars responsible for speeding and other crashes was examined (see Table 3.14). No differences were found in the numbers of occupants in speeding and other crashes overall ($\chi^2(2)=1.15$, $p>.05$) or when restricted to those crashes for which a driver less than 25 years old was responsible ($\chi^2(2)=3.30$, $p>.05$).

Table 3.14. Number of occupants of cars responsible for speeding and other crashes.

Number of occupants	**All car drivers responsible**		**Car drivers under 25 years responsible**	
	Speeding	Other	Speeding	Other
1	150 (45.5)	503 (48.7)	64 (37.6)	164 (45.8)
2	94 (28.5)	284 (27.5)	55 (32.4)	96 (26.8)
>2	86 (26.1)	246 (23.8)	51 (30.0)	98 (27.4)
Total	330 (100.1)	1033 (100.0)	170 (100.0)	358 (100.0)

The number of passengers (0, 1 or more than one) did not affect the proportion of speeding or other crashes of young drivers that occurred at night.

3.11 SUMMARY

There are 482 crashes in which excessive speed was coded as the most important or the second most important factor. These crashes resulted in 573 deaths and 464 people injured.

The characteristics of speeding crashes which involved alcohol were different from those which did not involve alcohol. The over-representation of the following factors in speeding crashes was greater when alcohol was present:

- occurrence at night or on weekends
- off path on curve crashes
- male drivers or motorcyclists (when BAC>.15)

In contrast, the over-representation of speeding crashes in urban areas was less when alcohol was involved.

Speeding crashes accounted for about half of the crashes in which motorcyclists were considered to be responsible.

Other predictions from earlier research which were supported by these analyses were the over-representation in speeding crashes of:

- loss of control on the gravel shoulder
- collision with objects or parked vehicles off road
- 17-20 year old controllers as responsible (21-40 year olds to some extent as well). In addition, controllers over the age of 40 were under-represented in speeding crashes.

In contrast to the predictions of earlier research, the analysis failed to demonstrate any over-representation of vehicle rollover in speeding crashes. No effects of passenger occupancy on speeding crashes of drivers under 25 years old were shown.

From the case studies it was expected that a strong role of offset impacts resulting in death of impact side occupants would be found. However, this factor was found in about 10% of all crashes and was no more common in speeding than other crashes. The conflict of this finding with that of other studies questions the coding of point of impact in the Fatality File.

The observation from the case studies of frequent nonuse of seat belts was supported and was most evident for speeding crashes in which the BAC of the car driver was unknown.

Other findings of the analyses included over-representation in speeding crashes of

- recreation (particularly return from recreation) as the purpose of the trip

- unemployed drivers and motorcyclists responsible

4. ALCOHOL CRASHES

An alcohol crash is defined here as a crash in which alcohol was coded as the most important or second most important contributing factor (731 crashes). There were 832 persons killed (28.9% of the total) and 352 persons hospitalised (22.9% of the total) as a result of alcohol crashes. In 28 additional crashes both alcohol and other drugs were considered to have played an important role.

Past studies have shown alcohol crashes to have a number of characteristics in terms of timing, location, crash pattern and characteristics of drivers involved. On the basis of past research one expects alcohol crashes to be more likely to:

- occur at night and on weekends
- occur in the Northern Territory
- be single vehicle crashes
- involve speeding
- involve more male than female drivers intoxicated
- involve motorcyclists and less likely to have articulated truck drivers responsible
- involve non-elderly adult pedestrians
- result in more alcohol-related fatalities among 21-25 year olds than among other age groups (FARS 1989)

This chapter examines alcohol crashes in which the maximum BAC was greater than .15, then those in which maximum BAC was between .05 and .15. It concludes with a comparison of these two levels of alcohol involvement.

For crash-based analyses, crashes were selected for analysis on the basis of two criteria: alcohol coded as the most or second most important factor (defining it as an alcohol crash) and the maximum BAC of persons responsible for the crash. As Table 4.1 shows, there were 25 alcohol crashes in which maximum BAC was less than .05, compared with 1060 nonalcohol crashes with the same maximum BAC. As would be expected, the proportion of crashes which were coded as alcohol crashes increases with maximum BAC. In the 54 alcohol crashes for which BAC was unknown, alcohol was known to have been present and contributed to the crash, but the precise level of BAC was not known.

Table 4.1. Alcohol as a contributory factor and maximum blood alcohol concentration (BAC - g/100ml) of persons responsible for crashes.

Type of crash	Maximum BAC			
	<.05	.05-.15	>.15	Unknown
Alcohol crash	25	228	424	54
Nonalcohol crash	1060	41	30	560

Crashes were classed according to the maximum BAC of persons responsible in order to assign a unique BAC level to those crashes in which more than one person had been judged to be responsible. These multiple responsibility crashes were uncommon, however (763 persons were judged to be responsible for 731 crashes).

4.1 MISSING DATA

The unavailability of blood alcohol concentration data for some persons involved in crashes complicates any examination of the role of alcohol in crashes. Overall, BAC was known for 1150 (79.8%) of drivers and motorcyclists killed in fatal crashes in 1988. 37.9% of these drivers and motorcyclists killed had a BAC>.05.

The preliminary analyses showed that BAC data were missing for 4120 of the 7498 persons included in the 1988 Fatality File. In general, BAC information was likely to be missing for persons who were not vehicle controllers (e.g., 85.5% of passengers) and persons who were not severely injured. Young children were rarely tested (or reported) but comprised few cases. In addition, the percentage of missing data varied markedly between states. For persons responsible for crashes, about 15% of the data were missing in NSW and SA but almost half of the data were missing in Queensland.

4.2 ALCOHOL CRASHES IN WHICH MAXIMUM BAC>.15

As Table 4.1 shows, there were 424 alcohol crashes in which maximum BAC was greater than .15 (23.5% of all crashes for which maximum BAC was known). These crashes resulted in death to 481 people and injury to 302 people. In this section, these crashes are compared with the 1131 nonalcohol crashes for which maximum BAC was known.

4.2.1 Timing

In Figure 4.1, the time of day that BAC>.15 alcohol crashes and nonalcohol crashes occurred is shown grouped into six hour blocks. A larger proportion of the alcohol crashes than nonalcohol crashes occurred at night (87.0% vs 34.6%, $z=18.39$, $p<.05$).

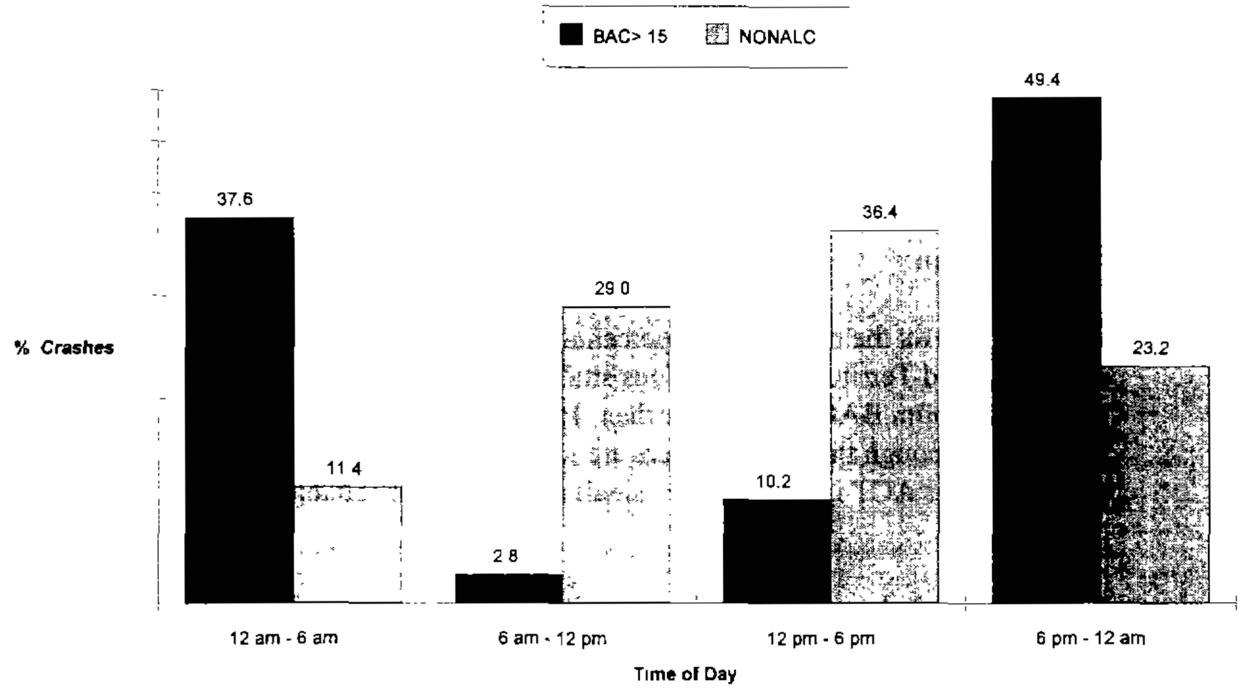


Figure 4.1. Time of day that BAC>.15 alcohol crashes and nonalcohol crashes occurred.

Almost half of the BAC>.15 alcohol crashes occurred on the weekend. This proportion was significantly higher than for nonalcohol crashes (49.3% vs 29.2%, $z=7.42$, $p<.05$). Figure 4.2 shows the distribution of the alcohol and nonalcohol crashes by day of week.

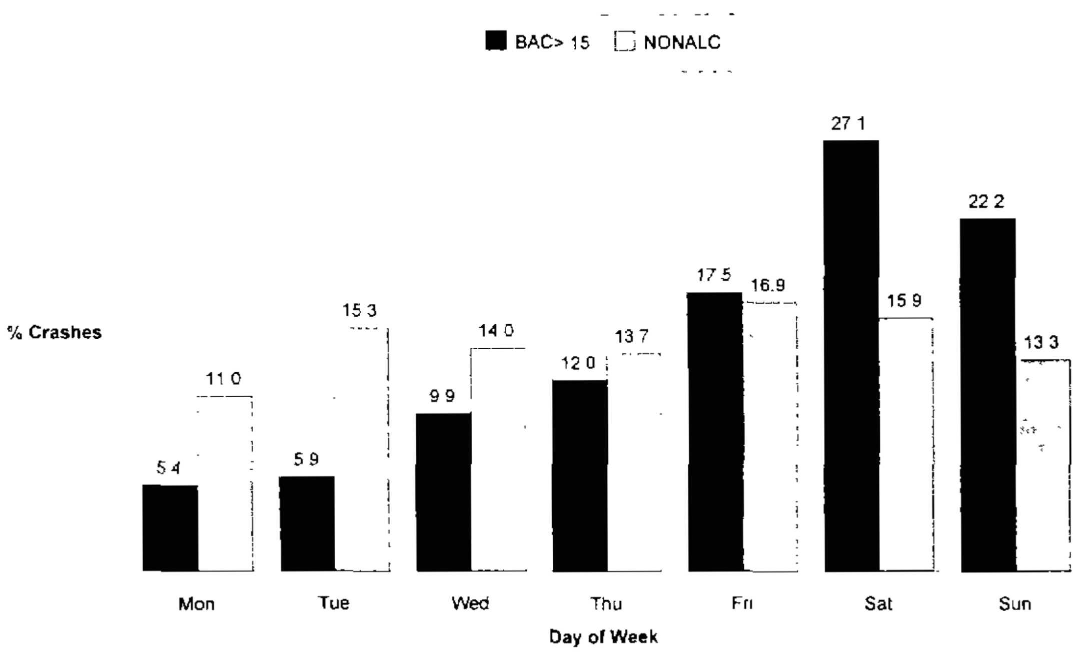


Figure 4.2. Day of week that BAC>.15 alcohol crashes and nonalcohol crashes occurred.

Further examination showed that a greater percentage of BAC>.15 alcohol crashes than nonalcohol crashes occurred on Saturday night or Sunday night (42.3% vs 13.5%, z=12.36, p<.05).

These findings are in accord with past research that has found alcohol crashes to be more likely to occur at night and on weekends than other crashes.

4.2.2 Location

Table 4.2 shows the numbers and percentages of alcohol and nonalcohol crashes in each State and Territory. As previous studies suggested, the percentage of crashes in which maximum BAC was greater than .15 appears to be highest in the Northern Territory, although the total numbers are too small to be statistically evaluated (the percentage for ACT is based on too small numbers to be reliable).

Table 4.2. Numbers and percentages of alcohol and nonalcohol crashes as a function of maximum BAC level in each State and Territory. The percentages are calculated using crashes for which BAC is known for at least one person responsible.

State	Alcohol crashes - Maximum BAC				Nonalcohol crashes		Total Known
	<.05	.05-.15	>.15	Unknown	Known	Unknown	
NSW	5 (0.7)	82 (11.0)	143 (19.2)	7	516 (69.2)	119	746 (100.1)
VIC	10 (2.2)	61 (13.6)	107 (23.8)	8	271 (60.4)	147	449 (100.0)
QLD	3 (1.4)	28 (13.3)	56 (26.5)	28	124 (58.8)	188	211 (100.0)
SA	3 (1.8)	29 (17.3)	48 (28.6)	1	88 (52.4)	28	168 (100.1)
WA	1 (0.8)	19 (14.5)	38 (29.0)	5	73 (55.7)	50	131 (100.0)
TAS	1 (1.7)	3 (5.2)	15 (25.9)	1	39 (67.2)	4	58 (100.0)
NT	2 (6.5)	3 (9.7)	11 (35.5)	3	15 (48.4)	8	31 (100.1)
ACT	0 (0.0)	3 (21.4)	6 (42.9)	1	5 (35.7)	16	14 (100.0)
Total	25 (1.4	228 (12.6)	424 (23.5)	54	1131 (62.6)	560	1808 (100.1)

The location of BAC>.15 alcohol crashes and nonalcohol crashes in terms of urban or rural area and type of intersection is presented in Table 4.3. The percentages of BAC>.15 alcohol crashes occurring in urban and rural areas were similar to those of nonalcohol crashes: 59.3% of the alcohol crashes and 56.9% of the nonalcohol crashes occurred in urban areas (z<1, p>.05). However, differences existed in the type of road on which the two types of crashes occurred ($\chi^2(3)=17.2$, $p<.05$). As Figure

4.3 shows, the alcohol crashes appeared less likely to occur on highways and more likely to occur on other rural roads.

Overall, BAC>.15 alcohol crashes were less likely to occur at intersections than nonalcohol crashes (19.1% vs 29.5%, z=4.13, p<.05). This was true for both urban and rural crashes ($\chi^2(1)$=.32, p>.05). Those alcohol crashes which did occur at intersections appeared to be more likely to occur at T-intersections than did nonalcohol crashes (61.25% vs 47.3%).

Table 4.3. Numbers of intersection and nonintersection crashes in urban and rural areas.

Intersection type	BAC>.15 alcohol crashes			Nonalcohol crashes		
	Urban	Rural	Total	Urban	Rural	Total
Nonintersection	183	160	343	370	427	797
Intersection	68	12	80*	273	61	334
X	24	2	26*	133	28	161
Y	2	2	4	6	3	9
T	41	8	49	129	29	158
Multiple	1	0	1	5	1	6
Total crashes	251	172	423*	643	488	1131

* Does not include one crash where location was unknown.

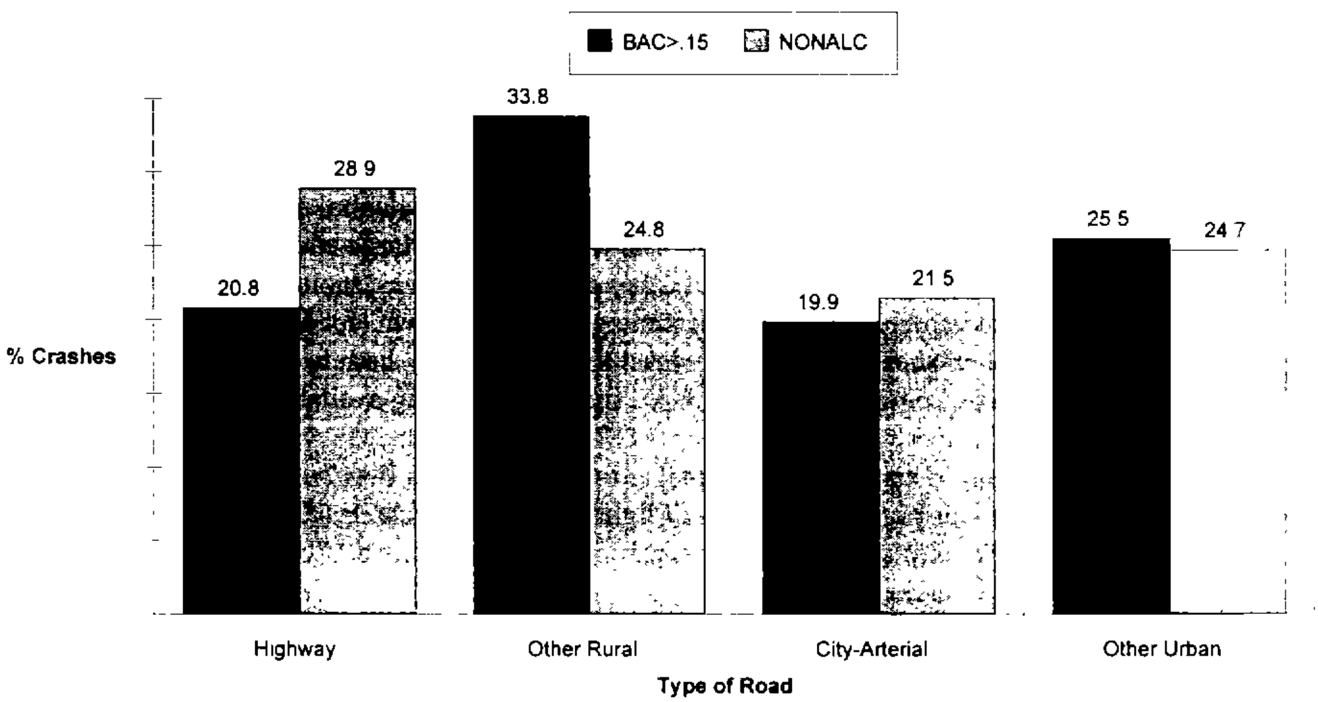


Figure 4.3. Type of road on which BAC>.15 alcohol crashes and nonalcohol crashes occurred.

The location of crashes can also be expressed as a function of speed zone. Three quarters of BAC > 0.15 and nonalcohol crashes occurred in areas zoned 60km/h or 100km/h. The distribution of crashes between these two speed zones was not affected by alcohol ($\chi^2(1)=0.63$, $p>.05$).

4.2.3 Crash pattern

As predicted from past studies, BAC>.15 alcohol crashes were more commonly classified as single vehicle than were nonalcohol crashes (72.4% vs 48.0%, $z=8.59$, $p<.05$). However, in 75 of the single-vehicle alcohol crashes in which BAC>.15, the pedestrian was responsible for the crash. When these crashes were removed, 54.7% of BAC>.15 alcohol crashes were true single-vehicle crashes compared with 35.4% of nonalcohol crashes. The percentage of single vehicle crashes remained significantly higher for the alcohol crashes ($z=6.90$, $p<.05$).

Figure 4.4 shows the crash patterns of single vehicle (pedestrian not responsible) and multi-vehicle crashes. The distributions of crash pattern among single vehicle alcohol and nonalcohol crashes differed ($\chi^2(6)=24.0$, $p<.05$). The upper panel of Figure 4.4 suggests that this difference resulted from single-vehicle alcohol crashes less often involving nonresponsible pedestrians and more often resulting in the vehicle leaving the carriageway on a curve. The mix of crash patterns in alcohol and nonalcohol multi-vehicle crashes also differed ($\chi^2(9)=39.3$, $p<.05$). The lower panel of Figure 4.4 suggests that this was due to fewer vehicle adjacent and more vehicle opposite crashes among the alcohol crashes. The smaller percentage of BAC > .15 crashes which occurred at intersections is evident in the % adjacent DCA group.

4.2.4 Vehicles driven by persons responsible for crashes

The types of vehicles driven by persons responsible for alcohol and nonalcohol crashes are presented in Table 4.4. The frequencies are large enough to be able to make meaningful comments about cars and car derivatives, motorcycles and light commercial vehicles only. The percentage BAC unknown (for alcohol and nonalcohol crashes) was generally least for motorcycles, largely as a result of most motorcyclists being killed and so BAC information being available from the autopsy.

About a fifth of car drivers responsible for crashes had a BAC>.15 (21.9%). This percentage was higher for drivers of light commercial vehicles (29.6%, $z=2.26$, $p<.05$). Approximately a quarter of motorcyclists responsible for crashes had a BAC>.15 (25.1%).

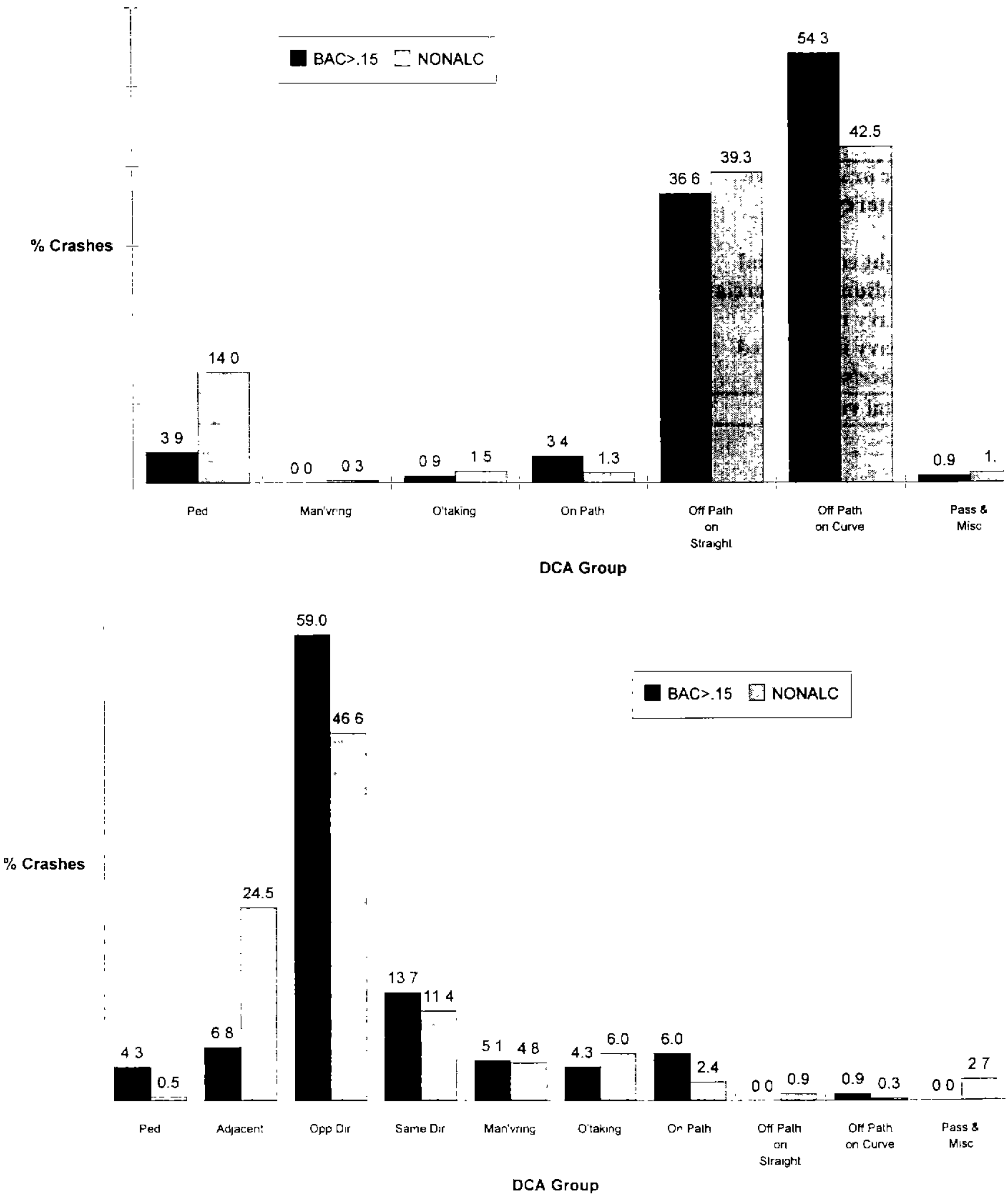


Figure 4.4. Crash patterns (DCA group) of BAC>.15 alcohol crashes and nonalcohol crashes. The upper panel describes single vehicle crashes (for which pedestrians were not responsible) and the lower panel describes multi-vehicle crashes.

Table 4.4. Types of vehicle driven by persons responsible for alcohol and nonalcohol crashes.

Vehicle type	Nonalcohol	<.05	.05-.15	>.15	Total known
Car or derivative	648 (62.7)	18 (1.7)	140 (13.6)	226 (21.9)	1032 (99.9)
Motorcycle	123 (57.2)	8 (3.7)	30 (14.0)	54 (25.1)	215 (100.0)
Bus	11 (84.6)	1 (7.7)	0 (0.0)	1 (7.7)	13 (100.0)
Light commercial	95 (53.1)	1 (0.6)	30 (16.8)	53 (29.6)	179 (100.1)
Medium commercial	30 (83.3)	0 (0.0)	4 (11.1)	2 (5.6)	36 (100.0)
Heavy rigid	4 (80.0)	0 (0.0)	0 (0.0)	1 (20.0)	5 (100.0)
Heavy articulated	70 (87.5)	2 (2.5)	6 (7.5)	2 (2.5)	80 (100.0)
Other/unknown	3 (50.0)	0 (0.0)	1 (16.7)	2 (33.3)	6 (100.0)
Total vehicles	984	30	211	341	1566

Table 4.5 summarises the ages of cars driven by persons responsible for alcohol and nonalcohol crashes. It should be noted that very little vehicle age data were available from Queensland and about half of the data from Victoria and Western Australia were missing.

Table 4.5. Ages of cars responsible for alcohol and nonalcohol crashes.

Age of car	Nonalcohol	.05-.15	>.15
<5 years	148 (22.8)	31 (22.1)	26 (11.5)
5-10 years	139 (21.5)	19 (13.6)	36 (15.9)
>10 years	206 (31.8)	55 (39.3)	104 (46.0)
Unknown	155 (23.9)	35 (25.0)	60 (26.5)
Total cars	648 (100.0)	140 (100.0)	226 (99.9)

Almost half of the cars responsible for BAC>.15 alcohol crashes were more than 10 years old. This compares with less than a third of cars in nonalcohol crashes (46.0% vs 31.8%).

On average, cars responsible for BAC>.15 alcohol crashes were older than cars responsible for nonalcohol crashes (11.1 vs 8.7 years, $t(657)=4.58$, $p<.05$).

4.2.5 Vehicle occupancy

Table 4.6 summarises vehicle occupancy data for cars responsible for alcohol and nonalcohol crashes. The number of occupants of cars driven by persons responsible for BAC >0.15 alcohol crashes and non alcohol crashes did not differ (1.75 vs 1.87, $t(986) = -1.54$, $p>0.05$).

Table 4.6. Number of occupants in cars responsible for alcohol and nonalcohol crashes.

Number of occupants	Nonalcohol	.05-.15	>.15
1	307 (47.4)	67 (47.9)	135 (60.0)
2	186 (28.7)	40 (28.6)	53 (23.6)
3	71 (11.0)	18 (12.9)	19 (8.4)
>3	83 (12.8)	15 (10.7)	18 (8.0)
Total cars	647 (99.9)	140 (100.1)	225 (100.0)

The percentages of vehicles classified "possibly" or "definitely over the speed limit" in alcohol and nonalcohol crashes are summarised in Table 4.7. It appears that vehicles whose driver was responsible for a BAC>.15 alcohol crash were more likely than those of nonalcohol crashes to be judged to be travelling at "possibly over the speed limit" or "definitely over the speed limit".

Table 4.7. Numbers and percentages of vehicles classified "possibly" or "definitely over the speed limit" in alcohol and nonalcohol crashes.

Speed category	Nonalcohol	.05-.15	>.15
Possibly over speed limit	125 (12.7)	48 (22.7)	85 (24.9)
Definitely over speed limit	150 (15.2)	73 (34.6)	111 (32.6)
Not speeding	613 (62.3)	72 (34.1)	92 (27.0)
Unknown	96 (9.8)	18 (8.5)	53 (15.5)
Total vehicles	984 (100.0)	211 (99.9)	341 (100.0)

4.2.6 Persons responsible for crashes

The blood alcohol concentrations of the road users responsible for alcohol crashes are presented in Table 4.8. There was more than one road user responsible in some alcohol crashes. The Table 4.5 shows that pedestrians judged responsible for alcohol crashes often had BAC levels greater than .15.

Table 4.8. Blood alcohol concentrations (BAC) of road users responsible for alcohol crashes (row percentage in brackets).

BAC	Road user type									
	Driver		Motorcyclist		Cyclist		Pedestrian		Total	
<.05	22	(61.1)	8	(22.2)	1	(2.8)	5	(13.9)	36	(100)
.05-.15	181	(77.0)	30	(12.7)	2	(0.9)	22	(9.4)	235	(100)
>.15	287	(67.4)	54	(12.7)	4	(0.9)	81	(19.0)	426	(100)
Unknown	46	(69.7)	2	(3.0)	0	(0.0)	18	(27.3)	66	(100)
Total	536	(70.2)	94	(12.3)	7	(0.92)	126	(16.5)	763	(100)

Overall, males were over-represented as responsible for alcohol crashes with BAC>.15 (93.9% for these crashes, 77.8% for nonalcohol crashes, z=7.42, p<.05).

The age profiles of persons responsible for these crashes and nonalcohol crashes differed ($\chi^2(5)$=83.1, p<.05). As Figure 4.5 shows, the age group 26-40 appeared to be over-represented in the high alcohol crashes (38.9% vs 23.7%). Males aged 26-40 comprised 154 of the 424 persons responsible for BAC>.15 alcohol crashes (36.3% vs 19.5% of nonalcohol crashes, z=6.94, p<.05).

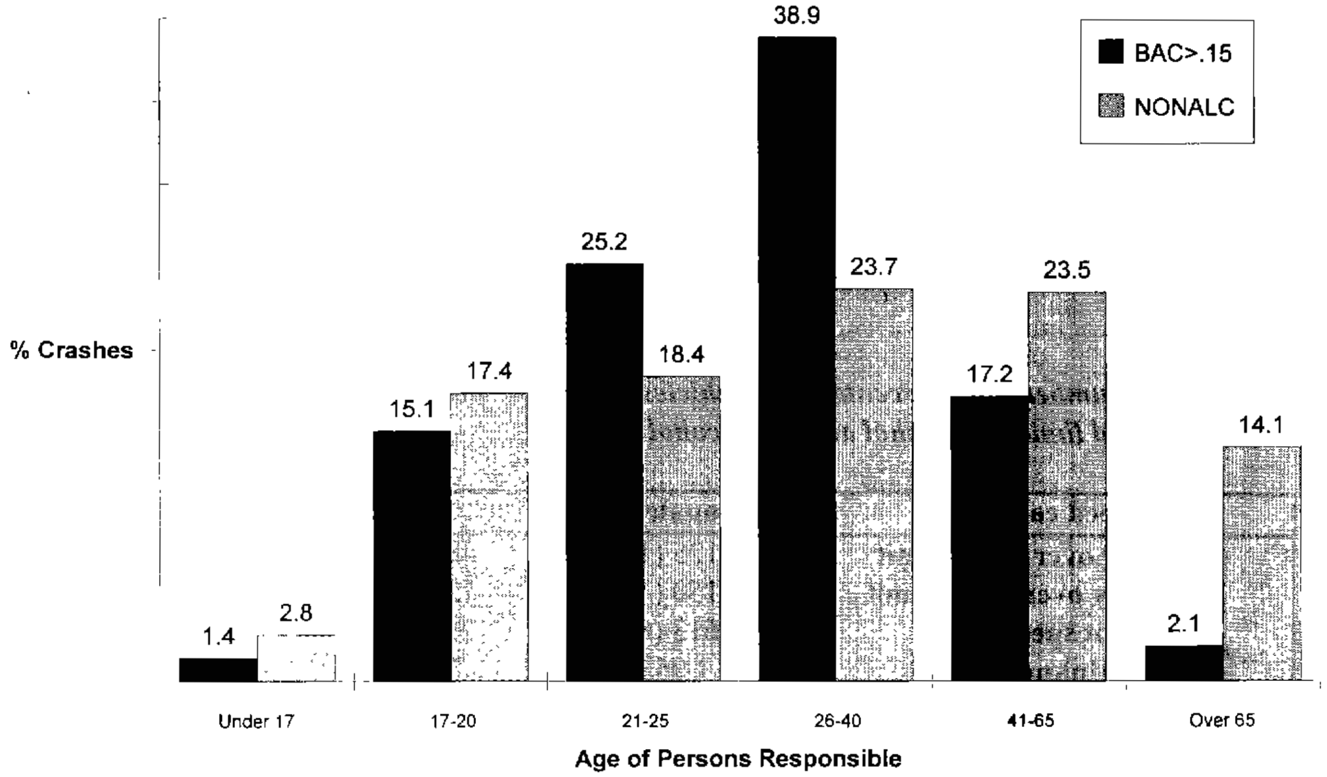


Figure 4.5. Percentages of persons responsible for BAC>.15 alcohol crashes and nonalcohol crashes in each age group.

Drivers. Drivers comprised 287 of the 424 persons responsible for BAC>.15 crashes. When drivers alone were considered, males remained over-represented as responsible for alcohol crashes with BAC>.15 (92.7% vs 78.3% for nonalcohol crashes, z=5.49, p<.05). The age profiles of drivers responsible for BAC>.15 alcohol crashes and nonalcohol crashes again differed ($\chi^2(5)$=57.5, p<.05), with the same over-representation of drivers in the age group 26-40 in alcohol crashes (42.5% vs 26.3%, z=5.16, p<.05). Males aged 26-40 comprised 111 of the 285 drivers responsible for BAC>.15 alcohol crashes (38.9%) but males aged 26-40 comprised fewer (21.2%) of the drivers responsible for nonalcohol crashes (z=5.93, p<.05).

Seat belts were available but not worn by 132 drivers responsible for BAC>.15 alcohol crashes (46.0%). This proportion is significantly higher than that found for drivers responsible for nonalcohol crashes (20.1%, z=8.60, p<.05).

Motorcyclists. Motorcyclists comprised 54 of the persons responsible for BAC>.15 alcohol crashes and all motorcyclists were male. These crashes made up almost a third of crashes for which motorcyclists were responsible (30.5% of alcohol and nonalcohol crashes for which BAC was known). Almost all motorcyclists were male for the nonalcohol crashes, so the sex ratios were similar for the two types of crashes. While the figure looks similar to that for drivers, the age profiles of motorcyclists responsible for BAC>.15 alcohol crashes and nonalcohol crashes did not differ ($\chi^2(4)=2.9$, $p>.05$, see Figure 4.6).

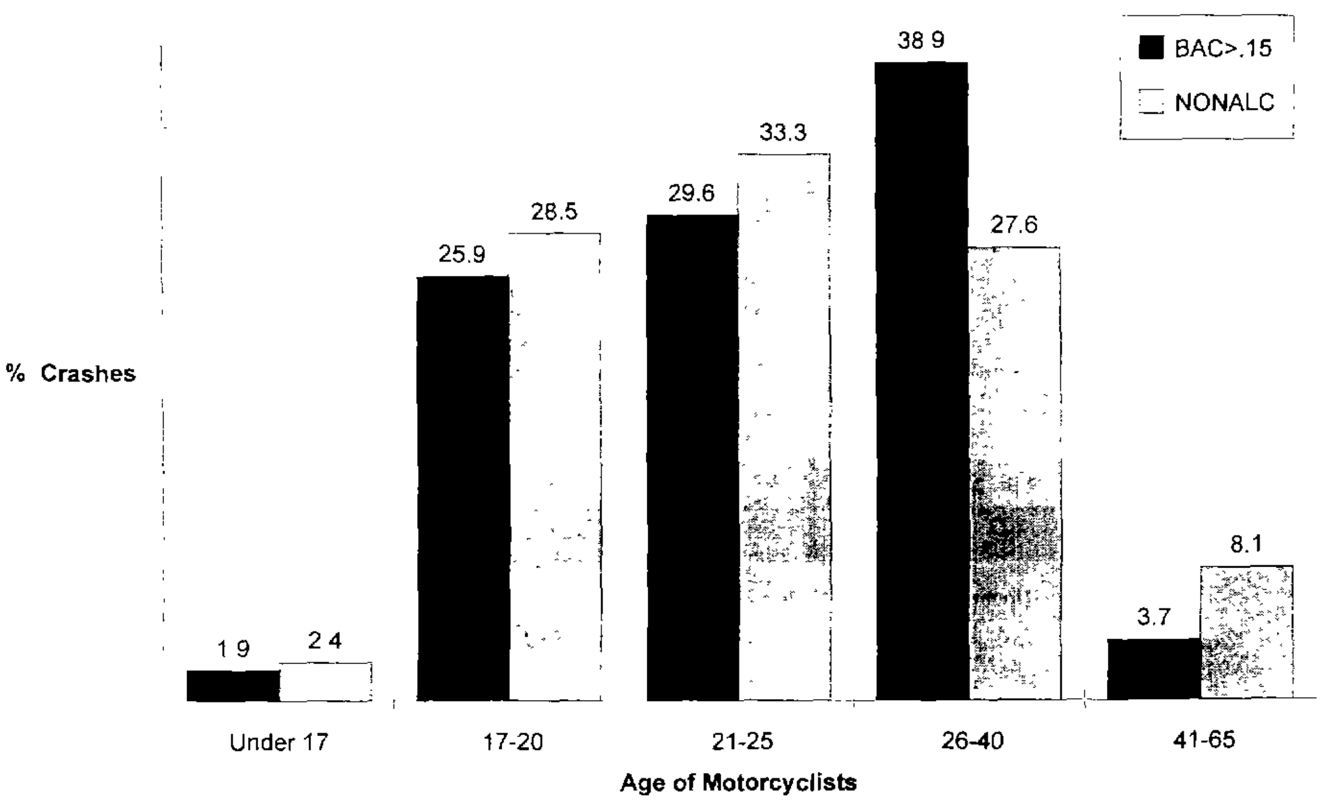


Figure 4.6. Percentages of motorcyclists responsible for BAC>.15 alcohol crashes and nonalcohol crashes in each age group.

Pedestrians. In 79 alcohol crashes, the maximum BAC of greater than .15 belonged to a pedestrian (a total of 81 pedestrians). Almost all of these crashes occurred at night (89.9% vs 32.6% of nonalcohol crashes for which pedestrians were responsible). About half of the crashes occurred on the weekend (46.8% vs 22.9% of nonalcohol pedestrian crashes). Crashes where pedestrians were responsible occurred primarily in urban areas regardless of whether or not alcohol was involved (86.1% where max BAC>.15, 94.4% of nonalcohol crashes).

76 of the 81 pedestrians responsible for BAC>.15 alcohol crashes were male, a higher proportion than for nonalcohol crashes for which pedestrians were responsible (93.8%

vs 59.1%, z=5.58, p<.05). As Figure 4.7 shows, the age profiles of pedestrians responsible for BAC>.15 alcohol crashes and nonalcohol crashes differed markedly ($\chi^2(5)=46.0$, $p<.05$). Most drunk pedestrians were between the age of 21 and 65 but almost half of the sober pedestrians were over the age of 65. The most common type of pedestrian responsible for a BAC>.15 crash was a male aged between 21 and 65 (58/81) whereas the most common type of pedestrian responsible for a nonalcohol crash was a female aged over 65 years (38/63).

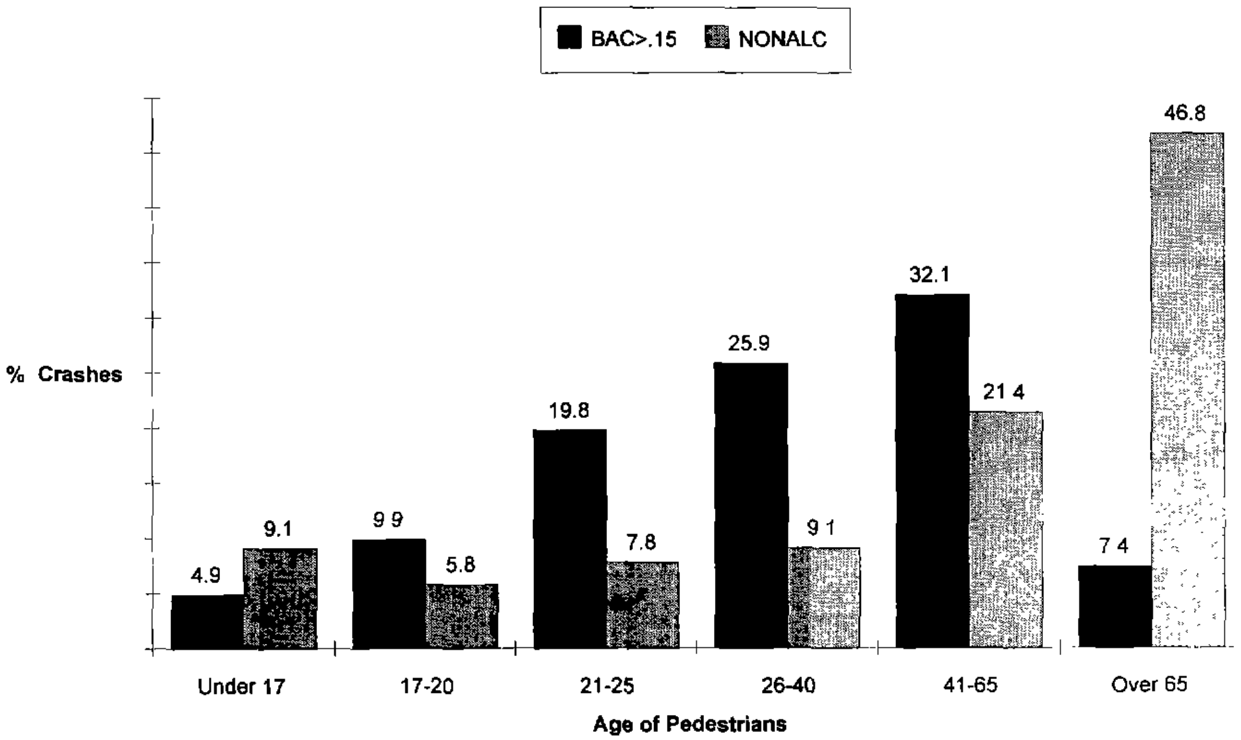


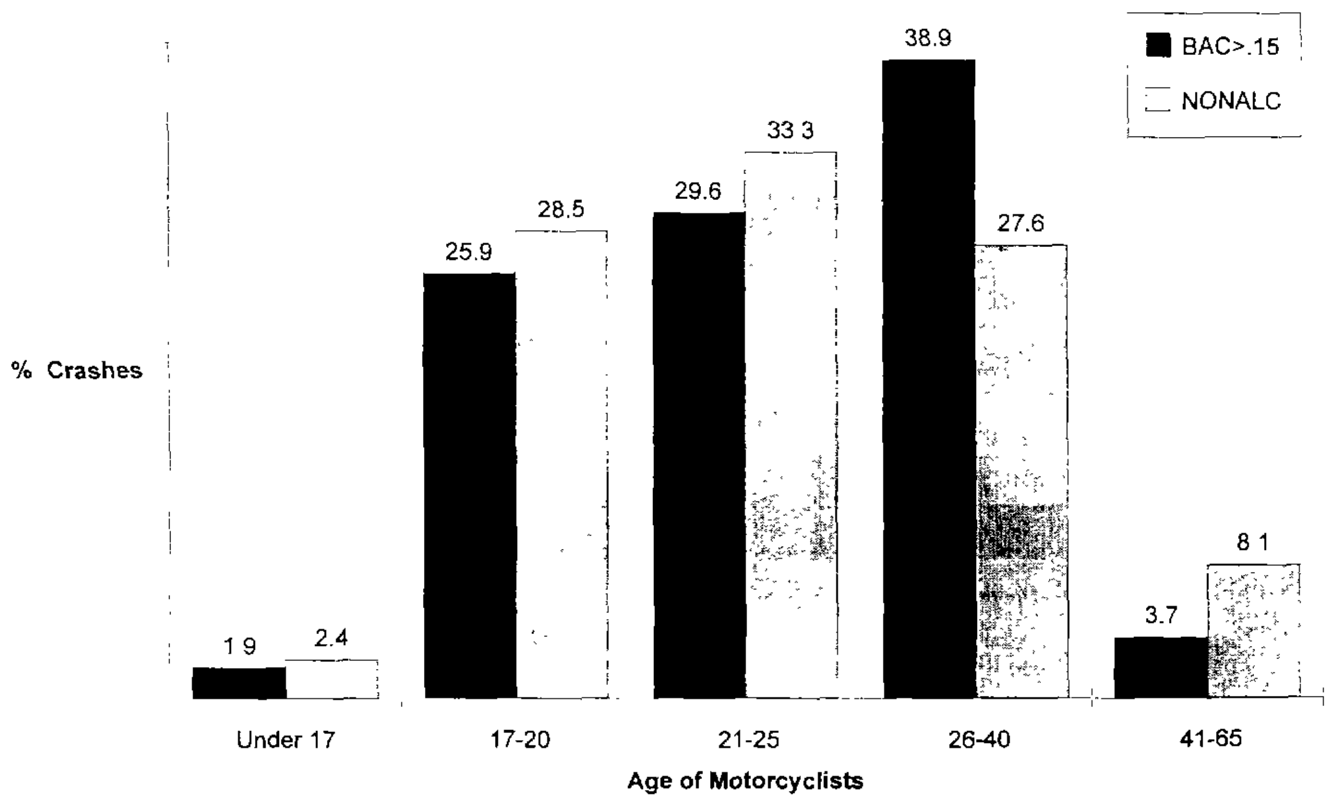
Figure 4.7. Percentages of pedestrians responsible for BAC>.15 alcohol crashes and nonalcohol crashes in each age group.

4.2.7 Persons killed

There were 481 persons killed in crashes in which the maximum BAC of persons responsible was greater than .15. In general, the characteristics of persons killed were similar to those of persons responsible (because of the large degree of overlap between the two groups).

The fatalities comprised 417 males and 64 females. Figure 4.8 shows the different age distributions of persons killed in the alcohol and nonalcohol crashes ($\chi^2(5)=108.3$, $p<.05$). The figure suggests that relatively more persons aged between 21 and 40 were killed in the alcohol crashes.

Motorcyclists. Motorcyclists comprised 54 of the persons responsible for BAC>.15 alcohol crashes and all motorcyclists were male. These crashes made up almost a third of crashes for which motorcyclists were responsible (30.5% of alcohol and nonalcohol crashes for which BAC was known). Almost all motorcyclists were male for the nonalcohol crashes, so the sex ratios were similar for the two types of crashes. While the figure looks similar to that for drivers, the age profiles of motorcyclists responsible for BAC>.15 alcohol crashes and nonalcohol crashes did not differ ($\chi^2(4)=2.9$, $p>.05$, see Figure 4.6).



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vs 59.1%, z=5.58, p<.05). As Figure 4.7 shows, the age profiles of pedestrians responsible for BAC>.15 alcohol crashes and nonalcohol crashes differed markedly ($\chi^2(5)=46.0$, $p<.05$). Most drunk pedestrians were between the age of 21 and 65 but almost half of the sober pedestrians were over the age of 65. The most common type of pedestrian responsible for a BAC>.15 crash was a male aged between 21 and 65 (58/81) whereas the most common type of pedestrian responsible for a nonalcohol crash was a female aged over 65 years (38/63).

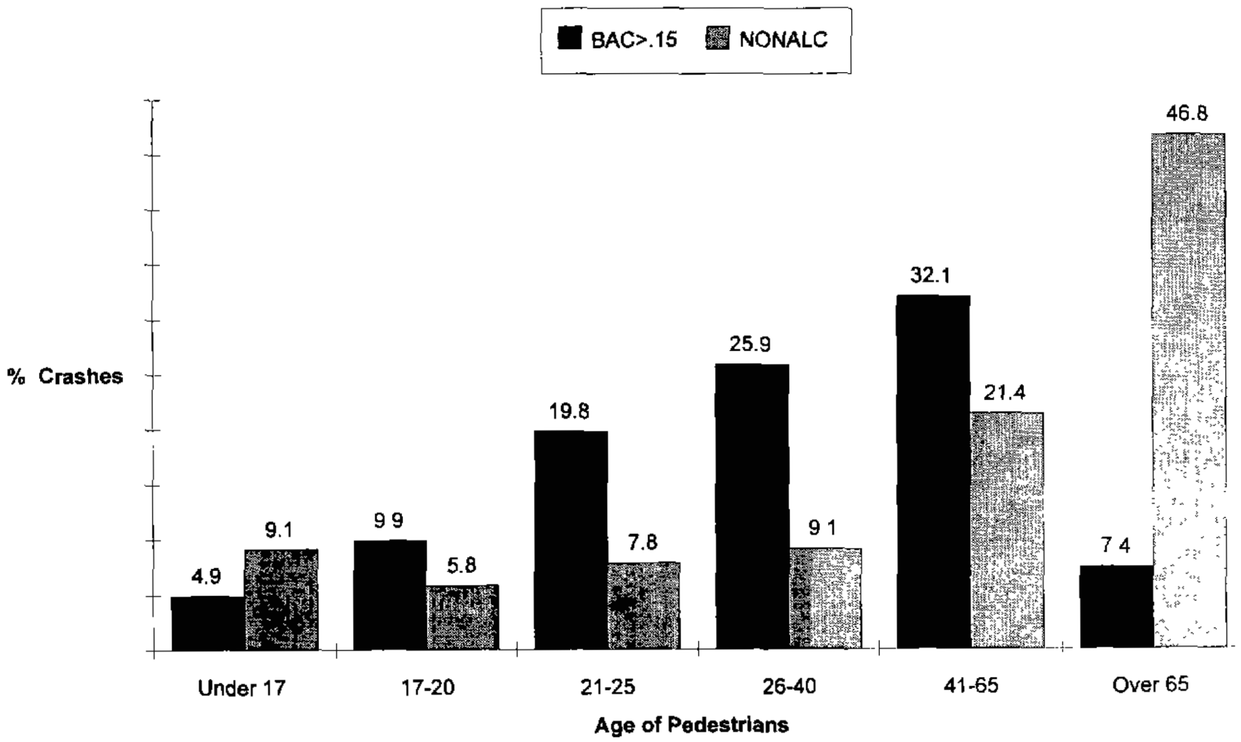

Figure 4.7. Percentages of pedestrians responsible for BAC>.15 alcohol crashes and nonalcohol crashes in each age group.

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The fatalities comprised 417 males and 64 females. Figure 4.8 shows the different age distributions of persons killed in the alcohol and nonalcohol crashes ($\chi^2(5)=108.3$, $p<.05$). The figure suggests that relatively more persons aged between 21 and 40 were killed in the alcohol crashes.

About half of the persons killed in BAC>.15 crashes were drivers (see Table 4.9). The proportion who were drivers was higher in the alcohol crashes than the nonalcohol crashes, however (49.5% vs. 43.2%, z=2.37, p<.05).

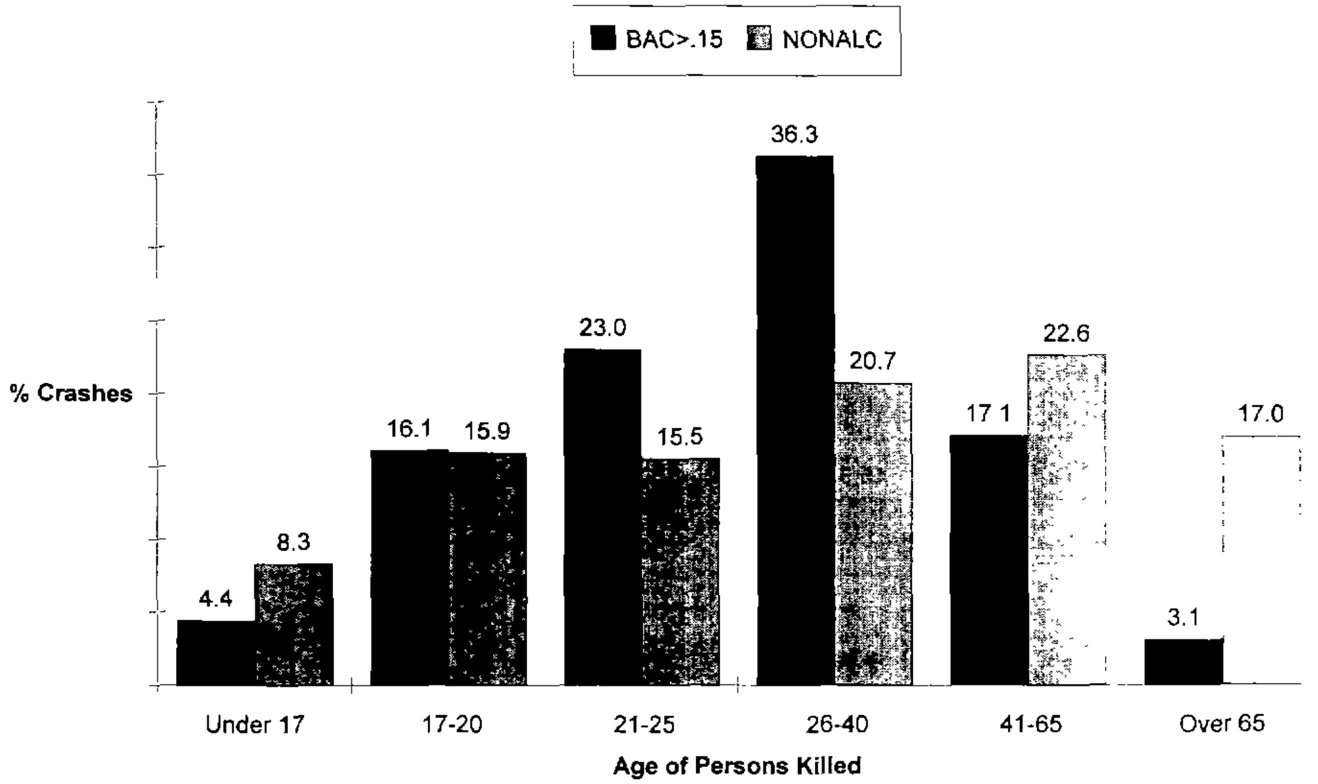


Figure 4.8. Percentages of persons killed in BAC>.15 alcohol crashes and nonalcohol crashes in each age group.

Table 4.9. Types of roadusers killed in BAC>.15 and nonalcohol crashes.

Road user type	BAC>.15 crashes	Nonalcohol crashes
Driver	238 (49.5)	555 (43.2)
Passenger	80 (16.6)	303 (23.6)
Motorcyclist	57 (11.9)	147 (11.4)
Bicyclist	5 (1.0)	43 (3.3)
Pedestrian	91 (18.9)	215 (16.7)
Other	10 (2.1)	21 (1.6)
Total	481 (100.0)	1284 (99.8)

Drivers killed. The age distributions of drivers killed in BAC>.15 alcohol crashes and nonalcohol crashes differed ($\chi^2(5)=44.0$, p<.05, see Figure 4.9). More than 60%

of drivers killed in BAC>.15 alcohol crashes were aged between 21 and 40 years, whereas only about 40% of drivers killed in nonalcohol crashes were in this age range. A greater proportion of drivers killed in the alcohol crashes were male than in the nonalcohol crashes (212 or 89.1% vs. 403 or 72.6%, $z=5.11$, $p<.05$).

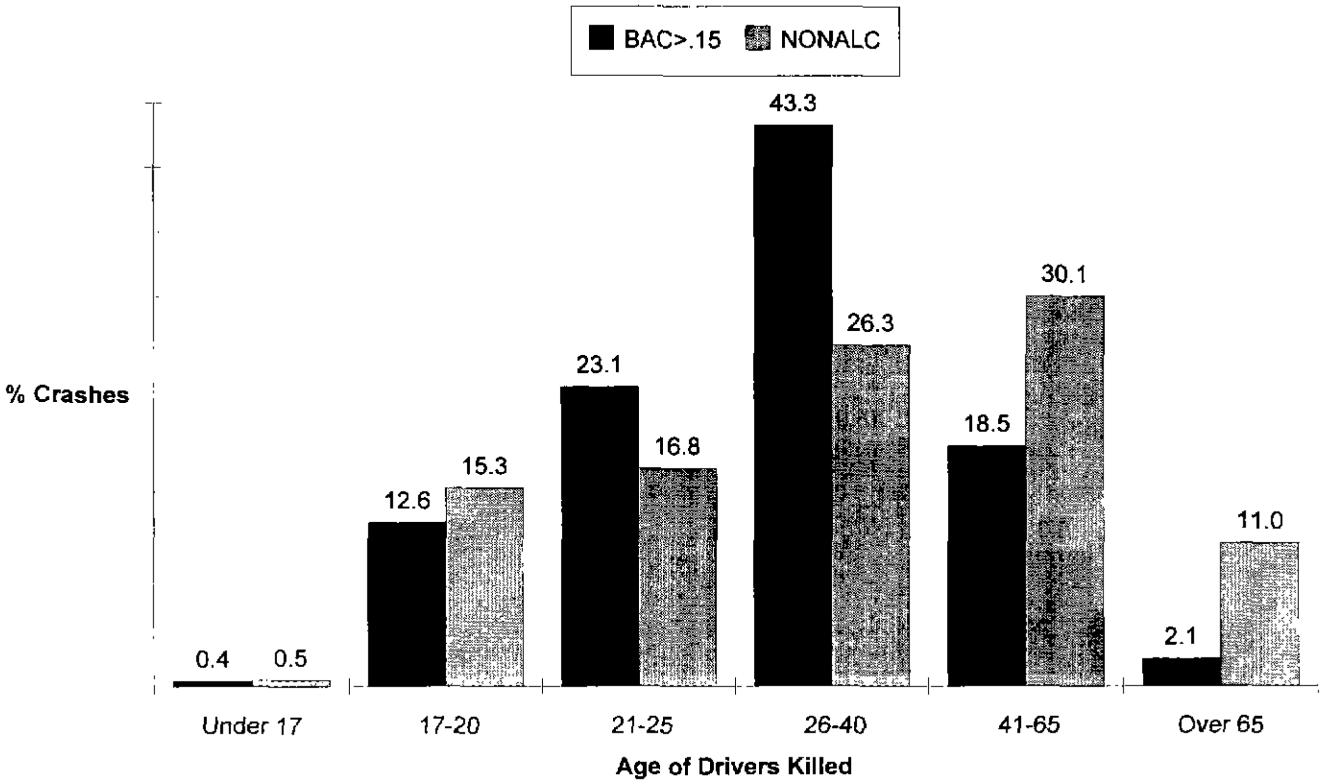


Figure 4.9. Percentages of drivers killed in BAC>.15 alcohol crashes and nonalcohol crashes in each age group.

Motorcyclists killed. Almost all of the motorcyclists killed in BAC>.15 crashes (and nonalcohol crashes) were aged between 17 and 40 years. All were male.

Pedestrians killed. The age distributions of pedestrians killed in BAC>.15 alcohol crashes and nonalcohol crashes differed ($\chi^2(5)=57.9$, $p<.05$). As Figure 4.10 shows, almost half of the pedestrians killed in the nonalcohol crashes were elderly. The sex ratios of the pedestrians also differed between the alcohol and nonalcohol crashes: 83 (91.2%) versus 120 (55.8%), $z=5.99$, $p<.05$.

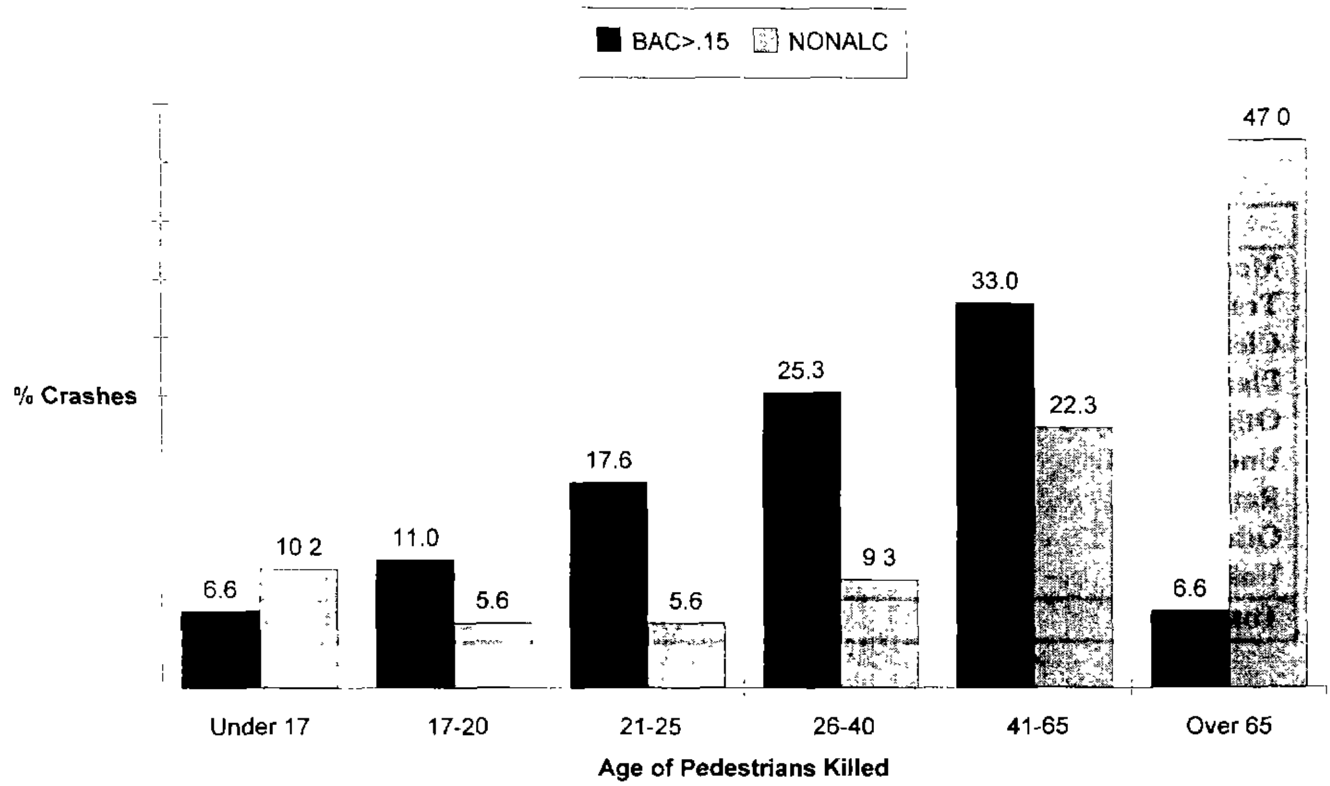


Figure 4.10. Percentages of pedestrians killed in BAC>.15 alcohol crashes and nonalcohol crashes in each age group.

4.2.8 Employment characteristics.

Statistical analysis showed a significant difference in the distributions of employment status of persons responsible for BAC>.15 alcohol crashes and nonalcohol crashes ($\chi^2(8)=87.4$, $p<.05$). Table 4.10 suggests that this may have resulted from more tradesmen, plant operators or labourers and unemployed persons and fewer retired persons and others (preschoolers, students, at home) in the alcohol group. It may be that this pattern was due to the over-representation of males as persons responsible for BAC>.15 alcohol crashes. To test this, a comparison was made for males only (there were too few females to perform a separate analysis). The significant difference between the distributions remained, however, suggesting that there is a real pattern of difference in employment status between those responsible for BAC>.15 alcohol crashes and nonalcohol crashes ($\chi^2(8)=47.9$, $p<.05$). It is possible that the differences in employment status reflected the generally younger age of the persons responsible for alcohol crashes (therefore fewer retired persons, etc.).

Table 4.10. The employment status of persons responsible for alcohol and nonalcohol crashes.

Employment status	Nonalcohol	.05-.15	>.15
Manager/Professional	105 (9.0)	17 (7.2)	24 (5.6)
Trades	114 (9.8)	31 (13.2)	67 (15.7)
Clerical/Sales	96 (8.2)	18 (7.7)	32 (7.5)
Plant/Labour	229 (19.6)	48 (20.4)	108 (25.4)
Other employed	34 (2.9)	11 (4.7)	22 (5.2)
Unemployed	51 (4.4)	23 (9.8)	46 (10.8)
Retired	151 (12.9)	6 (2.6)	15 (3.5)
Other	150 (12.8)	13 (5.5)	23 (5.4)
Unknown	238 (20.4)	68 (28.9)	89 (20.9)
Total	1168 (100.0)	235 (100.0)	426 (100.0)

4.2.9 Trip purpose

Trip purpose is coded in terms of origin and destination of the trip. Overall, information about the origin of the trip was only available for 51.3% of vehicles responsible for crashes. Destination information was available for 46.6% of vehicles responsible for crashes. Earlier analyses of these data showed that while there was a large amount of missing data, there seemed to be no systematic biases in the pattern of missing data (INTSTAT, 1991).

Tables 4.11 and Table 4.12 summarise the origins and destinations of trips for vehicles whose controllers were responsible for alcohol and nonalcohol crashes.

Table 4.11. Trip purpose coded in terms of origin of the trip for vehicles whose controllers (drivers or riders) were responsible for alcohol and nonalcohol crashes.

Origin of trip	Nonalcohol	.05-.15	>.15
Home	139 (13.7)	17 (8.0)	27 (7.8)
Work	151 (14.9)	8 (3.8)	12 (3.5)
Recreation	197 (19.4)	93 (43.7)	162 (47.0)
Private business	18 (1.8)	2 (0.9)	1 (0.3)
Other	6 (0.6)	1 (0.5)	1 (0.3)
Unknown	503 (49.6)	92 (43.2)	142 (41.2)
Total	1014 (100.0)	213 (100.1)	345 (100.1)

Table 4.12. Trip purpose coded in terms of destination of the trip for vehicles whose drivers were responsible for alcohol and nonalcohol crashes.

Destination of trip	Nonalcohol	.05-.15	>.15
Home	167 (16.5)	66 (31.0)	90 (26.1)
Work	149 (14.7)	8 (3.8)	7 (2.0)
Recreation	127 (12.5)	22 (10.3)	49 (14.2)
Private business	35 (3.5)	5 (2.3)	7 (2.0)
Other	9 (0.9)	1 (0.5)	1 (0.3)
Unknown	527 (52.0)	111 (52.1)	191 (55.4)
Total	1014 (100.1)	213 (100.0)	345 (100.0)

Where origin and destination were known, the most frequent trip purposes for vehicles responsible for BAC>.15 alcohol crashes were recreation to home (75 trips) and recreation to recreation (37 trips). The most frequent trip purposes for vehicles responsible for nonalcohol crashes were work to work (109 trips), recreation to home (100 trips) and recreation to recreation (69 trips).

4.3 ALCOHOL CRASHES IN WHICH MAXIMUM BAC WAS .05-.15

As Table 4.1 shows, there were 228 alcohol crashes in which maximum BAC was between .05 and .15 (12.6% of all crashes for which maximum BAC was known). These crashes resulted in death to 249 people and injury to 170 people. In this section, these crashes are compared with the 1131 nonalcohol crashes for which maximum BAC was known.

4.3.1 Timing

In Figure 4.11, the time of day that BAC .05-.15 alcohol crashes and nonalcohol crashes occurred is shown grouped into six hour blocks. A larger proportion of the alcohol crashes occurred at night than was the case for nonalcohol crashes (79.3% vs 34.6%, z=12.45, p<.05).

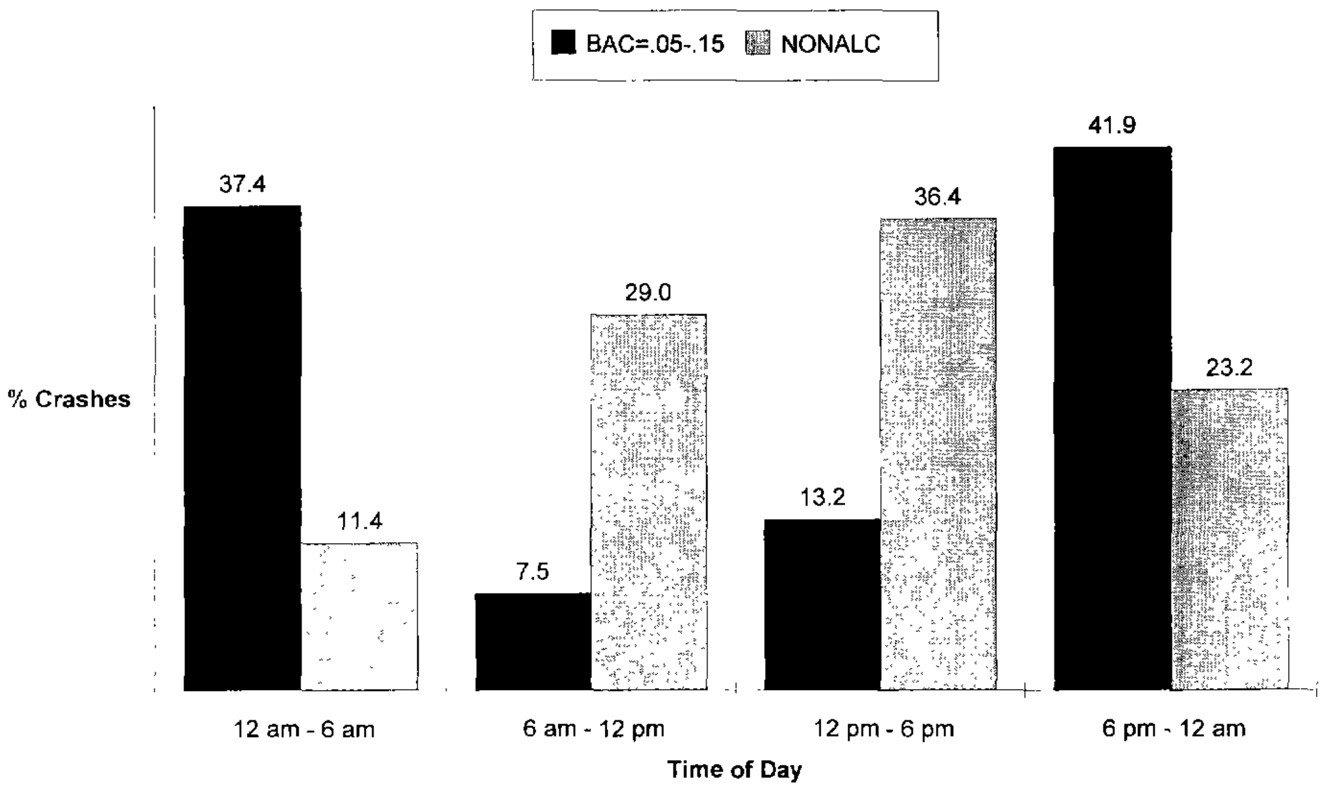


Figure 4.11. Time of day that BAC .05-.15 alcohol crashes and nonalcohol crashes occurred.

Many of the BAC .05-.15 alcohol crashes occurred on the weekend. This proportion was significantly higher than for nonalcohol crashes (43.4% vs 29.2%, z=4.21, p<.05). Figure 4.12 shows the distribution of the alcohol and nonalcohol crashes by day of week.

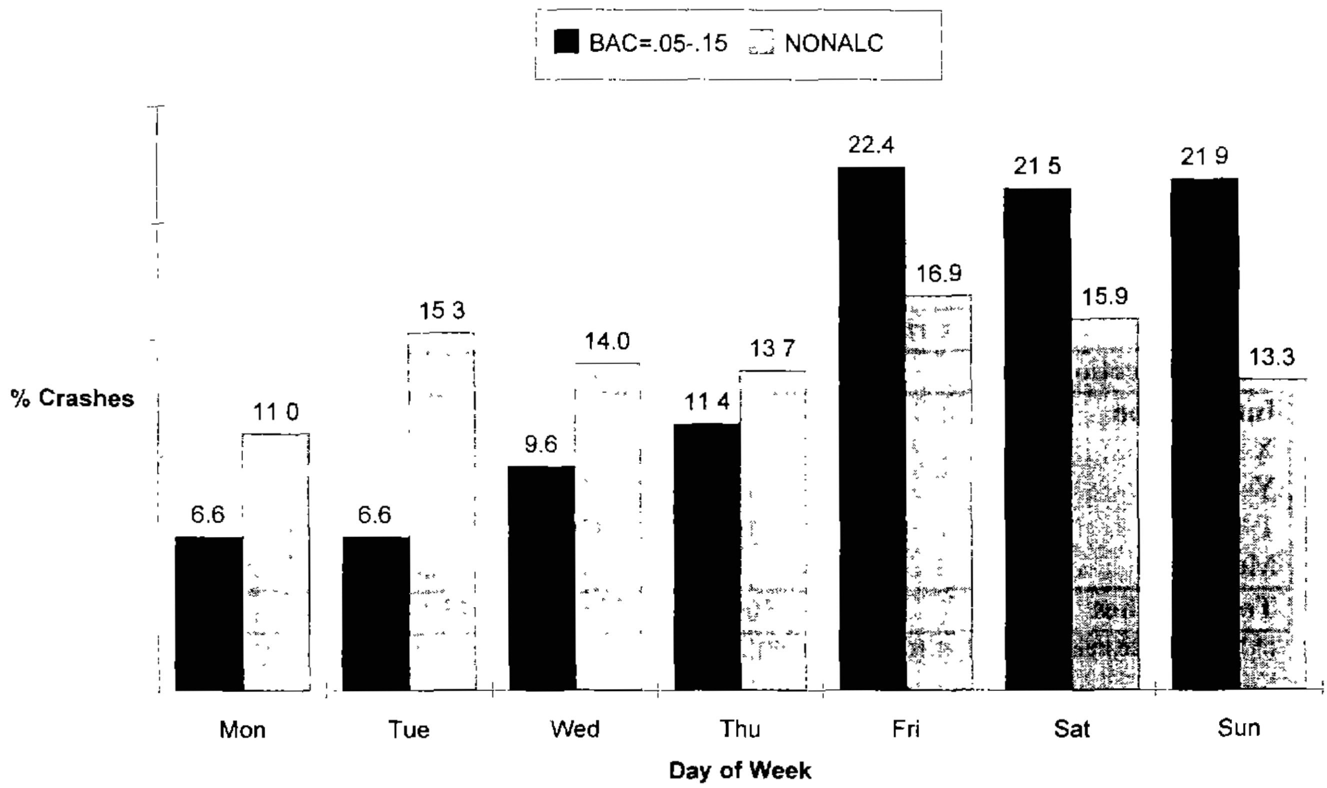


Figure 4.12. Day of week that BAC .05-.15 alcohol crashes and nonalcohol crashes occurred.

Almost a third of the crashes in which maximum BAC was between .05 and .15 occurred on Saturday night or Sunday night (72 or 31.7%). This proportion is greater than that found for nonalcohol crashes (152 or 13.5%, $z=6.74$, $p<.05$).

These findings are in accord with past research which found alcohol crashes to be more likely to occur at night and on weekends than other crashes.

4.3.2 Location

The numbers and percentages of alcohol and nonalcohol crashes in each State and Territory are shown in Table 4.2. BAC .05-.15 crashes made up between 5 and 21 percent of those crashes in which BAC was known for at least one person responsible. In most jurisdictions the value was between 11 and 17 percent. There was no evidence of more alcohol crashes at this level occurring in the Northern Territory (9.7%) than in other jurisdictions.

Table 4.17 shows the numbers of intersection and nonintersection crashes in urban and rural areas. The proportions of BAC .05-.15 alcohol crashes which occurred in urban and rural areas were similar to those of nonalcohol crashes: 56.1% of the alcohol crashes and 56.9% of the nonalcohol crashes occurred in urban areas ($z<1$, $p>.05$). Crashes in which maximum BAC was between .05 and .15 were less likely to occur at intersections than nonalcohol crashes (21.1% versus 29.5%, $z=4.75$, $p<.05$).

Of those crashes which did occur at intersections, it appears that a greater proportion of alcohol than nonalcohol crashes occurred at T-intersections (64.6% vs 47.3%).

Table 4.17*. Numbers of intersection and nonintersection crashes in urban and rural areas.

Intersection type	BAC .05-.15 alcohol crashes			Nonalcohol crashes		
	Urban	Rural	Total	Urban	Rural	Total
Nonintersection	88	92	180	370	427	797
Intersection	40	8	48	273	61	334
X	12	1	13	133	28	161
Y	1	2	3	6	3	9
T	27	4	31	129	29	158
Multiple	0	1	1	5	1	6
Total crashes	128	100	228	643	488	1131

(* Note: Table numbers 4.13 -4.16 are not used)

Differences existed in the type of road on which the two types of crashes occurred ($\chi^2(3)=18.1$, $p<.05$). As Figure 4.13 shows, compared to nonalcohol crashes, the alcohol crashes appeared less likely to occur on highways and more likely to occur on other rural roads. The figure also suggests that the alcohol crashes were less likely to occur on city arterials and more likely to occur on other urban roads than nonalcohol crashes.

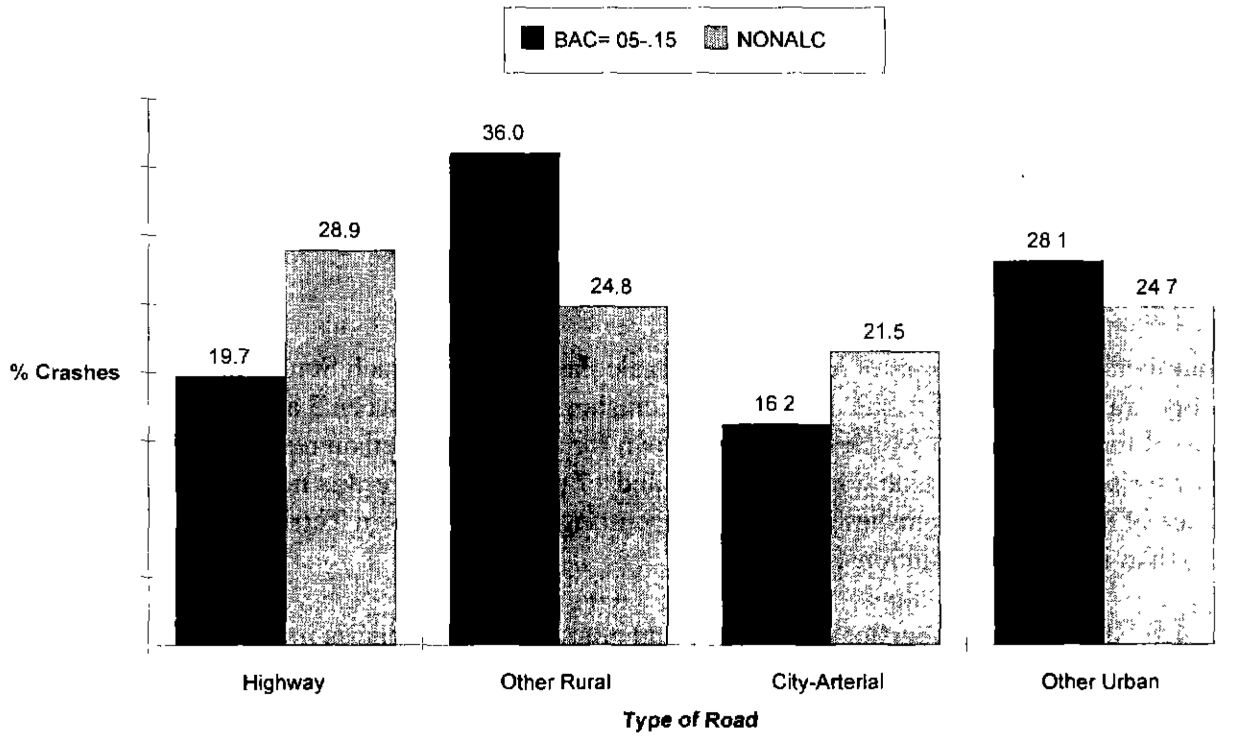


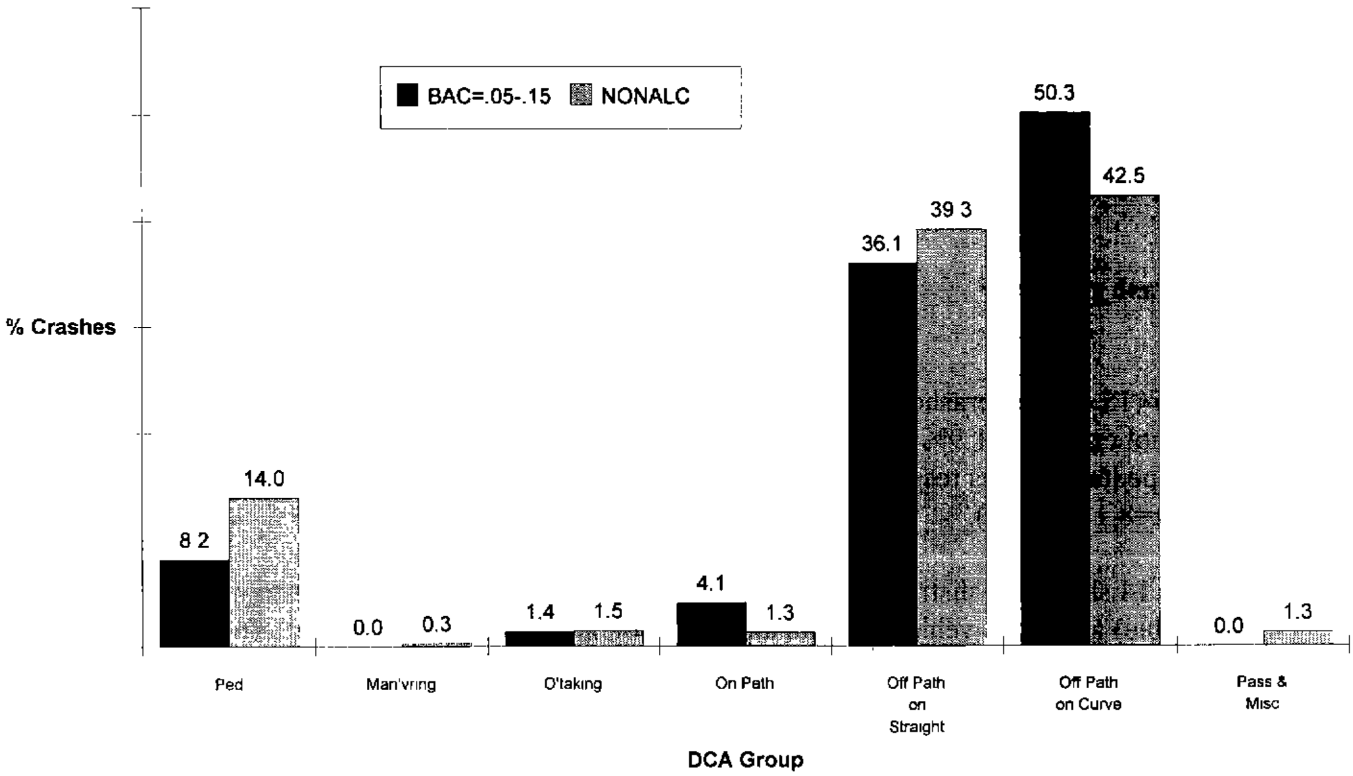
Figure 4.13. Type of road where BAC .05-.15 alcohol crashes and nonalcohol crashes occurred.

The location of crashes can also be expressed as a function of speed zone Three quarters of BAC .05- 15 and nonalcohol crashes occurred in areas zoned 60 km/h or 100 km/h. The distribution of crashes between these two speed zones was not affected by alcohol ($\chi^2(1)$= 0.001, p>.05).

4.3.3 Crash pattern

BAC .05-.15 alcohol crashes were more likely to involve only one vehicle than were nonalcohol crashes (71.9% vs 48.0%, z=6.59, p<.05). When single vehicle crashes where a pedestrian was responsible were removed, this difference remained (64.5% vs 35 4%, z=8.17, p<.05).

Figure 4.14 shows the distributions of crash patterns for single vehicle (pedestrian not responsible) and multi-vehicle alcohol and nonalcohol crashes. The crash patterns did not differ significantly between alcohol and nonalcohol single vehicle crashes ($\chi^2(6)$=11.2, p>.05, see upper panel). Among multi-vehicle crashes, the mix of crash patterns did differ significantly ($\chi^2(9)$=19.9, p<.05). From the lower panel of Figure 4.14 it appears that fewer BAC .05-.15 alcohol crashes involved vehicles from adjacent directions and there was possibly more overtaking in the alcohol crashes.



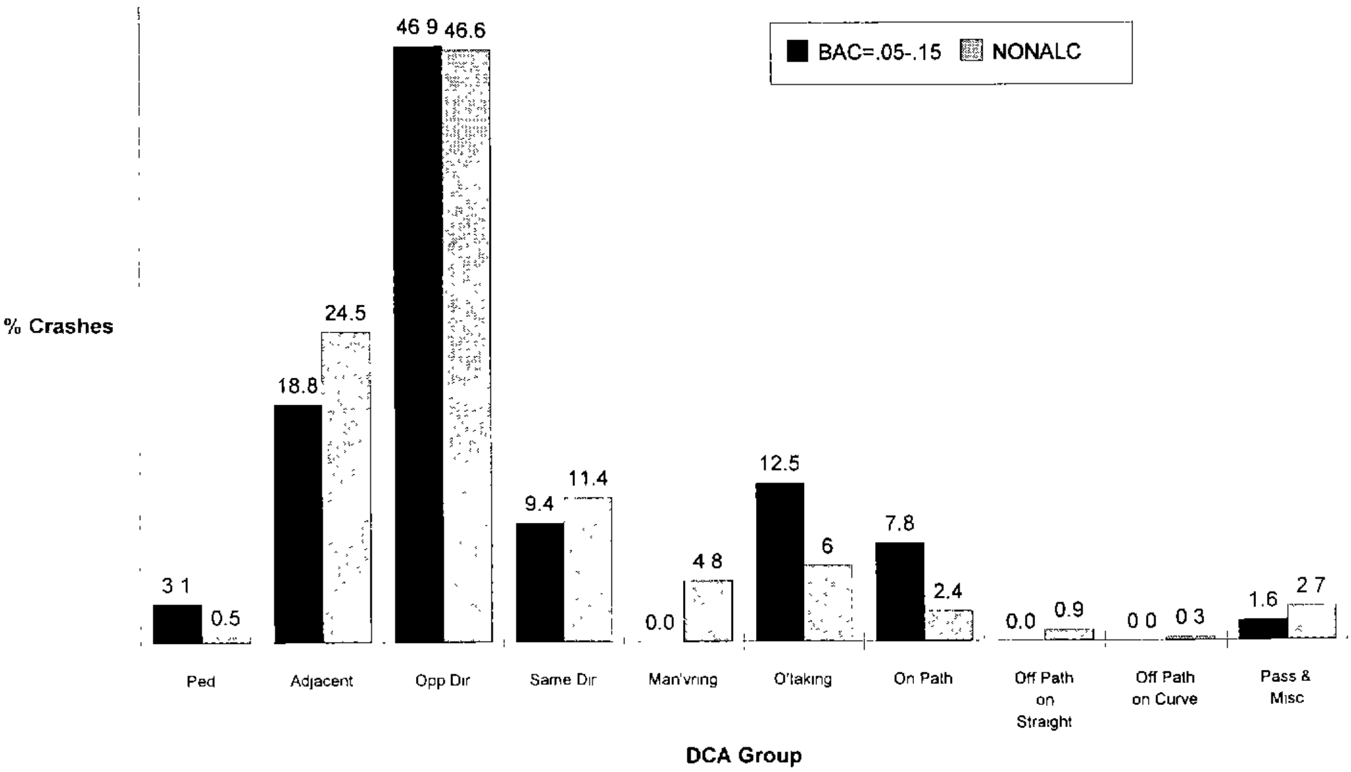


Figure 4.14. Crash pattern (DCA group) of BAC .05-.15 alcohol crashes and nonalcohol crashes. Upper panel shows single-vehicle crashes (pedestrian not responsible) and lower panel shows multi-vehicle crashes.

4.3.4 Vehicles driven by persons responsible for crashes

The types of vehicles driven by persons responsible for BAC .05-.15 alcohol crashes are presented in Table 4.4. In crashes for which the BAC of the person known was responsible, the proportions which were alcohol crashes with maximum BAC .05-.15 were similar for cars (13.6%), motorcycles (14.0%) and light commercial vehicles (16.8%).

The ages of cars driven by persons responsible for BAC .05-.15 alcohol crashes are summarised in Table 4.5. The data suggest that cars more than 10 years old are over-represented in these crashes compared with nonalcohol crashes (39.3% vs 31.8%, $z=1.71$, $p<.05$). Cars driven by persons responsible for BAC .05-.15 alcohol crashes were older on average than those driven by persons responsible for nonalcohol crashes (10.1 years vs. 8.7 years, $t(596)=2.16$, $p<.05$).

4.3.5 Vehicle occupancy

Table 4.6 summarises vehicle occupancy data for cars responsible for alcohol and nonalcohol crashes. Cars responsible for BAC .05-.15 crashes had similar numbers of occupants as cars responsible for nonalcohol crashes (1.97 vs 1.87, $t(855)=0.91$, $p>0.05$).

4.3.6 Speeding

Vehicles whose driver was responsible for a BAC .05-.15 alcohol crash were more likely than those of nonalcohol crashes to be judged to be travelling at "possibly over the speed limit" (22.7% vs 12.7%, $z=3.74$, $p<.05$, see Table 4.7) or "definitely over the speed limit" (34.6% vs 15.2%, $z=6.56$, $p<.05$).

4.3.7 Persons responsible for crashes

The blood alcohol concentrations of the road users responsible for alcohol crashes are presented in Table 4.8. Overall, males were over-represented as responsible for alcohol crashes with BAC .05-.15 (88.5% of these crashes, 77.8% of nonalcohol crashes, $z=3.71$, $p<.05$). The age profiles of persons responsible for these crashes and nonalcohol crashes differed ($\chi^2(5)=47.9$, $p<.05$). As Figure 4.15 shows, the age group 17-20 appeared to be over-represented in the alcohol crashes (28.6% vs 17.4%). Persons aged 21-40 also seemed somewhat over-represented. Males aged 17-40 comprised 168 of the 234 persons responsible for BAC .05-.15 alcohol crashes (72.1% vs 47.6% of nonalcohol crashes, $z=6.83$, $p<.05$).

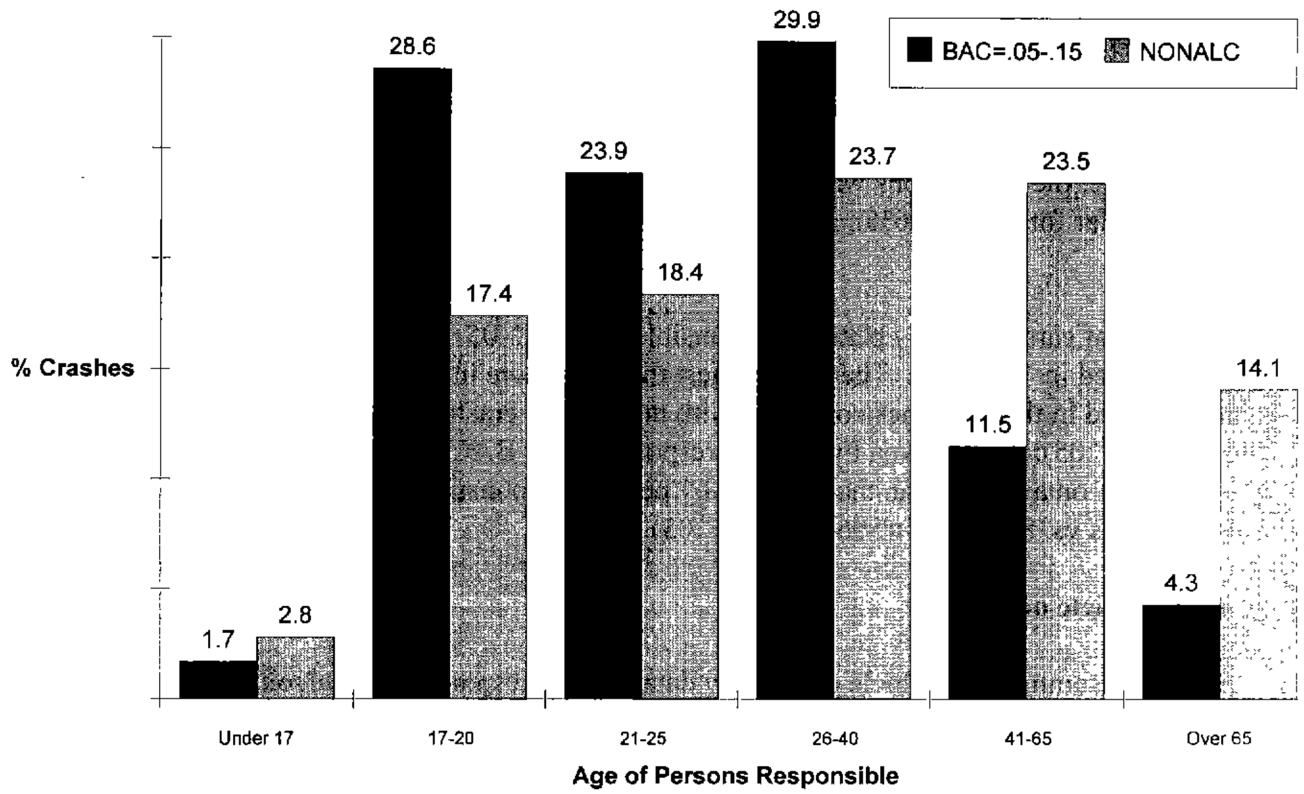


Figure 4.15. Percentages of persons responsible for BAC .05-.15 alcohol crashes and nonalcohol crashes in each age group.

Drivers. Drivers comprised 180 of the 234 persons responsible for BAC .05-.15 crashes. When drivers alone were considered, males remained over-represented as responsible for alcohol crashes with BAC .05-.15 (87.2% vs 78.3% for nonalcohol crashes, $z=2.70$, $p<.05$). The age profiles of drivers responsible for BAC .05-.15 alcohol crashes and nonalcohol crashes again differed ($\chi^2(5)=35.9$, $p<.05$). As Figure 4.16 shows, there appears to be an over-representation of drivers in the age group 17-20 in alcohol crashes and, to a lesser extent, drivers aged 21-40. Males aged 17-40 comprised 129 of the 180 drivers responsible for BAC .05-.15 alcohol crashes (71.7% vs 48.7% of nonalcohol crashes, $z=5.62$, $p<.05$).

Seat belts were available but not worn by 69 drivers responsible for BAC .05-.15 alcohol crashes (38.1%). This proportion is significantly higher than that found for drivers responsible for nonalcohol crashes (20.1%, $z=5.22$, $p<.05$).

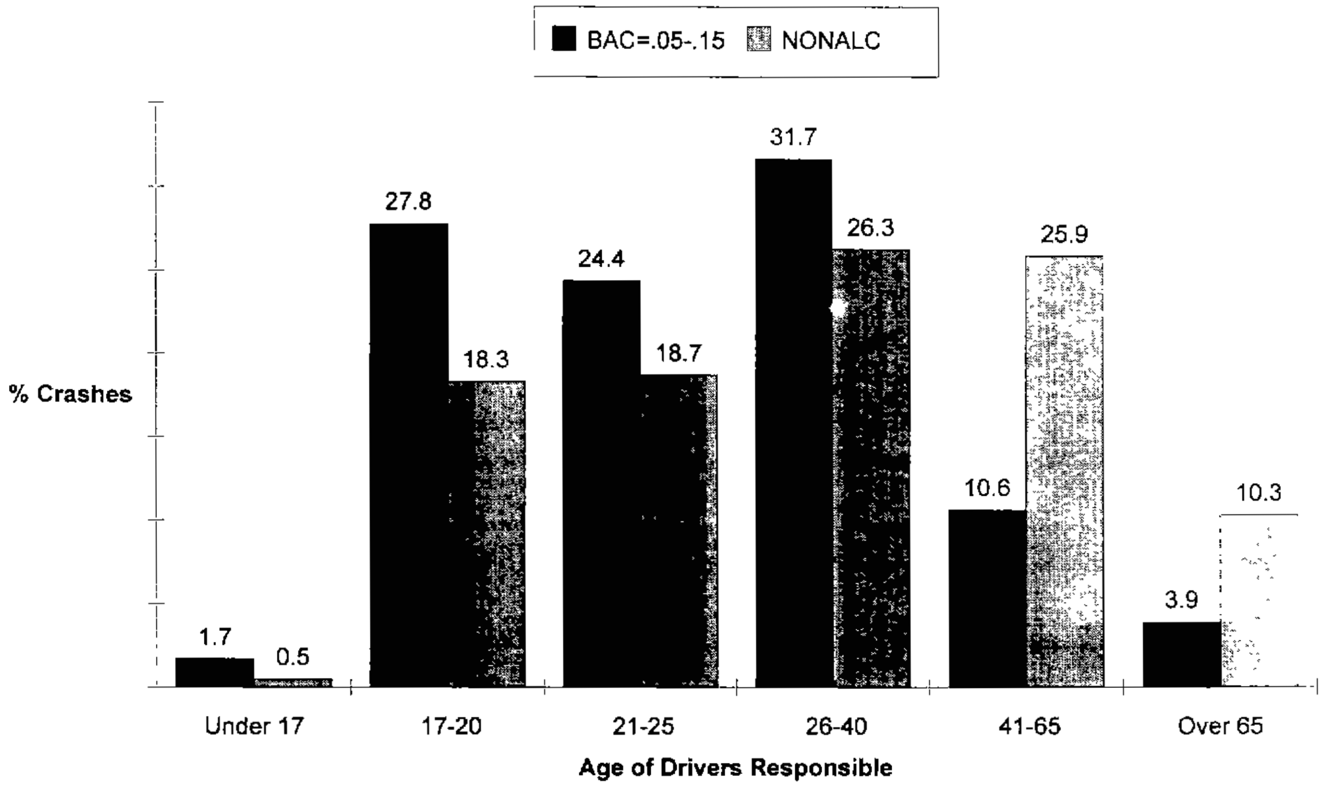


Figure 4.16. Percentages of drivers responsible for BAC .05-.15 alcohol crashes and nonalcohol crashes in each age group.

Motorcyclists. 29 of the 30 motorcyclists responsible for BAC .05-.15 alcohol crashes were male (as were 120 of the 123 motorcyclists responsible for nonalcohol crashes). The age profiles of motorcyclists involved in BAC .05-.15 alcohol crashes and nonalcohol crashes were similar ($\chi^2(4)$=.52, p>.05, see Figure 4.17).

Pedestrians. In 18 alcohol crashes, the maximum BAC of between .05 and .15 belonged to a pedestrian (a total of 22 pedestrians). Most of these crashes occurred at night (77.8% vs 32.6% of nonalcohol crashes for which pedestrians were responsible). About a third of the crashes occurred on the weekend (27.8% vs 22.9% of nonalcohol crashes). Crashes where pedestrians were responsible occurred primarily in urban areas regardless of whether or not alcohol was involved (88.9% where max BAC 0.5-.15, 94.4% of nonalcohol crashes).

Pedestrians comprised 22 of the 234 persons responsible for BAC .05-.15 alcohol crashes. 19 of these pedestrians were male, a higher proportion than for nonalcohol crashes for which pedestrians were responsible (86.4% vs 59.1%, z=2.47, p<.05). As Figure 4.18 shows, the age profiles of pedestrians responsible for BAC .05-.15 alcohol crashes and nonalcohol crashes differed ($\chi^2(5)$=30.9, p<.05). Most drunk pedestrians were in the age groups 17-20 and 41-65 but almost half of the sober pedestrians were over the age of 65.

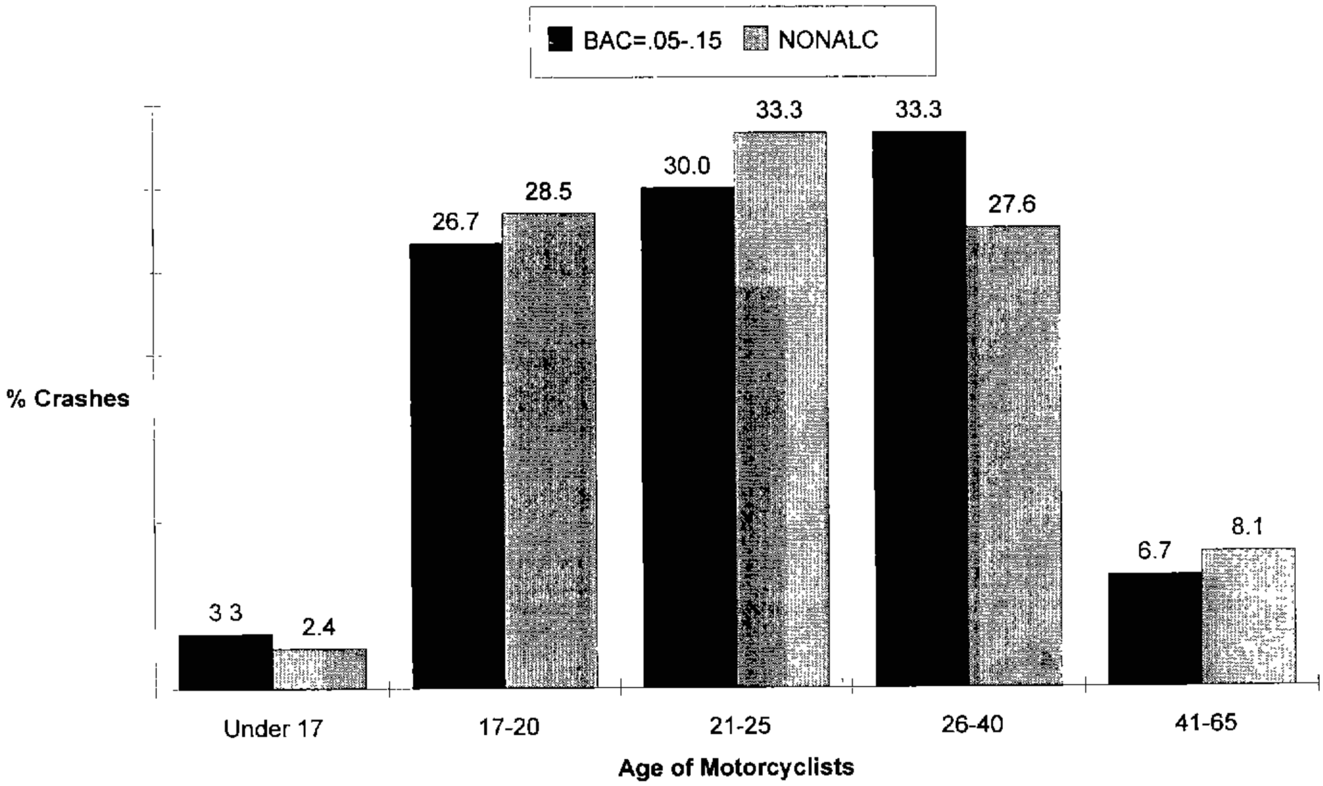


Figure 4.17. Percentages of motorcyclists responsible for BAC .05-.15 alcohol crashes and nonalcohol crashes in each age group.

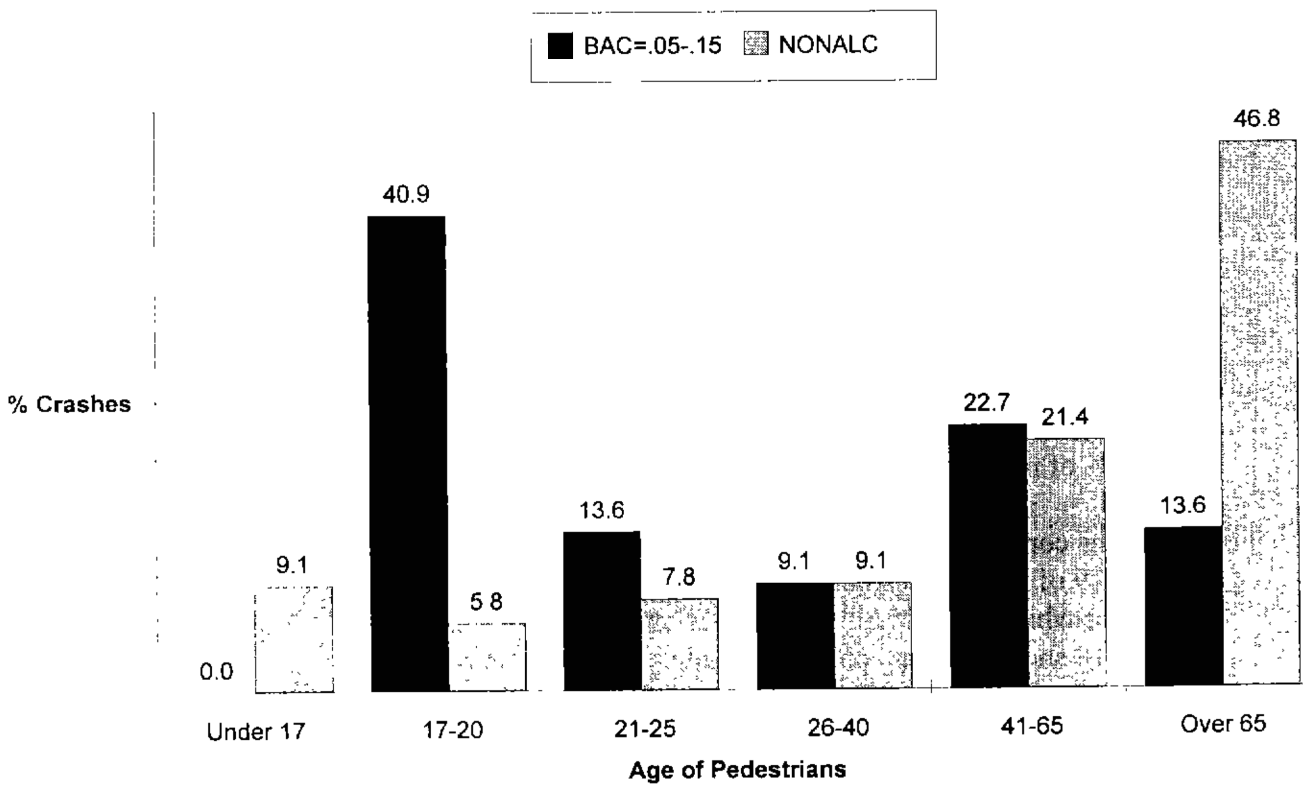


Figure 4.18. Percentages of pedestrians responsible for BAC .05-.15 alcohol crashes and nonalcohol crashes in each age group.

4.3.8 Persons killed

There were 249 persons killed in crashes in which the maximum BAC of persons responsible was between .05 and .15. The fatalities comprised 199 males and 50 females. Figure 4.19 shows the different age distributions of persons killed in the alcohol and nonalcohol crashes ($\chi^2(5)=59.8$, $p<.05$). The figure suggests that relatively more persons aged between 21 and 40 were killed in the alcohol crashes. Further analysis showed that this pattern was found for both males and females.

The distributions of road user types killed were similar in BAC .05-.15 crashes and nonalcohol crashes (see Table 4.18). About 70% of those killed were vehicle occupants.

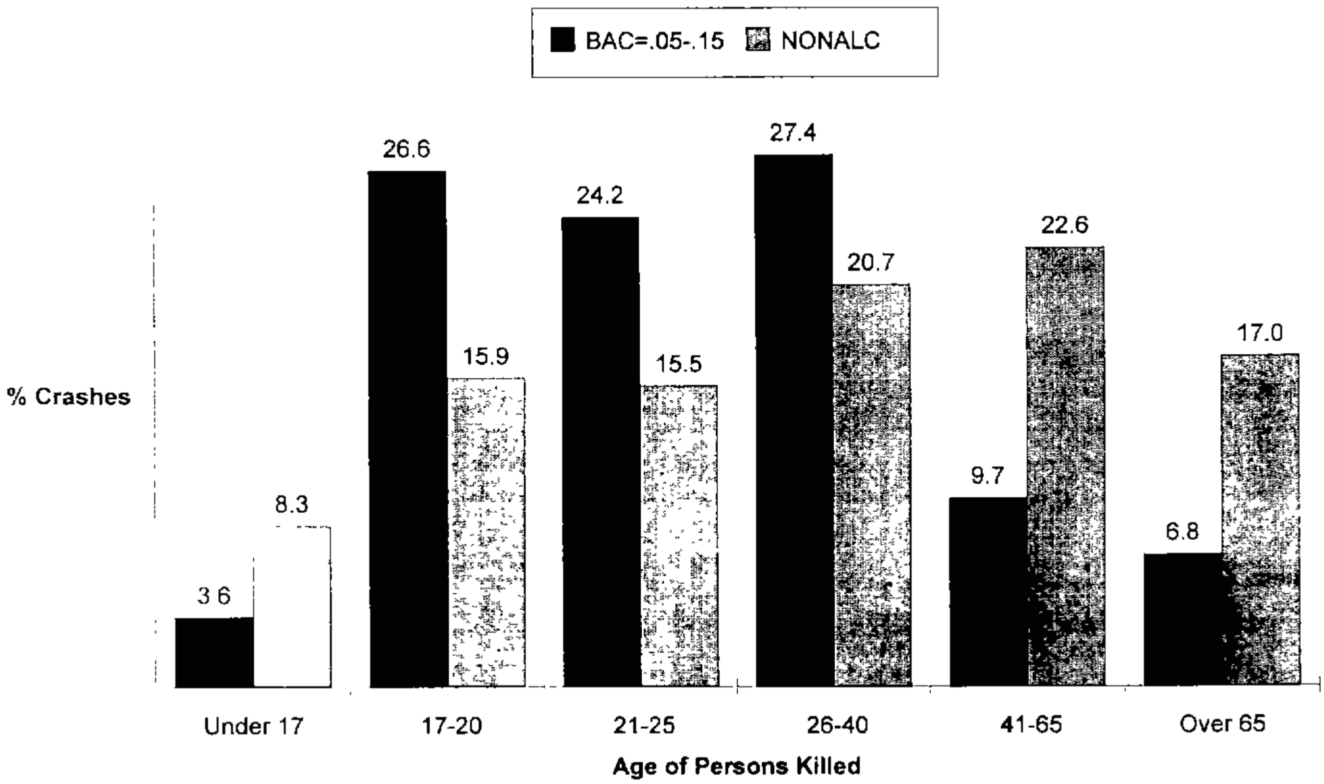


Figure 4.19. Percentages of persons killed in BAC .05-.15 alcohol crashes and nonalcohol crashes in each age group.

Table 4.18. Persons killed in BAC .05 -.15 and nonalcohol crashes as a function of road user type.

Road user type	BAC .05-.15 crashes	Nonalcohol crashes
Driver	106 (42.6)	555 (43.2)
Passenger	69 (27.7)	303 (23.6)
Motorcyclist	31 (12.4)	147 (11.4)
Bicyclist	5 (2.0)	43 (3.3)
Pedestrian	30 (12.0)	215 (16.7)
Other	8 (3.2)	21 (1.6)
Total	249 (99.9)	1284 (99.8)

Drivers killed. The age distributions of drivers killed in BAC .05-.15 alcohol crashes and nonalcohol crashes differed ($\chi^2(5)=21.6$, $p<.05$, see Figure 4.20). In general, drivers killed in the alcohol crashes were younger than those killed in the nonalcohol crashes. A greater proportion of drivers killed in the alcohol crashes were male than in the nonalcohol crashes (89 or 84.0% vs. 403 or 72.6%, $z=2.46$, $p<.05$).

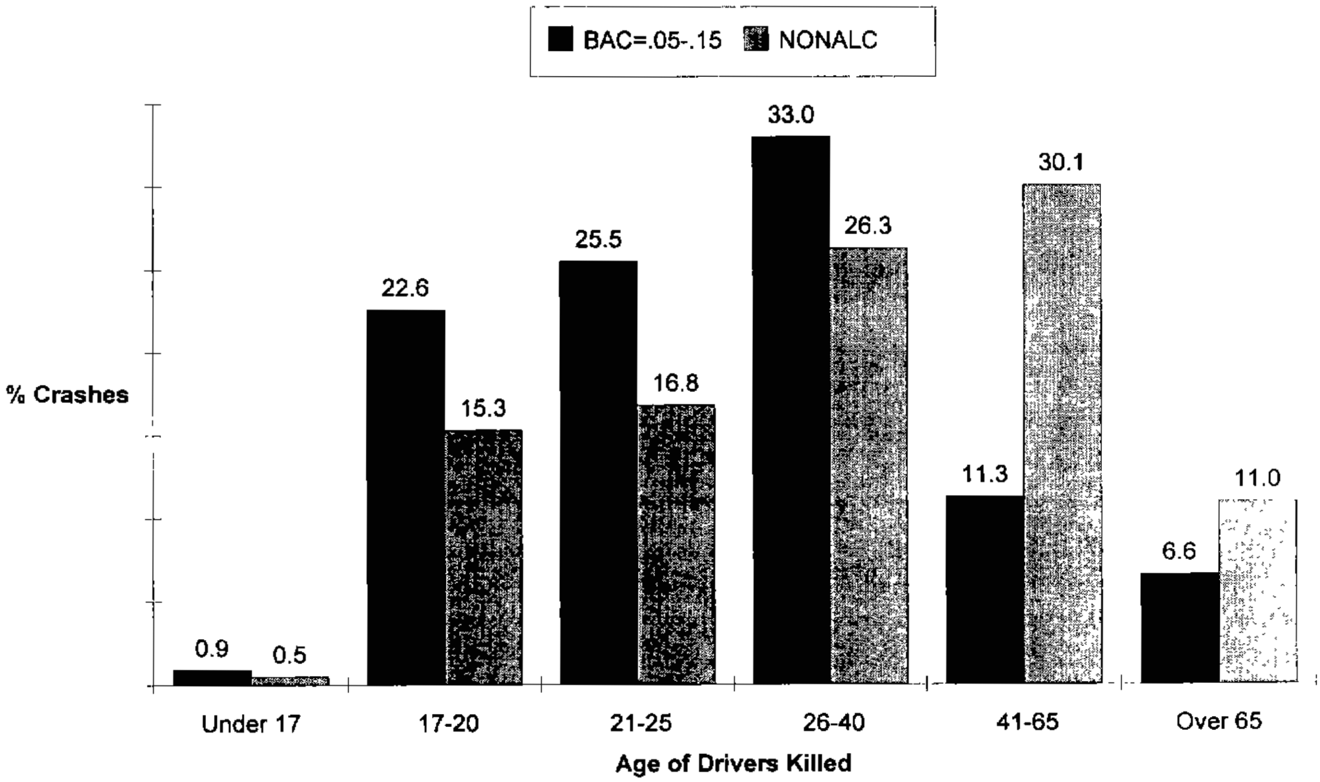


Figure 4.20. Percentages of drivers killed in BAC .05-.15 alcohol crashes and nonalcohol crashes in each age group.

Motorcyclists killed. Almost all of the motorcyclists killed in BAC .05-.15 crashes (and nonalcohol crashes) were aged between 17 and 40 years. Most motorcyclists killed were male: 30 of the 31 motorcyclists killed in BAC .05-.15 crashes were male and 143 of the 147 motorcyclists killed in nonalcohol crashes.

Pedestrians killed. The age distributions of pedestrians killed in BAC .05-.15 alcohol crashes and nonalcohol crashes differed ($\chi^2(5)=30.3$, $p<.05$). As Figure 4.21 shows, almost half of the pedestrians killed in the nonalcohol crashes were elderly. The sex ratios of the pedestrians also differed between the two groups: 26/30 (86.7%) males killed in the alcohol crashes versus 120/215 (55.8%) males killed in the nonalcohol crashes, $z=3.23$, $p<.05$.

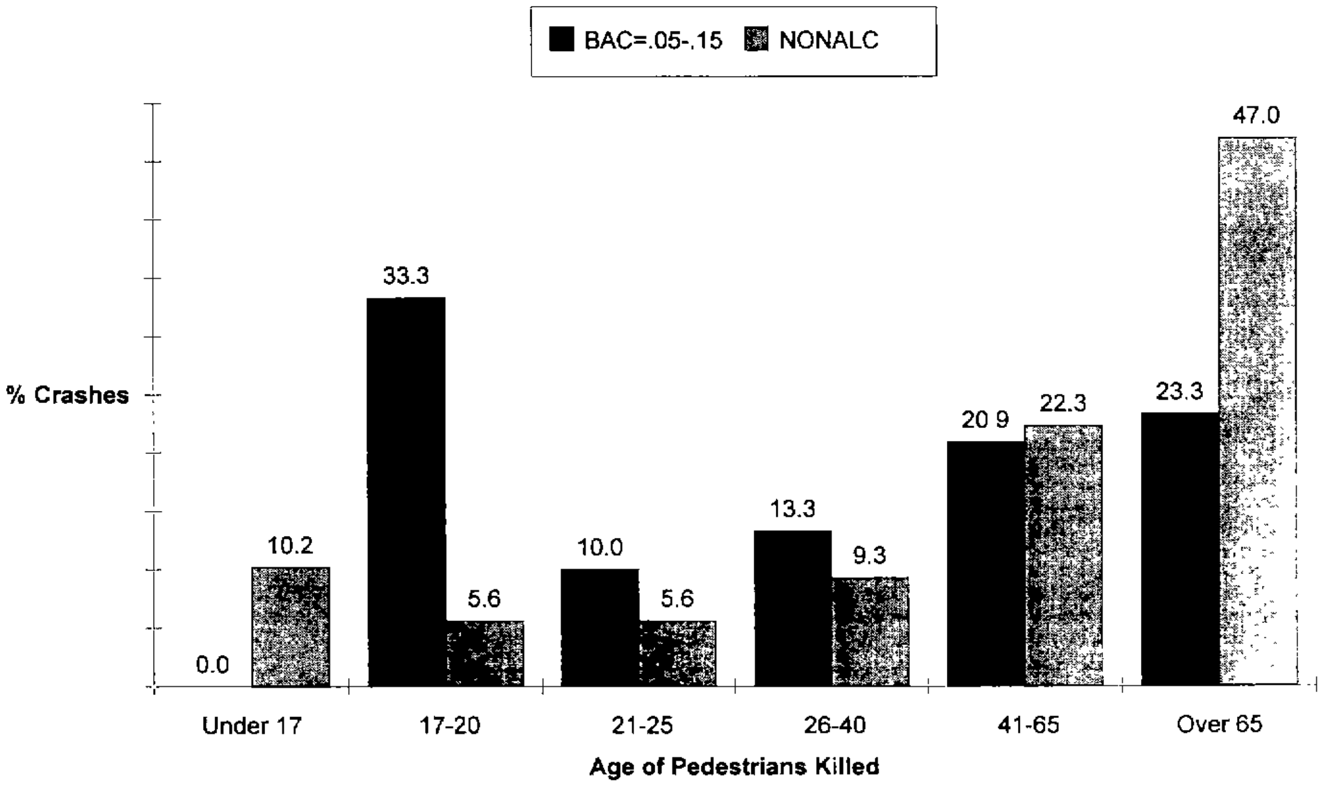


Figure 4.21. Percentages of pedestrians killed in BAC .05-.15 alcohol crashes and nonalcohol crashes in each age group.

4.3.9 Employment characteristics

The employment status of persons responsible for alcohol and nonalcohol crashes is summarised in Table 4.10. Statistical analysis showed a significant difference between the distributions of employment status of persons responsible for BAC .05-.15 crashes and persons responsible for nonalcohol crashes ($\chi^2(8)=50.3$, $p<.05$). Inspection of Table 4.10 suggests that the alcohol group contained comparatively fewer retired persons and others (preschoolers, students, at home) than the nonalcohol group but comparatively more persons for whom employment status was unknown.

When employment status was examined for males alone (to control for the over-representation of males in alcohol crashes), the data showed the same pattern ($\chi^2(8)=29.7$, $p<.05$).

4.3.10 Trip purpose

Tables 4.11 and 4.12 show trip purpose coded in terms of origin and destination of the trip. Origin and destination were missing for about half of the vehicles responsible for crashes. Of the 99 BAC .05-.15 alcohol crashes for which origin and destination were known, the most frequent trip purpose was recreation to home (55 trips). For the 469 nonalcohol crashes for which origin and destination were known, 109 were work-work, 100 were recreation-home and 69 were recreation-recreation.

4.4 A COMPARISON OF ALCOHOL CRASHES IN WHICH MAXIMUM BAC>.15 AND ALCOHOL CRASHES IN WHICH MAXIMUM BAC LAY BETWEEN .05 AND .15

As shown in Table 4.8, there were 424 alcohol crashes in which maximum BAC>.15 and 228 alcohol crashes in which maximum BAC lay between .05 and .15. Thus the highest BAC crashes were more common and resulted in more deaths and injuries.

4.4.1 Timing

Alcohol crashes in which maximum BAC exceeded .15 were more likely to occur at night thán alcohol crashes in which maximum BAC was between .05 and .15 (87.0% vs 79.3%, z=2.57, p<.05).

The proportion of crashes which occurred on the weekend did not differ for the two maximum BAC levels (49.3% vs 43.4%, z=1.44, p>.05). However, the proportion of crashes which occurred on Saturday night or Sunday night was greater for the higher maximum BAC (42.3% vs 31.7%, z=2.64, p<.05).

4.4.2 Location

BAC>.15 alcohol crashes varied more between states than did BAC .05-.15 alcohol crashes. The percentage of crashes in which maximum BAC was greater than .15 appeared to be highest in the Northern Territory but this did not appear to be the case for BAC .05-.15 alcohol crashes.

The proportions of crashes which occurred in urban areas did not differ (59.3% vs 56.1%, z<1, p>.05). Neither did the proportion which occurred at intersections (19.1% vs 21.1%, z<1, p>.05) or the type of roads on which the crashes occurred ($\chi^2(3)$=1.69, p>.05). Almost three-quarters of BAC >0.15 and BAC 0.05- 0.15 crashes occurred in areas zoned 60km/h or 100km/h. The distribution of crashes between these two speed zones was not affected by the level of alcohol ($\chi^2(1)$=0.28, p>.05)

4.4.3 Crash pattern

Similar proportions of alcohol crashes at the two maximum BAC levels were single vehicle (72.4% vs 71.9%, z<1, p>.05). However, when single-vehicle crashes involving pedestrians were removed, the proportion of BAC>.15 alcohol crashes which were single vehicle crashes was less than that of BAC .05-.15 alcohol crashes (54.7% vs 64.5%, z=2.42, p<.05).

Analysis showed that the types of crashes (as represented by DCA groups) was similar for single vehicle crashes (pedestrian not responsible) at the two alcohol levels ($\chi^2(5)$=4.83, p>.05). The patterns of multi-vehicle crashes differed, however ($\chi^2(8)$=16.95, p<.05). The data suggest that there were relatively more crashes involving vehicles from adjacent directions and relatively fewer crashes involving vehicles from opposite directions at the lower alcohol level.

4.4.4 Vehicles driven by persons responsible for crashes

The types of vehicles driven by persons responsible for BAC .05-.15 and BAC>.15 crashes are presented in Table 4.4. The table shows that similar mixes of vehicles were responsible for BAC>.15 and BAC .05-.15 alcohol crashes: about two-thirds were cars and another third was made up equally of motorcycles and light commercial vehicles.

The ages of cars driven by persons responsible for BAC .05-.15 and BAC>.15 alcohol crashes are presented in Table 4.5. Cars more than 10 years old were not over-represented in the BAC>.15 crashes (46.0% vs 39.3%, $z=1.26$, $p>.05$). The mean ages of cars driven by persons responsible for BAC>.15 and BAC .05-.15 crashes did not differ (11.1 vs. 10.1, $t(269)=1.37$, $p>.05$).

4.4.5 Vehicle occupancy

Table 4.6 summarises vehicle occupancy data for cars responsible for alcohol crashes. There was a trend for cars driven by persons responsible for the lower alcohol crashes to have more occupants (1.97 vs 1.75) but this failed to reach statistical significance ($t(417) = 1.80$, $p = 0.07$).

The percentages of vehicles classified as travelling "possibly" or "definitely over the speed limit" are summarised in Table 4.7. Percentages for BAC>.15 and BAC .05-.15 were very similar (24.9 vs 22.7%, and 32.6% vs 34.6%).

4.4.6 Persons responsible for crashes

Overall, there were 234 persons responsible for BAC .05-.15 alcohol crashes and 426 persons responsible for BAC>.15 alcohol crashes. Males comprised a higher proportion of persons responsible at the higher BAC level (93.9% vs 88.5%, $z=2.45$, $p<.05$). The age profiles of the two groups also differed ($\chi^2(5)=23.1$, $p<.05$). As Figure 4.22 shows, persons aged 17-20 appear to be over-represented in the lower BAC crashes and persons aged 26-40 in the higher BAC crashes.

Drivers. There were 180 drivers responsible for BAC .05-.15 alcohol crashes and 287 drivers responsible for BAC>.15 crashes. The percentage of males was again higher at the higher BAC level (92.7% vs 87.2%, $z=1.98$, $p<.05$). The age profiles varied significantly, $\chi^2(5)=21.4$, $p<.05$. Figure 4.23 shows that, as found in the overall analysis, drivers aged 17-20 were over-represented in BAC .05-.15 alcohol crashes and drivers aged 26-40 were over-represented in BAC>.15 alcohol crashes.

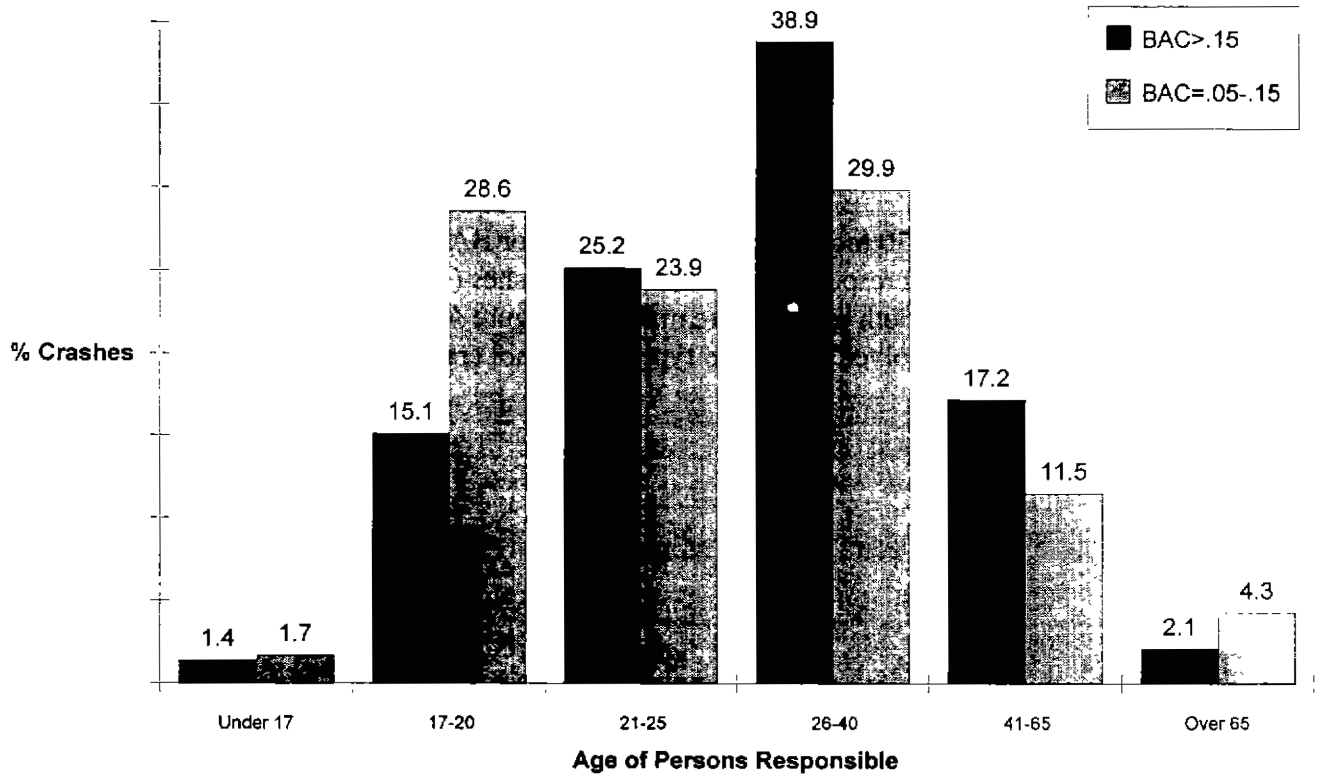


Figure 4.22. Age of persons responsible for BAC>.15 and BAC .05-.15 alcohol crashes.

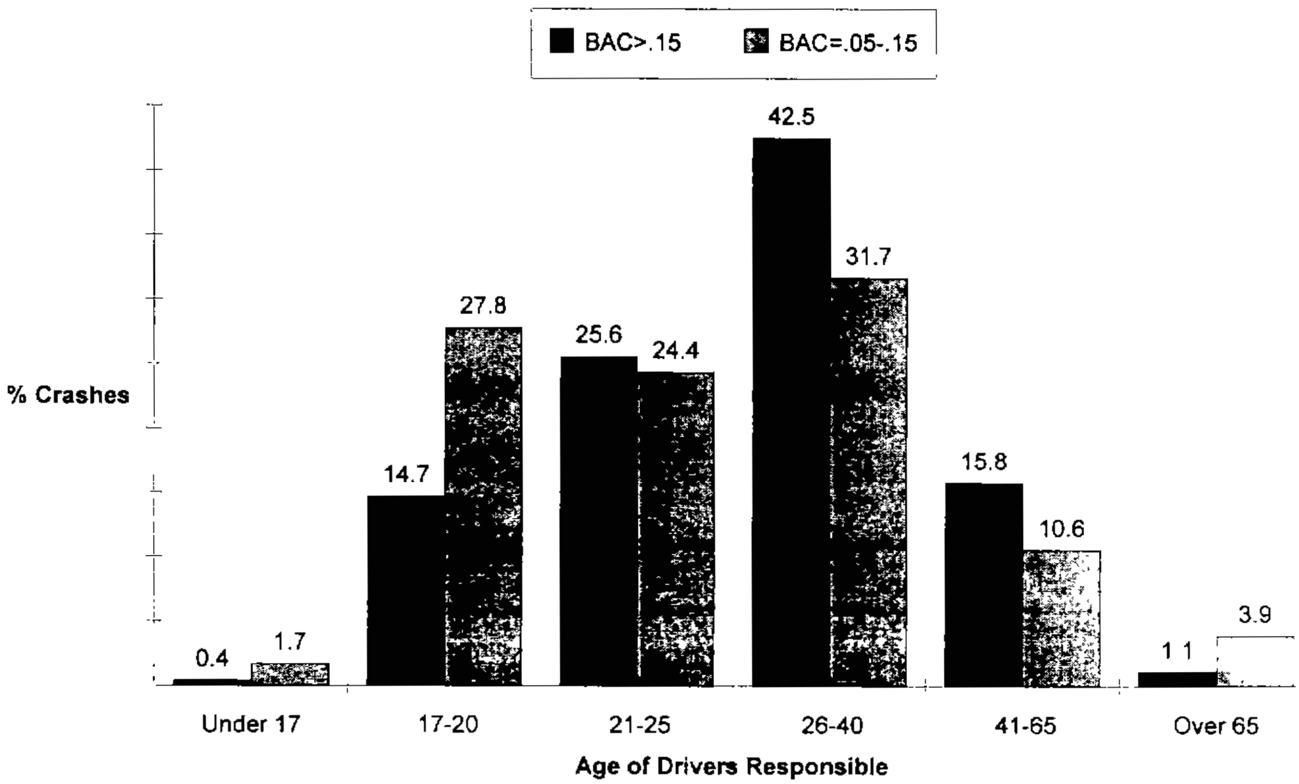


Figure 4.23. Age of drivers responsible for BAC>.15 and BAC .05-.15 alcohol crashes.

Drivers responsible for BAC>.15 crashes were more likely to be not wearing a seat belt (when one was available) than drivers responsible for BAC .05-.15 crashes (46.0% vs. 38.1%, $z=1.68$, $p<.05$).

Motorcyclists. There were 30 motorcyclists responsible for BAC .05-.15 alcohol crashes and 54 motorcyclists responsible for BAC>.15 crashes (12.8% and 12.7%). Almost all motorcyclists in both groups were male. As Figure 4.24 shows, the age profiles of motorcyclists involved in the two types of alcohol crashes were also similar, $\chi^2(4)=.70$, $p>.05$.

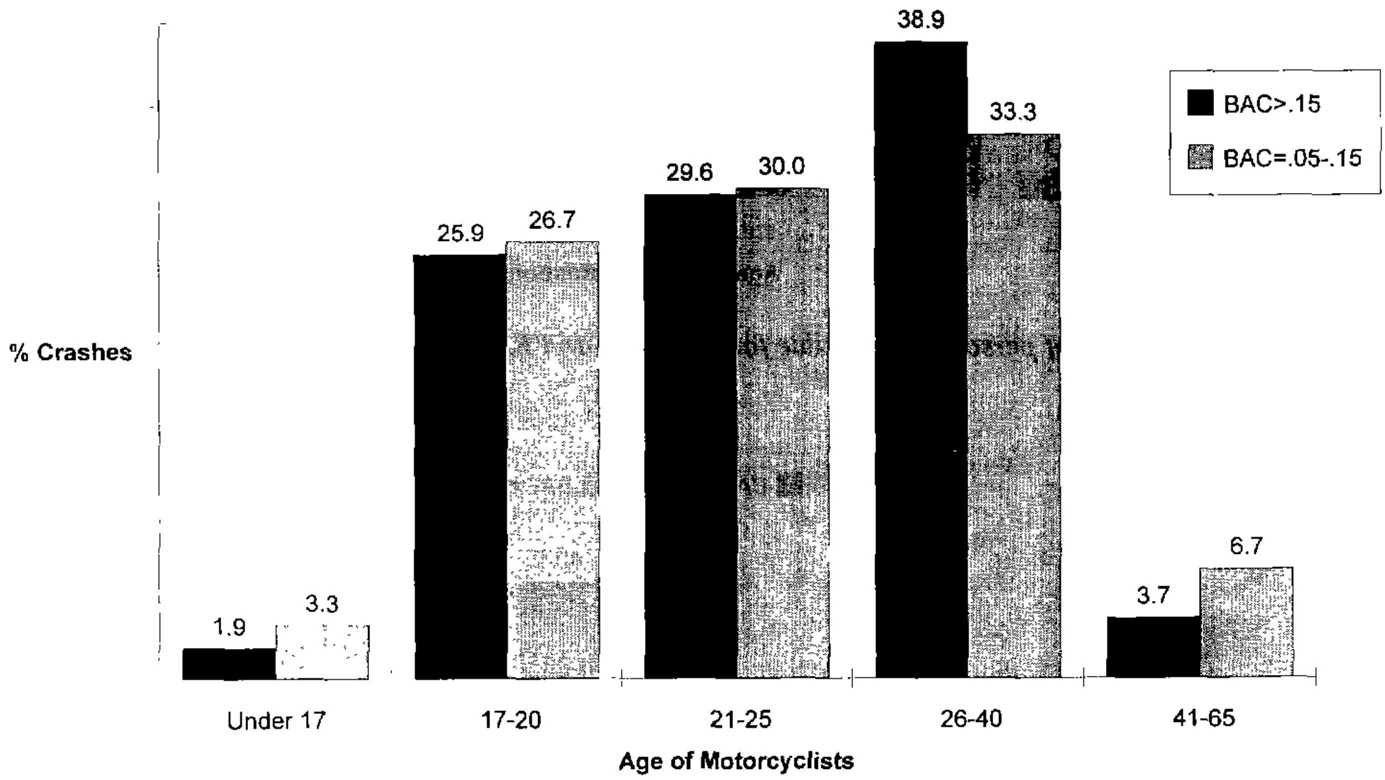


Figure 4.24. Age of motorcyclists responsible for BAC>.15 and BAC .05-.15 alcohol crashes.

Pedestrians. Pedestrians comprised a higher percentage of persons responsible for BAC>.15 alcohol crashes than BAC .05-.15 crashes (81 vs 22, 19.0% vs 9.4%, $z=3.24$, $p<.05$). At both BAC levels, most pedestrians were male (93.8% vs 86.4%, $z=1.15$, $p>.05$). In general, pedestrians responsible for BAC .05-.15 crashes appeared to be younger than those responsible for the higher alcohol crashes ($\chi^2(5)=15.0$, $p<.05$, see Figure 4.25).

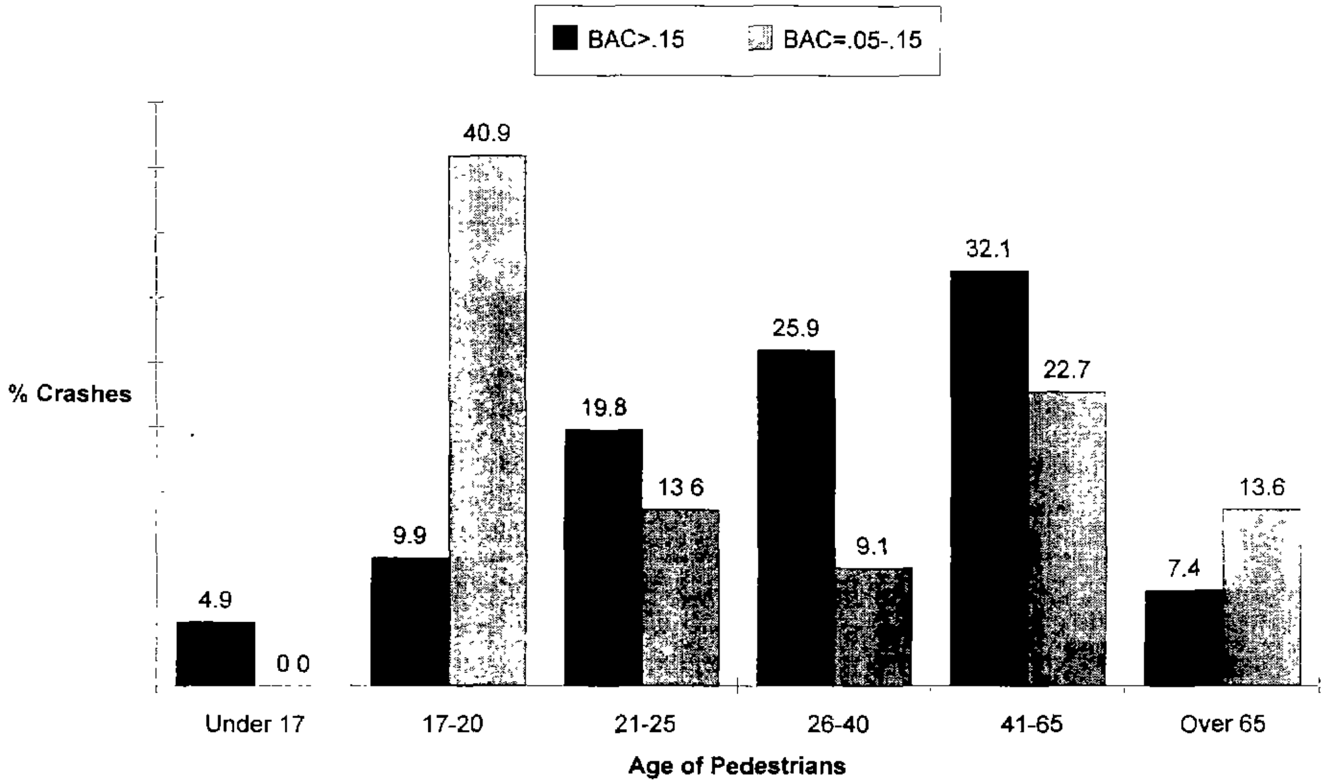


Figure 4.25. Age of pedestrians responsible for BAC>.15 and BAC .05-.15 alcohol crashes.

4.4.7 Persons killed

There were 481 persons killed in BAC>.15 alcohol crashes and 249 persons killed in BAC .05-.15 alcohol crashes. There were relatively more males killed in the higher alcohol crashes (86.7% vs. 79.9%, z=2.40, p<.05). Figure 4.26 shows the different age distributions of persons killed in the high and medium alcohol crashes ($\chi^2(5)$=22.3, p<.05). The figure suggests that relatively more persons aged between 17 and 20 were killed in the medium alcohol crashes and relatively more persons aged 26-40 were killed in the high alcohol crashes. Further analysis showed that this pattern was found for males and was similar, but not statistically significant, for females.

The distributions of road user types killed were similar in BAC>.15 and BAC .05-.15 alcohol crashes (see Table 4.19). More drivers and fewer passengers were killed at the higher alcohol level (drivers: z=1.77, p<.05, passengers: z=-3.53, p<.05). This may reflect the lower occupancy of vehicles driven by drivers responsible for BAC>.15 crashes.

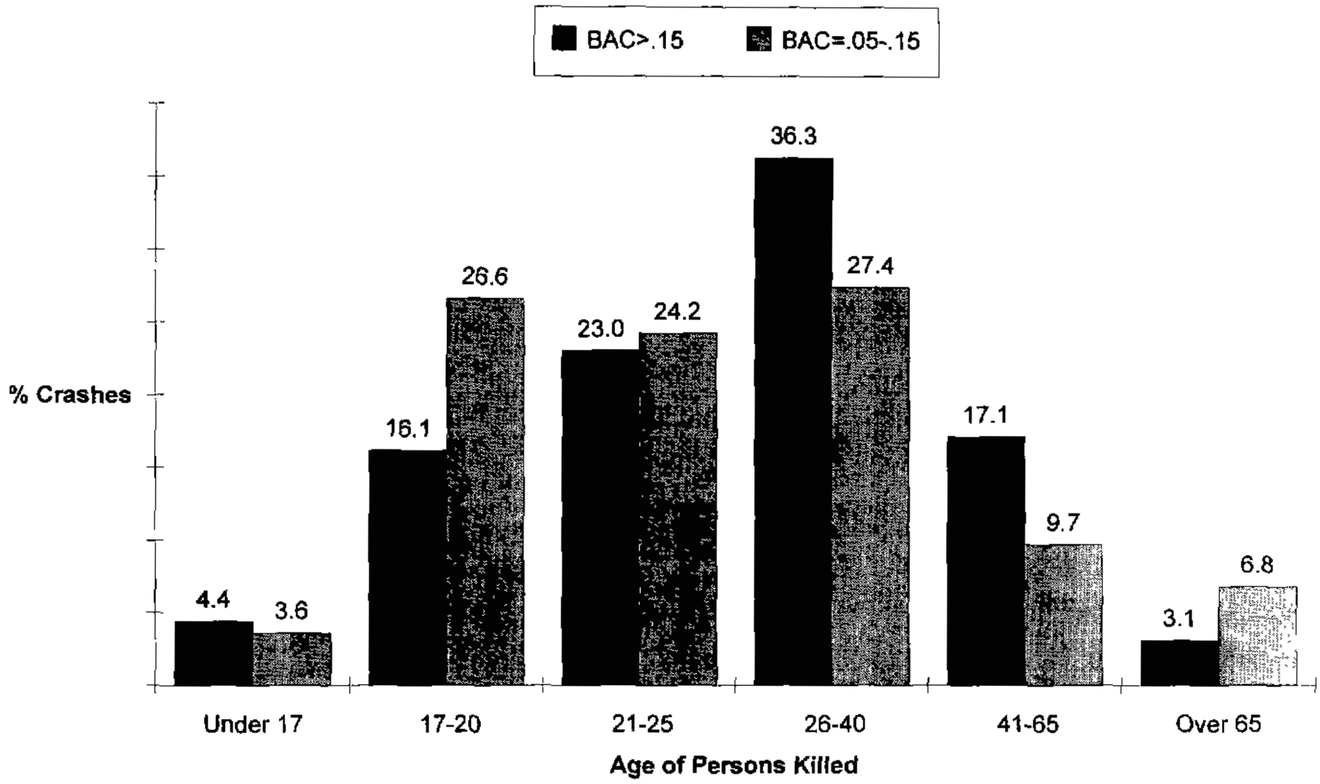


Figure 4.26. Percentages of persons killed in BAC>.15 and BAC .05-.15 alcohol crashes.

Table 4.19. Persons killed in BAC>.15 and BAC .05 -.15 crashes as a function of road user type.

Road user type	BAC>.15 crashes	BAC .05-.15 crashes
Driver	238 (49.5)	106 (42.6)
Passenger	80 (16.6)	69 (27.7)
Motorcyclist	57 (11.9)	31 (12.4)
Bicyclist	5 (1.0)	5 (2.0)
Pedestrian	91 (18.9)	30 (12.0)
Other	10 (2.0)	8 (3.2)
Total	481 (99.9)	249 (99.9)

Drivers killed. The age distributions of drivers killed in BAC>.15 and BAC .05-.15 alcohol crashes differed ($\chi^2(5)=13.7$, $p<.05$, see Figure 4.27). The figure suggests that there were proportionally more 17-20 year old drivers killed in the medium alcohol crashes and proportionally more 26-40 year old drivers killed in the high alcohol crashes. Similar proportions of drivers killed in the two groups were male (212/238 or 89.0% vs. 89/106 or 84.0%, $z=1.29$, $p>.05$).

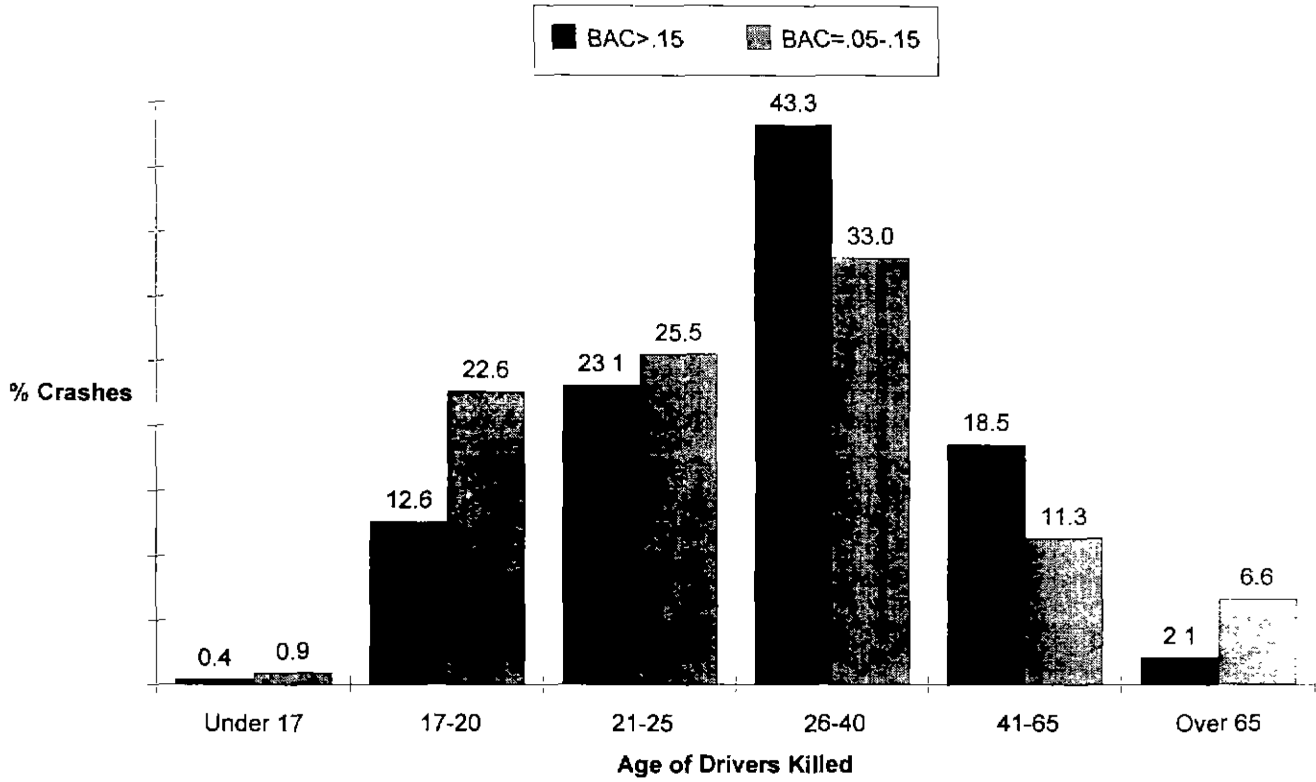


Figure 4.27. Percentages of drivers killed in BAC>.15 and BAC .05-.15 alcohol crashes.

Motorcyclists killed. Almost all of the motorcyclists killed in BAC>.15 and BAC .05-.15 crashes were aged between 17 and 40 years. The age distributions of the two groups did not differ, $\chi^2(4)=2.21$, $p>.05$ Most motorcyclists killed were male: all of the motorcyclists killed in BAC>.15 crashes and 30 of the 31 motorcyclists killed in BAC .05-.15 crashes were male.

Pedestrians killed. The age distributions of pedestrians killed in BAC>.15 and BAC .05-.15 alcohol crashes differed ($\chi^2(5)=18.2$, $p<.05$). As Figure 4.28 shows, pedestrians aged 17-20 and over 65 years appear to be over-represented among those killed in medium alcohol crashes. The sex ratios of the pedestrians were similar in the two groups: about 90% of those killed were male.

4.4.8 Employment characteristics

Table 4.10 shows the distributions of employment status for persons responsible for alcohol and nonalcohol crashes. Controllers in both BAC>.15 and BAC .05-.15 were most commonly from the plant operators/labourers category or the trades category. There was no difference in employment status between the two groups as a whole ($\chi^2(8)=7.64$, $p>.05$) or when only males were considered ($\chi^2(8)=7.61$, $p>.05$).

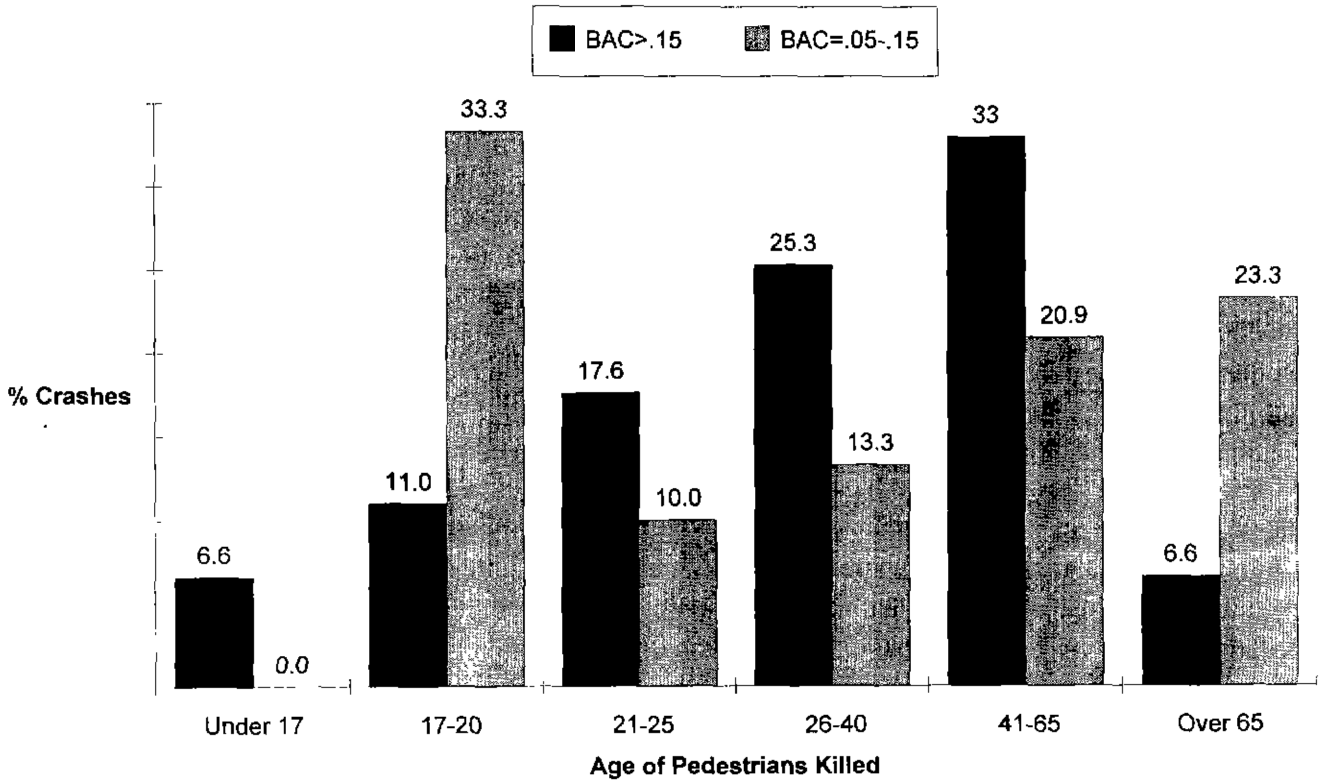


Figure 4.28. Percentages of pedestrians killed in BAC>.15 and BAC .05-.15 alcohol crashes.

4.4.9 Trip purpose

Origin and destination of the trip on which the crash occurred is summarised in Tables 11 and 12. Vehicles whose controllers were responsible for BAC>.15 and BAC .05-.15 crashes did not differ according to origin ($\chi^2(5)=1.63$, $p>.05$) or destination ($\chi^2(5)=4.58$, $p>.05$). The origin of the trip was coded as recreation in most of the cases for which this information was available and the destination was most frequently home.

4.5 SUMMARY

The results are summarised in tabular form in Table 4.20 and described in the text which follows.

A number of hypotheses about alcohol crashes derived from past research were tested. The data showed that alcohol crashes were more likely to:

- occur at night and on weekends
  over-representation at night higher for BAC>.15 than BAC .05-.15

- occur in the Northern Territory (BAC>.15 only)

- be single vehicle crashes
  when pedestrian crashes removed proportion SV less for BAC>.15 than BAC .05-.15

- involve speeding

- involve more male than female drivers intoxicated
  more so for BAC>.15 than BAC .05-.15

- involve motorcyclists (BAC>.15)

- involve non-elderly adult pedestrians

- result in more alcohol-related fatalities among 21-40 year olds than among other age groups
  also 17-20 year olds for BAC .05-.15 crashes

Other findings of the analyses were that, compared with nonalcohol crashes, alcohol crashes were:

- less likely to occur on highways and more likely to occur on other rural roads

- less likely to occur at intersections

- in BAC>.15 crashes, single vehicle (pedestrian not responsible) crashes were more likely to involve leaving the carriageway on a curve and less likely to involve nonresponsible pedestrians

- multi-vehicle crashes involved fewer vehicles from adjacent directions. BAC>.15 crashes involved more vehicles from opposing directions whereas BAC .05-.15 crashes possibly involved more overtaking than nonalcohol crashes.

- drivers of light commercial vehicles were over-represented in BAC>.15 crashes

- older cars

- in BAC>.15 crashes, driver responsible was more likely to be sole occupant of the vehicle, contributing to proportion killed who were drivers was higher

- more drivers responsible not wearing seat belts

- drivers responsible were less likely to be retired and (for BAC>.15 crashes) more likely to be manual workers or unemployed persons

- trip purpose was more often recreation to home

Table 4.20. Summary of characteristics of nonalcohol, BAC .05-.15 and BAC>.15 crashes. A statistically significant difference is represented by a difference in the number of asterisks.

Characteristic	Nonalcohol crashes	BAC .05-.15 crashes	BAC>.15 crashes
Occur at nights	*	**	***
Occur on weekends	*	**	**
Occur in Northern Territory	*	*	**
Less on highways and more on other rural roads	*	**	**
Less likely at intersections	*	**	**
Single vehicle crashes	*	**	**
SV nonpedestrian responsible	*	***	**
Multi-vehicle crashes: fewer adjacent directions	*	**	***
Multi-vehicle crashes: more opposing direction	*	**	***
Light commercial vehicles	*	*	**
Older cars	*	**	**
Vehicle occupancy	*	*	**
Not wearing seat belts	*	**	**
Involve speeding	*	**	**
More male than female drivers	*	**	***
Motorcyclists	*	*	**
Nonelderly adult pedestrians	*	**	**
Drivers responsible retired persons	**	*	*
Drivers responsible manual workers or unemployed	*	*	**
Trip purpose recreation to home	*	**	**
Result in more fatalities among 21-40 year olds	*	**	**
Result in more fatalities among 17-20 year olds	*	**	*

5. CRASHES FOR WHICH YOUNG ROADUSERS WERE RESPONSIBLE

The over-involvement of young and/or inexperienced drivers in road crashes is well-established international phenomenon (Drummond, 1988). It has also shown itself to be one of the most intractable road safety problems, reflecting perhaps the complexity of the problem relative to other road safety issues and the fact therefore that traditional road safety approaches are less applicable (Drummond, 1989).

On the basis of past research, one expects crashes in which young drivers are responsible to have a number of characteristics (compared to crashes in which other drivers are responsible):

- more fatal crashes at night because of more recreational driving
- more fatal crashes on weekends because of recreational driving
- more passengers
- more drivers male
- older vehicles mean that defects are more likely and that level of occupant protection may be less
- for 17-20 year olds, more crashes in states with lower licensing ages

This chapter examines crashes for which 17-20 year olds were judged to be responsible, then those for which 21-25 year olds were judged to be responsible. It concludes with a comparison of crashes of the two age groups. The tables presented in this section will also be referred to when discussing 21-25 year olds and elderly road users.

Table 5.1 presents the numbers of road users responsible for crashes in each age group. It shows that 17-20 year olds made up 17.1% of persons responsible for fatal crashes, compared with 21-25 year olds who made up 19.9% of persons responsible for fatal crashes. Drivers comprised the bulk of persons responsible for crashes in each age group.

In the following discussion, 17-20 year olds are referred to as the "*younger*" group; 21-25 year olds as the "*young*" group and 26-65 year olds as the "*older*" group.

Table 5.1. Road users responsible for crashes classified by age group. There were an additional 23 persons responsible for crashes for whom road user type or age group was not available.

Road user type	Age group					
	<17	17-20	21-25	26-65	Over 65	Total
Driver	18	332	373	926	153	1802
Motorcyclist	7	64	84	90	1	246
Bicyclist	28	3	3	19	5	58
Pedestrian	77	30	38	130	121	396
Other	2	0	0	0	0	2
Total	132 (5.3%)	429 (17.1%)	498 (19 9%)	1165 (46.5%)	280 (11.1%)	2504 (100%)

5.1 CRASHES IN WHICH ROADUSER RESPONSIBLE WAS AGED 17-20 YEARS

There were 425 crashes in which the roaduser responsible was aged 17-20 years. These crashes resulted in death to 478 people and injury to 406 people. In this section, these crashes are compared with the 1255 crashes for which the person responsible was aged between 26 and 65 years.

5.1.1 Timing

Crashes for which 17-20 year olds and 26-65 year olds were responsible were distributed differently across the day ($\chi^2(3)=44.8$, $p<.05$). Figure 5.1 suggests that crashes of 17-20 year olds were relatively more frequent between midnight and 6 am.

Closer examination of the time of occurrence of crashes as a function of blood alcohol concentration of the person responsible showed that young sober drivers were also over-represented between 6 pm and midnight ($\chi^2(3)=22.2$, $p<.05$).

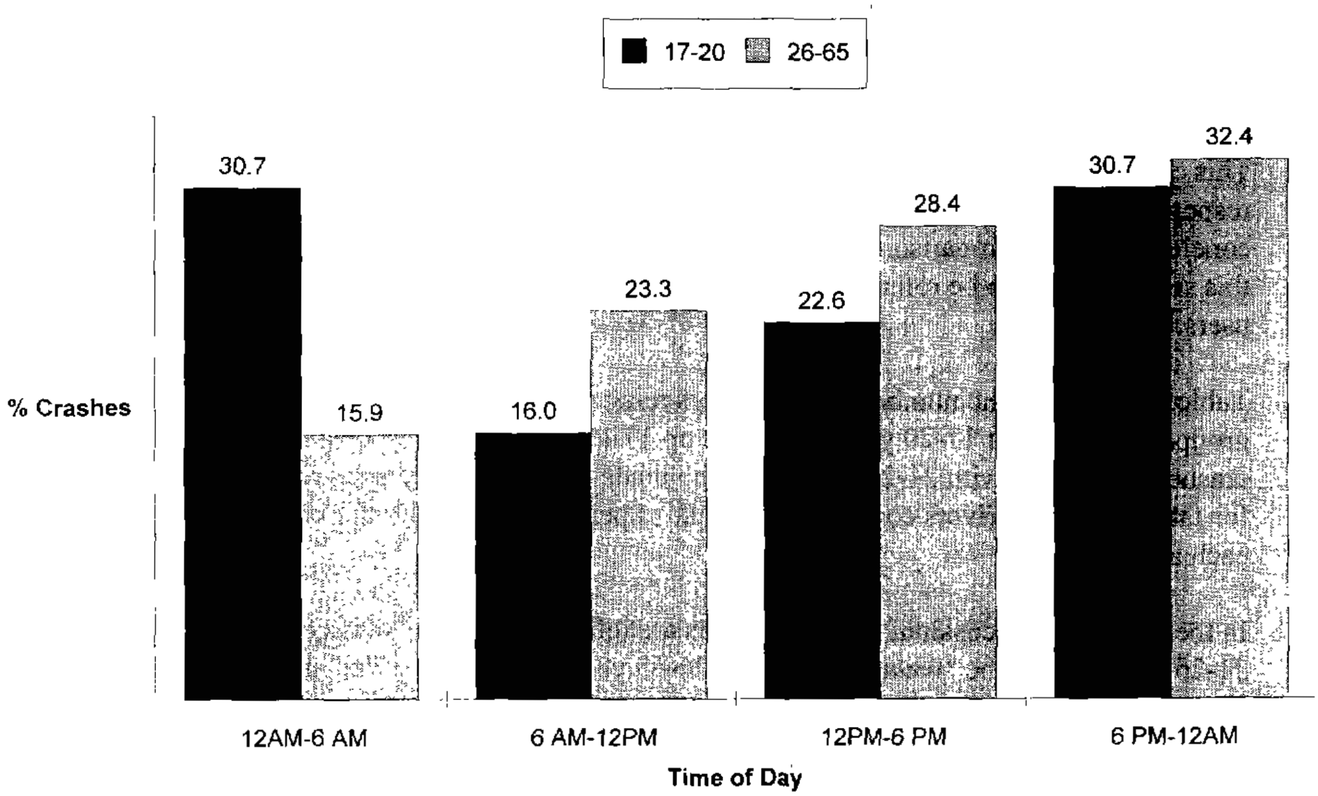


Figure 5.1. Percentages of crashes for which 17-20 year olds and 26-65 year olds were responsible as a function of time of day.

Crashes of younger and older persons also varied according to day of the week ($\chi^2(6)=23.3$, $p<.05$). Figure 5.2 suggests that the crashes of younger persons were over-represented on the weekend. Further analysis showed that this pattern was statistically significant only at high alcohol levels (BAC>.15, $\chi^2(6)=14.0$, $p<.05$).

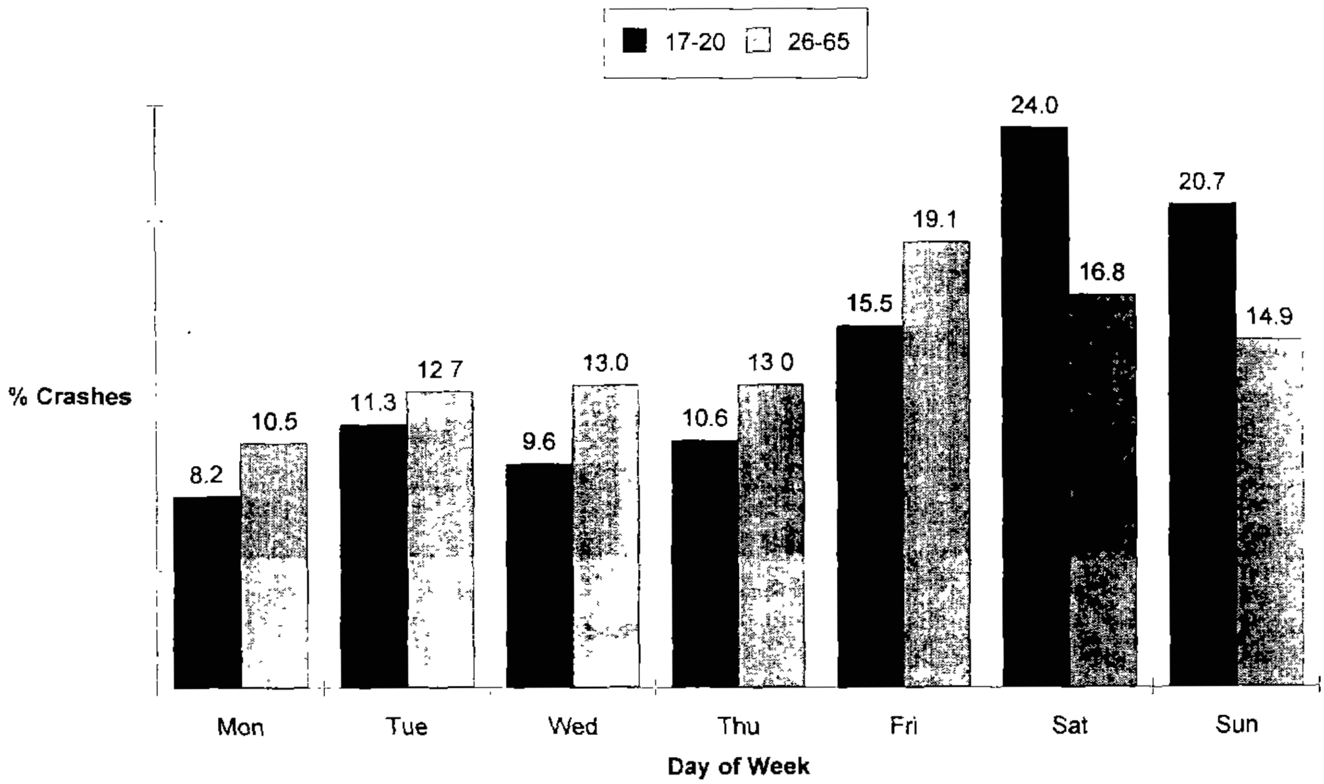


Figure 5.2. Percentages of crashes for which 17-20 year olds and 26-65 year olds were responsible as a function of day of week.

These findings are in accord with past research which has shown over-involvement of young drivers at night and on weekends, particularly where alcohol is involved.

5.1.2 Location

There was no difference between the distributions by State or Territory of crashes of younger and older persons ($\chi^2(7)=10.0$, $p>.05$). This was somewhat surprising because relatively more crashes of younger persons would have been expected in jurisdictions where the licensing age is lower (e.g. South Australia). Perhaps the reason there was no difference is that there is no control for demographic inequalities. SA may have a lower licensing age but it also has one of the lowest percentage of young people (15-19 years: SA 0.075; ACT 0.095; QLD 0.083).

Crashes of younger roadusers were more likely than those of older persons to occur in urban areas (60.6% vs 51.1%, $z=3.33$, $p<.05$). Differences also existed in the types of roads on which the crashes occurred ($\chi^2(3)=31.8$, $p<.05$). Figure 5.3 suggests that crashes of younger roadusers were more likely to occur on "other urban" and less likely to occur on highways.

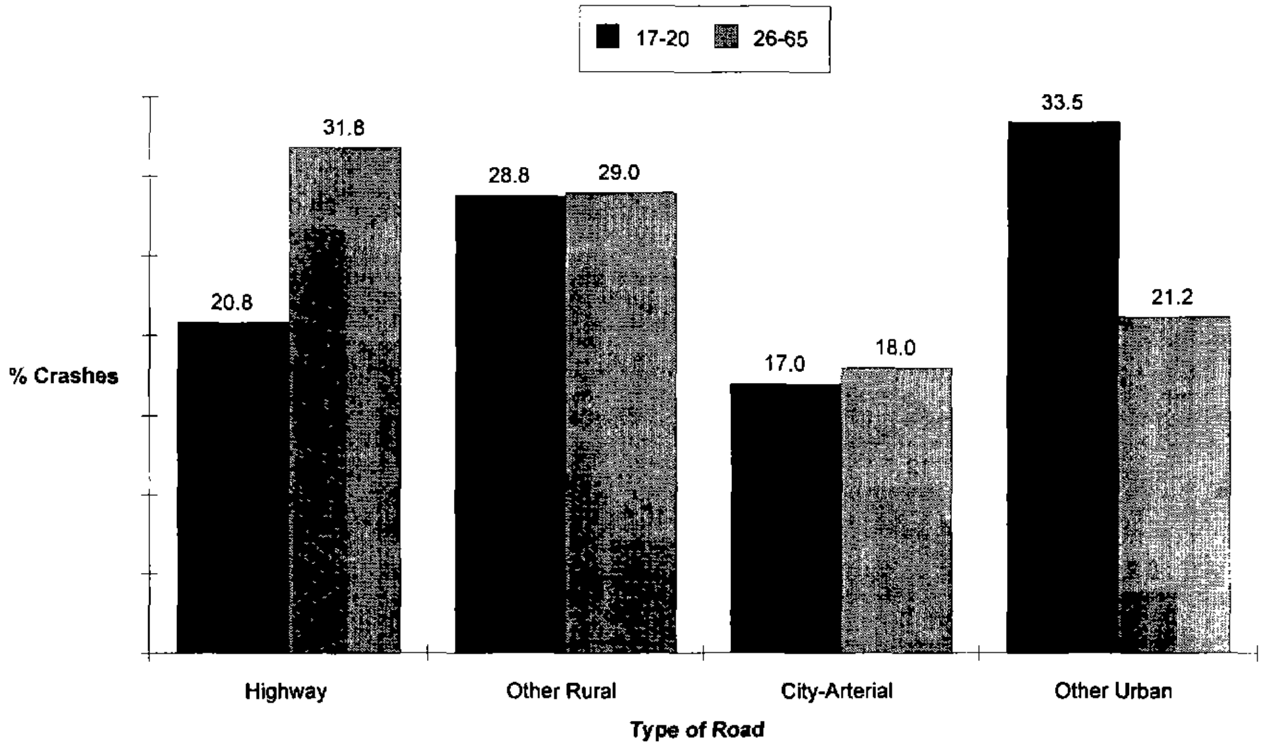


Figure 5.3. Percentages of crashes for which 17-20 year olds and 26-65 year olds were responsible as a function of type of road.

The over-representation of crashes of young people in urban areas is also apparent when crashes are classified according to the speed limit at the crash location ($\chi^2(7)=16.3$, $p<.05$). As Table 5.2 suggests, relatively more crashes of young drivers occurred in 60 km/h speed zones and relatively fewer occurred in 100 km/h speed zones.

Table 5.2. Speed limits at crash locations (by age of person responsible).

Speed limit (km/h)	Age of person responsible			
	17-20	21-25	26-65	Over 65
<60	3 (0.7)	5 (1.0)	4 (0.4)	2 (0.7)
60	186 (43.8)	208 (42.4)	391 (35.5)	178 (63.8)
61-79	55 (12.9)	64 (13.1)	123 (11.2)	21 (7.5)
80	6 (1.4)	3 (0.6)	10 (0.9)	3 (1.1)
100	128 (30.1)	152 (31.0)	425 (38.6)	62 (22.2)
110	34 (8.0)	44 (9.0)	115 (10.4)	12 (4.3)
Unavailable	2 (0.5)	5 (1.0)	8 (0.7)	0 (0.0)
Unknown	11 (2.6)	9 (1.8)	25 (2.3)	1 (0.4)
Total crashes	425 (100.0)	490 (99.9)	1101 (100.0)	279 (100.0)

The proportions of crashes which occurred at intersections did not differ according to age group (17-20: 26.4%, 26-65: 22.9%, z=1.44, p>.05) and no difference was observed in the type of intersection at which the two groups of crashes occurred ($\chi^2(3)=0.4$, p>.05).

5.1.3 Crash pattern

Table 5.3 gives a breakdown of crashes for which 17-20 year olds and 26-65 year olds were responsible.

Table 5.3. Types of crashes for which roadusers aged 17-20 were responsible.

Type of Crash	Age of roaduser responsible		17-20 as percentage of all crashes
	17-20	26-65	
All crashes	429	1165	17.1
Pedestrian responsible	30	130	7.6
Single vehicle	271	620	19.2
Urban	260	611	17.7
Rural	168	552	16.2
SV urban	158	323	19.1
SV urban ped resp	24	112	6.9
MV urban	102	288	16.0
MV urban ped resp	1	2	16.7
SV rural	112	295	19.2
SV rural ped resp	5	15	12.2
MV rural	56	257	12.4
MV rural ped resp	0	0	-

Note: Urban and rural do not add to give all crashes because location was unknown for two crashes There were no multi-vehicle rural crashes for which pedestrians were responsible.

Crashes for which younger people were responsible were more often single-vehicle crashes (63.1% vs 54.0%, z=3.22, p<.05). This remained true when crashes in which pedestrians were responsible were removed (60.8% vs 49.1%, z=2.98, p<.05) but was true only for crashes in which the person responsible was sober, however (BAC<.05: 53.5% vs 41.3%, z=2.01, p<.05). The issue of pedestrians' responsibility for crashes is dealt with in a later section.

Because of the different rates of single vehicle crashes in crashes of younger and older persons, crash pattern was analysed separately for these two groups. The mix of types of single vehicle crashes differed between the two groups ($\chi^2(5)=11.8$, p<.05). As Figure 5.4 suggests, the proportion of single vehicle crashes which were off-path on curve seemed higher for the younger group while the reverse appeared to be true for pedestrian crashes. The distributions of multi-vehicle crashes for the two groups did not differ ($\chi^2(9)=9.7$, $p>.05$, see Figure 5.5). Most multi-vehicle crashes (regardless of age) were classified as crashes of vehicles from opposing directions.

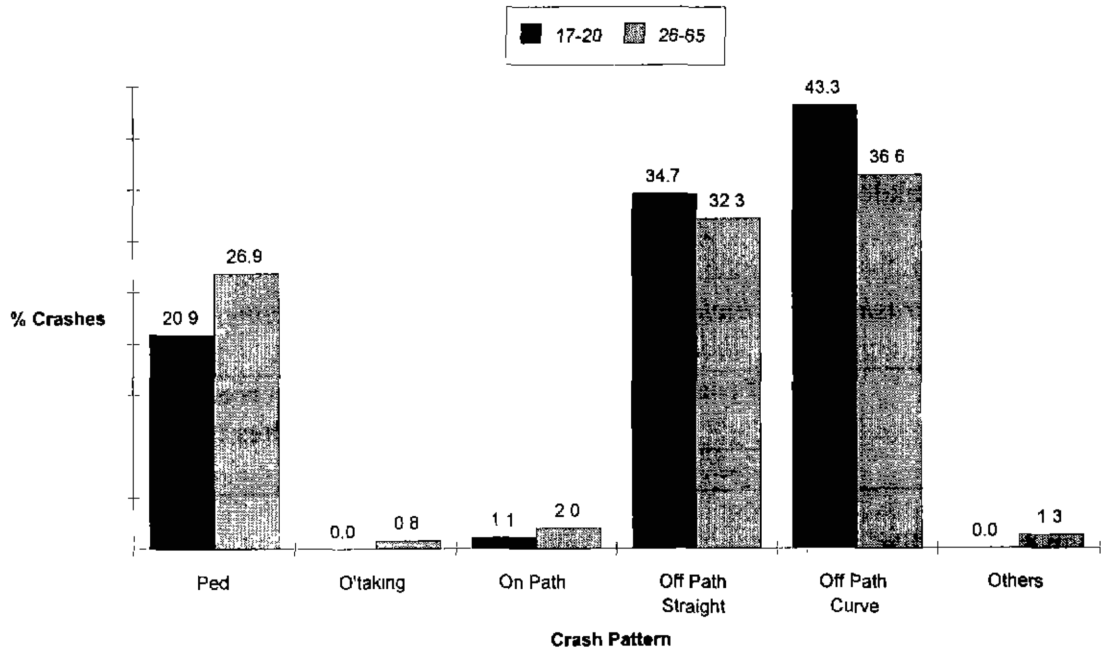


Figure 5.4. Crash patterns (DCA group) of single vehicle crashes for which persons aged 17-20 and 26-65 years were responsible.

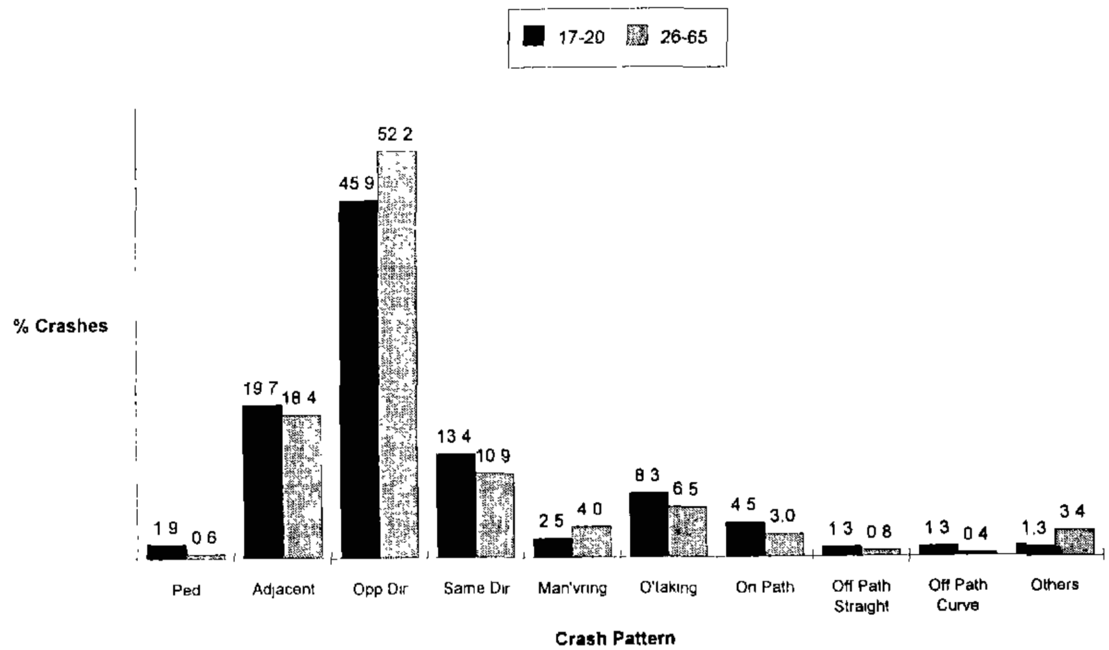


Figure 5.5. Crash patterns (DCA group) of multi-vehicle crashes for which persons aged 17-20 and 26-65 years were responsible.

5.1.4 Vehicles driven by persons responsible for crashes

The types of vehicles driven by persons responsible for crashes are shown classified by age group of the controller in Table 5.4. Compared to 26-65 year olds, 17-20 year olds had a different mix of vehicles in crashes ($\chi^2(13)=77.3$, $p<.05$). The table suggests that the difference resulted from the younger persons being less likely to drive medium and heavy commercial vehicles and buses.

Table 5.5 summarises the ages of cars (not all vehicles) driven by drivers responsible for crashes. It should be remembered that vehicle age data were largely missing from Queensland crashes and about half of the data were missing from Victoria and Western Australia.

The age distributions of cars driven by 17-20 year olds and 26-65 year olds differed significantly ($\chi^2(3)=32.3$, $p<.05$). It is clearly apparent from Table 5.5 that this difference may have resulted from older cars, on average, being driven by the younger drivers.

Table 5.4. The types of vehicles driven by persons responsible for crashes classified by age group of the controller.

Vehicle type	Age group of controller					
	<17	17-20	21-25	26-65	Over 65	Total
Car or derivative	15 (27.3)	275 (68.9)	303 (65.9)	646 (62.4)	134 (84.3)	1373
Motorcycle	7 (12.7)	64 (16.0)	84 (18.3)	90 (8.7)	1 (0.6)	246
Bus	0 (0.0)	1 (0.3)	4 (0.9)	12 (1.2)	2 (1.3)	19
Light commercial	1 (1.8)	53 (13.3)	41 (8.9)	123 (11.9)	13 (8.2)	231
Medium commercial	1 (1.8)	2 (0.5)	8 (1.7)	40 (3.9)	1 (0.6)	52
Heavy commercial	1 (1.8)	1 (0.3)	16 (3.5)	92 (8.9)	1 (0.6)	111
Other/ unknown	30 (54.5)	3 (0.8)	4 (0.9)	32 (3.1)	7 (4.4)	76
Total vehicles	55 (99.9)	399 (100.1)	460 (100.1)	1035 (100.1)	159 (100.0)	2108

Table 5.5. Ages of cars driven by persons responsible for crashes as a function of age group of driver.

Vehicle age (years)	**Age of driver**					
	<17	**17-20**	**21-25**	**26-65**	**Over 65**	**Total**
<5	1 (6.7)	35 (12.7)	46 (15.2)	151 (23.4)	23 (17.2)	256
5-10	1 (6.7)	38 (13.8)	49 (16.2)	113 (17.5)	29 (21.6)	230
>10	8 (53.3)	119 (43.3)	110 (36.3)	166 (25.7)	37 (27.6)	440
Unknown	5 (33.3)	83 (30.2)	98 (32.3)	216 (33.4)	45 (33.6)	447
Total cars	15 (100.0)	275 (100.0)	303 (100.0)	646 (100.0)	134 (100.0)	1373

The number of occupants of cars responsible for crashes is summarised in Table 5.6. The distribution of number of occupants differed between cars driven by 17-20 year olds and 26-65 year olds responsible for crashes ($\chi^2(3)=9.3$, $p<.05$). This appears from Table 5.6 to result from overall higher occupancies in cars driven by the younger group.

Table 5.6. The number of occupants of cars responsible for crashes.

Number of occupants	**Age of driver**					
	<17	**17-20**	**21-25**	**26-65**	**Over 65**	**Total**
1	5 (33.3)	116 (42.3)	137 (45.7)	340 (52.8)	59 (44.0)	657
2	7 (46.7)	77 (28.1)	83 (27.7)	159 (24.7)	53 (39.6)	379
3	2 (13.3)	40 (14.6)	43 (14.3)	66 (10.2)	19 (14.2)	170
>3	1 (6.7)	41 (15.0)	37 (12.3)	79 (12.3)	3 (2.2)	161
Total cars	15 (100.0)	274 (100.0)	300 (100.0)	644 (100.0)	134 (100.0)	1367

The percentages of vehicles classified as "possibly" or "definitely over the speed limit" are summarised in Table 5.7. Vehicles driven by persons aged 17-20 were more likely to be judged as travelling "definitely over the speed limit" than vehicles driven by 26-65 year old persons (32.6% vs 14.2%, z=7.91, p<.05).

Table 5.7. Numbers and percentages of vehicles classified "possibly" or "definitely over the speed limit" according to the age of the controller.

Speed category	Age of driver					
	<17	17-20	21-25	26-65	Over 65	Total
Possibly over speed limit	5 (9.1)	70 (17.5)	86 (18.7)	163 (15.7)	9 (5.7)	333
Definitely over speed limit	9 (16.4)	130 (32.6)	116 (25.2)	147 (14.2)	3 (1.9)	405
Not speeding	40 (72.7)	153 (38.3)	211 (45.9)	597 (57.7)	139 (87.4)	1140
Unknown	1 (1.8)	46 (11.5)	47 (10.2)	128 (12.4)	8 (5.0)	230
Total vehicles	55 (100.0)	399 (99.9)	460 (100.0)	1035 (100.0)	159 (100.0)	2108

5.1.5 Persons responsible for crashes

The types of road users aged 17-20 and 26-65 who were responsible for crashes are presented in Table 5.1. The road user mix differed significantly between the two age groups ($\chi^2(3)=24.4$, p<.05), there seemed to be more motorcyclists in the younger group.

The younger and older persons responsible were equally likely to be male (84.6% vs 83.5%, z=0.53, p>.05).

The blood alcohol concentrations (BACs) of the two groups differed ($\chi^2(3)=29.5$, p<.05). As Table 5.8 shows, 17-20 year olds appeared to be more likely to have a BAC of between .05 and .15 but less likely to have a BAC>.15.

Drivers. Of the 429 17-20 year olds responsible for crashes, 332 (77.4%) were drivers. The percentage of drivers responsible for crashes who were male was unaffected by age (17-20: 81.6%, 26-65: 82.9%, z=-0.54, p>.05). The two groups differed according to blood alcohol concentration, however ($\chi^2(3)=26.2$, p<.05, see Figure 5.6). The figure suggests that 17-20 year olds were no more likely than older drivers to be drunk and when drunk were less likely to have a high BAC.

Table 5.8. Blood alcohol concentrations (BAC) of persons responsible for crashes as a function of age.

Blood alcohol concentration (g/100ml)	**Age of person responsible**					
	<17	**17-20**	**21-25**	**26-65**	**Over 65**	**Total**
<.05	37 (28.0)	186 (43.4)	203 (40.8)	538 (46.2)	166 (59.3)	1130
.05-.15	4 (3.0)	82 (19.1)	69 (13.9)	111 (9.5)	10 (3.6)	276
>.15	6 (4.5)	69 (16.1)	117 (23.5)	253 (21.7)	10 (3.6)	455
Unknown	85 (64.4)	92 (21.4)	109 (21.9)	263 (22.6)	94 (33.6)	643
Total persons	132 (99.9)	429 (100.0)	498 (100.1)	1165 (100.0)	280 (100.1)	2504

Motorcyclists. 64 motorcyclists between 17 and 20 years old were responsible for crashes. For both this group and the 26-65 year olds, almost all motorcyclists were male. The two groups did not differ according to blood alcohol concentration ($\chi^2(3)=1.7$, $p>.05$).

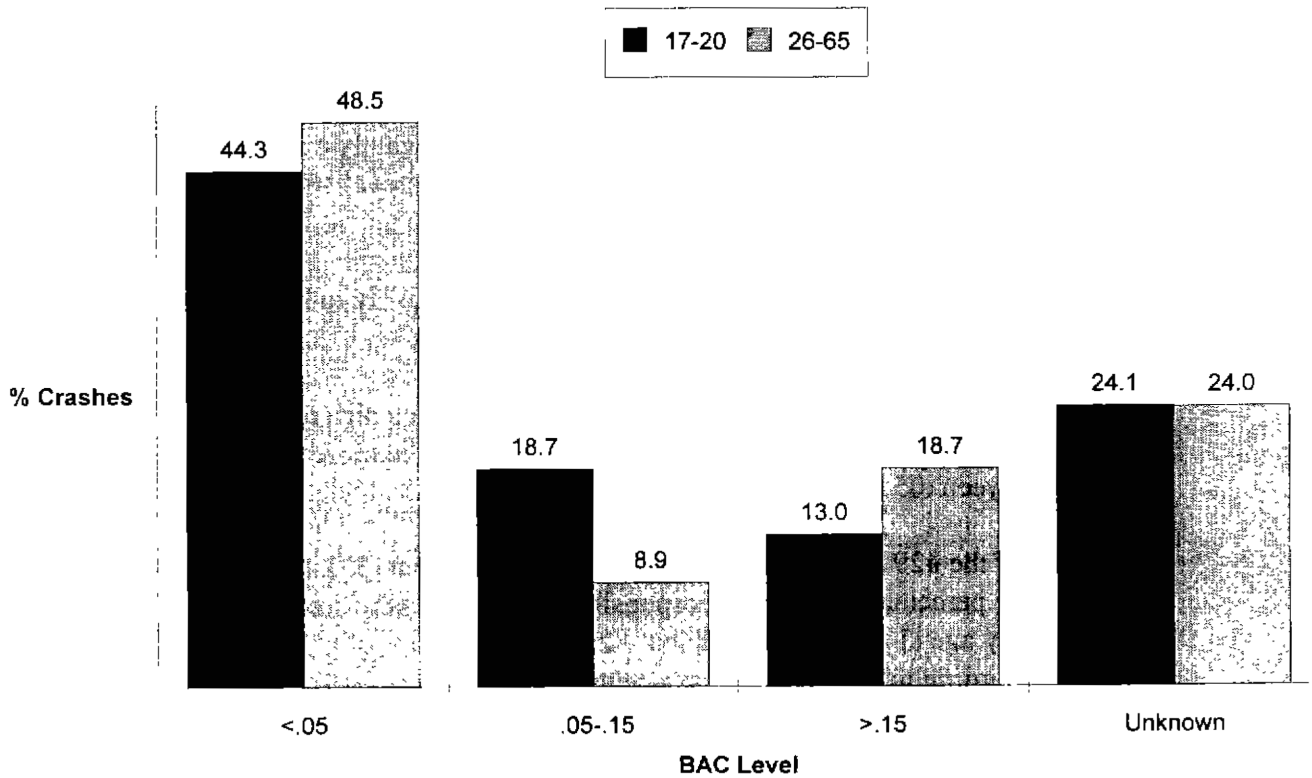


Figure 5.6. Percentages of drivers responsible for crashes aged 17-20 and 26-65 according to blood alcohol concentration (BAC).

Pedestrians. 30 pedestrians aged between 17 and 20 were responsible for crashes. (86.7% male 17-20, 78.5% 26-65). The two groups differed according to blood alcohol concentration, however ($\chi^2(3)=18.6$, $p<.05$, see Figure 5.7). The figure suggests that 17-20 year olds were more likely to have a BAC of between .05 and .15 but less likely to have a BAC<0.05 or unknown.

5.1.6 Persons killed

There were 478 persons killed in crashes for which 17-20 year olds were at least partially responsible. The fatalities comprised 361 males and 117 females. Figure 5.8 shows the different age distributions for persons killed in crashes for which 17-20 year olds and 26-65 year olds were responsible ($\chi^2(5)=993.4$, $p<.05$). While the clearest pattern is that of persons responsible for the crashes being killed, the figure also shows that 29% of the persons killed in crashes for which 17-20 year olds were responsible did not belong to this age group.

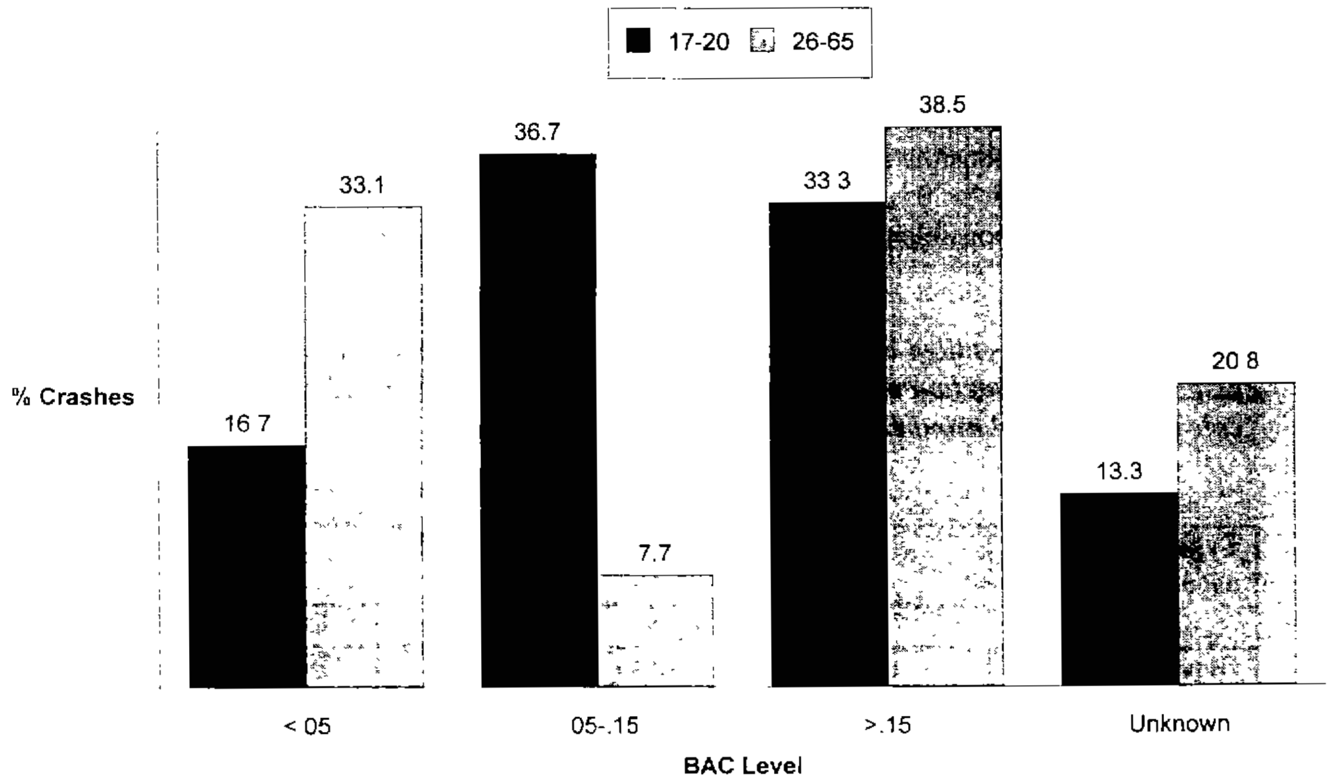


Figure 5.7. Percentages of pedestrians responsible for crashes aged 17-20 and 26-65 according to blood alcohol concentration (BAC).

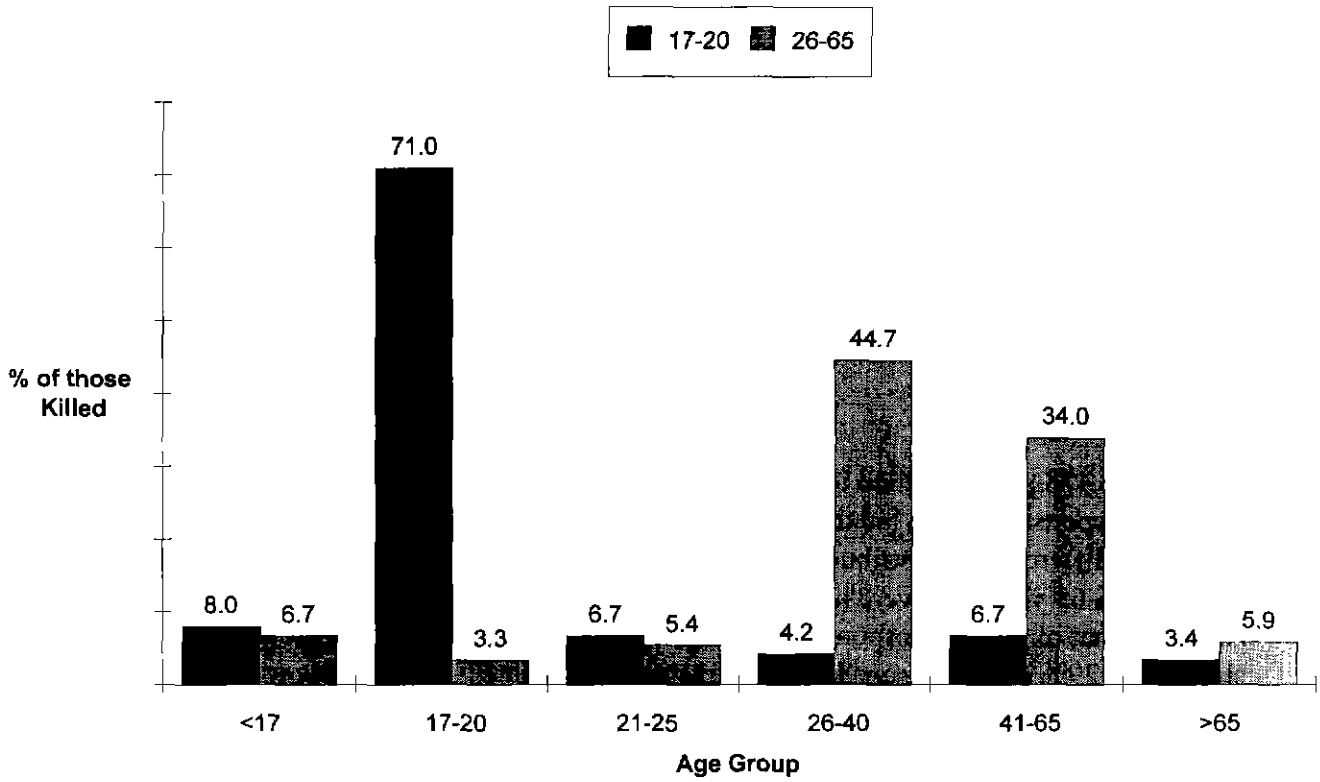


Figure 5.8. Percentages of persons in each age group killed in crashes for which 17-20 year olds and 26-65 year olds were responsible.

The distributions of road users killed is shown in Table 5.9. Crashes for which 17-20 year olds were responsible resulted in death to relatively more motorcyclists and pedestrians ($z=3.28$, $p<.05$) and relatively fewer drivers than crashes for which 26-65 year olds were responsible ($z=-3.93$, $p<.05$).

Table 5.9. Persons killed in crashes for which particular age groups were responsible as a function of road user type. Double counting of crashes prevents calculation of total number of road users of each type killed.

Type of road user killed	Age of person responsible			
	17-20	**21-25**	**26-65**	**Over 65**
Driver	177 (37.0)	227 (40.4)	596 (47.5)	99 (33.1)
Passenger	153 (32.0)	156 (27.8)	332 (26.5)	58 (19.4)
Motorcyclist	71 (14.9)	88 (15.7)	118 (9.4)	5 (1.7)
Bicyclist	7 (1.5)	4 (0.7)	30 (2.4)	10 (3.3)
Pedestrian	63 (13.2)	77 (13.7)	170 (13.5)	127 (42.5)
Other/unknown	7 (1.5)	10 (1.8)	9 (0.7)	0 (0.0)
Total persons killed	478 (100.1)	562 (100.1)	1255 (100.0)	299 (100.0)

5.1.7 Employment characteristics

Comparisons of employment status of drivers responsible for crashes across age groups may give little specific information about these drivers but may provide only general information about all drivers of these age groups (see Table 5.10). While the distribution of employment status was found to differ significantly between 17-20 year old and 26-65 year old drivers responsible for crashes ($\chi^2(8)=56.1$, $p<.05$), this may reflect only general differences between these two age groups.

5.1.8 Trip purpose

Trip purpose is coded in terms of origin and destination of the trip. Overall, these data items were available for about half of the vehicles responsible for crashes. Tables 5.11 and 5.12 summarise the origins and destinations of trips for vehicles whose controllers were responsible for crashes. Trips of pedestrians responsible for crashes are not included in the summary.

The origins of trips for 17-20 year old and 26-65 year old drivers differed significantly ($\chi^2(5)=67.0$, $p<.05$) with Table 5.11 suggesting that the younger group were less likely to be returning from work and more likely to be returning from recreation. The destinations of trips for the two groups also differed significantly ($\chi^2(5)=56.9$, $p<.05$) showing the same pattern (see Table 5.12).

Table 5.10. The employment status of drivers responsible for crashes.

Employment status	**Age of driver**					
	<17	**17-20**	**21-25**	**26-65**	**Over 65**	**Total**
Manager/ professional	0 (0.0)	8 (2.9)	26 (8.6)	89 (13.8)	3 (2.2)	126
Trades	2 (13.3)	44 (16.0)	39 (12.9)	47 (7.3)	2 (1.5)	134
Clerical/sales	0 (0.0)	34 (12.4)	33 (10.9)	62 (9.6)	0 (0.0)	129
Plant/labour	2 (13.3)	28 (10.2)	51 (16.8)	84 (13.0)	1 (0.7)	166
Other employed	0 (0.0)	9 (3.3)	11 (3.6)	24 (3.7)	1 (0.7)	45
Unemployed	2 (13.3)	23 (8.4)	23 (7.6)	35 (5.4)	0 (0.0)	83
Retired	0 (0.0)	0 (0.0)	0 (0.0)	30 (4.6)	86 (64.2)	116
Other	8 (53.3)	27 (9.8)	16 (5.3)	67 (10.4)	11 (8.2)	129
Unknown	1 (6.7)	102 (37.1)	104 (34.3)	208 (32.2)	30 (22.4)	445
Total	15 (99.9)	275 (100.1)	303 (100.0)	646 (100.0)	134 (99.9)	1373

Table 5.11. Trip purpose coded in terms of origin of the trip for vehicles whose controllers were responsible for crashes classified as a function of age of controller.

Origin of trip	Age of driver					
	<17	17-20	21-25	26-65	Over 65	Total
Home	11 (20.0)	45 (11.3)	49 (10.7)	123 (11.9)	27 (17.0)	255
Work	3 (5.5)	16 (4.0)	42 (9.1)	174 (16.8)	6 (3.8)	241
Recreation	18 (32.7)	149 (37.3)	148 (32.2)	218 (21.1)	19 (11.9)	552
Private business	4 (7.3)	4 (1.0)	3 (0.7)	12 (1.2)	8 (5.0)	31
Other	2 (3.6)	3 (0.8)	2 (0.4)	4 (0.4)	0 (0.0)	11
Unknown	17 (30.9)	182 (45.6)	216 (47.0)	504 (48.7)	99 (62.3)	1018
Total	55 (100.0)	399 (100.0)	460 (100.1)	1035 (100.1)	159 (100.0)	2108

Table 5.12. Trip purpose coded in terms of destination of the trip for vehicles whose controllers were responsible for crashes classified as a function of age of controller.

Destination of trip	Age of driver					
	<17	17-20	21-25	26-65	Over 65	Total
Home	9 (16.4)	80 (20.1)	93 (20.2)	204 (19.7)	23 (14.5)	409
Work	2 (3.6)	22 (5.5)	40 (8.7)	158 (15.3)	5 (3.1)	227
Recreation	20 (36.4)	78 (19.5)	68 (14.8)	86 (8.3)	20 (12.6)	272
Private business	2 (3.6)	9 (2.3)	10 (2.2)	39 (3.8)	6 (3.8)	66
Other	2 (3.6)	4 (1.0)	2 (0.4)	5 (0.5)	1 (0.6)	14
Unknown	20 (36.4)	206 (51.6)	247 (53.7)	543 (52.5)	104 (65.4)	1120
Total	55 (100.0)	399 (100.0)	460 (100.0)	1035 (100.1)	159 (100.0)	2108

5.1.9 Seat Belt Wearing

The proportions of car drivers responsible for crashes who were not wearing a seat belt were similar for 17-20 year olds and 26-65 year olds. (28.4% and 26.3%, respectively). However, passengers in cars driven by 17-20 year old drivers responsible for crashes were more likely not to be wearing a seatbelt than passengers of older drivers (37.6% vs 25.9%, $z=2.87$, $p>.05$).

5.2 CRASHES IN WHICH ROADUSER RESPONSIBLE WAS AGED 21-25 YEARS

There were 490 crashes in which the person responsible was aged 21-25 years. These crashes resulted in death to 562 people and injury to 514 people. In this section, these crashes are compared with the 1255 crashes for which the person responsible was aged between 26 and 65 years.

5.2.1 Timing

Crashes for which 21-25 year olds and 26-65 year olds were responsible were distributed differently across the day ($\chi^2(3)=23.1$, $p<.05$). Figure 5.10 suggests that crashes of 21-25 year olds were relatively more frequent between midnight and 6 am. Further examination of the data showed that this pattern was statistically significant for those crashes in which blood alcohol concentration of the person responsible was over .15 only ($\chi^2(3)=14.3$, $p<.05$).

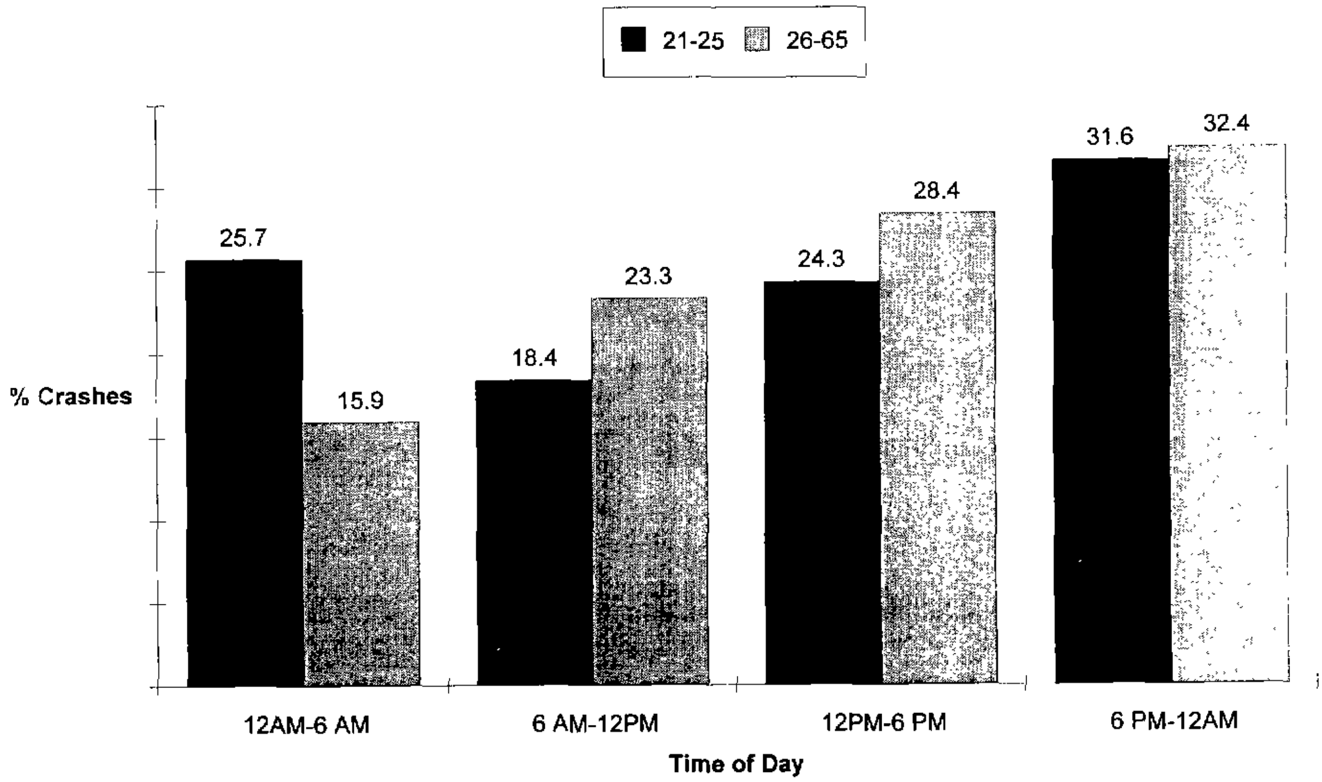


Figure 5.10. Percentages of crashes for which 21-25 year olds and 26-65 year olds were responsible as a function of time of day.

Crashes of young and older persons also varied according to day of the week ($\chi^2(6)=13.3$, $p<.05$). Figure 5.11 suggests that the crashes of young persons were over-represented on the weekend.

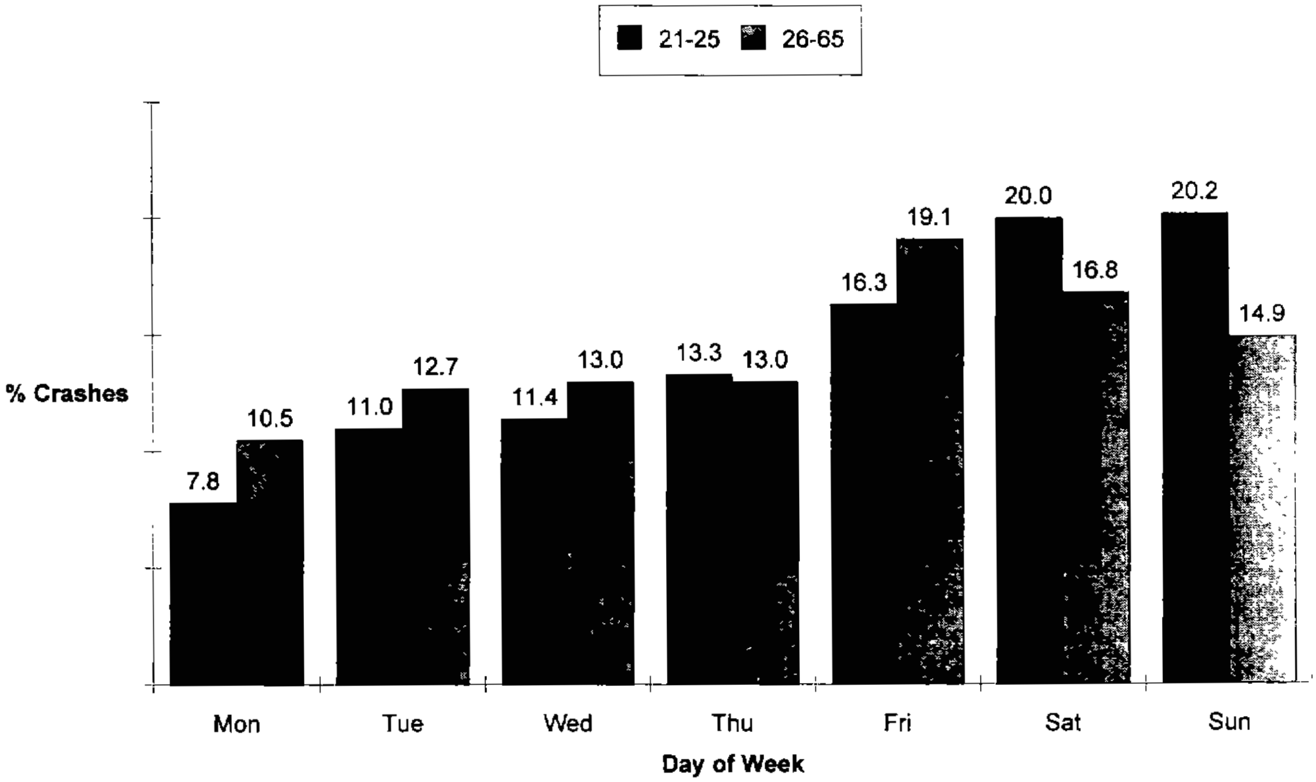


Figure 5.11. Percentages of crashes for which 21-25 year olds and 26-65 year olds were responsible as a function of day of week.

5.2.2 Location

Crashes for which 21-25 year olds were responsible were not over-represented compared to those of 26-65 year olds in any State or Territory ($\chi^2(7)=5.8$, $p>.05$). This suggests that any effects of differences in minimum licensing ages has dissipated by the time persons reach 21-25 years old. Note this analysis did not allow for different age distributions across the states.

Crashes of young persons were no more likely than those of older persons to occur in urban areas (54.9% vs 51.1%, $z=1.40$, $p>.05$). However, differences existed in the types of roads on which the crashes occurred ($\chi^2(3)=31.8$, $p<.05$). Figure 5.12 suggests that crashes of young persons were less likely to occur on highways.

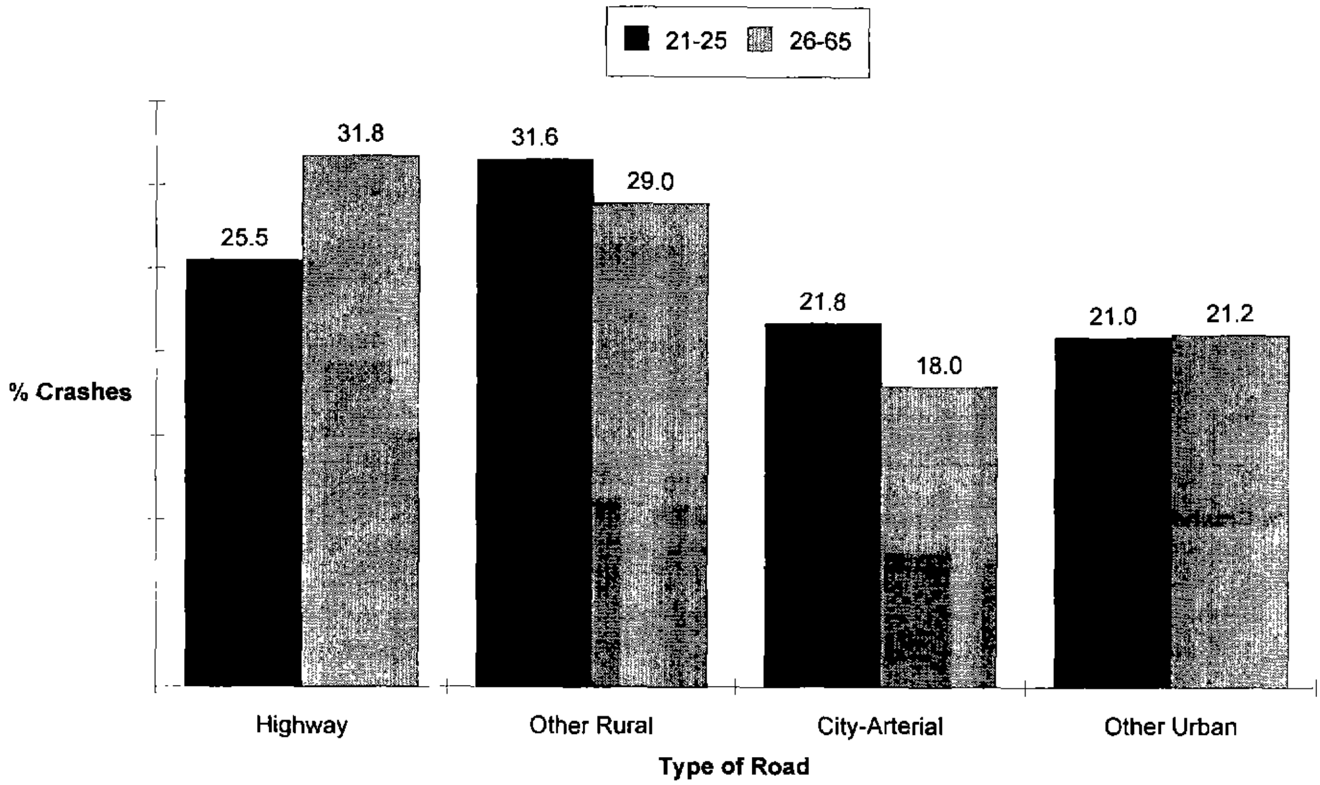


Figure 5.12. Percentages of crashes for which 21-25 year olds and 26-65 year olds were responsible as a function of type of road.

The proportions of crashes which occurred at intersections did not differ according to age group (21-25: 21.6%, 26-65: 23.0%, $z=-0.62$, $p>.05$) and no difference was observed in the type of intersection at which the two groups of crashes occurred ($\chi^2(3)=2.7$, $p>.05$).

The distribution of crashes of young and older persons differed according to the speed limit at the crash location ($\chi^2(7)=15.1$, $p<.05$). As Table 5.2 shows, crashes of the younger group occurred relatively more often in 60 km/h zones and relatively less often in 100 km/h zones.

5.2.3 Crash pattern

Table 5.13 gives a breakdown of the types of crashes for which roadusers aged 21-25 years were responsible.

Table 5.13. Types of crashes for which roadusers aged 21-25 years were responsible.

Type of Crash	Age of roaduser responsible		21-25 as percentage of all crashes
	21-25	26-65	
All crashes	490	1101	20.4
Pedestrian responsible	38	110	10.6
Single vehicle	274	595	20.0
Urban	269	562	19.4
Rural	221	537	21.9
SV urban	145	301	18.3
SV urban ped resp	29	95	9.1
MV urban	124	261	20.9
MV urban ped resp	1	2	20.0
SV rural	129	292	22.3
SV rural ped resp	8	13	21.1
MV rural	92	245	21.3
MV rural ped resp	0	0	-

Note: Urban and Rural do not add to give all crashes because location was unknown for two crashes. There were no multi-vehicle rural crashes for which pedestrians were responsible.

The percentages of crashes for which 21-25 year olds and 26-65 year olds were responsible which were single-vehicle were similar (55.9% vs 54.0%, $z=0.70$, $p>.05$). This pattern remained when crashes for which pedestrians were responsible were removed and did not differ according to BAC.

The types of crashes for which 21-25 year old and older persons were responsible did not differ ($\chi^2(9)=9.1$, $p>.05$, see Figure 5.13).

5.2.4 Vehicles driven by persons responsible for crashes

Compared to 26-65 year olds, 21-25 year olds had a different mix of vehicles in crashes ($\chi^2(13)=56.7$, $p<.05$). Table 5.4 suggests that the difference resulted from the younger persons more commonly driving cars in the crashes.

The age distributions of cars driven by 21-25 year olds and 26-65 year olds responsible for crashes differed ($\chi^2(3)=14.9$, $p<.05$). From Table 5.5 it appears that cars driven by the younger group were older, on average.

In contrast to expectations from earlier studies, the number of occupants did not differ for cars driven by persons from the two age groups ($\chi^2(3)=5.7$, $p>.05$, see Table 5.6). The pattern was similar to that for the younger group, however.

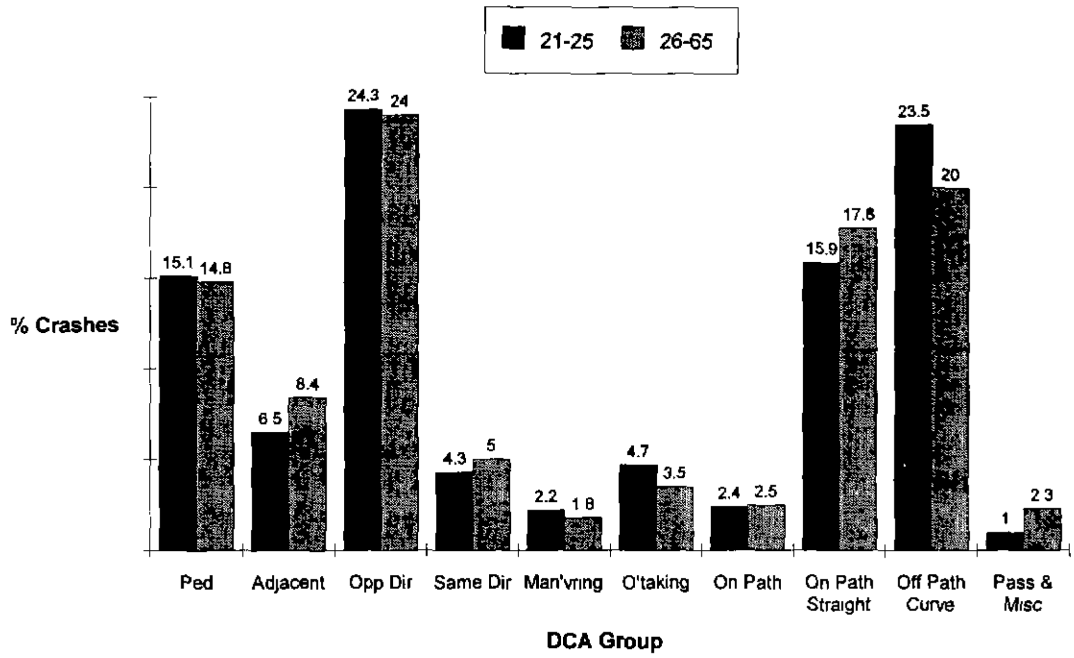


Figure 5.13. Crash patterns (DCA groups) of crashes of 21-25 year olds and 26-65 year olds.

Vehicles driven by 21-25 year olds were more likely to be judged to be travelling at "definitely over the speed limit" than vehicles driven by 26-65 year olds ($\chi^2(6)$=40.1, p<.05, see Table 5.7).

5.2.5 Persons responsible for crashes

The types of road users aged 21-25 and 26-65 who were responsible for crashes are presented in Table 5.1. The road user mix differed significantly between the two age groups ($\chi^2(3)$=35.9, p<.05), there appearing to be more motorcyclists in the younger group.

The younger and older persons responsible were equally likely to be male (83.5% vs 83.5%, z=0.00, p>.05).

The blood alcohol concentrations (BACs) of the two groups differed ($\chi^2(3)$=8.90, p<.05). As Table 5.8 shows, 21-25 year olds appeared to be more likely to have a BAC of between .05 and .15.

Drivers. Of the 498 21-25 year olds responsible for crashes, 373 (74.9%) were drivers. The percentage of drivers responsible for crashes who were male was unaffected by age (21-25: 80.4%, 26-65: 82.9%, z=-1.07, p>.05). The two groups differed according to blood alcohol concentration, however ($\chi^2(3)$=11.7, p<.05, see

Figure 5.14). The figure suggests that 21-25 year olds were more likely to have a BAC of between .05 and .15. The percentage of drivers responsible who were male differed according to BAC (see Table 5.14). Young and older drivers with high BAC were equally likely to be male. However young sober or lower BAC drivers were less likely to be male than their older counterparts.

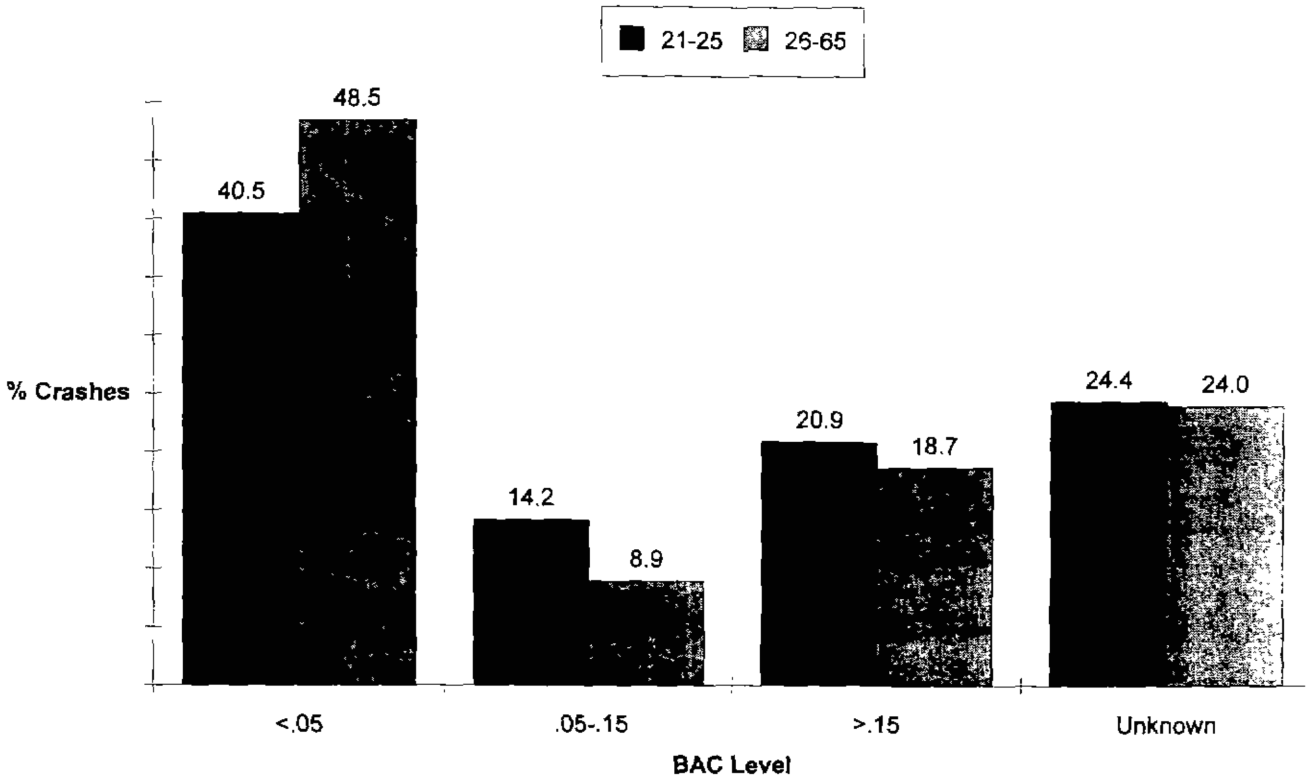


Figure 5.14. Percentages of drivers responsible for crashes aged 21-25 and 26-65 according to blood alcohol concentration (BAC).

Table 5.14. Numbers and percentages of drivers responsible who were male as a function of blood alcohol concentration (BAC) and age group.

BAC	21-25 year old drivers	26-65 year old drivers
<.05	108 (71.5)	359 (80.0)
.05-.15	43 (81.1)	76 (92.7)
>.15	70 (89.7)	161 (93.1)
Unknown	79 (86.8)	172 (77.5)
Total male drivers	300 (80.4)	768 (82.9)

Motorcyclists. There were 84 motorcyclists aged 21-25 years who were responsible for crashes. All but one were male. The patterns of blood alcohol concentration of 21-25 and 26-65 year old motorcyclists were similar ($\chi^2(3)=3.4$, $p>.05$), about a half of the motorcyclists were sober.

Pedestrians. Of the 498 21-25 year olds responsible for crashes, 38 (7.6%) were pedestrians. The percentage of pedestrians responsible for crashes who were male was unaffected by age (21-25: 78.9%, 26-65: 78.5%, $z=0.05$, $p>.05$). The patterns of blood alcohol concentration of the two groups were similar ($\chi^2(3)=2.6$, $p>.05$), with a large number of pedestrians having a BAC>.15.

5.2.6 Persons killed

There were 562 persons killed in crashes for which 21-25 year olds were at least partially responsible. The fatalities comprised 420 males and 142 females. Figure 5.15 shows the different age distributions for persons killed in crashes for which 21-25 year olds and 26-65 year olds were responsible ($\chi^2(5)=864.6$, $p<.05$). While the clearest pattern is that of persons responsible for the crashes being killed, the figure also shows that about a third of the persons killed in crashes for which 21-25 year olds were responsible did not belong to this age group, compared with only about 20% of persons killed in crashes for which 26-65 year olds were responsible (34.3% vs 21.2%, $z=5.93$, $p<.05$).

Persons killed in crashes for which 21-25 year olds were responsible were less likely to be drivers (40.4% vs 47.5%, $z=-2.81$, $p<.05$) and were more likely to be motorcyclists (15.7% vs 9.4%, $z=3.92$, $p<.05$) than were persons killed in crashes in which 26-65 year olds were responsible (see Table 5.9).

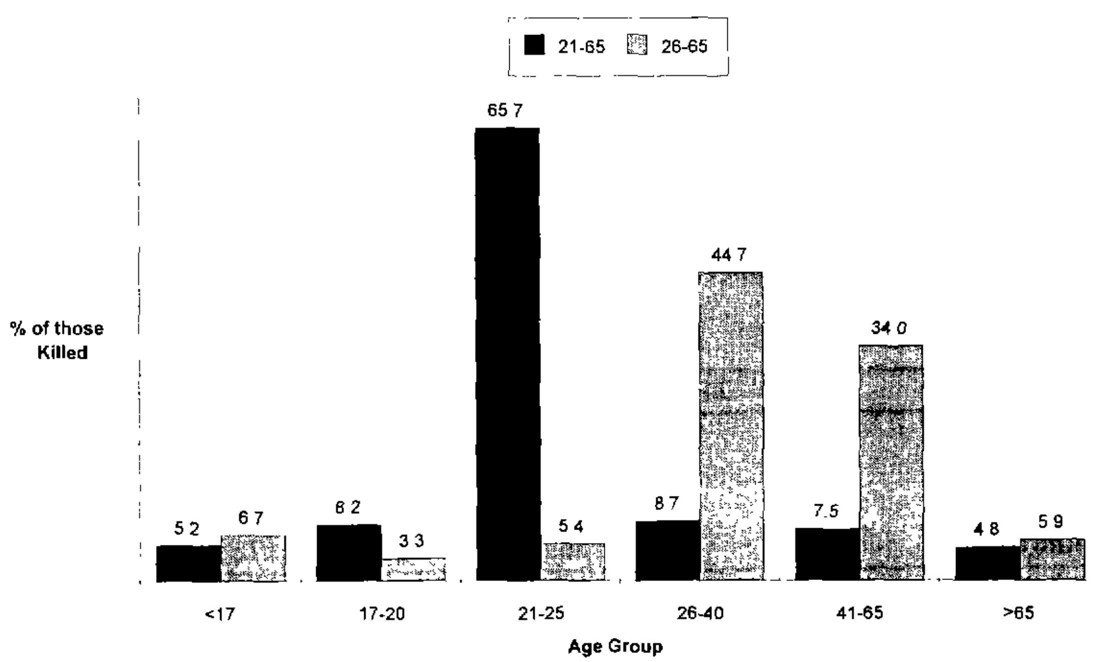


Figure 5.15. Percentages of persons in each age group killed in crashes for which 21-25 year olds and 26-65 year olds were responsible.

Drivers killed. Relatively more 26-65 year old drivers were killed by members of their own age group than were 21-25 year old drivers (96.3% vs 86.3%, $z=5.24$, $p<.05$). Just under 80% of drivers killed in both types of crashes were male (77.1% vs 78.9%, $z=-0.56$, $p>.05$).

Motorcyclists killed. In contrast to the findings for drivers, relatively more 21-25 year old motorcyclists were killed by members of their own age group than were 26-65 year old motorcyclists (93.2% vs. 83.9%, $z=2.02$, $p>.05$). Almost all motorcyclists killed in both types of crashes were male.

Pedestrians killed. The pattern for pedestrians killed differs somewhat from that found for drivers and motorcyclists. As Figure 5.16 shows, only about half of the pedestrians killed in crashes for which 21-25 year olds were responsible were themselves aged 21-25. In contrast, 78.7% of pedestrians killed in crashes for which 26-65 year olds were responsible were themselves aged 26-65 (48.1% vs 78.7%, $z=-4.82$, $p<.05$).

Pedestrians killed in crashes for which 21-25 year olds or 26-65 year olds were responsible were equally likely to be male (68.8% vs 70.6%, $z=-0.29$, $p>.05$).

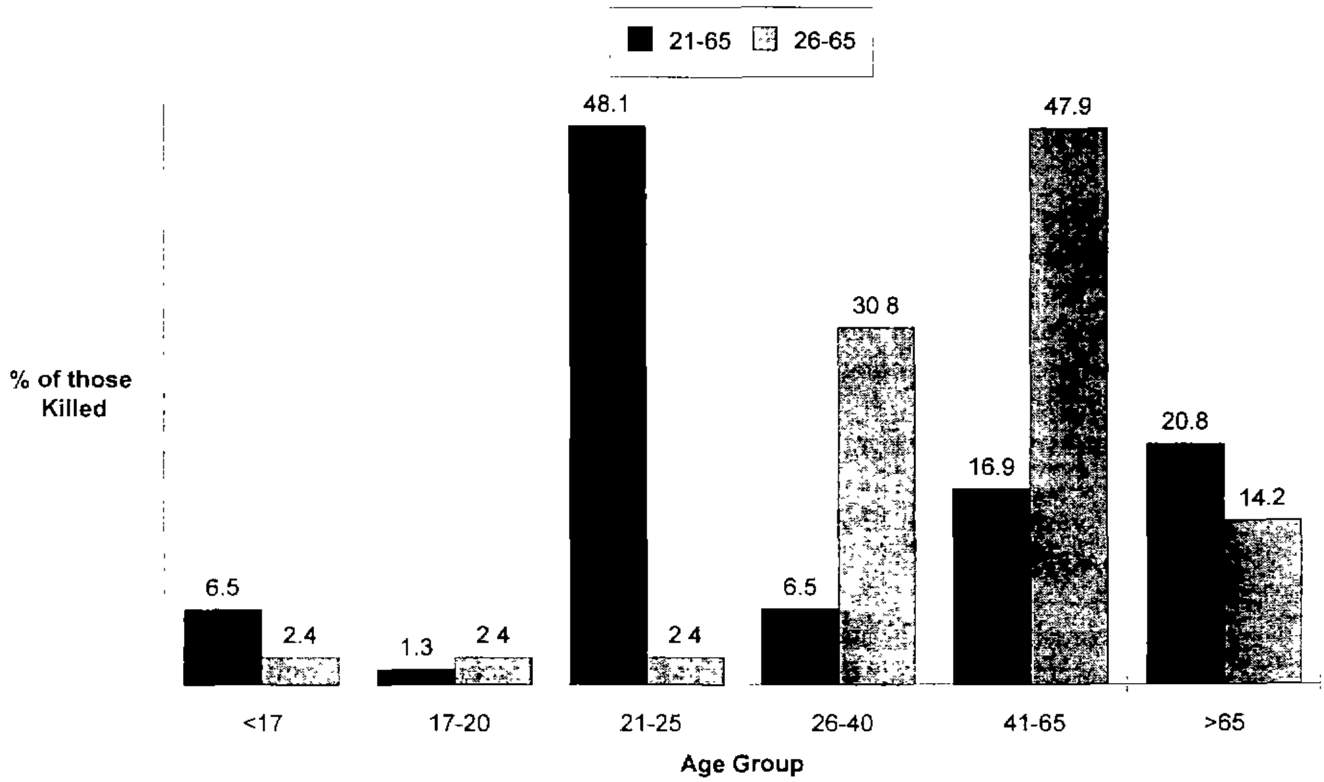


Figure 5.16. Percentages of pedestrians in each age group killed in crashes for which 21-25 year olds and 26-65 year olds were responsible.

5.2.7 Employment characteristics

The employment status of 21-25 year olds responsible for crashes differed from that of 26-65 year olds ($\chi^2(8)=36.3$, $p<.05$). From Table 5.10 it appears that members of the younger group were less likely to be employed in managerial or professional positions or to be not in the workforce, whereas they were more likely to be employed in trades or plant and labour related jobs.

5.2.8 Trip purpose

The trip purposes of 21-25 year old and 26-65 year old persons responsible for crashes differed (origin: $\chi^2(5)=30.5$, $p<.05$; destination: $\chi^2(5)=26.0$, $p<.05$). From Tables 5.11 and 5.12 it appears that 21-25 year olds were less likely to be driving to or returning from work and more likely to be driving to or returning from recreation.

5.2.9 Seat Belt Wearing

The proportion of drivers responsible for crashes who were not wearing a seat belt were similar for 21-25 year olds and 26-65 year olds (28.4% and 26.3%, respectively) However, passengers in cars driven by 21-25 year old drivers responsible for crashes were more likely not to be wearing a seat belt than passengers of older drivers (38.6% vs 25.2%, $z=3.16$, $p<.05$)

5.3 SUMMARY

The chapter examined crashes for which 17-20 year olds and 21-25 year olds were judged to be responsible and compared the characteristics of these crashes with crashes for which 26-65 year olds were judged to be responsible. This summary compares the results of those analyses with expectations based on past research and notes where the two young driver groups may differ.

In accord with past research, the analyses showed that:

- crashes of both 17-20 and 21-25 year old groups were relatively more frequent at night
- crashes of 17-20 and 21-25 year olds were relatively more common on the weekend, but this pattern resulted from high alcohol crashes only
- cars driven by 17-20 and 21-25 year old drivers responsible for crashes were older on average than cars driven by older drivers
- cars driven by 17-20 year olds but not 21-25 year olds had more passengers than cars driven by older drivers

Two predictions from past research were not supported by the results of the analyses:

- there were not more crashes of 17-20 year old drivers in states with lower licensing ages
- there was no over-representation of male drivers among those responsible for crashes (compared with older drivers)

In addition to the specific predictions of past research, crashes of young people were shown to have the following characteristics:

- crashes of 17-20 year olds were more likely to occur in urban areas, on "other urban" roads and less likely to occur on highways than crashes of older drivers. Crashes of 21-25 year olds were less likely to occur on highways.
- percentages of crashes for which 21-25 year olds and 26-65 year olds were responsible which were single-vehicle were similar whereas percentages of crashes for which 17-20 year olds were responsible were more often single-vehicle crashes
- 17-20 year olds and 21-25 year olds had a different mix of vehicles in crashes and they are more commonly driving cars in the crashes
- 17-20 year olds and 21-25 year olds responsible for crashes were likely to be motorcyclists, male and have a BAC of between .05 and .15
- persons killed in crashes for which 17-20 year olds and 21-25 year olds were responsible were less likely to be drivers and were more likely to be motorcyclists than were persons killed in crashes in which 26-65 year olds were responsible
- the distribution of employment status was found to differ significantly between 17-20 and 21-25 year olds and 26-65 year old drivers responsible for the crashes but this may reflect only overall age-based distributions of employment status, having little relation to crash involvement
- 17-20 year olds and 21-25 year old groups were less likely to be driving to or returning from work and more likely to be driving to or returning from recreation
- passengers of cars driven by 17-20 or 21-25 year olds were more likely not to be wearing a seat belt than were passengers in cars driven by older drivers. There was no difference found for drivers, however.

The differences between the three age groups are summarised in Table 5.15.

Table 5.15. Summary of characteristics of crashes for which 17-20, 21-25 and 26-65 year olds were responsible. A statistically significant difference is represented by a difference in the number of asterisks.

Characteristic	Younger (17-20 years)	Young (21-25 years)	Older (26-65 years)
Occur at nights	**	**	*
Occur on weekends (high alcohol crashes only)	**	**	*
More in urban areas	**	*	*
Less on highways	**	**	*
More car drivers	**	**	*
Older cars	**	**	*
Vehicle occupancy	**	*	*
Passengers not wearing seat belts	**	**	*
More male than female drivers	**	**	*
Motorcyclists	**	**	*
Person responsible had BAC .05-.15	**	**	*
Killed less likely to be drivers, more likely to be motorcyclists	**	**	*
Trip purpose recreation-related, less work-related	**	**	*

6. CRASHES FOR WHICH ELDERLY ROADUSERS WERE RESPONSIBLE

Past research suggests that crashes for which elderly drivers are responsible should have the following characteristics:

- relatively more female drivers than for other crashes
- more intersection crashes (because more urban driving)
- more multi-vehicle crashes (because more urban driving)
- more daytime crashes (because of more daytime driving)
- more urban crashes (because of shorter distances driven by the elderly).

As Table 5.1 shows, there were 280 crashes in which the person responsible was aged over 65 years. These crashes resulted in death to 299 people and injury to 189 people. In this section, these crashes are compared with the 1247 crashes for which the person responsible was aged between 26 and 65 years.

6.1 Timing

Crashes for which over 65 year olds and 26-65 year olds were responsible were distributed differently across the day ($\chi^2(3)=90.7$, $p<.05$). Figure 6.1 suggests that crashes of the elderly group were relatively more frequent between 6 am and noon and particularly so between noon and 6 pm. This is in agreement with the findings of past research.

Crashes of elderly and older persons also varied according to day of the week ($\chi^2(6)=13.4$, $p<.05$). Figure 6.2 suggests that the crashes of elderly persons were more likely to occur on Tuesdays, Wednesdays and Thursdays relative to those of the older group.

6.2 Location

The distributions of crashes of elderly and older persons differed across the States and Territories ($\chi^2(7)=17.2$, $p<.05$). From Figure 6.3 it appears that elderly persons were over-represented as responsible for crashes in Victoria and under-represented in Western Australia (which has a lower proportion of elderly people according to the census).

As predicted from earlier studies, crashes of elderly persons more often occurred in urban areas than those of older persons (75.6% vs 50.8%, $z=7.45$, $p<.05$). As a result of this difference, crashes for which elderly persons were responsible were more likely to occur in 60 km/h zones and less likely to occur in 100 km/h zones than crashes of the other drivers ($\chi^2(1)=52.6$, $p<.05$). This difference remained when analysis was restricted to urban crashes ($\chi^2(1)=6.43$, $p<.05$).

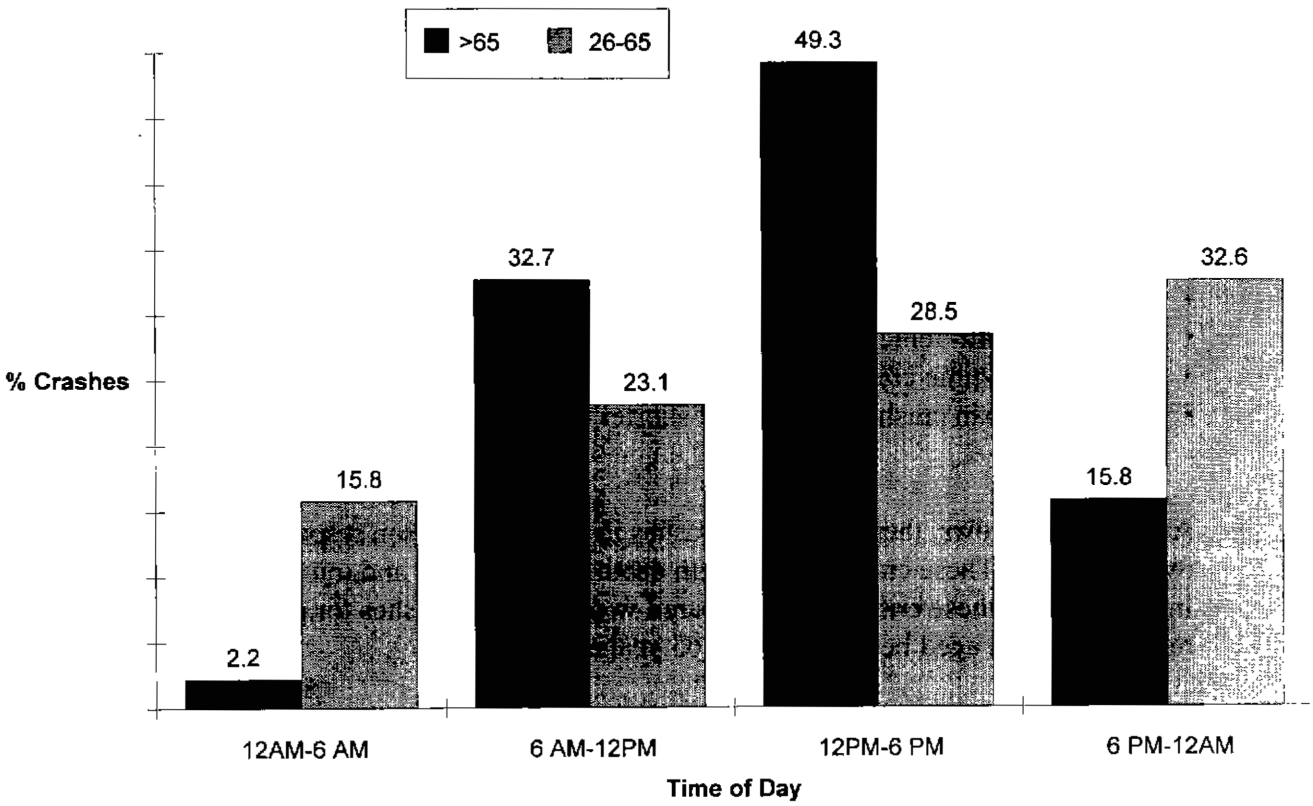


Figure 6.1. Percentages of crashes for which persons aged over 65 years and 26-65 years old were responsible as a function of time of day.

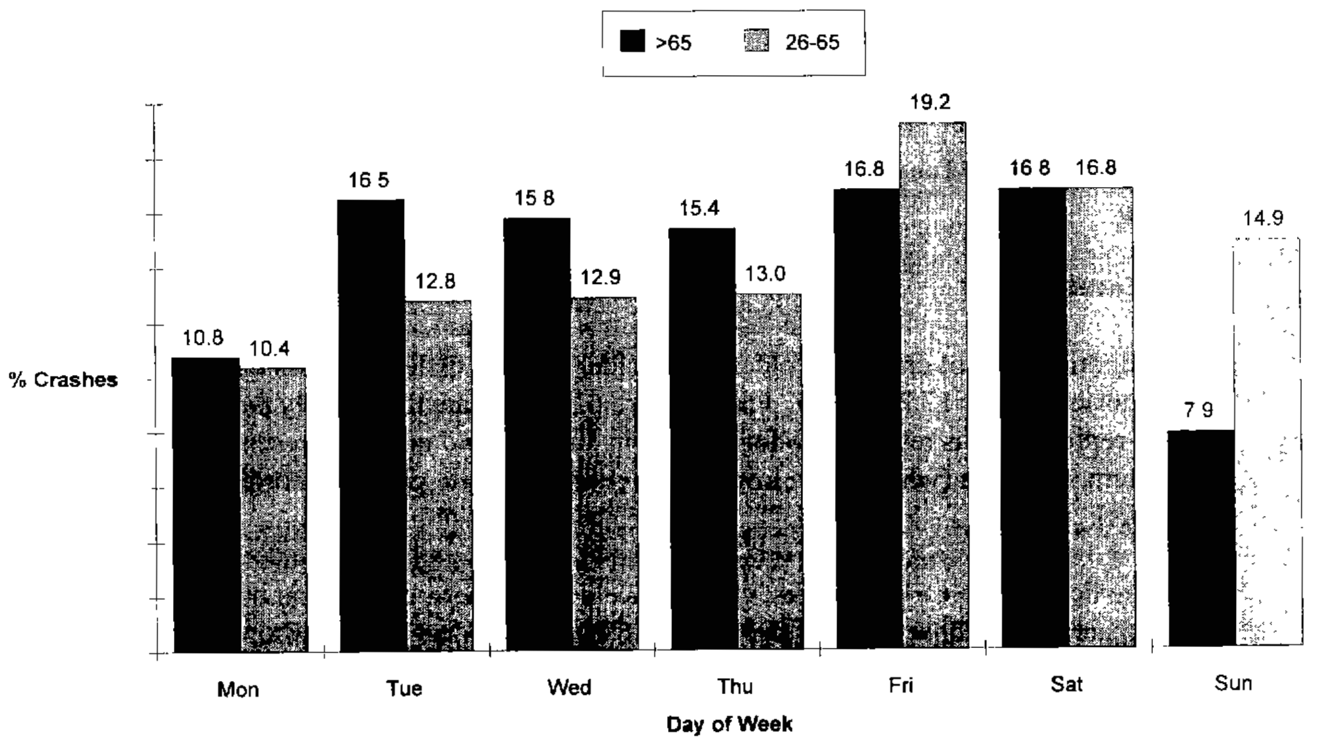


Figure 6.2. Percentages of crashes for which persons aged over 65 years and 26-65 years old were responsible as a function of day of week.

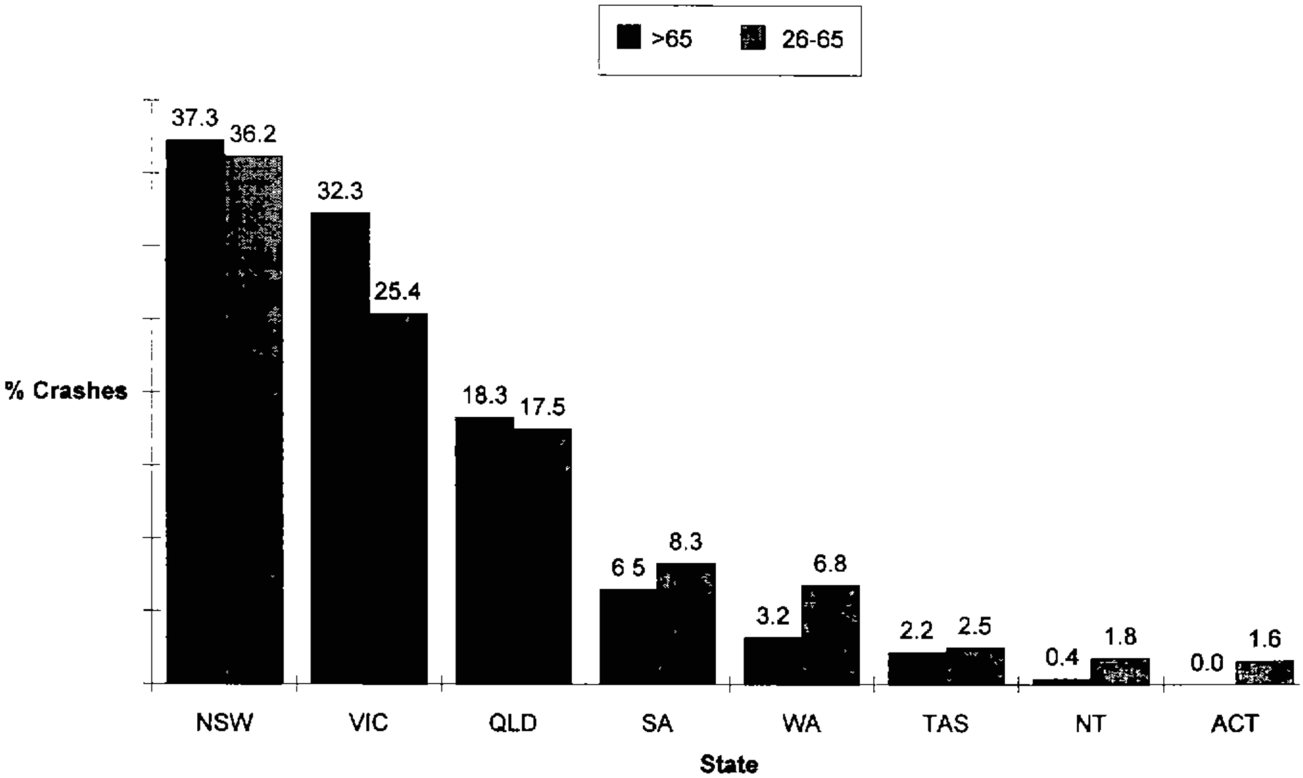


Figure 6.3. Distribution across States and Territories of crashes for which over 65 year olds and 26-65 year olds were responsible.

Overall, crashes of elderly people were about twice as likely to occur at an intersection as those of older people (44.8% vs 22.9%, z=7.33, $p<.05$). However, this applied to crashes for which elderly drivers were responsible but not to crashes for which elderly pedestrians were responsible. When urban crashes only were examined, intersections remained more dangerous for elderly people ($\chi^2(3)=16.5$, $p<.05$).

The types of intersections at which crashes occurred are shown in Table 6.1. The mix of intersections was the same for the two groups when considered overall ($\chi^2(3)=3.1$, $p>.05$), when drivers and pedestrians were analysed separately and when urban crashes only were examined.

Table 6.1. Types of intersections at which crashes occurred.

Type of intersection	Persons aged over 65 years	Persons aged 26-65 years
X	65 (52.0)	108 (43.2)
Y	2 (1.6)	8 (3.2)
T	56 (44.8)	129 (51.6)
Multi	2 (1.6)	5 (2.0)
Total intersection crashes	125 (100.0)	250 (100.0)

The types of traffic controls present at intersections did not differ between the two age groups for drivers ($\chi^2(11)=15.1$, $p>.05$) or pedestrians ($\chi^2(7)=5.0$, $p>.05$) responsible for crashes.

6.3 Crash pattern

Table 6.2 gives a breakdown of crashes for which over 65 year olds and 26-65 year olds were responsible as a function of single/multi-vehicle, urban/rural and responsibility of pedestrians. The roaduser responsible was more likely to be a pedestrian in the elderly group (43.0% vs. 10.1%, $z=11.49$, $p<.05$). The over-representation of urban areas in crashes of elderly persons results from the large number of crashes in which pedestrians were responsible. When pedestrians responsible are removed, urban crashes make up 34.4% of crashes of elderly roadusers and 41.9% of crashes of 26-65 year old road users ($z=-2.28$, $p<.05$).

Table 6.2. Types of crashes for which roadusers aged over 65 years were responsible.

Type of Crash	Age of roaduser responsible		>65 as percentage of all crashes
	>65	26-65	
All crashes	279	1094	11.6
Pedestrian responsible	120	110	32.8
Single vehicle	162	589	11.8
Urban	211	555	15.2
Rural	68	537	6.7
SV urban	130	297	16.4
SV urban ped resp	113	95	35.1
MV urban	81	258	13.6
MV urban ped resp	2	2	33.3
SV rural	32	292	5.5
SV rural ped resp	5	13	13.2
MV rural	36	245	8.3
MV rural ped resp	0	0	0.0

Note: Urban and rural do not add to give all crashes because location was unknown for two crashes. There were no multi-vehicle rural crashes for which pedestrians were responsible.

Overall, similar percentage of crashes of the elderly and older group were single-vehicle (58.1% vs. 54.0%, $z=1.23$, $p>.05$). When crashes in which pedestrians were responsible were removed, however, crashes of the elderly group were much less likely to be single-vehicle than crashes of the older group (27.7% vs 49.1%, $z=5.02$, $p<.05$).

The following discussion of crash types excludes crashes in which the pedestrian was responsible. The mix of crash patterns for single-vehicle urban crashes differed significantly ($\chi^2(6)=21.1$, $p<.05$). Figure 6.4 suggests that elderly roadusers had relatively fewer off path on curve crashes. In multi-vehicle urban crashes, elderly roadusers had relatively more vehicle adjacent crashes and relatively fewer vehicle opposing crashes than their 26-65 year old counterparts ($\chi^2(8)=38.6$, $p<.05$, see Figure 6.5).

Elderly and other roadusers had similar crash patterns for single vehicle rural crashes and for multi-vehicle rural crashes (single:$\chi^2(5)=9.09$, $p>.05$; multi:$\chi^2(8)=14.02$, $p>.05$). Most single-vehicle rural crashes were off path on straight or on curve whereas most multi-vehicle rural crashes involved vehicles from adjacent or opposite directions..

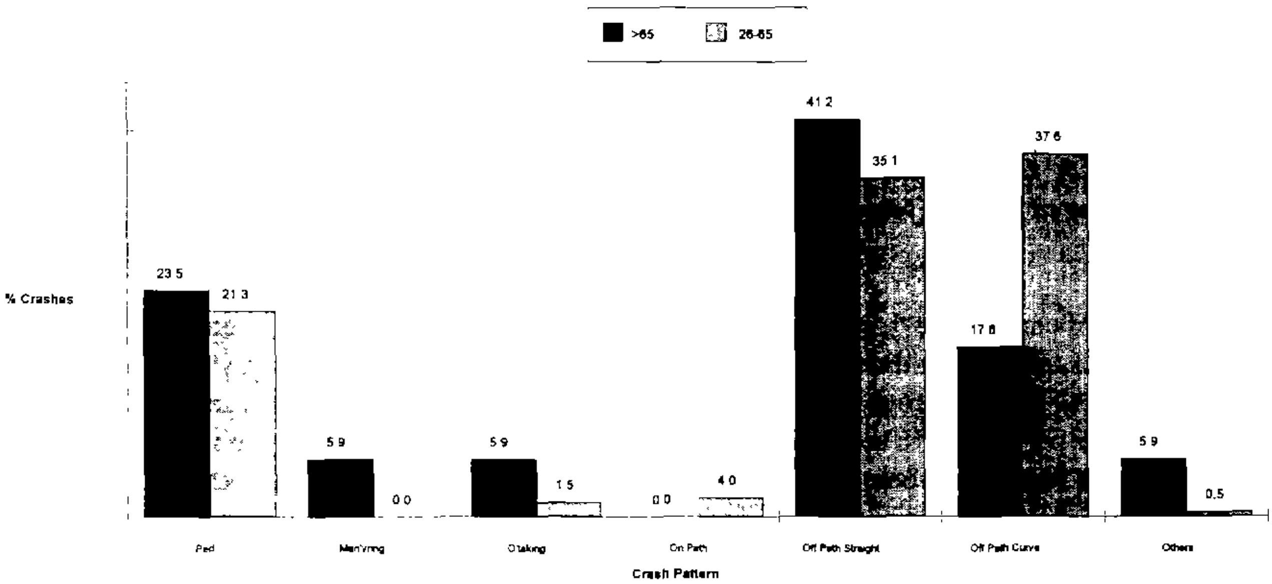


Figure 6.4. Crash patterns (DCA group) of single vehicle urban crashes for which persons aged over 65 years and 26-65 years were responsible. Does not include crashes for which pedestrians were considered responsible.

6.4 Vehicles driven by persons responsible for crashes

The mix of vehicle types driven by persons over 65 who were responsible for crashes differed from that of 26-65 year old persons responsible for crashes ($\chi^2(13)=50.8$, $p<.05$). It appears from Table 5.4 that elderly persons were less likely to drive motorcycles and trucks.

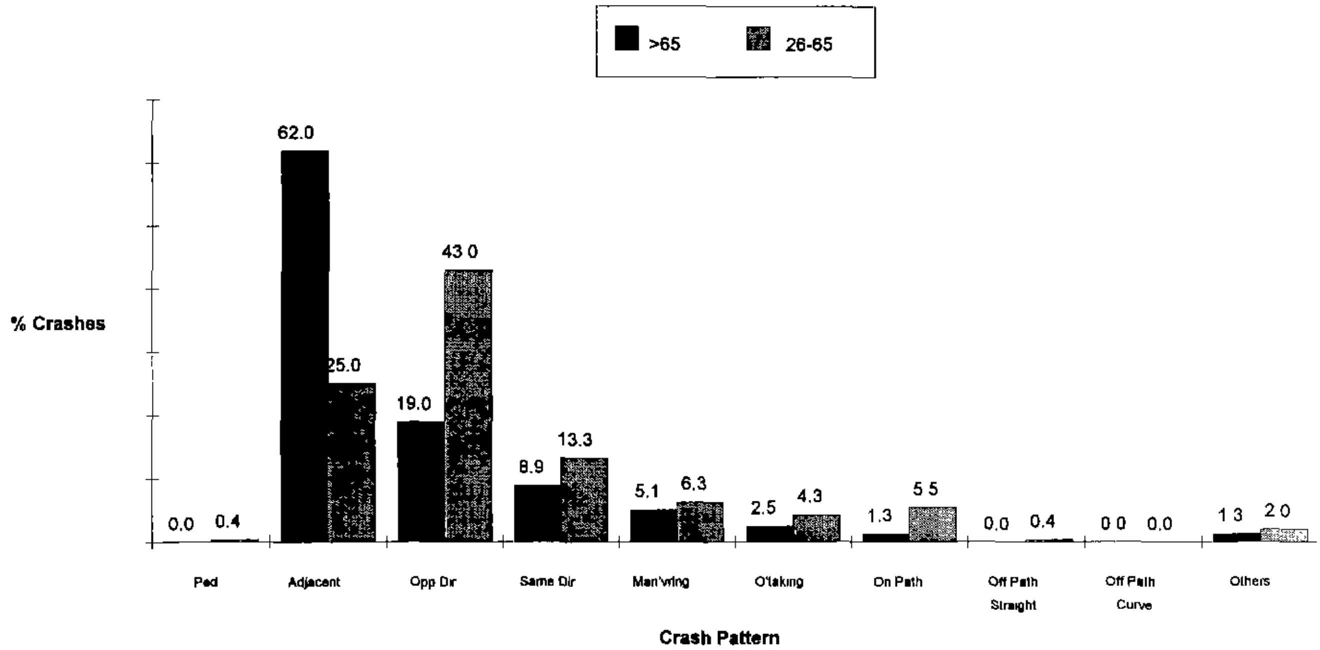


Figure 6.5. Crash patterns (DCA group) of multi-vehicle urban crashes for which persons aged over 65 years and 26-65 years were responsible.

The age of cars (Table 5.5) did not differ between the older and elderly drivers ($\chi^2(3)=3.1$, $p>.05$) nor did the average number of occupants in cars driven by members of the two groups (1.76 vs 1.87, $t(728)=-0.92$, $p>.05$). However cars driven by elderly persons were more likely to have two occupants and less likely to have four occupants than cars driven by members of the other group (see Table 5.6, $\chi^2(3)=22.8$, $p<.05$).

As can be seen from Table 5.7, fewer elderly drivers were judged to be travelling at "possibly" (5.7% vs 15.7%, $z=-3.34$, $p<.05$) or "definitely over the speed limit" (1.9% vs 14.2%, $z=-4.35$, $p<.05$). This difference remained when urban and rural crashes were examined separately.

6.5 Persons responsible for crashes

The types of road users aged over 65 and 26-65 who were responsible for crashes are presented in Table 5.1. The road user mix differed significantly between the two age groups ($\chi^2(3)=171.7$, $p<.05$), there appearing to be a higher percentage of elderly pedestrians responsible for crashes.

The elderly persons responsible were less likely to be male (68.5% vs 83.5%, $z=-5.69$, $p<.05$).

The blood alcohol concentrations (BACs) of the two groups differed ($\chi^2(3)=69.4$, $p<.05$). As Table 5.8 shows, over 65 year olds appeared to be less likely to have a BAC over .05 and were more likely to have unknown BAC.

Drivers. Of the 280 over 65 year olds responsible for crashes, 153 (54.6%) were drivers. The elderly drivers responsible for crashes were less likely to be male than were other drivers (75.0% vs 82.9%, z=-2.33, $p<.05$). The two groups differed according to blood alcohol concentration, ($\chi^2(3)=34.1$, $p<.05$, see Figure 6.6). The figure suggests that elderly drivers were less likely to have a BAC over .05 and were more likely to have unknown BAC.

Motorcyclists. There was only one elderly motorcyclist responsible for a crash.

Pedestrians. 131 elderly pedestrians were responsible for crashes. The proportion of pedestrians who were male was lower for the elderly group than for 26-65 year olds (59.5% vs 78.5%, z=-3.26, $p<.05$). The BACs of the two groups also differed ($\chi^2(3)=45.4$, $p<.05$) with fewer alcohol-affected pedestrians in the elderly group.

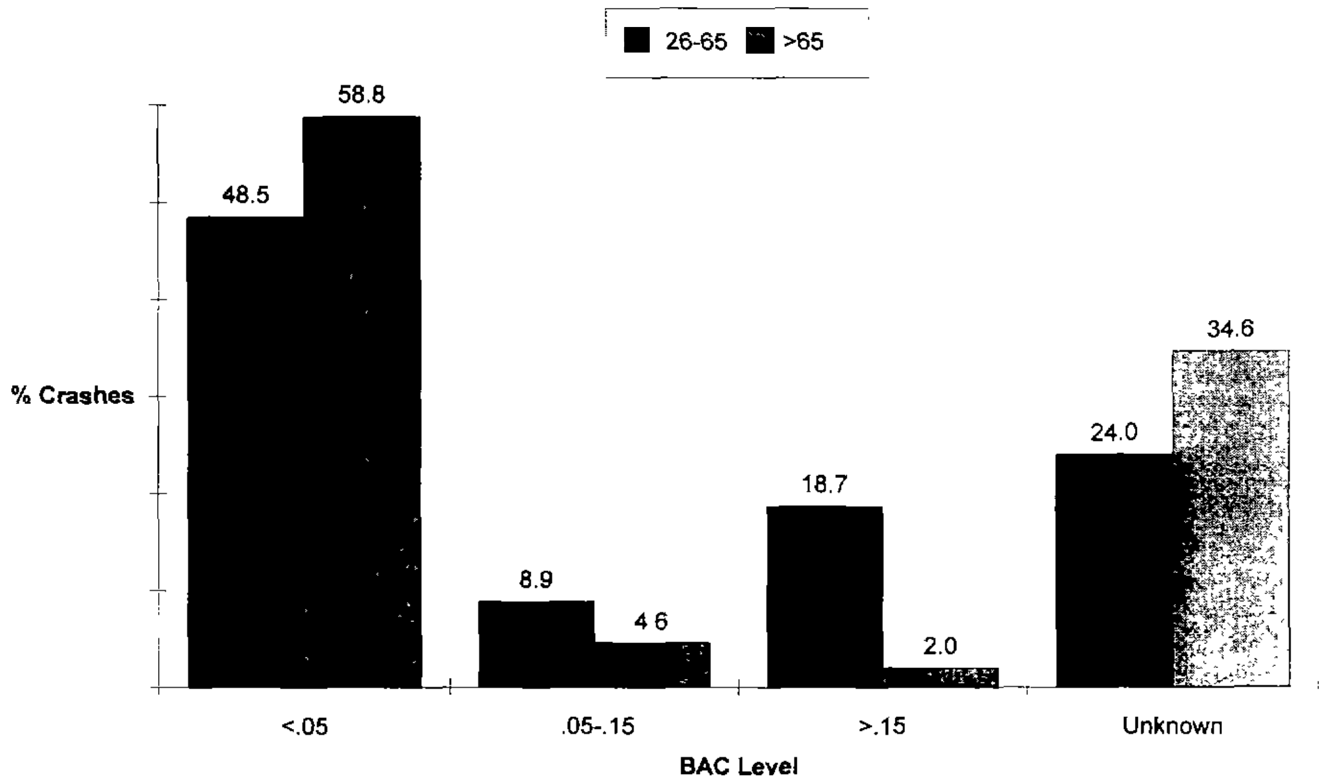


Figure 6.6. Percentages of drivers responsible for crashes aged over 65 years or 26-65 years according to blood alcohol concentration.

6.6 Persons killed

There were 299 persons killed in crashes for which persons aged over 65 years were at least partially responsible. The fatalities comprised 169 males and 130 females. Figure 6.7 shows the different age distributions for persons killed in crashes for which over 65 year olds and 26-65 year olds were responsible ($\chi^2(5)=1040.4$, $p<.05$). More than 90% of the persons killed in crashes for which over 65 year olds were responsible belonged to this age group.

Crashes for which over 65 year olds were responsible resulted in death to relatively more pedestrians (42.5% vs 13.5%, z=11.46, p<.05) and fewer other road users than crashes for which 26-65 year olds were responsible (see Table 5.9).

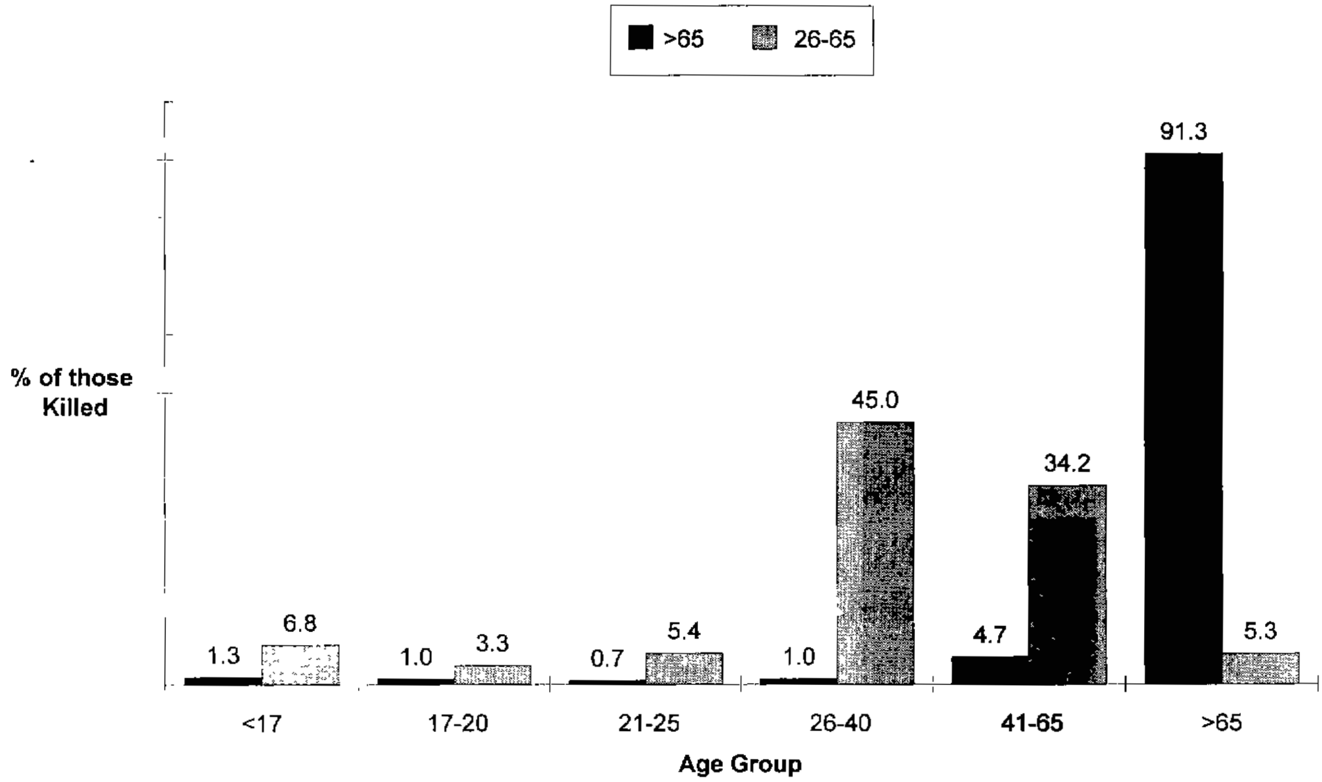


Figure 6.7. Percentages of persons in each age group killed in crashes for which over 65 year olds and 26-65 year olds were responsible.

6.7 Employment characteristics

Not surprisingly, the employment mix of persons responsible for crashes who were over 65 years differed from those persons aged 26-65 years ($\chi^2(8)=325.4$, $p<.05$). From Table 5.10 it can be seen that this was largely due to 64.2% of the elderly group being retired.

6.8 Trip purpose

The trip purposes of persons aged over 65 years old who were responsible for crashes differed from those of persons aged 26-65 years (origin: $\chi^2(5)=42.1$, $p<.05$; destination: $\chi^2(5)=24.0$, $p<.05$). Table 5.11 suggests that members of the elderly group were more likely to be travelling from home or from an unknown origin and less likely to be travelling from work. Their destination appeared to be less likely to be home or work and more likely to be unknown (see Table 5.12).

6.9 Summary and conclusions

The analyses confirmed the predictions of past research that crashes for which elderly drivers are responsible have the following characteristics:

- more daytime crashes
- more urban crashes.
- more intersection crashes. This was found when elderly drivers were responsible for crashes but not when elderly pedestrians were responsible for crashes.
- more multi-vehicle crashes. Crashes for which elderly drivers were responsible appeared more likely to involve vehicles from adjacent directions and less likely to involve vehicles from opposite directions.
- relatively more female drivers responsible than for other crashes. The analysis also showed that more elderly pedestrians responsible were female.

In addition the analyses showed that, compared to crashes for which 26-65 year olds were responsible, crashes of over 65 year olds were:

- more common mid-week
- more common in Victoria and less common in Western Australia

Cars driven by over 65 year olds responsible for crashes were, relative to cars driven by 26-65 year olds, less likely to be speeding.

Elderly persons responsible for crashes were less likely to have a blood alcohol concentration over .05 but more likely to have an unknown blood alcohol concentration.

More than 90% of the persons killed in crashes for which over 65 year olds were responsible belonged to this age group.

7. CASE SCENARIOS

7.1. INTRODUCTION

The 1988 Fatality File is the most comprehensive database for fatal crashes in Australia, and as such is an extremely valuable and useful resource. Nevertheless its value can be enhanced by using the database together with insights able to be gained by reference back to the original source material for each case.

Limitations of databases

The information that is able to be extracted from mass data (organised in the form of a structured database) is inherently circumscribed to the variables coded in the database. Thus the more comprehensive the set of variables used to model the particular event, the more completely does the database describe the essential and significant factors and parameters of the particular event. It is also evident that databases for practical purposes are limited in their capacity to describe (model) reality and their function is to try to code sufficient variables so as to be useful: a database is not reality but an abstraction of it. The power and value of mass data lies in the statistical analysis of this data to obtain statistically significant insights and hence a better and more confident understanding of the particular event. These statistical analyses highlight areas for further research, analysis or targeting for countermeasure development.

It is important to recall that the database was derived (abstracted) from the original source material, which for each event remains the richest source of material available. For this reason the project brief also included the requirement to review a sample of the original case material for each crash group. This review was aimed at obtaining additional insights into the common crash types, not discernible from the database, and to develop typical case scenarios for particular crash types.

Method

For each causal variable FORS selected a representative sample of crashes, and supplied copies of the original case material. The file for each case typically contained: the Coroner's findings regarding the fatalities associated with the crash, police report and summaries regarding the accident, witness statements regarding pre-trip activity and circumstances of the crash, autopsy reports and photographs of the crash scene and damaged vehicles. In a number of cases, only some of this material was available, with for example, witness statements not being available. In addition all the cases had the original coding forms used for each case, which formed the input to construct the 1988 Fatality File database.

The basic approach was to read all the case material and summarise this on a proforma (refer Appendix 2). The main areas focussed on related to:

pretrip activities
contributory circumstances
crash description

sketch of vehicle movement and crash type
injuries causing death and vehicle damage

The case scenarios were then developed from the summaries for each case. A total of 188 cases were examined, divided more or less equally into the following seven groups. The selection criteria for inclusion of cases in a particular group was based on the assessment of the major causal factor involved in the crash. Typically these were derived from police or inquest findings. The cases involved the following causal variables:

fatigue
speeding
alcohol (BAC 0.05- 0.15)
alcohol (BAC > 0.15)
younger roadusers aged 17- 20 years
young roadusers aged 21- 25 years
elderly roadusers over 65 years

The following sections set out the case scenarios derived from the case material, for each of the above groups.

7.2. CASE SCENARIOS FOR FATIGUE INVOLVED CRASHES

The crash types where fatigue has been considered to be the major causal variable are usually identified on the basis that surviving drivers or other vehicle occupants may state that the driver was tired and momentarily fell asleep. In other cases where there are no witnesses, the circumstances before and after the crash suggest that the driver must have dozed off.

The review of the 29 cases, highlights the following typical scenarios leading up to "fatigue" crashes:

Fatigue Scenario 1: **Alcohol involved.**

In these cases the driver would have arrived at the pub early in the day, and stayed for quite some time, leaving in the late evening. In driving away from the venue the driver, at some stage, becomes drowsy and falls asleep (momentarily or longer) losing control of the vehicle which leaves the road hitting a tree or pole, or rolling over.

Fatigue Scenario 2: **Alcohol plus a long drive.**

The feature of these crash types is that the driver would typically attend a party or other function and stay late or till early morning (eg 5-6am), having consumed significant levels of alcohol combined with very little, if any, sleep. The driver may then embark on a fairly long trip back home. At some point the driver falls asleep or loses concentration resulting in the vehicle running off the road and colliding with trees or poles or rolling over. In some cases the driver awakes to find himself on the gravel road shoulder and in trying to correct the vehicle, overcorrects resulting in the car cutting across the road to the opposite side, and striking fixed objects or on-coming traffic.

It is also evident from the case studies that for younger people in particular it is not uncommon for them to drive in the morning having been at a party most of the night and slept very little. It is not surprising that this combination of factors would lead to fatigue and loss of concentration or falling asleep whilst driving. Interestingly it would seem that these drivers appear to very much overestimate their capacity to drive in these circumstances (and oblivious to the risks) and appear to "push on" regardless.

Fatigue Scenario 3: **General tiredness, long trips.**

There are a series of crashes where the driver has become tired through long hours of work (e.g working seven days straight) or has worked night shift, prior to the trip. Following this activity the driver may then embark on a long trip (e.g from one country town to another) involving perhaps 2-4hrs of driving, and then at some stage falling asleep and losing control as described in the previous examples.

Similar situations to these arise in cases where the person may be tired due to illness combined with medication, thus being susceptible to drowsiness or a loss of attentiveness.

As shown by the statistical analysis, these crash types are predominantly rural, where the longer travel times allow greater opportunity for fatigue to develop sufficiently for the driver to doze off. Because of the usually higher speeds involved in the rural environment, these crashes are particularly severe and thus more likely to be fatal. This compares with urban situations where the shorter travel time enables the driver to perhaps just cope, without having a crash occurring. On the other hand, in the urban environment, though fatigue related crashes may still occur, due to the lower speeds these crashes would be less likely to result in a fatality.

Fatigue Scenario 4: **Holiday travel.**

These crashes are characterised by long travel times in the case of people taking touring holidays between major centres or capital cities. These trips are also characterised by the cars having four or perhaps more occupants (as highlighted in the statistical summary). Consequently the long trip time could lead to driver drowsiness resulting in vehicles running off the road as described previously.

Because of the long distances that are often involved, driving is often shared, resulting in inexperienced drivers being responsible for parts of the journey. These drivers also suffer from fatigue, and may find themselves on the gravel shoulder of the road and losing vehicle control followed by the inevitable crash. Usually the more experienced driver would be trying to gain some sleep in this period, and hence would not be observing the novice driver. Significantly these novice drivers appear to be unaware that their lack of experience leaves them ill-prepared to cope with the hazards that can arise when travelling on rural highways.

Fatigue Scenario 5: **Truck Involved Crashes.**

Of the 7 multi vehicle collisions, 5 involved truck and car crashes. In two of these cases the truck driver fell asleep running into the rear of stationary cars. One case involved a car stopped on the emergency lane of the highway, with the driver standing beside the car adjusting the roof rack. The truck driver fell asleep, and drifted into the emergency lane striking the vehicle from behind and killing the car's driver. The truck driver awoke only metres prior to the point of impact. In the other case the truck driver ran into the rear of a vehicle stopped at an intersection. Again the truck driver was tired and failed to notice the stationary vehicle. In this case the driver did not regularly do this 3 hr drive and said he was tired and was intending to rest at the next stop.

In other cases the truck was the struck vehicle, with the car driver falling asleep and drifting into the oncoming traffic lane, into the path of the truck.

7.3. CASE SCENARIOS FOR CRASHES INVOLVING SPEEDING

The crash types where speeding has been considered to be the major causal variable are usually identified on the basis of information given by surviving drivers, other vehicle occupants or witnesses. In other cases where there are no witnesses, the circumstances of the crash (for example extent of vehicle damage) suggest that the driver must have been driving at excessive speed.

Crashes in which speeding has been considered to be a major causative factor typically involve young drivers, driving at night, losing control of their vehicle on the gravel shoulder of the roadway and colliding with fixed roadside objects (trees, poles), or rolling over, or colliding with oncoming vehicles.

Over 50% of these drivers (from the sample of cases) would have a BAC in excess of 0.05%. The collisions are typically high severity impacts with fatal injuries incurred by the impact side occupant, with a disproportionate number not wearing seatbelts. The vehicles involved are typically older than for other crash types and this is even more evident for high BAC drivers.

From the case studies, a high proportion of the vehicles are Holdens and Fords, which could be a reflection on the preference and low cost availability of these (older) vehicles for young drivers. The age and model type of the vehicle is also significant in speeding crashes as both the crashworthiness and handling of these vehicles would be somewhat less than for newer model vehicles. Thus not only are young drivers more prone to speed but they do so in vehicles which are more likely to lead to loss of control (at higher speeds) and in the event of a collision a higher likelihood of injury, particularly in high speed impacts. Nearly 50% of speeding crashes tended to occur in 60km/h speed zones, with, not surprisingly, a high number of collisions involving poles or trees. About 20% of speeding crashes involved motorcyclists.

Some typical scenarios are:

Speeding scenario 1: **Motorcycle crashes.**

Typically these crashes occur on urban roads with speed limits in the 60km\h range, involving young riders.

One typical scenario is that of a bike speeding on an urban road and colliding with a car turning across its path. One explanation of these crashes is that the high speed of the bike on these streets means that motorcycle is not in sight (sight distances for urban roads are not generally designed for high speeds) as the car drivers commence their manoeuvre, and because of their excessive speed, the motorcyclist is unable to take evasive action in time. Other crashes involve inexperienced riders on new powerful bikes or even crashing while test riding a bike prior to purchasing.

Speeding scenario 2: **Speeding cars.**

A number of different crash scenarios are evident for this category. However they can be summarised as usually involving young drivers driving at a speed which is excessive for the road environment and the capabilities of the driver. One common situation is for a young driver, commonly with friends in the car, noticeably exceeding the speed limit, with the vehicle moving onto the gravel shoulder of the roadway. This motion may simply be due to a momentary lapse of attention or the rear of the car may start to slide due to excess speed for the curve.

This initial loss of control results in the driver trying to bring the car back onto the bitumen roadway, with the result however of over-correcting with the car then cutting right across the road and striking a tree or pole or oncoming traffic. Alternatively the car will strike a fixed object on the road side. In other cases the vehicle may also rollover. Damage to the vehicle is generally severe with high deformations, with the fatalities usually being on the impact side of the vehicle. As seatbelt usage is typically lower than average, ejection of occupants is not uncommon.

Speeding crashes also involve other circumstances, such as suicide by the driver deliberately moving into the path of an oncoming truck, for example.

Two of the cases involved stolen cars, travelling at high speed. In one case the vehicle was speeding through an intersection (at night, lights off) and was "clipped" by another car sending it out of control into a pole. In the other the car was being driven by a 15 year old at an estimated 160km/h, lost control on the gravel road shoulder and hit a tree.

Speeding scenario 3: **Intersection collisions.**

In some of the cases the vehicle may be speeding through an intersection and become involved with a relatively minor collision with another vehicle, which is sufficient to push the fast moving car out of control resulting in a severe impact with roadside poles. In these cases the other driver doesn't see the speeding car or motorcycle until impact. Some of these crashes involve stolen cars being driven at high speeds through intersections, disregarding traffic signals. Another case involved pedestrians crossing at an intersection, being hit by a speeding small truck. In this case both the truck driver and the fatally injured pedestrian had a BAC above 0.05, suggesting that the alertness of both parties was diminished.

Speeding scenario 4: **Testing out the car.**

There is also a group of speeding crashes where the driver is testing out a car. In one example, the car driver was testing out his friends car (accompanied by the owner and some other friends) after an afternoon of working on the car, preceded by a few beers. This testing occurred on an urban street in a 40 km/h speed zone, which despite the low limit did not deter the driver unexpectedly accelerating hard and losing control of the vehicle at a high speed (in excess of 100km/h) on a bend, impacting a tree. The car owner died in the crash.

Summary for speeding crashes

Overall speeding crashes may be characterised by the drivers not perceiving (or caring about?) the risk inherent in driving at a speed excessive for the road and driver capabilities, nor the possible consequences. That is, if something perturbs the car's motion then the car's high speed and the driver's inexperience (lack of skill), compounded by the vehicle's age, result in loss of control with fatal consequences due to the high energy impact.

The same perturbations to the vehicle's travel may well occur to many other motorists but either due to lower speeds, or perhaps appropriate skill levels and newer models, the vehicle can be controlled or the lower impact energy does not result in fatal or serious injuries.

The driver's skill levels, what ever they may be, are of course further reduced by alcohol and lack of experience. It would also appear from statements made by the drivers after crashes (at police interviews) that, the drivers in a number of cases do not appear to look at their speedometer regularly, and appear to disregard consideration of their speed relative to the speed limit or road environment.

7.4. CASE SCENARIOS FOR ALCOHOL INVOLVED CRASHES

7.4.1 ALCOHOL: BAC 0.05 -0.15

Of the 26 cases reviewed in detail, 62% were single vehicle crashes, and another 23% involved a car and a pedestrian. Two were multi-vehicle crashes, and another two were single vehicle motorcycle crashes.

Alcohol (<0.15) scenario 1: **Single vehicle crashes.**

For the single vehicle crashes, the most common scenario involved a young driver, often with passengers. The driver would lose control, typically on a bend, and leave the roadway, colliding with a fixed object, usually a tree or pole, or road signs and traffic lights. For these single vehicle crashes, rollovers occurred in about 30% of the cases. Often the fatally injured driver or passenger was not wearing a seatbelt, and was ejected.

Drivers of the vehicles were commonly noted to have been drinking at the pub, or had a few drinks with their mates. Subsequent driving of the vehicle exhibited factors ranging from sleepiness, inattentiveness to speeding, and to what could be regarded as "showing off" to mates in the car. The single vehicle crashes also exhibited a range of miscellaneous circumstances which could be regarded as consequences of careless and inattentive driving. These include a car leaving the road and ending up in a river; a motor cycle failing to notice cattle on the road, and a car hitting rocks at the end of a no-through road.

Alcohol (<0.15) scenario 2: **Pedestrians.**

The other major group of crashes involved pedestrians. In some cases both the car driver and pedestrian involved had BAC > 0.05. Usually, the driver failed to clearly notice the pedestrians, who were often wearing dark coloured clothing. It is clear that this is a particularly risky scenario, as both parties have reduced awareness and control. These examples tend to suggest the need to focus beyond drink driving and to the problem of intoxicated people in general, managing themselves in the transport system. In one case the pedestrians declined a lift and were subsequently run over.

As with the single vehicle crashes, there was also an element of what can only be described as very high risk, foolish driving where "stunts" go wrong. For example, a 17 year old driver drag racing swerved towards an onlooker in fun, but the pedestrian jumped the "wrong" way and was struck.

7.4.2 ALCOHOL: BAC > 0.15

Alcohol (>0.15) scenario 1: **Pattern of Alcohol consumption.**

The significant feature of these crash types is the level of intoxication reached by the driver (as well as any passenger). Commonly the activities leading up to the crash involve the driver going to a series of pubs usually starting some time in the early evening. This usually involves social drinks with friends but includes moving onto other venues where alcohol is consumed. Typically those involved may go onto parties or discos later in the evening, stay late continuing to drink through the period. Meals may or may not be taken in this time. At some later stage the driver may leave together with some friends and be driving home or to some other venue.

Significantly, in most cases witnesses (bar tenders, passengers, friends) usually state that the driver did not appear to be that alcohol affected. This contrasts with the actual high BAC reading later measured.

***Alcohol (>0.15) scenario 2:* Common crash patterns.**

The common crash is where the vehicle leaves the road, perhaps on a bend and collides with a tree or pole or rolls over. Other crashes involve the driver losing control by moving onto the gravel shoulder and trying to correct the vehicle resulting in crashes with trees or poles. Often excess speed is also involved. This is true with young drivers, who may have recently (eg. within days of the crash) purchased a high performance vehicle. Not all cases involve young drivers for there is also older age group who may also go to the pub all day and then drive.

Other crashes involve these drivers being on the wrong side of the road and colliding with oncoming vehicles. For motorcycles, often the vehicle may hit the curb and lose control colliding with fixed objects from fire hydrants to trees.

***Alcohol (>0.15)* Scenario Summary**

Overall these crashes are characterised by people drinking, usually socially, over a number of hours, moving from hotel to hotel or to other parties, resulting in a high level of BAC. However the degree of intoxication (and hence impairment of driving capacity) does not appear to be apparent to observers, or possibly the person himself.

Once on the road the driver usually loses control of the vehicle, often with excess speed involved, resulting in impact with trees or poles, or roll-overs, and in some cases other vehicles. Though in most cases the intoxicated driver is killed, in many others, fellow passengers are killed or seriously injured as may be the occupants of other vehicles.

7.5. CASE SCENARIOS FOR YOUNGER ROADUSERS AGED 17-20 YEARS

The review of the cases sorted by the age of the driver considered responsible being 17-20 years old provides a wide cross-section of crash types and circumstances. The crashes may be grouped into single vehicle car or motorcycle crashes; multi vehicle crashes; bicyclists being struck and pedestrians being hit.

***Younger roadusers scenario 1 (aged 17-20 y):* Single vehicle crashes.**

A significant proportion of these cases involved a car leaving the road and hitting a tree or pole, or rolling over. A whole series of circumstances were often evident: One case scenario involved the young driver with his mates in his 1971 model V8 speeding and losing control; another involved losing control on wet roads due to bald tyres. One case involved the driver (after working that night, and previous late nights) agreeing to drive some friends at night to a city, some 2hrs drive away, to settle a family dispute. The driver's fatigue led to the car leaving the road and hitting a tree, with three of the occupants killed. In these cases, often neither the driver nor passengers were wearing their seat belts. Alcohol involvement of the driver was not uncommon, with BAC levels exceeding 0.1% in a number of cases.

Younger roadusers scenario 2 (aged 17-20 y): **Motorcycle crashes.**

Motorcycle crashes typically involved the motorcycle leaving the roadway and colliding with a fixed object such as a pole tree or road sign. In most of the cases, the rider's BAC was well over 0.1%. Circumstances included unlicensed or learner drivers; borrowed motorcycle; and speeding. A number of crashes were in typical urban speed zones of 60km/h.

Younger roadusers scenario 3 (aged 17-20 y): **Multi-vehicle crashes.**

Typically this involved car to car collisions. However in some cases bicyclists were hit from behind. In one of these cases the cyclist had no lights on the bike, and in another the driver failed to notice the cycle due to inattention. Similarly a motorcycle was struck from behind whilst stopped at the lights. The car driver failed to notice the stopped motorbike in time, was unlicensed and had a high BAC. The multi-vehicle car crashes often involved intersection collisions with one of the drivers failing to heed stop or give way signs. Other circumstances included drivers having their vision obscured (other vehicles or direct sunlight) and turning in front of oncoming vehicles. In some of these cases the young driver was involved but not necessarily responsible for the crash. Other cases involved the young driver swerving to avoid stopped cars waiting to turn right, losing control and hitting oncoming traffic.

Younger roadusers scenario 4 (aged 17-20 y): **Pedestrian Involved Crashes.**

These often involved the young driver hitting a older pedestrian. Typically the elderly pedestrian would step onto the roadway without apparently looking, and also commonly the young driver did not see the pedestrian (who may have been wearing dark clothing) at the time. Often the pedestrian had a high BAC reading. In some cases the pedestrian was on a crossing, others on the side of the roadway. In some cases the young driver was considered to have been speeding. One case involved the police stopping a high BAC driver from using his car, with the driver walking and later struck by a car whilst lying on the roadway.

These cases highlight the high risk faced by both intoxicated drivers and intoxicated pedestrians: the emphasis on stopping drink driving may well lead in a number of cases to a shift from having at-risk drivers to these drivers instead becoming at-risk high BAC pedestrians. It is also evident that the interaction of alcohol impaired drivers with alcohol impaired pedestrians may well be a particularly high risk combination.

7.6. CASE SCENARIOS FOR YOUNG ROADUSERS AGED 21-25 YEARS

The cases of crashes involving drivers aged 21-25 were similar to those involving the drivers aged 17-20 years, except that fewer were single vehicle crashes.

Young roadusers scenario 1 (aged 21-25 years): **Single vehicle crashes.**

A significant proportion of these crashes involved drivers losing control of their vehicle on rural roads, on bends with the vehicle rolling over. Ejection of the passenger or driver was common, with resultant fatal injuries. Other single vehicle crashes involved hitting tress or poles. One case involved the car catching fire as a result of petrol being carried in the cabin in a spare petrol can. High BAC levels and fatigue were involved in some of these cases.

Young roadusers scenario 2 (aged 21-25y): **Motorcycle crashes.**

The majority of these were single vehicle losing control and hitting trees or poles. These cases commonly involved BAC in excess of 0.1%. Another notable feature was that the motorcycle was new, or borrowed and with the rider a learner or inexperienced. One case illustrates the point. The rider was travelling on his new bike with a group of other motorcyclist, whilst approaching a bend at a speed excessive for the bend (perhaps for that rider). The bike went into the gravel, slid over an embankment into the trees, with the rider killed upon this impact. Inattention also plays its role with one rider going over to the wrong side of the road and colliding head on with a near stationary truck.

Young roadusers scenario 3 (aged 21-25y): **Multi-vehicle crashes.**

The majority of these crashes involved cars or trucks veering into the path of oncoming traffic, with resultant head-on collisions. Examples include a truck being overloaded, being driven by not the usual driver, at excess speed for the road and load. The truck tended to swerve to the wrong side of the road on bends, with the resultant head on collision with the on-coming car. Other common cases involved intersection collisions. These included cars failing to give way at stop signs or proceeding through a red light. Other cases involved turning in front of oncoming traffic.

Young roadusers scenario 4 (aged 21-25y): **Pedestrians.**

A significant proportion of the cases involved pedestrians being struck by cars. However half of these cases involved young children. As an example, one case involved parents dropping children off after an outing, with the children disembarking without effective supervision. The 5 year old dashed across the road and was struck by a car, which was considered to be travelling in excess of the speed limit. Another involved a group of children being struck whilst crossing the road near an intersection, which was known to be hazardous. The driver did not see the children in time and vice versa.

The other pedestrian cases involved high BAC pedestrians being struck whilst walking along the roadway. One case involved a young driver, bogged in the median strip, alighting from her car to examine the situation and being struck by a passing car. Overall the impression is one of inattentive driving (and lack of awareness of risk by pedestrians), with perhaps excess speed such that when the drivers encounter an emergency situation, their response is too late or inadequate.

7.7. CASE SCENARIOS FOR ELDERLY ROADUSERS -AGED OVER 65 YEARS

Crashes involving elderly drivers are characterised by the high proportion being multi -vehicle crashes. Other crashes involved collisions with trains, pedestrians and some single vehicle crashes.

Elderly roadusers scenario 1 (aged over 65y): **Multi-vehicle crashes.**

These crashes fell into three main groups:

(i). Head-on collisions: These involved vehicles veering to the wrong side of the road and colliding with oncoming vehicles. In some of these cases the older driver was responsible and in others the other driver (for example young drivers aged 25y) veered into the path of the elderly driver: most of these cases involved fatigue/ falling asleep on the part of one of the drivers. Examples include an older driver being tired during a long trip, falling asleep and veering over into oncoming traffic. Another case of the older driver veering into the path of oncoming traffic was attributed to possible epilepsy and the effects of medication. Other cases involve misjudgment on the part of the older driver. For example, as the roadway narrowed from three to two lanes, the older driver tried get ahead of a truck, misjudged the gap remaining, struck the truck and then struck an oncoming vehicle. Another case, not isolated to older drivers, involved the driver stopped waiting to turn right, being hit by a vehicle from behind, and pushed into oncoming traffic.

(ii) Miscellaneous: Other cases involve a multitude of circumstances. For example an older driver was driving a truck, which tried to brake to avoid vehicles stopped in front of it. The brakes did not function properly, resulting in the truck skidding and rolling onto a car, crushing the vehicle and killing its occupant.

(iii) Intersection crashes: The other major category of multi-vehicle crashes occurs at intersections. Typically this involves the older driver failing to give way to other vehicles at intersection, as required. These drivers either do not observe or notice the stop or give way signs and collide with cross traffic; or do stop at the intersection but then proceed into the path of a vehicle going through the intersection. In these cases it would appear that these drivers either did not see the approaching car or misjudged its proximity. Often in these cases other elderly (in their 70's) passengers are in the car as well and these may be killed in the collision.

Circumstances include one case in which the older driver went out for lunch, consumed some alcohol, was tired, stopped at a stop sign but then proceeded into the path of a vehicle going through the intersection.

Two other cases cited involve collisions with trains at crossings. In both of these cases the crossing had bells and flashing lights, with the older driver apparently not aware of either as they drove straight into the train.

Elderly roadusers scenario 2 (aged over 65y): **Single vehicle crashes.**

These were much less frequent than the multi-vehicle crashes. These typically involved the older driver being fatigued, falling asleep and losing control of the vehicle which then left the road and rolled over. Case examples include the driver falling asleep, moving onto the gravel shoulder with the passenger noticing and waking the driver. The driver then tried to regain control, skidded on the shoulder and rolled over.

Elderly roadusers scenario 3 (aged over 65y): **Pedestrians.**

Crashes involving older drivers with pedestrians were relatively infrequent. However one case involved a 82y pedestrian stepping out onto the road without looking, and into the path of a car. Another case involved a 22y pedestrian moving unexpectedly onto the road way from between parked vehicles, and struck by a car driven by a 65y old. The pedestrian was agitated as he had been having a family dispute, the car driver also had consumed some alcohol.

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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 Automotive 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)
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
crash	Fatal crash
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 diagram in Appendix.
head-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)
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
near intersection	Less than 10m from intersection but not within intersection
off path crash	A crash in which the vehicle loses control and leaves the carriageway; also includes crashes with the vehicles 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) andPERLOC=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)
rear end crashes	Vehicle colliding with rear of another vehicle in the same lane (DCA=30)
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, 10, 11)
same direction crash	Crash involving vehicles travelling in the same direction (DCA 30-39)
single motor vehicle crash	A fatal crash involving a single moving/non-stationary motor vehicle; crashes involving one vehicle hitting a parked vehicle are included, but collisions with bicycles or pedestrians are excluded
urban	City, town population >200, not urban/rural boundaries (LANDCLS=1, 3, 5, 7, 9)

APPENDIX 1

DEFINITIONS FOR CLASSIFYING ACCIDENTS-DCA'S

DEFINITIONS FOR CLASSIFIYING ACCIDENTS - DCA'S

PEDESTRIAN (ON FOOT OR IN TOY/PRAM)	VEHICLES FROM ADJACENT DIRECTIONS (INTERSECTIONS ONLY)	VEHICLES FROM OPPOSING DIRECTIONS	VEHICLES FROM SAME DIRECTION	MANOEUVRING	OVERTAKING	ON PATH	OFF PATH, ON STRAIGHT	OFF PATH ON CURVE OR TURNING	PASSENGERS & MISCELLANEOUS
NEAR SIDE 00	CROSS TRAFFIC 10	HEAD ON (not overtaking) 20	Vehicles in same lane: REAR END 30	U TURN 40	HEAD ON (incl. side swipe) 50	PARKED 60	OFF CARRIAGEWAY TO LEFT 70	OFF CARRIAGEWAY TO LEFT ON RIGHT BEND 80	FELL IN/FROM VEHICLE 90
EMERGING 01	RIGHT FAR 11	RIGHT THRU 21	LEFT REAR 31	U TURN INTO FIXED OBJECT/ PKD VEHICLE 41	OUT OF CONTROL 51	DOUBLE PARKED 61	LEFT OFF CARRIAGEWAY INTO OBJECT/ PKD VEH 71	OFF CARRIAGEWAY LEFT ON RIGHT BEND INTO OBJECT/PKD VEH 81	LOAD OR MISSILE STRUCK VEHICLE 91
FAR SIDE 02	LEFT FAR 12	LEFT THRU 22	RIGHT REAR 32	LEAVING PARKING 42	PULLING OUT 52	ACCIDENT OR BROKEN DOWN 62	OFF CARRIAGEWAY TO RIGHT 72	OFF CARRIAGEWAY TO RIGHT ON RIGHT BEND 82	STRUCK TRAIN/ AEROPLANE 92
PLAYING WORKING LYING, STANDING ON CARRIAGEWAY 03	RIGHT NEAR 13	RIGHT/LEFT 23	Vehicles in parallel lanes: LANE SIDE SWIPE 33	ENTERING PARKING 43	OVERTAKE TURNING 53	VEHICLE DOOR 63	RIGHT OFF CARRIAGEWAY INTO OBJECT/ PKD VEH 73	OFF CARRIAGEWAY RIGHT ON RIGHT BEND INTO OBJECT/PKD VEH 83	PARKED VEH RUN AWAY INTO OBJECT/ PKD VEH 93
WALKING WITH TRAFFIC 04	TWO RIGHT TURNING 14	RIGHT/RIGHT 24	LANE CHANGE RIGHT (not overtaking) 34	PARKING VEHICLES ONLY 44	CUTTING IN 54	PERMANENT OBSTRUCTION ON CARRIAGEWAY 64	OUT OF CONTROL ON CARRIAGEWAY 74	OFF CARRIAGEWAY TO RIGHT ON LEFT BEND 84	PARKED VEH RUN AWAY INTO VEHICLE 94
FACING TRAFFIC 05	RIGHT/LEFT FAR 15	LEFT/LEFT 25	LANE CHANGE LEFT 35	REVERSING 45	PULLING OUT REAR END 55	TEMPORARY ROADWORKS 65	OFF END OF ROAD T INTERSECTION 75	OFF CARRIAGEWAY RIGHT ON LEFT BEND INTO OBJECT/PKD VEH 85	
ON FOOTPATH MEDIAN 06	LEFT NEAR 16		RIGHT TURN SIDE SWIPE 36	REVERSING INTO FIXED OBJECT/ PKD VEHICLE 46		STRUCK OBJECT ON CARRIAGEWAY 66		OFF CARRIAGEWAY TO LEFT ON LEFT BEND 86	
DRIVEWAY 07	LEFT/RIGHT FAR 17		LEFT TURN SIDE SWIPE 37	EMERGING FROM DRIVEWAY 47		ANIMAL (not ridden) 67		OFF CARRIAGEWAY LEFT ON LEFT BEND INTO OBJECT/PKD VEH 87	
STRUCK WHILE BOARDING OR ALIGHTING VEHICLE 08	TWO LEFT TURNING 18			FROM FOOTPATH 48				OUT OF CONTROL ON CARRIAGEWAY 88	OTHER 98
OTHER PEDESTRIAN 09	OTHER ADJACENT 19	OTHER OPPOSING 29	OTHER SAME DIRECTION 39	OTHER MANOEUVRING 49	OTHER OVERTAKING 59	OTHER ON PATH 69	OTHER STRAIGHT 79	OTHER CURVE 89	UNKNOWN 99

APPENDIX 2

CASE SCENARIOS

PROFORMA USED FOR ANALYSIS OF ORIGINAL CASE MATERIAL AND DEVELOPMENT OF CASE SCENARIOS

Case No	General	Road Type	Road Surface	Veh. Details	Passengers	Contributary Circumstances	Pre-Trip Activity	Accident Des.	Sketch	Cause of Death/ Occupant Injury
	Date :	Made	Dry	A Model :						
	Time :	Unmade	Wet	Year :						
	Day :	Rural	Level	Driver :						
	Municipality :	Urban	Slope	Age :						
	Speed Limit :	Highway	Crest	Sex :						
				Seat Belts :						
	Clear	Stop Sign	Straight	B Model :						
	Rain	Give Way	Curve	Year :						
	Fog	No Control		Driver :						
	Daylight	Lights		Age :						
	Dawn			Sex :						
	Dust			Seat Belts :						
	Date :	Made	Dry	A Model :						
	Time :	Unmade	Wet	Year :						
	Day :	Rural	Level	Driver :						
	Municipality :	Urban	Slope	Age :						
	Speed Limit :	Highway	Crest	Sex :						
				Seat Belts :						
	Clear	Stop Sign	Straight	B Model :						
	Rain	Give Way	Curve	Year :						
	Fog	No Control		Driver :						
	Daylight	Lights		Age :						
	Dawn			Sex :						
	Dust			Seat Belts :						
	Date :	Made	Dry	A Model :						
	Time :	Unmade	Wet	Year :						
	Day :	Rural	Level	Driver :						
	Municipality :	Urban	Slope	Age :						
	Speed Limit :	Highway	Crest	Sex :						
				Seat Belts :						
	Clear	Stop Sign	Straight	B Model :						
	Rain	Give Way	Curve	Year						
	Fog	No Control		Driver :						
	Daylight	Lights		Age						
	Dawn			Sex :						
	Dust			Seat Belts :						