DRINKING BEHAVIOUR AND OTHER CHARACTERISTICS OF INJURED DRIVERS AND RIDERS

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ABSTRACT:

A total of 381 drivers and motorcycle riders admitted to the Royal Adelaide Hospital as the result of a road crash were interviewed concerning their demographic characteristics, driving history, attitudes about drinking and driving, drinking behaviour and details of the crash as well as having blood samples taken to determine blood alcohol concentration. It was found that male drivers in this sample drove with a positive blood alcohol concentration more often than both female drivers and male motorcycle riders. Having a high blood alcohol concentration at the time of admission was associated with a number of factors including: involvement in a night-time single-vehicle crash; working in a blue-collar occupation for male drivers; being a young female driver; frequent or problem drinking including excess and binge drinking; drinking in an hotel or vehicle; drinking beer; previous alcohol-related licence suspension; and having peers who drink-drive.

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EXECUTIVE SUMMARY

The primary objective of the study was to identify the demographic characteristics and usual drinking and drink-driving behaviour of injured drivers and motorcycle riders most likely to be associated with involvement in an alcohol-related crash. A representative sample of drivers and riders admitted to the Royal Adelaide Hospital from June 1985 to July 1987, and not discharged on either the same or the following day, was interviewed in detail. Blood samples were taken for liver enzyme analysis and the results of the mandatory tests for blood alcohol were obtained. The sample comprised 135 male and 64 female drivers of cars, car derivatives or vans and 172 male motorcycle riders; blood alcohol concentrations (BAC) on admission to hospital were obtained for 363 of these 371 road users. About 34%, 21% and 19% of the three respective road user groups recorded a BAC of at least .08 g/100mL, and the mean positive BACs were .15, .13 and .12 respectively.

Very few demographic differences were apparent between the three groups of road users, other than some age-related differences between male drivers and riders. As a group, the riders were younger than the drivers. Although some demographic differences were found between those with zero and high (≥ .08) BACs within each of the three road user groups, it is likely that differential exposure accounts for at least some of these differences.

No differences were evident between those with low (.001-.079) and high BACs with respect to either where, with whom, or what beverage they were drinking prior to the crash: males drinking beer and females drinking wine or spirits and drinking in hotel-based premises with friends were commonly reported behavioural patterns. Significantly more individuals with a high BAC believed that their BAC exceeded the legal limit (.08 at that time in South Australia) and also reported that their drinking contributed to the crash. Women however seemed less able to estimate whether they had exceeded the limit.

An examination of usual drinking behaviour showed that males with high BACs reported quite different patterns of drinking than did those with a zero BAC. Both the frequency of drinking and the quantity consumed were higher among those with a high BAC, and differences were also apparent with respect to why, where, with whom and what they drank. As a group, the female drivers with high BACs drank more often and a greater quantity than did women with a BAC of zero. Although they were more likely to drink in an hotel, their other usual drinking patterns were similar to those of the zero BAC group.

Given that drinking within a population represents a continuum from the lowest to the highest amounts, and not a dichotomy, the classification of an individual as being alcohol dependent is difficult except in the most extreme cases. Several approaches, namely self-report, screening inventories and liver enzyme levels, were used in this study in an attempt to determine what proportion of those involved in an alcohol-related crash were alcohol dependent. In conjunction with each other, the results suggest that a relatively small but nevertheless significant proportion - in the order of about one in five - of males with a BAC of at least .150 may have been alcohol dependent. In contrast, individuals with a BAC between .080 and .149 were no more likely than those with lower BACs to show, or at least report, signs of dependence. There was little indication of dependence among the female drivers.

Among males, although the differences between the BAC groups with respect to behaviour and attitudes relating to drink-driving were in the anticipated directions, it was interesting to note that the groups reported similar exposures to drink-driving countermeasures as well as similar attitudes towards enforcement practices. The study provided little support for the deterrent value of licence suspensions resulting from drink-driving: almost 40% of those with a BAC of at least .150 reported a previous alcohol-related suspension. Indeed, when several characteristics relating to drinking and drink-driving were examined simultaneously to control for each others effects, a previous alcohol-related licence suspension was the best predictor of having a high BAC at the time of admission to hospital. There were relatively few differences in drink-driving behaviour and attitudes among women.

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1. INTRODUCTION

1.1 GENERAL AIM

Alcohol is one of the most important factors in the causation of road crashes. However, the correlates of the drink driving behaviour leading to the crash have rarely been considered.

The purpose of this report is to describe the characteristics of injured drivers and riders admitted to hospital and to identify which of these characteristics are associated with crash involvement at a high blood alcohol concentration (BAC). This information can then be used to develop more effective countermeasures aimed at specific groups of drivers or riders to discourage them from driving after drinking and therefore reduce the incidence of alcohol related crashes.

Specific countermeasures developed in this way can then be implemented together with measures which are intended to change community attitudes and/or behaviour in relation to drink driving.

Although this report deals with the responses of individual drivers, it is noted that an adequate response to the problems associated with drinking and driving will also include changes to the physical environment to reduce the frequency of crashes and the severity of the ensuing injuries.

1.2 STRUCTURE OF THIS REPORT

Chapter 2 describes the methodology of the present research study. The rationale for and method of selecting drivers and riders for inclusion in the study are discussed. Methodologic issues relating primarily to selection bias are also addressed.

Univariate analyses of the data are presented in Chapters 3-6. Chapter 3 examines the BACs and demographic characteristics of male drivers, female drivers, and male motorcycle riders and compares the BACs and demographic characteristics of male drivers and female drivers, of male drivers and riders, and of young male drivers and riders. Chapter 4 presents demographic comparisons between those with zero and high BACs within each of the three samples (i.e. male drivers, female drivers, male riders). Chapter 5 describes the age, sex and pre-crash drinking behaviour of three groups of drivers and riders, namely those with BACs within the following ranges: .001 to .079

g/100 mL, .080 to .149, and .150 or above. It also makes comparisons between those with BACs below and at or above .080, and between those with BACs of .080 to .149 and those with BACs of .150 or above. Chapter 6 provides a comparison of usual drinking and drink driving behaviour and attitudes towards drink driving between drivers and riders with zero and high BACs.

The multivariable analyses presented in Chapter 7 are aimed at identifying which characteristics of a crash, which demographic factors, and which aspects of drinking patterns are most likely to indicate alcohol involvement, given the occurrence of a crash resulting in the driver or rider being hospitalized.

The major conclusions of the study are summarized in Chapter 8.

2. METHODOLOGY

2.1 IDENTIFICATION OF ROAD ACCIDENT ADMISSIONS

From August 27, 1985 to July 19, 1987 every person admitted to the Royal Adelaide Hospital (RAH) as a result of a road accident was identified and his or her road user category determined (ie driver, motorcycle rider, passenger, pillion passenger, pedestrian, bicycle rider, other). A pilot study was conducted from June 26 to July 16, 1985 to establish the procedure for the identification of patients and to trial the interview. No problems were encountered during this pilot study and it was subsequently decided to include the patients admitted during this period in the larger study.

Every morning, including weekends and public holidays, the principal investigator (OTH) checked the admission sheets in the hospital's Casualty Department. She recorded the name and current location of every patient identified as being a motor vehicle accident admission by the Casualty Officer at the time of arrival at hospital. The date and time of arrival at the RAH was also recorded. She then checked the entries in the Department's blood alcohol book, which records the name of every patient from whom a blood sample for subsequent alcohol analysis was taken. The outcome of the patient's Casualty admission is also recorded in this book, that is whether the patient was discharged home or admitted to a specific ward. This information provided the investigator with a further means of checking that all admissions had in fact been identified by her. Finally, she checked with the medical and nursing staff of the general surgical and orthopaedic wards which had admitted patients during the preceding 24 hours to ensure that all road accident patients under their care had been identified. Every few days the specialist units were also approached to determine whether any road accident admissions had not yet been identified by the investigator; these units included Intensive Care, High Dependency, Spinal Unit, Plastic Surgery, Oral Surgery and Neurosurgery. (Only very rarely is a road trauma patient admitted to a unit other than the orthopaedic, general surgical or specialist units mentioned above.)

2.2 DETERMINATION OF ROAD USER CATEGORY

When a road trauma admission was identified, the investigator used the information recorded in the case notes, which included the ambulance summary sheets, to establish the patient's road user category (RUC). If there was any ambiguity or reason to suspect that the RUC was not as recorded, she spoke to the patient in an attempt to clarify the situation; this was done at a time deemed suitable by the medical staff. For example, if the case notes referred to the patient as being a passenger but there was no mention of a driver either in the ambulance summary or in the admission record, and no other individuals were admitted from the same accident, the investigator would briefly interview the patient to confirm his or her RUC.

The investigator had been granted freedom from subpoenae, therefore preventing either herself or her records being called as evidence in any matter relating to the crash. A letter to this effect was carried at all times and if there was any indication that a patient was concerned about confidentiality, the investigator was able to reassure them further by explaining that anything told to her could not be used in any way as legal evidence against them.

2.3 INTERVIEW CRITERIA

The following criteria had to be met before the patient was interviewed:

- the patient was the driver or rider of the vehicle
- the accident occurred on a public road within South Australia
- a blood sample for determination of the patient's blood alcohol concentration was taken
- the patient was not discharged from hospital either the day of, or the day following, admission
- the patient was under the care of a consultant who had given permission for his patients to be included in the study
- the patient was able to be interviewed
- the patient consented to the interview.

The decision to exclude patients who were discharged either on the day of, or the day following, admission was based on the assumption that patients with relatively minor injuries may choose not to go to hospital to avoid having a blood alcohol sample taken if they had been drinking excessively: the inclusion of all admissions could have biassed the sample towards those with a zero or low BAC. On the other hand, it is unlikely that patients with more serious injuries (ie those requiring admission for a longer period) were able to avoid hospital treatment after the crash.

Due to the large number of admissions, it was not possible to interview all drivers or riders who met the criteria described above. Within the confines of these criteria, however, it was important to ensure that the method of patient selection would not further bias the sample in any way (eg by over-sampling those admitted for longer periods). Therefore, the adopted method involved interviewing all eligible drivers and riders admitted during a particular period (the interview period); depending on case-load, this was usually of two or three weeks duration. The following one or two weeks (the non-interview period) was then utilized to interview patients admitted during the preceding or an earlier interview period. All road accident admissions during the non-interview periods were nevertheless recorded and their RUC and BAC determined. Each interview period began and ended at midnight on a Thursday, to prevent any potential bias due to day of week.

Of patients admitted to the RAH during the interview periods, 381 drivers and riders were interviewed; a BAC result was obtained for 373 of these. During these same periods, 139 drivers and riders for whom a BAC was subsequently obtained were not interviewed; the reasons are detailed in Table 2.1.

Table 2.1
Reasons for not interviewing patients admitted during interview periods

Reason for Exclusion		No. of Patients
Discharged same or following day		59
Died in hospital		16
Consultant did not consent[1]		16
Other		48
discharged earlier than anticipated[2]	15	
absconded or discharged self against medical advice	13	
missed by the investigator	6	
inability to speak English	5	
unable to be interviewed because of physical condition	4	
refused interview	2	
admitted to ward not covered by research protocol	2	
patient's lawyer did not allow participation	1	
Total		139

[1] only one consultant withheld permission for his patients to be included in the study
[2] including four who had already consented to the interview

2.4 THE INTERVIEW

Every patient who was admitted to hospital during an interview period and who fitted the criteria stipulated above was asked by the investigator to participate in the study. There was no predetermined time at which the initial approach to the patient was to be made: this was entirely dependent on the patient's physical and emotional condition, and the investigator relied heavily on the opinion of the hospital staff. In the majority of cases, the patient was approached within ten days of admission (frequently after only a day or two), but in cases of more severe injury, especially involving the central nervous system, initial contact with the patient may have occurred only after several months of hospitalization. (In these instances, if the investigator felt that parts of the interview were of questionable reliability, either because of the time span between the crash and the interview or because of the effects of the patient's injuries, these parts were eventually coded as being unknown.)

When appropriate, the investigator approached the patient, who was told that the investigator was from the University's Road Accident Research Unit, as well as being a Research Fellow in the Department of Orthopaedic Surgery and Trauma. She then explained that she was doing a study on factors associated with accident involvement, including demographic characteristics, driving history, attitudes, drinking behaviour and crash characteristics. She stressed the confidential and anonymous nature of the research, and also that it was important to find out as much as possible about why people are involved in crashes, in the hope that their incidence could be decreased. The patient was given the opportunity to ask as many questions as they liked at that time. They were then told that as part of the research, after the completion of the interview, the investigator would be provided with the results of the blood alcohol test taken on admission to hospital. The patient was also asked if they would mind having a small blood sample taken by one of the blood sisters to determine their liver function; they were told that they could have these results if they so desired. Finally, the patient was given a consent form to read and sign, if they were willing to participate in the study.

As noted in a previous section, only two patients actually refused to take part in the study. However, a further 34 could have and should have been interviewed, but left hospital before the investigator had the opportunity to do so.

The actual interview took place at a time which was mutually convenient to the patient, the staff and the investigator. Frequently the time available for patients to be interviewed was restricted by normal ward routine, additional procedures such as surgery or diagnostic tests, and visitors to the patient, all of which obviously not only had priority over interviewing, but also frequently necessitated return visits to complete the interview. It should also be noted that many patients wanted to talk at length about issues which did not comprise part of the interview schedule, such as their concerns about injuries or their feelings towards deceased passengers. In these instances the investigator allowed the patients to do this (the investigator had a background in psychology and had previously worked as a counsellor), and in addition the patients were always encouraged to follow up their concerns with the appropriate hospital staff.

Several questionnaires formed part of the interview schedule. In most cases, the investigator explained their purpose and how to complete them, worked through several examples, and then let the patient complete the questionnaires in their own time. The investigator checked back with the patient after a day or two to see whether there were any problems in completing the questionnaires; if so, these were clarified at that time.

2.5 BLOOD ALCOHOL CONCENTRATION

In South Australia the law requires that a blood sample be taken for subsequent alcohol analysis from every person above the age of 14 who presents at a hospital within eight hours of a road crash. These results were made available to the investigator.

The BAC distributions of three samples of drivers and riders admitted to the RAH are shown in Table 2.2. These samples comprise those interviewed, those not interviewed but nevertheless admitted during the interview periods, and those admitted during non-interview periods.

Table 2.2
Blood alcohol concentrations of interviewed and non-interviewed drivers and riders

BAC (g/100mL)	Interview Period		Non-Interview Period
	Interviewed	Not Interviewed	
Zero	67.0%[1]	66.9	63.7
.001-.079	7.5	12.9	8.1
.080-.149	12.6	7.9	12.5
.150+	12.9	12.2	15.7
Total: %	100.0	100.0	100.0
No.	373	139	559

[1] % of total cases

Chi-square analyses of the data shown in Table 2.2 indicated that the BAC distribution of the interviewed drivers and riders did not differ significantly from that of those admitted during the interview periods but not interviewed, irrespective of whether the comparison was based on the BAC groups shown in the table (x^2=5.3, 3df, p=.149) or only on those with zero and high (.080+) BACs (x^2=0.9, 1df, p=.345). Similarly, when these two samples were combined and compared with drivers and riders admitted during the non-interview periods, no significant differences in BAC distribution were evident (four BAC groupings: x^2=2.8, 3df, p=.427; zero and high BACs: x^2=2.3, 1df, p=.133).

During the entire period of data collection, BAC results were not obtained for 105 drivers and riders admitted to the RAH as the result of an accident occurring in South Australia. In these instances a blood sample either was not taken, was taken but subsequently denatured or the result was not found.

2.6 BIAS WITHIN THE INTERVIEWED SAMPLE

The following groups of crash-involved drivers and riders were not represented in the interview sample:

- those who died as a result of the injuries sustained in the crash
- those with severe head injuries who remained in a vegetative, comatose or severely disabled state
- those whose injuries necessitated only a very brief period of admission
- those whose injuries did not warrant hospital admission
- those who were not injured.

Therefore it must be emphasized that drivers and riders at either end of the injury severity spectrum are not represented in the current sample of crash-involved drivers and riders. On the other hand, it would appear that the interviewed drivers and riders are indeed representative of those who sustained moderate to serious injuries resulting in admission to a major trauma hospital, given that only a small proportion of eligible drivers and riders were not interviewed and, in particular, that only about 0.5% actually refused to be interviewed. As evident from the preceding section, the BAC distribution of the interviewed drivers and riders was similar to that of those admitted throughout the study period but not interviewed.

3. BLOOD ALCOHOL CONCENTRATION AND DEMOGRAPHIC CHARACTERISTICS

3.1 INTRODUCTION

A detailed description of the methodology of this study was presented in Chapter 2. A breakdown of the interviewed sample by sex and type of vehicle driven at the time of the crash is shown in Table 3.1.

Table 3.1
Sample composition by sex and type of vehicle driven

Vehicle Type	Sex		Total
	Males	Females	
Motorcycle	172	2	174
Car or car derivative	124	62	186
Van	11	2	13
Light truck	5	-	5
Heavy truck	2	-	2
Articulated vehicle	1	-	1
Total	315	66	381

Of the 381 interviewed drivers and riders, 66 (17.3%) were female. However, it is important to note that of the 174 motorcycle riders in the sample, 172 were male. Hence, comparisons based on sex which use the entire sample of 381 may show significant sex differences where indeed the differences arise not from sex but from the different characteristics of male drivers and riders. Therefore, no comparisons are made between the total 315 males and 66 females. In the following sections comparisons based on sex excluded: drivers of trucks or articulated vehicles, because no females were identified as drivers of these vehicles; and motorcycle riders because, as noted above, only 2 of 174 were females. The exclusion of these individuals leaves three distinct subgroups: 135 male drivers of cars, car derivatives and vans; 64 female drivers of cars, car derivatives and vans; and 172 male motorcycle riders.

This chapter of the report:

- describes the BACs and demographic characteristics of the three groups defined above;

- compares the BACs and demographic characteristics of male and female drivers of cars, car derivatives and vans;
- compares the BACs and demographic characteristics of male drivers of cars, car derivatives and vans, and male motorcycle riders;
- compares the BACs and demographic characteristics of young (i.e. aged 26 or younger) male drivers of cars, car derivatives and vans, and young male motorcycle riders.

3.2 BLOOD ALCOHOL CONCENTRATION

Blood alcohol concentrations (BACs) were obtained for 363 of the 371 (97.8%) road users being examined in this report. The highest recorded BAC was .294 g/100mL. Tables 3.2 and 3.3 show, respectively, the BAC distribution and the mean BACs of the three groups.

Table 3.2
Distribution of blood alcohol concentration by sex and type of road user

BAC	Drivers[1]			Riders[2]
	Males	Females	Total	Males
Zero	58.8%[3]	75.4	64.1	70.8
.001–.079	6.9	3.3	5.7	9.9
.080–.149	15.3	14.8	15.1	9.4
.150+	19.1	6.6	15.1	9.9
Total known: %	100.0	100.0	100.0	100.0
No.	131	61	192	171
BAC unknown	4	3	7	1

[1] excludes 8 drivers of light trucks and heavy vehicles; 4 with BACs of zero and 4 with BACs of .107, .114, .150 and .211 g/100mL
[2] excludes 2 female motorcycle riders both with zero BACs
[3] % of total BAC known cases

Male drivers vs. female drivers: x^2=7.1, 3df, p=.070
Male drivers vs. male riders: x^2=9.1, 3df, p=.028

Although there was no statistically significant sex difference in the distribution of BACs as presented in Table 3.2, a significantly larger proportion of females than males recorded a BAC of zero (x^2=5.0, 1df, p=.025). This difference was reflected in a statistically significantly lower mean BAC among females. Among drinking drivers, females recorded a lower mean BAC than males although the difference was not statistically significant.

Table 3.3
Mean blood alcohol concentration by sex and type of road user

	Drivers[1]			Riders
	Males	Females	Total	Males
Mean BAC	.060 (.084)[2]	.031 (.061)	.051 (.079)	.034 (.064)
Mean positive BAC	.147 (.067)	.125 (.058)	.142 (.066)	.115 (.069)
Maximum BAC	.294	.213	.294	.268

[1] excludes drivers of light trucks and heavy vehicles
[2] standard deviation

Male drivers vs. female drivers:
mean BAC: t_{190}=2.47, p=.014
mean positive BAC: t_{67}=1.15, p=.256

Male drivers vs. male riders:
mean BAC: t_{300}=3.14, p=.002
mean positive BAC: t_{102}=2.37, p=.020

Male drivers were significantly more likely to have been drinking than male riders (x^2=4.7, 1df, p=.030). Both the mean BAC and the mean positive BAC were also significantly higher among the drivers.

3.3 DEMOGRAPHIC CHARACTERISTICS

It must be stressed that these comparisons have not taken into account probable differences in driving exposure that may, in themselves, be attributable to differences in these same demographic characteristics.

3.3.1 Age

The total sample ranged in age from 13 to 86 years. Table 3.4 presents the age breakdown of the three groups, as well as that of South Australian males and females aged 15 or above (Australian Bureau of Statistics, 1986).

The mean ages and age ranges of the individual groups are shown in Table 3.5.

There was no statistically significant age difference between the male and female drivers. Although the proportion of male drivers aged between 15 and 19 was approximately double that of female drivers, the difference was not significant at the 5% level of probability (x^2=3.6, 1df, p=.057).

Table 3.4
Age distribution by sex and type of road user compared to census data

Age (years)	Drivers[1]			Riders	Census Data, South Australia, 1986	
	Males	Females	Total	Males	Males	Females
15–19	20.1%[2]	9.4	16.7	30.4	11.2	10.3
20–24	25.4	26.6	25.8	28.1	11.0	10.3
25–49	35.1	37.5	35.9	40.4	46.3	44.4
50–64	10.4	15.6	12.1	1.2	18.8	18.1
65+	9.0	10.9	9.6	–	12.7	16.9
Total: %	100.0	100.0	100.0	100.0	100.0	100.0
No.	134	64	198	171	514,385	535,474

Note: A male driver aged 13 and a male rider aged 14 are not included in this table.

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

Male drivers vs. female drivers: x^2=4.2, 4df, p=.374
Male drivers vs. male riders: x^2=31.4, 4df, p<.001

Table 3.5
Mean ages and age ranges by sex and type of road user

Age (years)	Drivers[1]			Riders
	Males	Females	Total	Males
Mean Age	33.0 (16.9)[2]	37.2 (18.5)	34.4 (17.5)	23.9 (6.7)
Range	13–84	17–86	13–86	14–55
No. of Cases	135	64	199	172

[1] excludes drivers of light trucks and heavy vehicles
[2] standard deviation

Male drivers vs. female drivers: t_{197}=1.59, p=.115
Male drivers vs. male riders: t_{305}=6.44, p<.001

The mean age of the riders was significantly lower than that of the male drivers and a significantly larger proportion of the former were aged between 15 and 19 years (x^2=4.1, 1df, p=.042).

A comparison with age data from the 1986 census showed that among males, those aged between 15 and 24 were over-represented and those aged 25 or above were under-represented within the group of accident-involved males. Among females, the proportion aged between 15 and 19 was similar in both the accident-involved and population samples, the 20 to 24 year-olds were over-represented among the casualties, and those aged 25 or above were under-represented.

3.3.2 Ethnic origin

Fewer female than male drivers were born in Australia, although the difference was not statistically significant (Table 3.6). More than three quarters of each group reported an Anglo-Saxon ethnic background; no significant differences between groups were evident (Table 3.7).

Table 3.6
Birthplace by sex and type of road user

Birthplace	Drivers[1]			Riders
	Males	Females	Total	Males
Australia	76.3%[2]	65.6	72.9	74.4
Elsewhere	23.7	34.4	27.1	25.6
Total: %	100.0	100.0	100.0	100.0
No.	135	64	199	172

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

Male drivers vs. female drivers: x^2=2.5, 1df, p=.114
Male drivers vs. male riders: x^2=0.1, 1df, p=.705

3.3.3 Marital status

Marital status is shown in Tables 3.8 and 3.9.

The male and female drivers did not differ significantly in marital status. The proportion of single women was approximately equal to the proportion who were married or in a de facto relationship, whereas male drivers were somewhat more likely to be single rather than in a marital relationship. When only those drivers who were ever married or in a de facto relationship were examined, no difference between males and females was apparent in the proportion having had only one such relationship (80.8% and 76.3%, respectively; x^2=0.3, 1df, p=.578).

Table 3.7
Ethnic background by sex and type of road user

Ethnic Background	Drivers[1]			Riders
	Males	Females	Total	Males
Anglo-Saxon	77.0%[2]	78.1	77.4	84.9
Other	23.0	21.9	22.6	15.1
Total: %	100.0	100.0	100.0	100.0
No.	135	64	199	172

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

Male drivers vs. female drivers: x^2=0.0, 1df, p=.864
Male drivers vs. male riders: x^2=3.1, 1df, p=.079

Table 3.8
Marital status by sex and type of road user

Marital Status	Drivers[1]			Riders
	Males	Females	Total	Males
Single	52.6%[2]	42.2	49.2	70.3
Married/de facto	37.8	46.9	40.7	24.4
Separated/divorced/widowed	9.6	10.9	10.1	5.2
Total: %	100.0	100.0	100.0	100.0
No.	135	64	199	172

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

Male drivers vs. female drivers: x^2=1.9, 2df, p=.385
Male drivers vs. male riders: x^2=10.3, 2df, p=.006

Male riders were significantly more likely than their driving counterparts to be single. However, among those who had ever been married or in a de facto relationship, a larger proportion of riders than drivers had had more than one such relationship: this difference did not achieve significance at the 5% level (32.9% and 19.2%, respectively; x^2=3.7, 1df, p=.055).

Table 3.9
Number of marriages/de facto relationships by sex and type of road user

Number of Marriages etc.	Drivers[1]			Riders
	Males	Females	Total	Males
None	45.9%[2]	40.6	44.2	54.1
One	43.7	45.3	44.2	30.8
Two or more	10.4	14.1	11.6	15.1
Total: %	100.0	100.0	100.0	100.0
No.	135	64	199	172

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

Male drivers vs. female drivers: x^2=0.8, 2df, p=.666
Male drivers vs. male riders: x^2=5.7, 2df, p=.057

3.3.4 Children

More than three quarters of both male and female drivers who had ever been married or in a de facto relationship had at least one child (75.3% and 86.8%, respectively; x^2=2.0, 1df, p=.156).

Less than one half (46.8%) of a comparable sample of motorcycle riders had any children: the difference between the male drivers and riders was statistically significant (x^2=12.9, 1df, p<.001).

3.3.5 Education

As seen in Table 3.10, male and female drivers had similar educational backgrounds with approximately three quarters receiving at least some secondary schooling, but not progressing beyond this level. However, about 9% of both male and female drivers had only attended primary school; of the 12 males in this group, 11 were aged over 50, and one, aged 40, was born in Southern Europe. Five of the six females who had only attended primary school were older than 50 and/or Southern European or Asian immigrants.

A significant difference was evident in the educational backgrounds of male drivers and riders. Approximately equal proportions had at least some tertiary education, but fewer riders (two, aged 18 and 27) than drivers had primary level schooling only and, conversely, more had at least some secondary education.

Table 3.10
Highest level of education by sex and type of road user

Education	Drivers[1]			Riders
	Males	Females	Total	Males
Primary	8.9%[2]	9.4	9.0	1.2
Secondary	78.5	73.4	76.9	89.0
Tertiary	12.6	17.2	14.1	9.9
Total: %	100.0	100.0	100.0	100.0
No.	135	64	199	172

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

Male drivers vs. female drivers: x^2=0.8, 2df, p=.667
Male drivers vs. male riders: x^2=11.4, 2df, p=.003

3.3.6 Employment

Table 3.11 shows that two thirds of both male and female drivers were employed. However, women were significantly less likely to be unemployed and seeking work and, conversely, more likely not to be in the labour force. Twenty-three of the 135 male drivers were not in the labour force: 14 were retired or receiving an age pension, 8 were students, and one was a house-husband. Of the 64 female drivers, 20 were not labour force participants: 11 were homemakers, 6 were retired or in receipt of an age pension, 2 were studying and one received an invalid pension.

The drivers and riders also differed significantly with respect to employment. Almost identical proportions were unemployed, but the proportion of drivers not in the labour force was about three times that of riders. The status of these 23 drivers was reported in the preceding paragraph; 9 of the 10 riders not in the labour force were students and one was a house-husband.

The usual occupation of those in the labour force (i.e. those employed, or unemployed and seeking work) is shown in Table 3.12.

Table 3.11
Employment status by sex and type of road user

Status	Drivers[1]			Riders
	Males	Females	Total	Males
Employed	67.4%[2]	67.2	67.3	78.5
Unemployed	15.6	1.6	11.1	15.7
Not in work force	17.0	31.3	21.6	5.8
Total: %	100.0	100.0	100.0	100.0
No.	135	64	199	172

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

Male drivers vs. female drivers: x^2=11.7, 2df, p=.003
Male drivers vs. male riders: x^2=10.1, 2df, p=.006

Table 3.12
Usual occupation of labour force participants by sex and type of road user

Usual Occupation	Drivers[1]			Riders
	Males	Females	Total	Males
Service or farm workers, labourers	26.1%[2]	18.2	23.9	36.6
Shop assistants, process workers, drivers	36.0	18.2	31.0	34.2
Craftsmen, foremen	11.7	2.3	9.0	18.0
Clerical workers, members of Services	5.4	15.9	8.4	6.8
Managers, shop owners, farmers	12.6	13.6	12.9	1.9
Graziers, professionals	8.1	31.8	14.8	2.5
Total: %	100.0	100.0	100.0	100.0
No.	111	44	155	161

Note: Occupational categories are derived from Broom, Jones and Zubrzycki (1968)

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

Male drivers vs. female drivers: x^2=23.3, 5df, p<.001
Male drivers vs. male riders: x^2=20.7, 5df, p<.001

The majority of female drivers nominated their usual occupation as being one which fell into the highest three of six categories of social class of occupation, according to the classification of Broom, Jones and Zubrzycki (1968). In contrast, the usual occupations of the majority of male drivers fell into the lowest two categories. This difference in distribution of usual occupation was statistically significant. As noted above, the six categories reflect the social class of occupation (1 to 6, with higher scores denoting occupations of higher social class): the mean occupational level of the female drivers was significantly higher than that of the male drivers (3.8 and 2.7, respectively; t_{153}=3.83, p<.001).

Comparisons between male drivers and riders also indicated a significant difference in occupation between the two groups. For example, more than twice the proportion of drivers than riders reported occupations in the highest three categories, which approximate "white-collar" occupations. The mean occupational level of the drivers was significantly higher than that of the riders (2.7 and 2.1, respectively; t_{270}=3.32, p<.001).

Table 3.13 shows the number of full-time jobs in the last five years reported by those currently in the labour force.

Table 3.13
Number of full-time jobs in last five years for labour force participants by sex and type of road user

Number of Full-Time Jobs	Drivers[1]			Riders
	Males	Females	Total	Males
None	7.1%[2]	6.8	7.1	4.3
1–3	80.4	90.9	83.3	75.3
4+	12.5	2.3	9.6	20.4
Total: %	100.0	100.0	100.0	100.0
No.	112	44	156	162

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

Male drivers vs. female drivers: x^2=3.9, 2df, p=.145
Male drivers vs. male riders: x^2=3.6, 2df, p=.168

Although one in eight male drivers compared with only about one in forty female drivers reported four or more full-time jobs in the previous five years, this difference was not tested because of low expected cell frequencies.

One fifth of the male riders indicated having at least four jobs in the last five years, compared with one eighth of the male drivers; this difference was not significant (x^2=2.9, 1df, p=.089).

3.3.7 Residence

Approximately 30% of both male and female drivers resided outside of a capital city (31.1% and 31.2%, respectively; x^2=0.0, 1df, p=.984).

Although male riders were somewhat more likely than male drivers to live in a capital city, the difference was not significant (76.7% and 68.9%, respectively; x^2=2.4, 1df, p=.123).

The type of housing in which the drivers and riders lived is shown in Table 3.14. No significant differences in the proportion living in a house, as opposed to another type of residence, were evident between the male drivers and either the female drivers or male riders (x^2=2.5, 1df, p=.114 and x^2=2.2, 1df, p=.136, respectively).

Table 3.14
Residence type by sex and type of road user

Residence Type	Drivers[1]			Riders
	Males	Females	Total	Males
House	88.1%[2]	79.7	85.4	82.0
Flat or unit	10.4	17.2	12.6	13.4
Other	1.5	3.1	2.0	4.7
Total: %	100.0	100.0	100.0	100.0
No.	135	64	199	172

[1] excludes drivers of light trucks and heavy vehicles
[2] % of total cases

3.4 DIFFERENCES BETWEEN MALE AND FEMALE DRIVERS

The statistical significance of the differences between the male and female drivers, derived from the comparisons presented in the preceding sections, are summarized in Table 3.15 which shows the probability value associated with each null hypothesis.

The female drivers were significantly less likely to have been drinking prior to the crash and the mean BAC of females was significantly lower than that of males. However, no significant sex difference was evident in the mean BAC of the drinking drivers.

Table 3.15
Summary statistics (probability values) of comparisons between male and female drivers

Comparison	p–value
Likelihood of drinking	.025
Mean BAC	.014
Mean positive BAC	.256
Age distribution (Table 3.4)	.374
Mean age	.115
Birthplace	.114
Ethnic background	.864
Marital status	.385
No. of marriages/de facto relationships	.666
Of those ever married or in a de facto relationship:	
No. of marriages/de facto relationships	.578
No. of children	.156
Education	.667
Employment	.003
Of those in the labour force:	
Occupation	<.001
Mean social class of occupation	<.001
No. of full-time jobs in last 5 years	.145
Area of residence	.984
Type of residence	.114

A significantly larger proportion of females than males reported that they were not in the workforce. Among labour force participants, namely those either employed or seeking employment, the nature of occupation differed significantly between the sexes. The females were more likely than the males to have occupations classified as being of a higher social class, according to the classification of Broom et al. (1968). It should be noted that in the context of this classification, jobs frequently undertaken by females, such as those in medical and paramedical areas, including nursing, are allocated to the highest category, as is teaching.

In the other demographic aspects listed, no statistically significant difference was apparent between the male and female drivers.

3.5 DIFFERENCES BETWEEN MALE DRIVERS AND MALE RIDERS

Summary statistics of comparisons between male drivers and male riders are shown in the first column of Table 3.16.

Table 3.16
Summary statistics (probability values) of comparisons between male drivers and male riders

Comparison	p–value	
	All ages	Aged ≤ 26
Likelihood of drinking	.030	.052
Mean BAC	.002	.003
Mean positive BAC	.020	.024
Age distribution (Table 3.4)	<.001	–
Mean age	<.001	–
Birthplace	.705	.117
Ethnic background	.079	.127
Marital status	.006	.532
No. of marriages/de facto relationships	.057	.228
Of those ever married or in a de facto relationship:		
No. of marriages/de facto relationships	.055	.173
No. of children	<.001	.715
Education	.003	.587
Employment	.006	.326
Of those in the labour force:		
Occupation	<.001	.878
Mean social class of occupation	<.001	.395
No. of full-time jobs in last 5 years	.168	.787
Area of residence	.123	.797
Type of residence	.136	.045

Statistically significant differences were found between the male drivers and riders. Compared with male drivers, motorcycle riders were less likely to have been drinking, had lower BACs, were younger and more likely to be single and, if ever married or in a de facto relationship, less likely to have children. They were also less likely to have had only a primary school education and more likely to be employed, albeit in jobs of a lower social status.

The marital history of the drivers and riders also differed, although the differences did not achieve statistical significance at the 5% level of probability. Riders were somewhat more likely than drivers to have never been in a marital/de facto relationship, or to have had more than one such relationship.

No differences were evident with respect to place of birth or ethnicity, number of previous jobs, or area or type of residence.

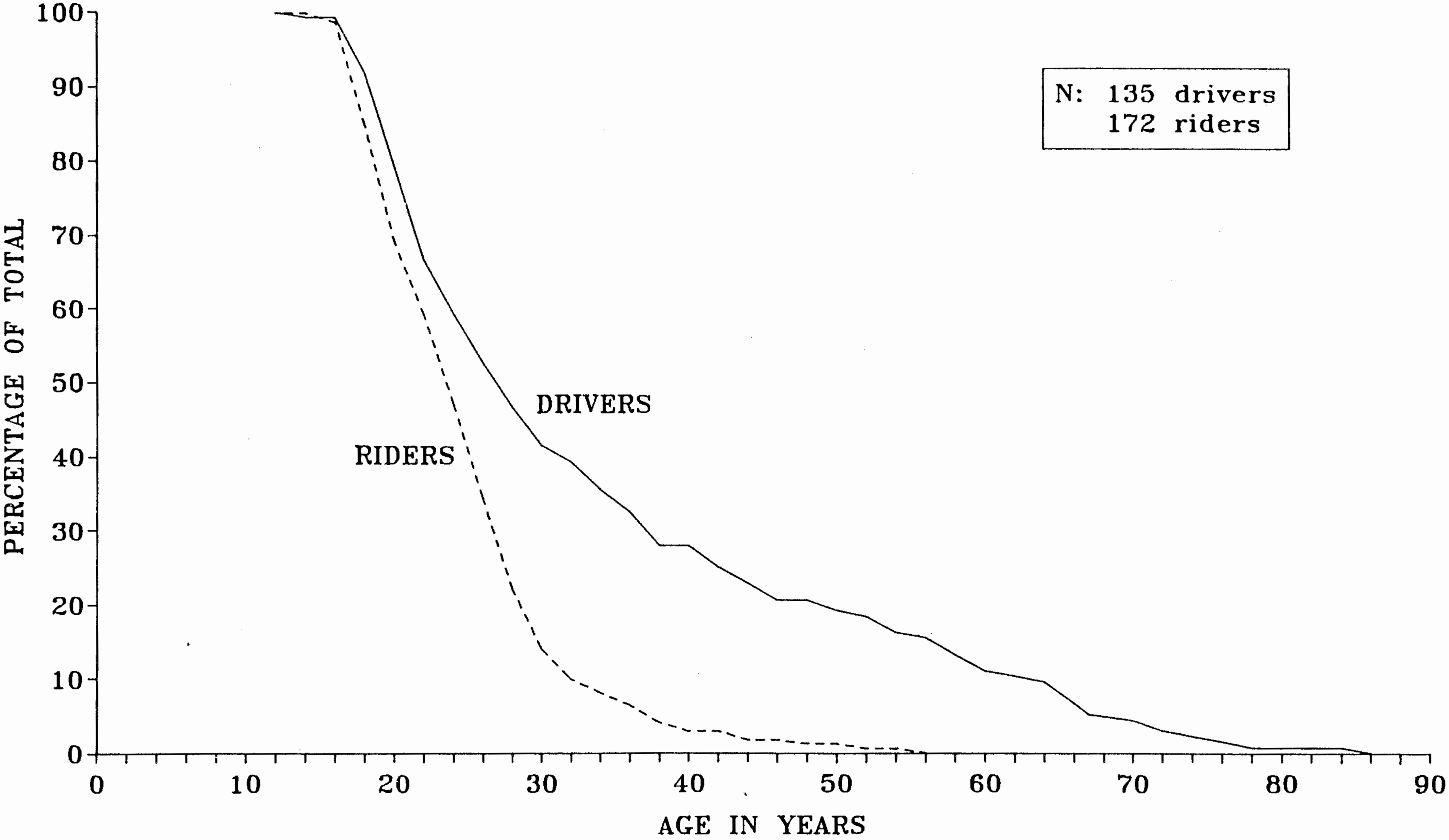
The differences that were evident between the drivers and riders could stem from the difference in age between the two samples. Figure 3.1 depicts the percentages of each group who were at or above the specified age. To account for the possible influence of age on BAC and the other demographic factors, all comparisons between drivers and riders were repeated, using only a subsample of those aged 26 or younger.

The probability values arising from comparisons between young drivers (N=68) and young riders (N=126) are shown in the second column of Table 3.16.

The results indicate that after controlling for the difference in age between drivers and riders, statistically significant differences in the listed demographic characteristics are no longer evident, with the exception of type of residence.

Although fewer young riders than drivers (30.2% and 44.1%, respectively) had been drinking, this difference just failed to achieve statistical significance at the 5% level of probability. However, the young motorcycle riders had a significantly lower mean BAC than did the young drivers (.035 and .067, respectively); this difference remained even when the comparison was restricted to those who had been drinking prior to the crash (BACs of .115 and .153, respectively).

Figure 3.1
A comparison of the age distributions for male drivers and male riders



4. DIFFERENCES IN DEMOGRAPHIC CHARACTERISTICS BY BLOOD ALCOHOL CONCENTRATION

4.1 INTRODUCTION

A breakdown of the interviewed sample by sex, type of vehicle driven and blood alcohol concentration (BAC) is shown in Table 4.1.

Table 4.1
Blood alcohol concentration by sex and type of road user

BAC	Drivers[1]			Riders	Total[2]
	Males	Females	Total	Males	
Zero	77	46	123	121	250
.001–.079	9	2	11	17	28
.080+	45	13	58	33	95
Total No.	131	61	192	171	373

[1] excludes drivers of light trucks and heavy vehicles
[2] includes drivers of trucks and articulated vehicles and female motorcycle riders

The table indicates that at the time of admission to hospital, only a relatively small number of drivers and riders had positive BACs below the then South Australian legal limit for fully licensed drivers of .08 g/100mL. Specifically, among those with known BACs, 6.9% of male drivers, 3.3% of female drivers and 9.9% of male riders registered BACs within this range. These individuals are excluded from the analyses reported in this chapter.

In the context of this report, an individual defined as having a high BAC registered a BAC of .08 or above at the time at which a blood sample was taken in Casualty. No attempt was made to estimate the BAC at the time of the crash.

The preceding chapter described the BACs and demographic characteristics of male and female drivers of cars, car derivatives and vans, and of male motorcycle riders. Comparisons were also made between the male and female drivers, and the male drivers and male riders.

To maintain comparability with the preceding chapter, comparisons between those with zero and high BACs are conducted within each of the three samples described above.

This chapter of the report therefore compares the demographic characteristics of:

- zero and high BAC male drivers of cars, car derivatives and vans;
- zero and high BAC male motorcycle riders;
- zero and high BAC female drivers of cars, car derivatives and vans.

4.2 MALE DRIVERS AND RIDERS

4.2.1 Age

Among the 131 male drivers with known BACs (and including those with positive BACs below .08), there was no correlation between age and BAC (r=-0.107, p=.111).

Table 4.2 shows the distribution of age by BAC. Overall, there was no statistically significant difference between male drivers who had not been drinking and those with a high BAC, although smaller proportions of high BAC drivers than zero BAC drivers were represented on both ends of the age spectrum.

Table 4.2
Age distribution by type of road user and blood alcohol concentration (males)

Age (years)	Male Drivers[1]		Male Riders	
	Zero BAC	High BAC[2]	Zero BAC	High BAC
15-19	25.0%[3]	13.3	34.2	18.2
20-24	19.7	35.6	25.8	36.4
25-49	32.9	35.6	38.3	45.5
50-64	10.5	11.1	1.7	–
65+	11.8	4.4	–	–
Total: %	100.0	100.0	100.0	100.0
No.	76	45	120	33

Note: A driver aged 13 and a rider aged 14, both with a BAC of zero, are not included in this table

[1] excludes drivers of light trucks and heavy vehicles
[2] BAC ≥ .08 g/100mL
[3] % of total cases

Zero BAC vs. high BAC - drivers: x^2=6.4, 4df, p=.172
riders: x^2=3.4, 2df, p=.186 (categories: 15-19, 20-24, 25+)

As seen in Table 4.3, the mean age of the zero BAC drivers was higher than that of the high BAC drivers, although not statistically significantly so. However, the median ages of the two groups were more similar: 27.0 and 25.0 years, respectively.

Table 4.3
Mean ages and age ranges by type of road user and blood alcohol concentration (males)

Age (years)	Male Drivers[1]		Male Riders	
	Zero BAC	High BAC[2]	Zero BAC	High BAC
Mean age	34.3 (18.3)[3]	30.6 (14.3)	23.7 (7.2)	24.4 (5.2)
Range	13–84	16–66	14–55	17–42
No.	77	45	121	33

[1] excludes drivers of light trucks and heavy vehicles
[2] BAC ≥ .08 g/100mL
[3] standard deviation

Zero BAC vs. high BAC - drivers: t_{120}=1.2, p=.248
riders: t_{152}=0.5, p=.623

Age did not correlate with BAC among the 171 male motorcycle riders with known BACs (r=0.040, p=.300). The age distribution, presented in Table 4.2, did not differ significantly between the zero and high BAC riders, although almost double the proportion of zero BAC riders than high BAC riders were teenagers. The mean age of both groups of riders was approximately 24 years (Table 4.3), but the median age of the zero BAC riders was somewhat lower than that of the high BAC riders (22.0 and 24.0 years, respectively).

4.2.2 Ethnic origin

Although a larger proportion of high BAC drivers than those with zero BACs were born in Australia, the difference was not statistically significant at the 5% level (84.4% and 68.8%, respectively; x^2=3.7, 1df, p=.056). A statistically significant difference was observed in the proportions reporting an Anglo-Saxon background (86.7% and 68.8%, respectively; x^2=4.9, 1df, p=.027).

About equal proportions of zero and high BAC riders reported an Anglo-Saxon background (84.3% and 87.9%), but those with zero BACs were somewhat less likely to have been born in Australia (70.2% and 78.8%; x^2=0.9, 1df, p=.332).

4.2.3 Marital status

Both groups of male drivers were similar in marital status (see Tables 4.4 and 4.5), with the majority being single. Of those ever married or in a de facto relationship, 80.5% of the 41 zero BAC drivers and 78.6% of the 28 high BAC drivers had had only one such relationship (x^2=0.0, 1df, p=.846).

Table 4.4
Marital status by type of road user and blood alcohol concentration (males)

Marital Status	Male Drivers[1]		Male Riders	
	Zero BAC	High BAC[2]	Zero BAC	High BAC
Single	55.8%[3]	53.3	69.4	78.8
Married/de facto	36.4	33.3	25.6	15.2
Separated/divorced/ widowed	7.8	13.3	5.0	6.1
Total: %	100.0	100.0	100.0	100.0
No.	77	45	121	33

[1] excludes drivers of light trucks and heavy vehicles
[2] BAC ≥ .08 g/100mL
[3] % of total cases

Zero BAC vs. high BAC - drivers: x^2=1.0, 2df, p=.609
riders: x^2=1.6, 2df, p=.451

Table 4.5
Number of marriages/de facto relationships by type of road user and blood alcohol concentration (males)

Number	Male Drivers[1]		Male Riders	
	Zero BAC	High BAC[2]	Zero BAC	High BAC
None	46.8%[3]	37.8	57.9	48.5
One	42.9	48.9	28.9	33.3
Two or more	10.4	13.3	13.2	18.2
Total: %	100.0	100.0	100.0	100.0
No.	77	45	121	33

[1] excludes drivers of light trucks and heavy vehicles
[2] BAC ≥ .08 g/100mL
[3] % of total cases

Zero BAC vs. high BAC - drivers: x^2=1.0, 2df, p=.616
riders: x^2=1.0, 2df, p=.600

Although a smaller proportion of riders with high BACs than those who had not been drinking were married or in a de facto relationship, the difference was not statistically significant (x^2=1.6, 1df, p=.208). Among those ever in a marital-type relationship, about two-thirds of each BAC group had had only one such relationship (x^2=0.1, 1df, p=.765).

4.2.4 Children

Drivers who recorded a BAC of zero were more likely than their drinking counterparts to have had children, given involvement in a marital-type relationship (82.9% and 67.9%, respectively; x^2=2.1, 1df, p=.145); this difference was not statistically significant.

A similar pattern was evident among motorcycle riders (51.0% and 35.3%, respectively; x^2=1.3, 1df, p=.262).

4.2.5 Education

Table 4.6 indicates that the educational backgrounds of zero and high BAC drivers were similar, as were those of comparable groups of riders.

Table 4.6
Highest level of education by type of road user and blood alcohol concentration (males)

Education	Male Drivers[1]		Male Riders	
	Zero BAC	High BAC[2]	Zero BAC	High BAC
Primary	9.1%[3]	8.9	1.7	-
Secondary	77.9	80.0	87.6	87.9
Tertiary	13.0	11.1	10.7	12.1
Total: %	100.0	100.0	100.0	100.0
No.	77	45	121	33

[1] excludes drivers of light trucks and heavy vehicles
[2] BAC ≥ .08 g/100mL
[3] % of total cases

4.2.6 Employment

Employment status is shown in Table 4.7. Although approximately two-thirds of both driver groups were employed, those with high BACs were somewhat more likely to be unemployed (x^2=2.6, 1df, p=.106) and, conversely, less likely not to be in the work force (x^2=2.3, 1df, p=.128) than were their non-drinking counterparts.

The two groups of riders were similar with respect to employment status.

Table 4.7
Employment status by type of road user and blood alcohol concentration (males)

Status	Male Drivers[1]		Male Riders	
	Zero BAC	High BAC[2]	Zero BAC	High BAC
Employed	64.9%[3]	64.4	77.7	81.8
Unemployed	13.0	24.4	15.7	12.1
Not in work force	22.1	11.1	6.6	6.1
Total: %	100.0	100.0	100.0	100.0
No.	77	45	121	33

[1] excludes drivers of light trucks and heavy vehicles
[2] BAC ≥ .08 g/100mL
[3] % of total cases

Zero BAC vs. high BAC - drivers: x^2=4.1, 2df, p=.131
riders: x^2=0.3, 2df, p=.865

Table 4.8 indicates the usual occupation of those in the work force. The occupational classification, by Broom, Jones and Zubrzycki (1968), approximates social class of occupation (1 to 6, with higher scores denoting occupations of higher social class). The three lowest occupational categories approximate "blue-collar" jobs and the remainder are commonly regarded as "white-collar" occupations: 90.0% of the high BAC drivers and 67.8% of the zero BAC drivers were blue-collar workers (x^2=6.6, 1df, p=.010). Moreover, the mean occupational level differed significantly between the two driver groups: the drivers with high BACs were more likely than those with a BAC of zero to be in occupations of lower social status (means are 2.2 and 2.9, respectively; t_{97}=2.4, p=.017).

In contrast to drivers, the table shows no marked differences with respect to occupation between the riders with zero and high BACs.

Table 4.8
Usual occupation of labour force participants by type of road user and blood alcohol concentration (males)

Occupation	Male Drivers[1]		Male Riders	
	Zero BAC	High BAC[2]	Zero BAC	High BAC
Service or farm workers, labourers	23.7%[3]	27.5	36.6	32.3
Shop assistants, process workers, drivers	28.8	55.0	34.8	29.0
Craftsmen, foremen	15.3	7.5	18.8	22.6
Clerical workers, Service personnel	8.5	-	4.5	16.1
Managers, shop owners, farmers	11.9	5.0	1.8	-
Graziers, professionals	11.9	5.0	3.6	-
Total: %	100.0	100.0	100.0	100.0
No.	59	40	112	31

[1] excludes drivers of light trucks and heavy vehicles
[2] BAC ≥ .08 g/100mL
[3] % of total cases

Table 4.9 shows the number of full-time jobs held in the last five years by those currently in the work force. Although the drivers with high BACs were more likely to have had four or more jobs during that time than the drivers who had not been drinking, the difference was not statistically significant (x^2=2.9, 1df, p=.089).

Table 4.9
Number of full-time jobs in last five years for labour force participants by type of road user and blood alcohol concentration (males)

No. of Jobs	Male Drivers[1]		Male Riders	
	Zero BAC	High BAC[2]	Zero BAC	High BAC
None	8.3%[3]	7.5	5.3	-
1-3	83.3	72.5	73.5	87.1
4+	8.3	20.0	21.2	12.9
Total: %	100.0	100.0	100.0	100.0
No.	60	40	113	31

[1] excludes drivers of light trucks and heavy vehicles
[2] BAC ≥ .08 g/100mL
[3] % of total cases

The two groups of riders also failed to differ significantly with respect to job history, although the high BAC riders were somewhat less likely than the zero BAC riders to have had four or more jobs in the preceding five years (x^2=1.1, 1df, p=.299).

4.2.7 Residence

The proportions of either drivers or riders living in a capital city did not differ significantly between those with zero and high BACs (drivers: 72.7% and 62.2% respectively, x^2=1.5, 1df, p=.227; riders: 80.2% and 66.7% respectively, x^2=2.7, 1df, p=.101).

The type of housing in which the males lived is shown in Table 4.10. No significant differences were observed between either the zero and high BAC drivers or the corresponding groups of riders in the proportions living in houses as opposed to other types of residences (x^2=1.1, 1df, p=.290 and x^2=0.0, 1df, p=1.0, respectively).

Table 4.10
Residence type by type of road user
and blood alcohol concentration (males)

Residence Type	Male Drivers[1]		Male Riders	
	Zero BAC	High BAC[2]	Zero BAC	High BAC
House	84.4%[3]	91.1	81.8	81.8
Unit or flat	14.3	6.7	14.9	12.1
Other	1.3	2.2	3.3	6.1
Total: %	100.0	100.0	100.0	100.0
No.	77	45	121	33

[1] excludes drivers of light trucks and heavy vehicles
[2] BAC ≥ .08 g/100mL
[3] % of total cases

4.3 FEMALE DRIVERS

As noted earlier, the sample of female drivers included only 13 women with a BAC of .08 or above. In most instances this number was too small to enable meaningful chi-square analyses. Therefore the data are merely presented as percentages, with no attempt to ascertain the statistical significance of any differences between the female drivers with zero and high BACs.

4.3.1 Age

Among the 61 female drivers with known BACs, there was a statistically significant inverse relationship between age and BAC (r=-0.280, p=.014). The mean age of the 13 women with BACs of .08 or above was significantly lower than that of the 46 women who had not been drinking (26.6 and 40.5 years, respectively; t_{58}=2.5, p=.015). The median ages of the two groups also differed: 25 and 37 years, respectively.

Table 4.11 shows the age distribution among the zero and high BAC female drivers.

Table 4.11
Age of female drivers by blood alcohol concentration

Age (years)	Zero BAC	High BAC[1]
15–19	10.9%[2]	–
20–24	21.7	46.2
25–40	28.3	53.8
41–49	4.3	–
50–64	19.6	–
65+	15.2	–
Total: %	100.0	100.0
No.	46	13

[1] BAC ≥ .08 g/100mL
[2] % of total cases

4.3.2 Ethnic origin

Similar proportions of the zero and high BAC female drivers were born in Australia (65.2% and 61.5%, respectively), although the latter were more likely to report an Anglo-Saxon background (73.9% and 92.3%, respectively).

4.3.3 Marital status

Over one-half of the women who had not been drinking were married or in a de facto relationship, compared with less than one-quarter of the high BAC women. Table 4.12 presents the marital status of the two groups.

Of the 5 high BAC women who had ever been married or in a de facto relationship, 3 had

had more than one such relationship, whereas only 5 of the 30 women with zero BACs had a similar marital history.

Table 4.12
Marital status of female drivers by blood alcohol concentration

Marital Status	Zero BAC	High BAC[1]
Single	37.0%[2]	61.5
Married/de facto	52.2	23.1
Separated/divorced/ widowed	10.9	15.4
Total: %	100.0	100.0
No.	46	13

[1] BAC ≥ .08 g/100mL
[2] % of total cases

4.3.4 Children

Most of the women ever in a marital-type relationship had children (26 of 30 women with zero BACs and 4 of 5 women with high BACs).

4.3.5 Education

Table 4.13 shows the educational backgrounds of the women.

Table 4.13
Highest level of education of female drivers by blood alcohol concentration

Education	Zero BAC	High BAC[1]
Primary	13.0%[2]	–
Secondary	67.4	84.6
Tertiary	19.6	15.4
Total: %	100.0	100.0
No.	46	13

[1] BAC ≥ .08 g/100mL
[2] % of total cases

In contrast to the zero BAC women, all of the high BAC women had at least some secondary education; however, given the younger age of the latter group, this is likely to be an artefact of age.

4.3.6 Employment

A larger proportion of the high BAC women than those who had not been drinking were in the work force (92.3% and 60.9%, respectively). Of the labour force participants, only one was unemployed; she had a zero BAC.

The usual occupation of those in the labour force is shown in Table 4.14.

Table 4.14
Usual occupation of labour force participants for female drivers by blood alcohol concentration

Usual Occupation	Zero BAC	High BAC[1]
Service or farm workers, labourers	14.3%[2]	25.0
Shop assistants, process workers, drivers	17.9	25.0
Craftsmen, foremen	3.6	–
Clerical workers, members of Service	3.6	33.3
Managers, shop owners, farmers	17.9	–
Graziers, professionals	42.9	16.7
Total: %	100.0	100.0
No.	28	12

[1] BAC ≥ .08 g/100mL
[2] % of total cases

The table shows that about one-third of the female drivers who had not been drinking were usually employed in blue-collar occupations (i.e. the top three categories in the table), compared with exactly one-half of those with high BACs. Although the mean occupational levels of the two groups differed, the difference was not statistically significant (4.2 and 3.1, respectively; $t_{38}=1.7$, $p=.102$).

Among those in the labour force, the zero and high BAC female drivers had similar job histories: about 90% of each group (25 of 28 and 11 of 12, respectively) reported having had one, two or three full-time jobs in the preceding five years, one woman with a zero

BAC had more, and the remainder had none.

4.3.7 Residence

Approximately 70% of the zero and high BAC women were Adelaide residents (71.7% and 69.2%, respectively); the remainder lived in other parts of South Australia.

The housing situation of the two groups was similar, as seen in Table 4.15.

Table 4.15
Residence type of female drivers by blood alcohol concentration

Residence Type	Zero BAC	High BAC[1]
House	78.3%[2]	76.9
Flat or unit	19.6	15.4
Other	2.2	7.7
Total: %	100.0	100.0
No.	46	13

[1] BAC ≥ .08 g/100mL
[2] % of total cases

4.4 DISCUSSION

Blood alcohol concentrations of .08 or above were recorded by 34% of male drivers, 19% of male motorcycle riders and 21% of female drivers. Comparisons of their demographic characteristics with those of their counterparts who had not been drinking indicated very few statistically significant differences. However, it should be noted that where sample sizes are relatively small, as in this study, differences between samples may fail to attain statistical significance, yet nevertheless be important. Consequently, this discussion highlights apparent differences between groups with zero and high BACs, without placing major emphasis on statistical significance.

Male drivers with high BACs were similar to those who had not been drinking in terms of their marital status, education, and place and type of residence. However, they were less likely to be either teenaged or elderly. A larger proportion were born in Australia and, similarly, more reported an Anglo-Saxon background. Given that they had ever married or cohabited, they were less likely to have children.

Similar proportions were employed at the time of the crash, but those with a high BAC were more likely to be unemployed and, conversely, less likely not to be in the labour force than were their non-drinking counterparts. If in the labour force, the high BAC drivers were more likely to work in jobs of a lower social status, and also more likely to have had more than three full-time jobs in the preceding five years.

Male motorcycle riders who had a BAC of at least .08 did not differ from those with a zero BAC in ethnic background, education, employment status, social class of occupation, or type of housing.

Compared to those with a zero BAC, high BAC riders were less likely to be teenagers or Adelaide residents. Fewer were married or in a de facto relationship; those who were in a marital-type relationship were however less likely to have children. Among those in the labour force, fewer high BAC riders reported having had more than three jobs in the last five years.

The two groups of female drivers did not differ in their place and type of residence. Similar proportions were born in Australia, although those with a high BAC were more likely to have an Anglo-Saxon background. Women with high BACs were more likely to be in the labour force, albeit working in jobs of a lower social status; their five-year job histories were similar with respect to the number of jobs.

The small number of female drivers with a high BAC were significantly younger, in terms of mean age, than their non-drinking counterparts, and encompassed a narrower age range: all were aged from 20 to 40 years. They were also more likely to be single. Although some of the women with zero BACs had not gone beyond a primary level education, this was not the case with the drinking drivers.

5. BLOOD ALCOHOL CONCENTRATION AND PRE-CRASH DRINKING BEHAVIOUR

5.1 INTRODUCTION

As in preceding chapters, this chapter of the report will focus on the results derived from male and female drivers of cars, car derivatives and vans, and male motorcycle riders. This chapter:

- describes the age, sex and pre-crash drinking behaviour of three groups of individuals, namely those with BACs within the following ranges: .001 to .079 g/100mL, .080 to .149, and .150 or above
- compares the age, sex and pre-crash drinking behaviour of those with BACs between .001 and .079 (ie low BACs), and those with BACs of .080 or above (ie high BACs)
- compares the age, sex and pre-crash drinking behaviour of those with BACs between .080 and .149, and those with BACs of .150 or above.

Within each BAC category, the data are grouped together with respect to sex and vehicle type, due to the relatively small number of individuals within some of these categories. However, the frequencies within each of the sex/vehicle categories are presented as appendices at the end of the report. The composition of the three BAC groups is shown in Table 5.1.

Table 5.1
Sex and type of road user by blood alcohol concentration

	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
Number	9	2	17	20	9	16	25	4	17

Note: MD = male drivers
FD = female drivers
MR = male riders

As noted in an earlier chapter, 91 drivers (of cars, car derivatives or vans) and riders had a BAC of .08 g/100mL or above at the time of admission to hospital. In the context of this report, a BAC of at least .08 is defined as being high. A BAC between .001 and .079 (defined here as a low BAC) was noted in 28 individuals. The BAC distribution of the individuals with positive BACs is shown in Table 5.2.

Table 5.2
Distribution of blood alcohol concentration for drivers and riders with a positive blood alcohol concentration

BAC (g/100mL)	Number	%
.001–.049	20	16.8
.050–.079	8	6.7
.080–.099	12	10.1
.100–.149	33	27.7
.150–.199	20	16.8
.200–.249	22	18.5
.250+	4	3.4
Total	119	100.0

Note: Drivers of light trucks and heavy vehicles and female riders are not included in this or subsequent tables

5.2 RESULTS

5.2.1 Age

The age distribution of the three groups, defined by BAC, is shown in Table 5.3.

Table 5.3
Age by blood alcohol concentration

Age (years)	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
15-19	28.6%[1]	20.0	6.5
20–24	32.1	33.3	41.3
25–49	32.1	37.8	45.7
50–64	3.6	6.7	4.3
65+	3.6	2.2	2.2
Total: %	100.0	100.0	100.0
No.	28	45	46

[1] % of total cases

There was no meaningful difference in age distribution between those with low (.001 to .079) and high (.080 or above) BACs. Although those with BACs of at least .150 were less likely to be aged in their teens than those with BACs between .080 and .149, the difference was not statistically significant at the 5% level (x^2=3.6, 1df, p=.057).

No female driver or male rider with a positive BAC was aged 50 or above (see Table A1 in the Appendix). Of the fifteen female drivers with positive BACs, only one was aged under 20, and she recorded a low BAC.

5.2.2 Sex

Table 5.4 shows the sex distribution of the three groups.

Table 5.4
Sex by blood alcohol concentration

Sex	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
Male	92.9%[1]	80.0	91.3
Female	7.1	20.0	8.7
Total: %	100.0	100.0	100.0
No.	28	45	46

[1] % of total cases

Although the largest proportion of females is seen among those with BACs between .080 and .149, the difference in sex distribution between that BAC group and the group with a BAC of at least .150 was not statistically significant (x^2=2.4, 1df, p=.123). The comparison between the low and high BAC groups involved too low expected cell values to enable meaningful chi-square analysis.

5.2.3 Pre-crash alcohol consumption

The drivers and riders were asked how much alcohol they had drunk in the twelve hours preceding the crash. These results are shown in Table 5.5, where each standard alcoholic drink is represented as 10g of ethanol.

Five individuals reported that they had not been drinking during this time (see Appendix, Table A2): of these, one 23 year old male rider with a BAC of .128 reported that he had ended a two-day drinking binge just 14 hours prior to the crash and believed that he still had alcohol in his system. The remaining four individuals denied any alcohol consumption at all, although their BACs indicated otherwise. Table 5.6 documents their BAC, age and sex, as well as the type of vehicle they were driving.

Table 5.5
Self-reported twelve hour pre-crash alcohol consumption by blood alcohol concentration

Quantity (g)	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
None	7.7%[1]	5.0	2.6
1–20	11.5	2.5	–
21–40	19.2	10.0	–
41–80	46.2	42.5	13.2
81–120	11.5	20.0	31.6
121–200	–	17.5	26.3
201+	3.8	2.5	26.3
Total: %	100.0	100.0	100.0
No.	26	40	38
Unknown	2	5	8

[1] % of total cases

Table 5.6
Details of drivers and riders with a positive blood alcohol concentration who denied pre-crash alcohol consumption

Case	BAC	Age	Sex	Vehicle type
1	.002	23	M	motorcycle
2	.032	21	M	car
3	.112	31	F	car
4	.239	20	M	car

Because these four individuals denied any pre-crash drinking, they have been excluded from any subsequent tables and discussion in this chapter.

The self-reported alcohol consumption in the two hours prior to the crash is shown in Table 5.7.

Table 5.7
Self-reported two hour pre-crash alcohol consumption by blood alcohol concentration

Quantity (g)	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
None	34.8%[1]	17.5	11.4
1–20	30.4	27.5	14.3
21–40	13.0	35.0	22.9
41–80	21.7	20.0	34.3
81–120	–	–	5.7
121–200	–	–	11.4
201+	–	–	–
Total: %	100.0	100.0	100.0
No.	23	40	35
Unknown	3	4	10

Note: Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

[1] % of total cases

The usual drinking behaviour of these drivers and riders will be described in detail in the next chapter. However, the relationship between the self-reported quantity of alcohol consumed prior to the crash and the maximum quantity typically consumed is relevant in the context of this chapter. Table 5.8 presents data on this relationship, using the highest quantity typically consumed at least once a month as the basis for comparison.

As seen in the table, in almost one-third of those with a high BAC but in only one-eighth of those with a low BAC, the self-reported amount of alcohol consumed prior to the crash was greater than the highest quantity typically consumed at least once a month. However, this difference was not statistically significant (x^2=3.4, 1df, p=.066). Similar proportions of those with BACs between .080 and .149, and .150 or above reported an atypically high pre-crash consumption (x^2=0.0, 1df, p=.876).

Table A3 in the Appendix shows that for at least one-half of the women in each of the BAC groups, the amount of alcohol consumed prior to the crash was greater than the highest amount typically consumed at least once a month; the corresponding proportions were lower among both male drivers and riders.

Table 5.8
Self-reported quantity of pre-crash alcohol consumption relative to highest quantity typically consumed at least once a month by blood alcohol concentration

Quantity	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
Greater	12.5%[1]	30.8	32.4
Equivalent	12.5	12.8	18.9
Less	75.0	56.4	48.6
Total: %	100.0	100.0	100.0
No.	24	39	37
Unknown	2	5	8

Note: Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

[1] % of total cases

The frequency of drinking the amount of alcohol consumed prior to the crash is depicted in Table 5.9.

Table 5.9
Self-reported frequency of alcohol consumption at the pre-crash level by blood alcohol concentration

Frequency	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
At least once/week	79.2%[1]	60.0	50.0
At least once/month	8.3	7.5	15.8
Rarely	12.5	30.0	18.4
Never	–	–	10.5
Other	–	2.5	5.3
Total: %	100.0	100.0	100.0
No.	24	40	38
Unknown	2	4	7

Note: Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

[1] % of total cases

The majority of drivers and riders in every BAC group drank at least the quantity of alcohol consumed before the crash on one or more occasions per week. However, the data presented in Table A4 of the Appendix support the sex difference noted earlier: "at least weekly" consumption of the amount of alcohol consumed prior to the crash was less likely among the females.

According to their drinking histories, four individuals had never previously consumed that amount of alcohol; each of their BACs was above .150.

5.2.4 Self-perception of blood alcohol concentration

Before the BAC results were known to the individuals, they were asked whether they thought they exceeded the then South Australian legal limit of .08 for fully licensed drivers. These results are shown in Table 5.10.

Table 5.10
Self-perception of having exceeded the .08 limit by blood alcohol concentration

Exceeded	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
Yes	24.0%[1]	32.6	81.0
No	68.0	55.8	11.9
Don't know	8.0	11.6	7.1
Total: %	100.0	100.0	100.0
No.	25	43	42
Unknown	1	1	3

Note: Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

[1] % of total cases

Approximately three-quarters of those with low BACs and seven-eighths of those with BACs of at least .150 were correct in their perception of being below or above the legal limit, respectively (omitting those who said that they did not know). However, only one-third of those with BACs between .080 and .149 were correct in their prediction.

When those respondents who were unable to predict their BAC were included, individuals with high BACs were significantly more likely than those with low BACs to report that they would be above the legal limit of .08 (x^2=8.2, 1df, p=.004). Furthermore, a substantively larger proportion of those with BACs of at least .150 than those with BACs between .080 and .149 believed they exceeded the limit (x^2=20.2, 1df, p<.001).

However, the data in Table A5 of the Appendix indicate that females may have been less able than males to estimate whether they exceeded the .08 limit. Only two (17%) of twelve female drivers with BACs of .080 or above believed they would be over the limit, and both had BACs in excess of .150. In contrast, the corresponding figures among the 42 male drivers and 31 male riders with high BACs were 67% and 58%.

5.2.5 Self-perception of alcohol as a factor in crash involvement

The drivers and riders were asked whether they thought that their drinking contributed in any way to the crash. Table 5.11 presents these results.

Table 5.11
Self-perception of own alcohol consumption contributing to the crash by blood alcohol concentration

Perception	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
Yes – a lot	8.0%[1]	11.6	35.7
Yes – somewhat	8.0	32.6	33.3
No	80.0	48.8	11.9
Don't know	4.0	7.0	19.0
Total: %	100.0	100.0	100.0
No.	25	43	42
Unknown	1	1	3

Note: Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

[1] % of total cases

As shown in the table, 16%, 44% and 69% of, respectively, the .001-.079, .080-.149, and .150 or above BAC groups felt that their drinking was a factor in crash involvement.

A comparison between those with low and high BACs showed that a significantly larger proportion of the latter group identified their drinking as contributing to the crash (x^2=12.7, 1df, p<.001). Those with BACs of at least .150 were significantly more likely than those with BACs in the .080-.149 range to report alcohol as a contributor (x^2=5.3, 1df, p=.021).

In the previous section it was noted that females appeared less able than males to predict whether they would exceed the .08 limit. However, the results presented in Table A6 of the Appendix suggest that females were not less likely than males to attribute their crash involvement to their drinking.

5.2.6 Drinking location

The location of the last drinking episode prior to the crash is shown in Table 5.12.

Table 5.12
Self-reported pre-crash drinking location by blood alcohol concentration

Location	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
Bar, tavern, disco etc	41.7%[1]	48.8	55.0
Own home	4.2	7.3	2.5
Other person's home	20.8	26.8	15.0
Private club	8.3	4.9	10.0
Other	25.0	12.2	17.5
Total: %	100.0	100.0	100.0
No.	24	41	40
Unknown	2	3	5

Note: Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

[1] % of total cases

Hotel-based premises, such as bars, taverns or hotel discotheques, were most frequently nominated as the last place of alcohol consumption: at least 40% of those in each of the BAC groups reported drinking in these locations.

Table A7 in the Appendix shows that a total of five individuals stated that their last drink was in their own home, and drinking in another person's home was reported by twenty-two. Eight people had been drinking in private clubs, and eighteen nominated other locations (eg work, public outdoor areas, motor vehicles, restaurants, or social events in halls or theatres). No noteworthy differences were apparent either between males and females, or between drivers and riders.

For the purpose of statistical analysis, the locations were subsequently categorized as hotel-based premises, private homes, and other locations, including clubs. Using this classification, the low and high BAC groups did not differ significantly in their location of drinking (x^2=1.3, 2df, p=.518); nor did the .080-.149 and .150 or above BAC groups

(x^2=3.3, 2df, p=.192). Although the proportion of the former BAC group who reported drinking in a private home was double that of the latter group, this difference was also not statistically significant (x^2=2.9, 1df, p=.087).

5.2.7 Drinking company

The relationship between the drivers and riders and the people with whom they were drinking during the last drinking episode prior to the crash is shown in Table 5.13.

Table 5.13
Self-reported pre-crash drinking company by blood alcohol concentration

Company	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
Alone	4.2%[1]	2.4	–
Partner, relatives	4.2	2.4	5.0
Friends of same sex	41.7	51.2	40.0
Friends of opposite sex	–	4.9	2.5
Friends of both sexes	45.8	36.6	45.0
Other	4.2	2.4	7.5
Total: %	100.0	100.0	100.0
No.	24	41	40
Unknown	2	3	5

Note: Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

[1] % of total cases

As is evident from the table, all three BAC groups were very similar with respect to their drinking company. The vast majority reported drinking with friends, and among these individuals, drinking in mixed company was frequent.

However, among those who reported drinking with friends, the results in Table A8 of the Appendix suggest some trends within the individual groups. Most of the male drivers with BACs of at least .150 and most of the females had been drinking with friends of both sexes, but male riders with high BACs were more likely to have been drinking only with other males.

5.2.8 Type of alcohol

The predominant type of alcohol consumed prior to the crash is indicated in Table 5.14.

Table 5.14
Self-reported pre-crash beverage type by blood alcohol concentration

Alcohol Type	BAC (g/100mL)		
	.001–.079	.080–.149	.150+
Beer	83.3%[1]	75.0	73.7
Spirits	16.7	17.5	15.8
Wine	–	7.5	10.5
Total: %	100.0	100.0	100.0
No.	24	40	38
Unknown	2	4	7

Note: Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

[1] % of total cases

The table indicates that the predominant type of alcohol consumed was similar in each BAC group. Beer was nominated as the predominant type by approximately three-quarters of the people in each of the three BAC groups, and spirits were consumed by between 15% and 20% of each group. Only 7% of all those who could recall what they had been drinking had primarily drunk wine.

However, as seen in Table A9 of the Appendix, sex differences were apparent, with women being less likely than men to have consumed beer.

5.3 DISCUSSION

5.3.1 Comparisons between individuals with low and high BACs

The age and sex distributions of the group of drivers and riders with BACs in the range of .001 to .079 (ie low BACs) were similar to those of the group with BACs of at least .080 (ie high BACs).

The individuals with a high BAC were more likely than those with a low BAC to report a pre-crash alcohol consumption in excess of their highest typical monthly consumption, although the difference between the two groups was not statistically significant. No differences were evident with respect to either where, with whom, or what they were drinking prior to the crash.

A significantly larger proportion of the high BAC drivers and riders than of those with low BACs thought that their BAC had exceeded .08, which was at that time the South Australian legal limit for fully licensed drivers. Furthermore, those with high BACs were significantly more likely to report that their drinking had contributed to their involvement in the crash.

5.3.2 Comparisons between individuals with BACs of .080-.149 and .150 or above

Comparisons were also made between individuals with BACs in the range of .080 to .149 and those with a BAC of at least .150. Although both teenagers and females were less likely to be represented among those with BACs of at least .150, the differences were not statistically significant.

No difference was found between these two BAC groups with respect to the self-reported quantity of pre-crash alcohol consumption relative to the highest typical monthly consumption of alcohol. A statistically significantly higher proportion of those with a BAC of at least .150 believed they had exceeded the then legal limit of .08. Also, a statistically significantly larger percentage of those with BACs of .150 or above reported that their alcohol consumption contributed to the crash.

Although the pre-crash beverage type and drinking company of the two groups was similar, those with a BAC between .080 and .149 were more likely, albeit not statistically significantly so, to have been drinking in a private home than were those with higher BACs.

5.3.3 Comparisons between males and females

Although statistical analyses were not undertaken to test the significance of differences between males and females, due to the relatively few females in the sample, the tables presented in the Appendix nevertheless suggested some sex differences. For example, the self-reported quantity of alcohol consumed prior to the crash appeared more likely to be atypically high among females. Although they seemed less able to estimate whether they had exceeded a BAC of .08, they did not appear to be less likely than males to attribute their crash involvement to their drinking. The majority of males reported drinking beer before the crash, whereas the majority of females had been drinking either wine or spirits.

6. BLOOD ALCOHOL CONCENTRATION, ATTITUDES AND USUAL DRINKING BEHAVIOUR

6.1 INTRODUCTION

This chapter of the report examines the usual drinking and driving behaviour and attitudes reported by crash-involved male and female drivers of cars, car derivatives and vans, and male motorcycle riders. It is confined to those drivers and riders who reported consuming alcohol during the month prior to hospitalization. Those who drank only very rarely, abstained completely or, because of unusual circumstances, did not drink in the preceding month are excluded from consideration.

Because sex differences have previously been noted in drinking patterns (eg Horn & Wanberg, 1969), the data in this chapter are presented separately for males and females, with the data derived from male drivers and riders grouped together. For males, data presented in tables provide information for each of four BAC groups (zero, .001 to .079 g/100mL, .080 to .149, and .150 or above), although statistical analysis is limited to comparisons between those with a BAC of zero and those with a BAC of .080 or above (high BAC group).

The tables presented for female drivers use BAC groups of zero and .080 or above due to the small number of female drivers. For this same reason, the tables themselves should be interpreted with caution since, in many cases, the small numbers precluded meaningful statistical analysis.

6.2 MALE DRIVERS AND RIDERS

6.2.1 Drinking pattern

A BAC of zero was recorded for 198 male drivers (of cars, car derivatives and vans) and motorcycle riders. Of these, 153 (77.3%) reported that they had consumed alcohol in the month preceding the crash, 19 (9.6%) reported drinking only small amounts very infrequently, such as on special occasions, and 19 (9.6%) abstained completely from alcohol; the remaining seven individuals (3.5%) reported no consumption in the month prior to the crash, due to extraordinary circumstances (eg illness, financial difficulties).

All those with positive BACs reported that they drank alcohol in the preceding month, with the exception of one individual who consumed alcohol only on the night of the crash: he has been excluded from the data presented in this chapter.

The drivers and riders were asked to compare their drinking pattern during the month preceding the crash with that during a typical month, with respect to quantity of alcohol consumed. The results are shown in Table 6.1.

Table 6.1
Self-reported quantity of alcohol consumption in preceding month relative to a typical month by blood alcohol concentration (males)

Quantity	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
Greater	14.0%[1]	7.7	14.7	17.5
Equivalent	81.3	92.3	79.5	82.5
Less	4.7	-	5.9	-
Total: %	100.0	100.0	100.0	100.0
No.	150	26	34	40

[1] % of total cases

The majority in each of the BAC groups reported no changes in quantity: there was no significant difference between the zero and high BAC groups in this regard (x^2=0.0, 1df, p=.964). Because of this reported similarity of drinking pattern between the month prior to the crash and a typical month, the tables presented throughout this chapter will, in general, deal only with drinking patterns during the month prior to the crash.

The number of days on which alcohol was reportedly consumed in the preceding month is shown in Table 6.2.

About one-third of those in each of the three positive BAC groups reportedly drank in excess of four days a week on average (ie 17 or more days in the month), compared with about one-sixth of those with a zero BAC. It is interesting to note that, in terms of drinking frequency, the males with an intermediate BAC (ie .001 to .079) more closely resembled those with higher BACs than those with a BAC of zero. A statistically significant difference was apparent between the zero and high BAC groups (x^2=32.3, 4df, p<.001), with a higher reported frequency of consumption among the latter.

Detailed information about levels of drinking during the preceding month was obtained from each individual. These data were used to derive the amount of alcohol most frequently consumed in a drinking session during that month, as well as the frequency of each individual's highest level of consumption during a single drinking session.

Table 6.2
Self-reported number of drinking days in preceding month by blood alcohol concentration (males)

No. of Days	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
1-3	27.5%[1]	7.7	-	2.4
4-8	32.7	23.1	28.6	19.5
9-16	23.5	34.6	40.0	41.5
17-24	7.8	19.2	17.1	17.1
25-31	8.5	15.4	14.3	19.5
Total: %	100.0	100.0	100.0	100.0
No.	153	26	35	41

[1] % of total cases

Table 6.3 presents data on the most frequently consumed quantity of alcohol. The high BAC group was significantly more likely to report higher levels of consumption than the zero BAC group (x^2=29.5, 5df, p<.001).

Table 6.3
Self-reported quantity of alcohol most frequently consumed in preceding month by blood alcohol concentration (males)

Quantity (g)	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
5-20	21.6%[1]	11.5	2.9	-
25-40	22.2	23.1	22.9	15.0
45-80	30.7	15.4	28.6	25.0
85-120	7.8	19.2	17.1	20.0
125-200	12.4	15.4	17.1	15.0
205+	5.2	15.4	11.4	25.0
Total: %	100.0	100.0	100.0	100.0
No.	153	26	35	40

Note: 10g of alcohol = one standard drink
[1] % of total cases

Utilizing the highest reported consumption in the preceding month, each person's alcohol consumption pattern was classified using the National Heart Foundation's (1980) grid based on quantity and frequency of consumption. Figures 6.1 and 6.2 indicate the

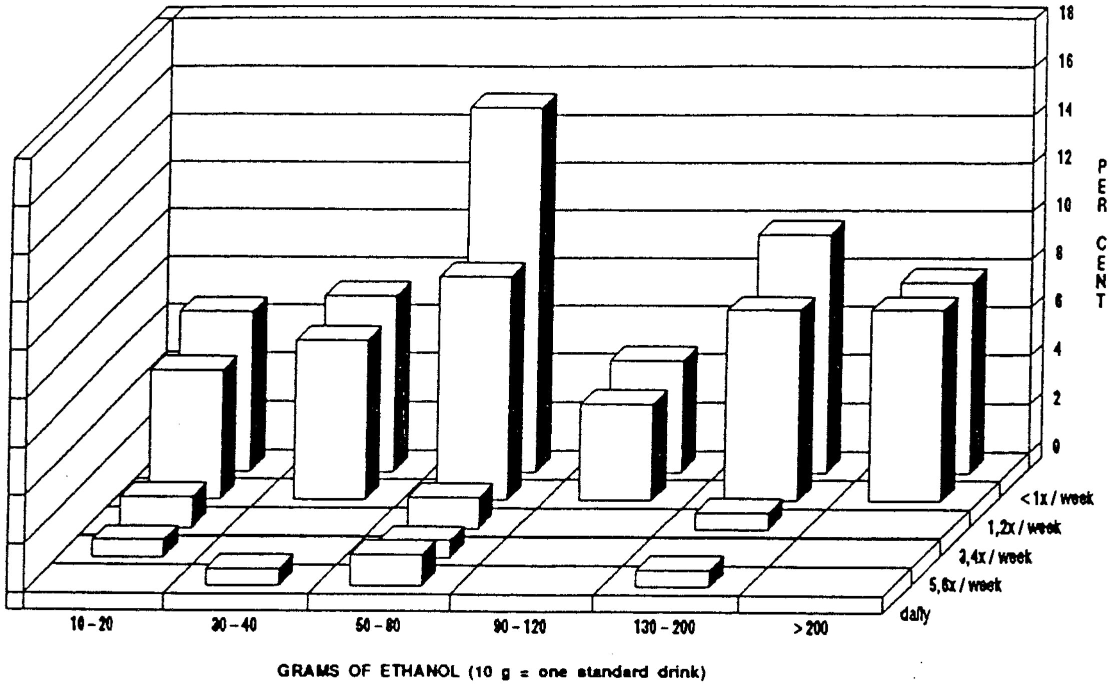


Figure 6.1
Highest alcohol consumption in preceding month of male drivers and riders with a blood alcohol concentration of zero

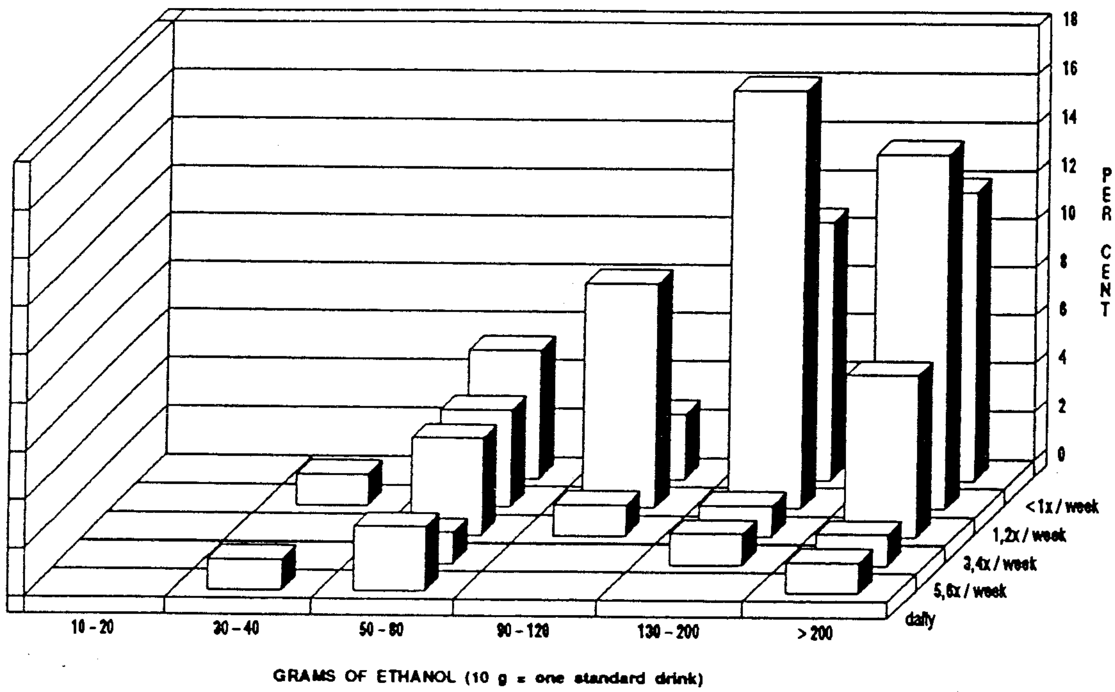


Figure 6.2
Highest alcohol consumption in preceding month of male drivers and riders with a blood alcohol concentration of .080 or above

proportions of, respectively, the zero and high BAC groups in each category of consumption. The modal category within each group, namely 5 to 8 standard drinks less than once a week among those with a zero BAC, and 13 to 20 drinks once or twice a week among those with a high BAC, is one indicator of the greater quantity and frequency of drinking within the latter group.

Estimates of risk have been associated with these categories of consumption (National Heart Foundation, 1980); the relationship between the two is depicted in Figure 6.3. According to L. Drew (personal communication, July 1989), the risk categories relate to the risk of experiencing any significant alcohol-related problem, either physical or social.

Frequency \ Quantity (no. of drinks)	1 or 2	3 or 4	5 to 8	9 to 12	13 to 20	More than 20
Less than once a week	A	A	A	B	C	D
1 or 2 days per week	A	A	A	B	C	D
3 or 4 days per week	A	A	B	C	D	E
5 or 6 days per week	A	B	C	D	E	E
Every day	A	B	C	D	E	E

	Male drinkers:	Female drinkers:
A	No risk	Low risk
B	Low risk	Intermediate risk
C	Intermediate risk	High risk
D	High risk	Very high risk
E	Very high risk	Very high risk

Figure 6.3
Quantity and frequency of alcohol consumption and the associated risk of developing alcohol-related problems

The relationship between risk and BAC is shown in Table 6.4. According to this classification, approximately one-half of those males with a BAC of zero are at no risk of developing alcohol-related problems if the present pattern of consumption is maintained, whereas at least two-thirds of those with a positive BAC fall into the intermediate, high or very high risk categories. The difference between the zero and high BAC groups was statistically significant (x^2=37.6, 3df, p<.001).

Table 6.4
Risk of developing alcohol-related problems by blood alcohol concentration (males)

Risk Level	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
None	52.3%[1]	15.4	14.3	7.5
Low	10.6	19.2	20.0	15.0
Intermediate	19.9	15.4	42.9	25.0
High, very high	17.2	50.0	22.9	52.5
Total: %	100.0	100.0	100.0	100.0
No.	151	26	35	40

[1] % of total cases

The drivers and riders were asked how many times during the preceding month they had consumed enough alcohol to feel intoxicated (Table 6.5). The results indicate that about one-third of those with a zero BAC reported drinking at least to the point of intoxication on average one or more times a week, compared with about one-half of those with a BAC between .001 and .079 and between .080 and .149, and four-fifths of those with BACs of .150 or above. The difference between the zero and high BAC groups was again statistically significant (x^2=32.9, 3df, p<.001), with the latter being more likely to report a greater number of intoxications.

The drivers and riders were also questioned about the frequency with which they drink to excess; the definition of excessive drinking was left to individual interpretation. Table 6.6 indicates that as BAC increases, so too does the proportion reporting at least weekly excessive drinking. The opposite pattern is observed with respect to the proportion who reported rarely or never drinking to excess. Again, a statistically significant difference was found between those with a zero and high BAC (x^2=34.1, 3df, p<.001).

Table 6.5
Self-reported number of intoxications in preceding month by blood alcohol concentration (males)

Number	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
None	36.6%[1]	15.4	17.1	5.0
1-3	32.0	30.8	31.4	12.5
4-8	23.5	26.9	31.4	47.5
9+	7.8	26.9	20.0	35.0
Total: %	100.0	100.0	100.0	100.0
No.	153	26	35	40

[1] % of total cases

Table 6.6
Self-reported frequency of excessive drinking by blood alcohol concentration (males)

Frequency	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
At least once/week	6.7%[1]	11.5	19.4	30.8
1-3 times/month	10.7	30.8	16.1	30.8
Few times/year	53.3	38.5	58.1	35.9
Rarely/never	29.3	19.2	6.5	2.6
Total: %	100.0	100.0	100.0	100.0
No.	150	26	31	39

[1] % of total cases

The frequency of binge drinking, defined as drinking for two or more days without attending to most of the things one would normally do, is presented in Table 6.7. One-quarter of those with a BAC of at least .150 reported six or more binges during the past year, compared with only a small proportion of those with lower BACs. Overall, the difference between the zero and high BAC groups was statistically significant (x^2=34.7, 2df, p<.001).

Based on the times they drank in the month preceding the crash, each individual was asked whether they drank frequently, occasionally, or not at all in certain circumstances. The percentages of each BAC group who reported drinking at least occasionally in specified locations, with particular types of people, and for specific reasons are shown in

Tables 6.8, 6.9 and 6.10, respectively. Chi-square analyses were used to compare the percentages of the zero and high BAC groups reporting at least occasional drinking (as opposed to never drinking) in the specified circumstances.

Table 6.7
Self-reported frequency of binge drinking by blood alcohol concentration (males)

Frequency	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
At least 6 times/year	0.7%[1]	8.0	2.9	25.6
1-5 times/year	11.2	24.0	26.5	30.8
Rarely/never	88.2	68.0	70.6	43.6
Total: %	100.0	100.0	100.0	100.0
No.	152	25	34	39

[1] % of total cases

Table 6.8 indicates that, for each of the two groups with BACs at or above .080, the most frequently nominated location of drinking was a hotel: more than 90% reported drinking there at least occasionally during the preceding month. In contrast, both groups with BACs under .080 most commonly reported drinking at the homes of friends or relatives. It is also interesting to note that more than one-third of those with BACs of at least .080 reported that they had consumed alcohol in a motor vehicle.

Comparisons between the zero and high BAC groups revealed that a significantly greater percentage of those with high BACs reported drinking at least occasionally in a bar or hotel, in a motor vehicle (both $p<.001$), at a public function such as a sports match or a concert, at a party, and at a disco or dance (all $p<.01$). No significant differences were evident with respect to the proportions who reported drinking at least occasionally in a private home (either their own or someone else's), at a restaurant, or outdoors in a public place.

Table 6.9 indicates that the vast majority of each BAC group reported that, in the previous month, they had at least occasionally consumed alcohol in the company of friends. More than one-half of each group also reported drinking with their partner, and with other relatives: no statistically significant differences were apparent between the zero and high BAC groups. However, those with a high BAC were significantly more likely than those with a BAC of zero to report drinking on their own ($p<.01$), and with others, namely strangers, casual acquaintances or work associates (p<.001). It is also of note that drinking alone at least occasionally was reported by more of those with a BAC of at least .150 than of those with a BAC between .080 and .149.

Table 6.8
Percentage reporting at least occasional drinking in specified locations by blood alcohol concentration (males)

Location	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
Home	73.2%	68.0	62.9	78.0
Other's home	75.8	88.0	74.3	80.5
Bar, hotel etc	58.2	68.0	91.4	92.7
Restaurant	26.8	32.0	28.6	34.1
Party	46.4	64.0	68.6	65.9
Disco	23.5	40.0	40.0	41.5
Public function	14.4	16.0	28.6	36.6
Outdoors	23.5	40.0	37.1	31.7
Vehicle	11.1	28.0	34.3	43.9
Total no.	153	25	35	41

Table 6.9
Percentage reporting at least occasional drinking in specified company by blood alcohol concentration (males)

Company	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
Alone	22.9%	16.0	31.4	48.8
Partner	56.2	60.0	54.3	51.2
Other relatives	59.5	52.0	65.7	63.4
Friends	94.1	100.0	97.1	97.6
Others	16.3	28.0	51.4	41.5
Total no.	153	25	35	41

Fifteen different reasons for drinking were described to the drivers and riders. Table 6.10 shows that for each BAC group, at least occasional drinking was most commonly reported for the following reasons: to be sociable, to celebrate, and for the enjoyment of the taste. Moreover, at least three-quarters of each group reported drinking for the above-mentioned reasons. However, more than one-half of those with a BAC of .150 or above also reported that they drank either occasionally or frequently to relieve tension, to cheer up, to relieve loneliness or boredom, to get drunk, or to feel lively and funny. In contrast, at least occasional drinking was not reported by more than one-half of any other BAC group for any other specified reason, with the exception of drinking to get drunk or to feel lively and funny among those with a BAC between .001 and .079.

Table 6.10
Percentage reporting at least occasional drinking for specified reasons by blood alcohol concentration (males)

Reason	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
Relieve tension, relax	22.9%	32.0	38.2	56.1
Forget worries	14.4	20.0	35.3	48.8
Relieve aches, pains	4.6	12.0	11.8	22.0
Be sociable	90.2	88.0	97.1	92.7
Cheer up	28.1	40.0	47.1	58.5
Anger, frustration	9.8	16.0	23.5	39.0
Relieve stress	13.7	24.0	26.5	36.6
Increase confidence	10.5	12.0	17.6	29.3
Get to sleep	12.4	12.0	8.8	22.0
Peer pressure	11.1	12.0	8.8	14.6
Enjoy taste	73.9	80.0	82.4	85.4
Loneliness, boredom	14.4	32.0	26.5	53.7
Celebrate	81.7	88.0	85.3	87.8
Get drunk	30.1	60.0	44.1	65.9
Feel lively, funny	34.6	64.0	41.2	53.7
Total no.	153	25	34	41

A significantly larger percentage of the high BAC group than the zero BAC group reported that they drank at least occasionally for the following reasons: to relieve aches and pains, to relieve stress, to increase self-confidence (all p<.01), to relieve tension, to forget worries, to cheer up, because of anger or frustration, to relieve loneliness or boredom, or to get drunk (all p<.001). In this context, it is pertinent to note from the table that wherever a significant difference was found, the two high BAC groups also differed from each other: the percentages derived from those with BACs between .080 and .149 lie between those of the zero and highest BAC groups.

In response to a question on preferred type of alcohol, 248 of the 254 respondents nominated either beer, wine or spirits; the remainder had no preference. The beverage preferences of the former group are shown in Table 6.11.

Table 6.11
Preferred beverage type by blood alcohol concentration (males)

Beverage	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
Beer	60.4%[1]	70.8	88.2	82.9
Wine	10.7	-	2.9	2.4
Spirits	28.9	29.2	8.8	14.6
Total: %	100.0	100.0	100.0	100.0
No.	149	24	34	41

[1] % of total cases

Table 6.12
Mean age at specified stages of drinking history by blood alcohol concentration (males)

Stage	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
Onset of social drinking	17.0 (2.6)[1] (150)[2]	16.8 (3.1) (25)	16.8 (1.7) (35)	16.6 (2.2) (40)
First hangover	17.7 (2.8) (123)	16.4 (1.4) (23)	17.5 (2.5) (34)	17.2 (3.2) (40)
First intoxication	17.4 (2.7) (143)	16.4 (1.5) (24)	17.1 (2.2) (35)	17.0 (3.0) (41)

[1] standard deviation
[2] number of cases

The majority of each BAC group reported a preference for beer. Although wine was the preferred beverage for about one-tenth of the zero BAC group, almost nobody with a positive BAC preferred it. About three-tenths of both groups with BACs below .080 nominated spirits, compared with under 15% of the high BAC groups. The difference in preferred type of beverage between the zero and high BAC groups was significant (x^2=14.7, 2df, p<.001).

The drivers and riders were asked the ages at which they first began to drink socially, had a hangover, and drank enough to feel intoxicated. As seen from Table 6.12, only minor differences were evident between groups and, as such, the zero/high BAC group comparisons did not yield significant differences (social drinking: $t_{223}=1.1$, $p<.30$; hangover: $t_{195}=0.8$, $p<.50$; intoxication: $t_{217}=0.8$, $p<.50$).

6.2.2 Problem drinking

The drivers and riders were asked whether they believed their drinking was a problem for them. (When a respondent reported that although he might drink too much, his drinking was nevertheless not a problem for him, he was not recorded as having a drinking problem.) A greater proportion of those with a high BAC than of those with a zero BAC reported a drinking problem: one-fifth (19.5%) of those with a BAC of at least .150 felt that they currently had a drinking problem, compared with only a very small proportion in each of the other three BAC groups (zero BAC: 2.0%; .001-.079: 4.0%; .080-.149: 2.9%). Expected cell frequencies were, however, too small to enable meaningful chi-square analysis.

Among those who reported no current drinking problem, a previous drinking problem was reported by 7.3%, 4.2%, 23.5%, and 9.1% respectively of the four BAC groups; the difference between the zero and high BAC groups was statistically significant ($x^2=4.4$, 1df, $p=.037$).

Each individual was asked to complete two alcoholism screening inventories: the 25-item Alcohol Dependence Scale (ADS; Skinner & Horn, 1984), and six items of the revised Michigan Alcoholism Screening Test, or MAST (items 10,12,13,15,19,20; Selzer, Vinokur, & van Rooijen, 1975). Although overall the high BAC group achieved a significantly higher mean score on both inventories than did the zero BAC group (MAST: $t_{205}=4.2$, $p<.001$; ADS: $t_{205}=4.5$, $p<.001$), Table 6.13 indicates that the scores of those with a BAC of between .080 and .149 were in fact similar to those of the zero BAC group, whereas higher scores were evident among those with a BAC of .150 or above. It is also important to note that although the possible score range for the ADS is zero to 47, the highest score within the current sample was 24, and a score of 14 or above (suggestive of at least a moderate level of alcohol dependence) was obtained by 5 of 139, 2 of 24, none of 31, and 8 of 37 males in the four respective BAC groups.

Table 6.13
Mean scores on alcoholism screening inventories by blood alcohol concentration (males)

Inventory	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
MAST	0.1 (0.4)[1]	0.1 (0.4)	0.3 (0.7)	0.6 (1.1)
ADS	3.4 (3.9)	5.6 (5.2)	4.2 (4.1)	8.3 (6.5)
Total no.	139	24	31	37

[1] standard deviation

Elevated levels of liver enzymes are considered to be a possible marker of chronic heavy use of alcohol (eg Whitehead, Clarke & Whitfield, 1978). However, Table 6.14 shows that for each of the four enzymes (GGT: gamma glutamyltransferase; AST: aspartate aminotransferase; ALT: alanine aminotransferase; ALP: alkaline phosphotase), at least one-fifth of each BAC group obtained levels above the normal range (ie GGT: >45 U/l; AST: >25 U/l; ALT: >40 U/l; ALP: >120 U/l). Moreover, in no instance was there a statistically significant difference between the zero and high BAC groups (GGT: x^2=1.4, 1df, p=.246; AST: x^2=2.3, 1df, p=.133; ALT: x^2=1.6, 1df, p=.201; ALP: x^2=1.4, 1df, p=.241).

Table 6.14
Percentage with elevated levels of specified liver enzymes by blood alcohol concentration (males)

Enzyme	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
GGT	29.3%	21.4	31.8	45.2
AST	55.2	57.1	77.3	58.1
ALT	28.2	21.4	39.1	37.5
ALP	25.9	28.6	26.1	40.6
Total no.	116	14	23	32

6.2.3 Drink-driving behaviour

A strong positive relationship was evident between previous licence suspension arising from an alcohol-related driving conviction and BAC: one-third of those with a high BAC reported having lost their licence at least once because of drink-driving, compared with

7.8% of those with a zero BAC (x^2=23.1, 1df, p<.001). More specifically, for those with BACs in the .001 to .079, .080 to .149, and .150 or above ranges, the comparable figures were 19.2%, 28.6%, and 38.1%, respectively.

The drivers and riders were asked to what extent their driving would generally be affected after one or two drinks, and also after eight or more drinks. Table 6.15 indicates the proportions who felt that their driving would be impaired.

Table 6.15
Percentage expecting specified alcohol intake to impair driving ability by blood alcohol concentration (males)

Intake	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
10-20 g	14.5%	8.0	-	5.1
80+ g	90.1	84.0	77.1	76.9
Total no.	151	25	35	39

Overall, relatively few believed that one or two drinks would impair their driving. Nevertheless, those with a high BAC were significantly less likely than those with a zero BAC to report impairment (x^2=7.3, 1df, p=.007). Although more than three-quarters of each BAC group indicated that their driving would be impaired after consuming at least eight drinks, a significantly lower percentage of the high BAC group reported probable impairment (x^2=6.9, 1df, p=.009).

The number of occasions in the month prior to the crash on which the respondent drove within two hours of consuming any alcohol is shown in Table 6.16, from where it is apparent that the number of drink-driving occasions increases with increasing BAC. The difference between the zero and high BAC groups was statistically significant (x^2=30.5, 3df, p<.001).

They were also asked on how many of these occasions they may have had a BAC of .080 or above. Table 6.17 reports this information for those individuals who reported at least one episode in the past month of driving within two hours of drinking. Although a significant difference was found between the zero and high BAC groups (categories: none, 1-3, 4+; x^2=26.3, 2df, p<.001), it is evident from the table that, compared to those with a BAC between .080 and .149, those with a BAC of at least .150 were not only more likely to have driven with a high BAC, but also to have done so more often. Of the latter group, almost two-thirds reported doing so at least once a week, on average.

Table 6.16
Self-reported number of driving occasions within two hours of drinking in preceding month by blood alcohol concentration (males)

Number	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
None	38.2%[1]	20.0	11.4	12.8
1-3	31.6	36.0	28.6	12.8
4-8	19.7	24.0	40.0	38.5
9+	10.5	20.0	20.0	35.9
Total: %	100.0	100.0	100.0	100.0
No.	152	25	35	39

[1] % of total cases

Table 6.17
Self-reported number of driving occasions with estimated BAC of at least .08 in preceding month by blood alcohol concentration (males)

Number	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
None	67.0%[1]	35.0	45.2	17.6
1-3	23.4	45.0	38.7	20.6
4-8	8.5	10.0	12.9	50.0
9+	1.1	10.0	3.2	11.8
Total: %	100.0	100.0	100.0	100.0
No.	94	20	31	34

[1] % of total cases

Table 6.18 provides information about drink-driving within the peer groups of the crash-involved drivers and riders. More specifically, the drivers and riders reported how many of their friends would drive if they were probably over the .08 legal limit.

Table 6.18
Reported number of friends who would drive with estimated BAC of at least .08 by blood alcohol concentration (males)

Number	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
Most	31.8%[1]	40.0	34.3	70.0
Few	20.3	16.0	22.9	20.0
One or two	32.4	28.0	37.1	7.5
None	15.5	16.0	5.7	2.5
Total: %	100.0	100.0	100.0	100.0
No.	148	25	35	40

[1] % of total cases

Relatively few differences were seen between each of the groups with a BAC below .150: approximately one-third of each of these groups reported that most of their friends would drive under these circumstances. (It is important to note that the frequency of driving at a high BAC was not examined.) However, those with a BAC of at least .150 were twice as likely to report that most of their friends would drive with a BAC of .08 or above. It is also noteworthy that only a very small proportion of both high BAC groups reported that no friends are likely to drive with a high BAC. A statistically significant overall difference was found between the zero and high BAC groups (x^2=13.8, 3df, p=.003) and marked differences were evident between the two high BAC groups, as noted above.

6.2.4 Exposure to, and attitudes towards, drink-driving countermeasures

One-fifth of those with a BAC of .150 or above reported that they had been breath tested at a random breath testing station, as did 28% of those with lower BACs (Table 6.19): the difference between the zero and high BAC groups was not significant (x^2=0.5, 1df, p=.486). Fewer drivers and riders were breath tested either under suspicion of DUI (driving under the influence) or for other reasons. Again, no differences between the zero and high BAC groups were evident.

The drivers and riders were also asked how many times they had seen a random breath testing (RBT) unit in operation in the preceding year; their responses are shown in Table 6.20. No more than one-fifth of each BAC group reported never having seen an RBT operation during this time, whereas at least one-fifth had seen more than ten. Overall, no significant difference was found between the zero and high BAC groups (x^2=6.5, 4df, p=.168).

Table 6.19
Percentage reporting being breath tested under specified circumstances in preceding year by blood alcohol concentration (males)

Circumstance	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
RBT	28.4%	28.0	28.6	20.0
DUI check	0.7	12.0	-	5.0
Other	6.1	16.0	2.9	12.5
Total no.	148	25	35	40

Table 6.20
Reported number of random breath testing operations seen in preceding year by blood alcohol concentration (males)

Number	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
None	15.5%[1]	4.0	20.0	17.5
1,2	20.3	8.0	14.3	27.5
3-5	14.2	40.0	28.6	22.5
6-10	17.6	28.0	14.3	12.5
11+	32.4	20.0	22.9	20.0
Total: %	100.0	100.0	100.0	100.0
No.	148	25	35	40

[1] % of total cases

The number of friends and acquaintances known to have been tested in the preceding year was used as another measure of exposure to RBT. As seen from Table 6.21, about two-thirds reported knowing someone who had been random breath tested; there were relatively few differences either between the four BAC groups or between the zero and high BAC groups (x^2=0.4, 2df, p=.811).

Table 6.21
Reported number of friends/acquaintances known to have been random breath tested in preceding year by blood alcohol concentration (males)

Number	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
None	34.0%[1]	25.0	38.2	37.5
1-5	45.6	54.2	41.2	47.5
6+	20.4	20.8	20.6	15.0
Total: %	100.0	100.0	100.0	100.0
No.	147	24	34	40

[1] % of total cases

Table 6.22
Percentage agreeing with specified drink-driving statements by blood alcohol concentration (males)

Statement	BAC (g/100mL)			
	zero	.001-.079	.080-.149	.150+
No one should ever drive after drinking any amount of alcohol				
	28.3% (152)[1]	24.0 (25)	14.3 (35)	10.0 (40)
The legal blood alcohol limit of .08 is not strict enough				
	46.4 (151)	32.0 (25)	20.0 (35)	17.5 (40)
Not enough arrests are made for impaired driving				
	79.7 (148)	72.0 (25)	60.0 (35)	75.0 (40)
The police should do more random breath testing				
	69.4 (147)	72.0 (25)	68.6 (35)	55.0 (40)
My family would not want me to drive soon after having 3 or 4 drinks				
	82.1 (151)	68.0 (25)	71.4 (35)	64.1 (39)
At a party I usually drink the same amount whether I am driving or not				
	10.5 (143)	20.8 (24)	23.5 (34)	30.8 (39)
After a party I usually drive home, irrespective of how much I've drunk				
	13.2 (151)	24.0 (25)	25.7 (35)	25.6 (39)

[1] number of cases

Seven statements about drinking and driving were presented to the drivers and riders who were then asked to what extent they agreed or disagreed with each statement (ie agree strongly, agree somewhat, neither agree nor disagree, disagree somewhat, disagree strongly). The percentage agreeing with each statement is shown in Table 6.22.

The proportion who agreed that one should not drive after drinking any alcohol decreased with increasing BAC; the difference between the zero and high BAC groups was significant (x^2=7.6, 1df, p=.006). A similar pattern was evident with respect to reducing the then legal blood alcohol limit: the proportion in agreement with this ranged from almost one-half of those with a zero BAC to almost one-fifth of those in the highest BAC group, and the zero/high BAC group difference was significant (x^2=16.5, 1df, p<.001).

The majority of those in each BAC group believed that more people should be arrested for impaired driving, and that more RBT should be conducted. However, no direct relationship was found between BAC and either of these two statements, and the differences between the zero and high BAC groups were not statistically significant (x^2=3.7, 1df, p=.053 and x^2=1.5, 1df, p=.229, respectively).

Although the majority in each BAC group reported that their family would not want them to drive soon after consuming three or four drinks, those with a zero BAC were nevertheless significantly more likely to agree than were those with a high BAC (x^2=6.0, 1df, p=.014). As BAC increased, so too did the percentage reporting that they drink the same amount irrespective of whether they will be driving. In other words, those with a high BAC were significantly less likely than those with a BAC of zero to modify their drinking if they were going to drive (x^2=10.2, 1df, p=.001). (Those who claimed never to drink to a level that would affect their driving were excluded from this analysis.) The drivers and riders were also asked about modification of driving: about one-quarter of those with a positive BAC reported that they usually drive home, irrespective of their prior alcohol consumption, compared to about half this proportion in the zero BAC group. The difference between the zero and high BAC groups was significant (x^2=5.4, 1df, p=.021).

6.3 FEMALE DRIVERS

It was noted in Section 4.3 that, in most instances, the number of female drivers with a high BAC was too small to enable meaningful statistical analysis. Therefore throughout this section the data are again merely presented, without determining the statistical significance of any differences between the zero and high BAC groups.

6.3.1 Drinking pattern

Forty-six of the 61 female drivers with known BACs recorded a BAC of zero. Of these, 33 (71.7%) reported alcohol consumption in the month prior to the crash, six (13.0%) stated that they drank a small quantity only very infrequently, six (13.0%) claimed to be total abstainers, and one (2.2%) did not drink in the preceding month although she did usually drink. Two females, both drinkers, had a BAC between .001 and .079, but because of the very small size of this group, their results are not presented. A BAC between .080 and .149 was obtained by nine females, comprising eight drinkers, and one who drank only on the day of the crash and was therefore excluded. All four women with a BAC of .150 or above reported that they had consumed alcohol in the preceding month.

Table 6.23 shows the women's drinking pattern during the preceding month, compared with that during a typical month. There is a suggestion of an increase in the amount of consumption by the women with a high BAC.

Table 6.23
Self-reported quantity of alcohol consumption in preceding month relative to a typical month by blood alcohol concentration (females)

Quantity	BAC (g/100mL)	
	zero	.080+
Greater	3.0%[1]	33.3
Equivalent	87.9	58.3
Less	9.1	8.3
Total: %	100.0	100.0
No.	33	12

[1] % of total cases

The number of days on which drinking occurred in the month prior to the crash is shown in Table 6.24. All females with a high BAC drank at least once a week on average (ie four or more days in the month), whereas about one-third of the women with a zero BAC drank less than weekly.

The quantity of alcohol most frequently consumed by the women is shown in Table 6.25. Those with a high BAC appear more likely to report higher levels of consumption. It is also worth noting that, in marked contrast to the males, no female reported a modal consumption level in excess of 80 grams.

Table 6.24
Self-reported number of drinking days in preceding month by blood alcohol concentration (females)

No. of Days	BAC (g/100mL)	
	zero	.080+
1-3	36.4%[1]	-
4-8	42.4	66.7
9-16	3.0	25.0
17-24	15.2	8.3
25-31	3.0	-
Total: %	100.0	100.0
No.	33	12

[1] % of total cases

Table 6.25
Self-reported quantity of alcohol most frequently consumed in preceding month by blood alcohol concentration (females)

Quantity (g)	BAC (g/100mL)	
	zero	.080+
5-20	45.5%[1]	8.3
25-40	36.4	25.0
45-80	18.2	66.7
85+	-	-
Total: %	100.0	100.0
No.	33	12

Note: 10g of alcohol = one standard drink
[1] % of total cases

The majority of women in both BAC groups were found to be at low risk of developing alcohol-related problems, based on their current reported pattern of consumption (Table 6.26). Nevertheless, a larger proportion of those with a high BAC than of those with a BAC of zero were classified as having at least an intermediate risk of developing such problems.

Table 6.26
Risk of developing alcohol-related problems by blood alcohol concentration (females)

Risk Level	BAC (g/100mL)	
	zero	.080+
Low	81.8%[1]	58.3
Intermediate	9.1	8.3
High	6.1	25.0
Very high	3.0	8.3
Total: %	100.0	100.0
No.	33	12

[1] % of total cases

Table 6.27 indicates that two-thirds of those with a zero BAC, but only one of the twelve women with a high BAC, reportedly never drank to the point of intoxication during the preceding month.

Table 6.27
Self-reported number of intoxications in preceding month by blood alcohol concentration (females)

Number	BAC (g/100mL)	
	zero	.080+
None	66.7%[1]	8.3
1-3	24.2	66.7
4-8	9.1	16.7
9+	-	8.3
Total: %	100.0	100.0
No.	33	12

[1] % of total cases

The reported frequency of excessive drinking is shown in Table 6.28. All of the women with a BAC of .080 or above reported drinking to excess at least a few times a year, compared to only one-half of those with a zero BAC.

Table 6.28
Self-reported frequency of excessive drinking by blood alcohol concentration (females)

Frequency	BAC (g/100mL)	
	zero	.080+
At least once/week	-	8.3
1-3 times/month	3.1%[1]	8.3
Few times/year	46.9	83.3
Rarely/never	50.0	-
Total: %	100.0	100.0
No.	32	12

[1] % of total cases

Most of the women in either BAC group reported only very rarely or never having experienced binge drinking (Table 6.29).

Table 6.29
Self-reported frequency of binge drinking by blood alcohol concentration (females)

Frequency	BAC (g/100mL)	
	zero	.080+
At least 6 times/year	-	-
1-5 times/year	6.1%[1]	16.7
Rarely/never	93.9	83.3
Total: %	100.0	100.0
No.	33	12

[1] % of total cases

Tables 6.30, 6.31 and 6.32 show the percentages of women in the zero and high BAC groups who stated that they drank at least occasionally in specified locations, in specified company, and for specific reasons.

As seen in Table 6.30, among women in the high BAC group, the most frequently nominated drinking location was a hotel, which was nominated by all except one. It is worth noting that a similar proportion of their male counterparts likewise reported drinking in a hotel at least occasionally in the preceding month. More than two-thirds of the women with a BAC of .080 or above also reported at least occasionally drinking in a restaurant, in their own home, and at the homes of friends or relatives. The zero BAC group most commonly reported drinking in either their own or someone else's home. The largest difference between the two BAC groups was with respect to the proportions who reported drinking in an hotel.

Table 6.30
Percentage reporting at least occasional drinking in specified locations by blood alcohol concentration (females)

Location	BAC (g/100mL)	
	zero	.080+
Home	69.7%	75.0
Other's home	57.6	66.7
Bar, hotel etc	33.3	91.7
Restaurant	39.4	75.0
Party	21.2	41.7
Disco	24.2	41.7
Public function	3.0	16.7
Outdoors	9.1	25.0
Vehicle	-	-
Total no.	33	12

Table 6.31
Percentage reporting at least occasional drinking in specified company by blood alcohol concentration (females)

Company	BAC (g/100mL)	
	zero	.080+
Alone	18.8%	41.7
Partner	68.8	50.0
Other relatives	43.8	41.7
Friends	81.3	91.7
Others	9.4	16.7
Total no.	32	12

Table 6.31 indicates that, in general, the two BAC groups were relatively similar with respect to their drinking company. Most reported that they drank at least occasionally

with friends, and at least one-half did so with their partner. However, the high BAC group was more than twice as likely as the zero BAC group to report drinking alone at least occasionally.

Table 6.32 shows that for both BAC groups, at least occasional drinking was most commonly reported for the following reasons: to be sociable, to celebrate, and for the enjoyment of the taste. Moreover, these were the only reasons nominated by more than one-half of either group. It is also interesting to note that the responses to some of the other specified reasons suggest that the high BAC women may have been more likely than those with a BAC of zero to use alcohol as a coping mechanism.

Table 6.32
Percentage reporting at least occasional drinking for specified reasons by blood alcohol concentration (females)

Reason	BAC (g/100mL)	
	zero	.080+
Relieve tension, relax	28.1%	50.0
Forget worries	6.3	33.3
Relieve aches, pains	-	-
Be sociable	93.8	83.3
Cheer up	18.8	25.0
Anger, frustration	15.6	33.3
Relieve stress	6.3	33.3
Increase confidence	6.3	16.7
Get to sleep	6.3	8.3
Peer pressure	-	8.3
Enjoy taste	62.5	83.3
Loneliness, boredom	9.4	16.7
Celebrate	71.9	83.3
Get drunk	12.5	8.3
Feel lively, funny	18.8	16.7
Total no.	32	12

Among those women who nominated either beer, wine or spirits as their preferred drink, about one-half of both BAC groups nominated spirits (Table 6.33). Whereas most males preferred beer, only one-tenth of each female group did so.

Table 6.33
Preferred beverage type
by blood alcohol concentration (females)

Beverage	BAC (g/100mL)	
	zero	.080+
Beer	11.1%[1]	9.1
Wine	40.7	36.4
Spirits	48.1	54.5
Total: %	100.0	100.0
No.	27	11

[1] % of total cases

The mean ages at various points in the women's drinking histories are presented in Table 6.34: no marked differences were apparent.

Table 6.34
Mean age at specified stages of drinking history
by blood alcohol concentration (females)

Stage	BAC (g/100mL)	
	zero	.080+
Onset of social drinking	19.4 (6.3)[1]	19.9 (5.4)
	(32)[2]	(12)
First hangover	18.9 (3.5)	20.3 (5.8)
	(24)	(10)
First intoxication	19.5 (5.4)	19.9 (5.4)
	(26)	(12)

[1] standard deviation
[2] number of cases

6.3.2 Problem drinking

Of those with a BAC of zero, 6.1% felt they had a drinking problem, compared with 16.7% of those with a high BAC. Among those without a current drinking problem, a previous drinking problem was reported by two of the thirty-one women with a zero BAC, and one of the ten with a high BAC.

The scores on the alcoholism screening inventories varied considerably between individuals and, given the small sample sizes, this prevents the calculation of an interpretable mean score. Overall, only two of the forty-three women who completed the ADS obtained a score of 14 or above (which suggests at least moderate alcohol dependence); both had a high BAC.

Table 6.35 shows that for each of the four liver enzymes, similar proportions of both groups of women obtained levels above the normal range (ie GGT: >30 U/l; AST: >25 U/l; ALT: >40 U/l; ALP: >120 U/l).

Table 6.35
Percentage with elevated levels of specified liver enzymes by blood alcohol concentration (females)

Enzyme	BAC (g/100mL)	
	zero	.080+
GGT	30.8%	25.0
AST	36.0	50.0
ALT	23.1	37.5
ALP	19.2	12.5
Total no.	26	8

6.3.3 Drink-driving behaviour

Two of the forty-five women reported having previously lost their licence because of drink-driving; both had a high BAC at the time of admission to hospital.

Table 6.36 indicates the proportion of women who felt that their driving would be impaired after consuming one or two standard drinks, and after eight or more. Those with a zero BAC were somewhat more likely than those with a high BAC to believe that one or two drinks would impair their driving. Almost all women, irrespective of BAC, believed that the consumption of eight or more drinks would lead to driving impairment.

Table 6.36
Percentage expecting specified alcohol intake to impair driving ability by blood alcohol concentration (females)

Intake	BAC (g/100mL)	
	zero	.080+
10-20 g	30.3%	-
80+ g	90.9	100.0
Total no.	33	12

The reported number of occasions during the month before the crash on which the women drove within two hours of drinking any alcohol is shown in Table 6.37. No such occasions were reported by almost two-thirds of the zero BAC group, compared with only one-third of the high BAC group.

Table 6.37
Self-reported number of driving occasions within two hours of drinking in preceding month by blood alcohol concentration (females)

Number	BAC (g/100mL)	
	zero	.080+
None	63.6%[1]	33.3
1-3	21.2	33.3
4-8	9.1	25.0
9+	6.1	8.3
Total: %	100.0	100.0
No.	33	12

[1] % of total cases

Of those women who reported driving at least once within two hours of drinking, nine of the twelve women with a zero BAC and all eight of those with a high BAC believed that on no occasion would they have exceeded the then legal limit of.08.

Table 6.38 indicates how many of their friends the women believed would drive if they thought they had a BAC of .08 or above. Those with a high BAC were somewhat more likely than those with a BAC of zero to report that at least one of their friends would drive under these circumstances.

Table 6.38
Reported number of friends who would drive with estimated BAC of at least .08 by blood alcohol concentration (females)

Number	BAC (g/100mL)	
	zero	.080+
Most	12.1%[1]	8.3
Few	21.2	25.0
One or two	33.3	58.3
None	33.3	8.3
Total: %	100.0	100.0
No.	33	12

[1] % of total cases

6.3.4 Exposure to, and attitudes towards, drink-driving countermeasures

As seen in Table 6.39, approximately one-fifth of the women with a BAC of zero reported that they had been breath tested at an RBT station during the preceding year, and one other woman had been tested under other circumstances. In contrast, none of those with a high BAC reported having been breath tested by the police in the year prior to the crash.

The number of RBT operations allegedly seen by the women is shown in Table 6.40: both groups appear to have had similar exposure.

Table 6.39
Percentage reporting being breath tested under specified circumstances in preceding year by blood alcohol concentration (females)

Circumstance	BAC (g/100mL)	
	zero	.080+
RBT	21.2%	-
DUI check	-	-
Other	3.0	-
Total no.	33	12

Table 6.40
Reported number of random breath testing operations seen in preceding year by blood alcohol concentration (females)

Number	BAC (g/100mL)	
	zero	.080+
None	30.3%[1]	16.7
1,2	12.1	25.0
3-5	24.2	33.3
6-10	12.1	16.7
11+	21.2	8.3
Total: %	100.0	100.0
No.	33	12

[1] % of total cases

Table 6.41
Reported number of friends/acquaintances known to have been random breath tested in preceding year by blood alcohol concentration (females)

Number	BAC (g/100mL)	
	zero	.080+
None	39.4%[1]	41.7
1-5	51.5	58.3
6+	9.1	0
Total: %	100.0	100.0
No.	33	12

[1] % of total cases

As seen in Table 6.41, approximately 60% of the women in both BAC groups knew of friends or acquaintances who had been random breath tested during the preceding year.

Table 6.42 shows the percentage of women agreeing with each of seven statements about drink-driving. Those with a BAC of zero were more likely than those with a high BAC to believe that no one should ever drive after drinking any amount of alcohol, and that the legal limit should be lower than .08 (the legal limit at that time). It is apparent from the table that similar proportions of the two BAC groups agreed with each of the remaining statements. More specifically, the majority of each BAC group supported more RBT and almost all supported more arrests for drink-driving. Most also agreed that their families would not want them to drive soon after having a few drinks, and that they would modify their drinking if they were going to drive, or not drive if they had drunk too much.

Table 6.42
Percentage agreeing with specified drink-driving statements by blood alcohol concentration (females)

Statement	BAC (g/100mL)	
	zero	.080+
No one should ever drive after drinking any amount of alcohol	39.4% (33)[1]	- (12)
The legal blood alcohol limit of .08 is not strict enough	57.6 (33)	16.7 (12)
Not enough arrests are made for impaired driving	90.9 (33)	90.9 (11)
The police should do more random breath testing	87.9 (33)	75.0 (12)
My family would not want me to drive soon after having 3 or 4 drinks	90.9 (33)	75.0 (12)
At a party I usually drink the same amount whether I am driving or not	14.8 (27)	16.7 (12)
After a party I usually drive home, irrespective of how much I've drunk	12.1 (33)	- (12)

[1] number of cases

6.4 DISCUSSION

6.4.1 Male drivers and riders

As a group, male drivers and riders with high BACs (ie .080 g/100mL or above) reported quite different patterns of drinking than did those with a zero BAC. They had a higher frequency of drinking, a higher frequency of both excessive and binge drinking, and a higher quantity of alcohol consumption. When the highest reported consumption (per session) in the month prior to the crash was classified simultaneously for quantity and frequency, the high BAC group's greater involvement with alcohol was again apparent. Moreover, when this consumption pattern was used to determine the risk of developing alcohol-related problems, it was found that at least two-thirds of those with a high BAC had at least an intermediate risk of developing problems if the reported pattern of consumption was maintained. In contrast, about one-half of those with a zero BAC showed no risk of developing such problems.

The zero and high BAC groups also differed with respect to where, with whom, and what they drank. For example, an hotel was the most commonly reported location of drinking by those with a BAC of at least .080, whereas the zero BAC group most commonly reported drinking at the homes of friends or relatives. Although each BAC group was just as likely as the other to report drinking with friends, their partner, or other relatives, solitary drinking and drinking with strangers, casual acquaintances or work associates was more frequently reported by the high BAC group. Beer was the preferred beverage for the majority in each BAC group, but those with a high BAC were nevertheless more likely than those with a zero BAC to prefer beer and, conversely, less likely to prefer wine or spirits.

In each BAC group, the most commonly reported reasons for drinking were to be sociable, to celebrate, and for the enjoyment of the taste. Moreover, similar proportions of the zero and high BAC groups reported drinking at least occasionally for these reasons. Each of the above-mentioned reasons reflect a positive state of mind and can be interpreted as being socially acceptable reasons for drinking. In contrast, a significantly larger percentage of the high BAC group than the zero BAC group reported that they drank at least occasionally for a number of reasons possibly indicative of some form of psychological trauma (eg to relieve stress, because of anger or frustration, to relieve loneliness or boredom). Thus, it is plausible that males with a high BAC, and particularly those with a BAC of at least .150, are more likely than those with a BAC of zero to use alcohol at least occasionally as a coping mechanism, albeit a maladaptive one.

One-fifth of those with a BAC of .150 or above felt that they had a current drinking problem, and a similar proportion obtained a score on the Alcohol Dependence Scale or ADS which was suggestive of at least a moderate level of alcohol dependence. Overall, the mean ADS score of this BAC group was higher than that of the other groups, of whom only a few reported a drinking problem. However, even the highest scores on the ADS were relatively low when compared with those obtained by normative samples undergoing treatment for alcohol dependence (Skinner & Horn, 1984). For two of the four liver enzymes, namely GGT and ALP, levels above the normal range were obtained by a larger proportion of those with BACs of .150 or above. In conjunction with each other, these results raise the possibility that a relatively small but nevertheless significant proportion (approximately one-fifth) of those with a BAC of at least .150 may be alcohol dependent. In contrast, individuals with a BAC between .080 and .149 appeared no more likely than those with lower BACs to show, or at least report, signs of dependence.

The results of this section also suggest that people with high BACs differ in their drink-driving behaviour to those with a BAC of zero: not only are the former less likely to believe that alcohol impairs their driving skills, but they also drink and drive more frequently. For example, more than one-half of those with BACs of .150 or above reported driving with a BAC perceived to be in excess of .08 at least once a week in the preceding month, on average, compared with only about one-tenth of those with a zero BAC. There were also differences in the reported drink-driving behaviour of the peer groups, in that those with a BAC of at least .150 were about twice as likely as the others to report that most of their friends would drive with a BAC of at least .08.

Data from this sample provide little support for the deterrent value of licence suspension resulting from drink-driving. This was particularly apparent among those with BACs at or above .150, almost 40% of whom reported previously having had their licence suspended because of an alcohol-related driving conviction.

Overall, about one-quarter reported that they had been random breath tested by the police in the year preceding the crash, about two-thirds knew of someone who had been tested, and about four-fifths said that they had seen an RBT unit in operation during this time. For each of these measures of exposure to random breath testing, the differences between groups were relatively small in magnitude.

The proportions who advocated reductions in the then legal limit of .08 decreased with increasing BAC. However, the zero and high BAC groups did not differ significantly in the extent to which they supported levels of enforcement operating at that time: the majority of each BAC group believed that the number of arrests for impaired driving should increase, as should the amount of RBT.

Reported acceptance of drink-driving, at a personal level, differed between groups. Drivers and riders with a zero BAC were significantly more likely than those with a high BAC to report not only that they would modify their drinking if they were going to drive, but also that they would not drive if they had drunk too much.

6.4.2 Female drivers

It must be emphasized that the number of women in this study was relatively small. This discussion therefore merely highlights apparent differences which should, however, be interpreted with caution.

Among female drivers who reported drinking during the month prior to the crash, some differences in drinking patterns were evident between women with BACs of zero and .080 or above. As a group, the women with high BACs were more likely to report drinking at least once a week, on average, as well as drinking a greater quantity than did women with a zero BAC. The reported frequency of drinking to the point of intoxication and of excessive drinking was higher among the high BAC women, but binge drinking was rarely reported by either group. Although the majority of women, irrespective of BAC, were not at risk of developing alcohol-related problems, based on their current drinking patterns, a larger proportion of the high BAC group were classified as having at least an intermediate risk of developing such problems.

An hotel was the most commonly reported location of drinking among women with a high BAC; moreover, a substantively larger proportion of these women than of those with a zero BAC reported at least occasional drinking in this location. In contrast, the zero BAC group most commonly reported drinking in a private home. In general, the reported drinking company of each group was similar, except that women with a high BAC appeared somewhat more likely to drink alone than did those with a zero BAC. The most commonly reported reasons for drinking within both BAC groups were to be sociable, to celebrate, and for the enjoyment of the taste. However, there was some indication that the women with a high BAC at the time of admission to hospital may have been more likely to use alcohol as a coping mechanism, for example by drinking in response to stress or tension, or to forget worries. About half of the women in both groups reported a preference for spirits, and about one-tenth preferred beer.

Results obtained by self-report and from screening inventories suggest, albeit tentatively, that 10-20% of the female drivers with high BACs may have a drinking problem.

There was little evidence overall to suggest that the drink-driving behaviour of women with a BAC of at least .080 differed markedly to that of those with a BAC of zero. Although women with a zero BAC were more likely than their high BAC counterparts to report driving impairment after only a couple of drinks, almost all women felt that driving impairment would result after eight or more drinks. Moreover, almost all believed that on no occasion in the month prior to the crash did they drive with a high BAC, although the majority did believe that at least one of their friends would drive in such a situation.

Although almost a quarter of the zero BAC group had been breath tested in the preceding year, not one of those with a high BAC had. However, both groups reported a similar number of sightings of RBT operations, and similar proportions knew of others who had been tested.

Women with a BAC of zero were more likely than those with a high BAC to condemn drinking and driving, and to advocate a lowering of the legal limit. In other areas, however, both groups held similar views. For example, the majority of each group supported an increase in enforcement levels, and most reported that they would modify their drinking if they were going to drive, or not drive if they had drunk too much.

7. MULTIVARIABLE ANALYSIS OF FACTORS ASSOCIATED WITH BLOOD ALCOHOL CONCENTRATION

7.1 INTRODUCTION

The results presented in the preceding chapters focussed on the drivers' and riders' status on specific variables in isolation. However, a multivariable analytical technique allows the examination of the effects of certain factors whilst simultaneously controlling for the confounding effects of other factors.

The purpose of the analyses reported in this chapter is to identify

- which characteristics of a crash are most likely to indicate alcohol involvement,
- which demographic variables are most likely to indicate alcohol involvement, and
- which aspects of drinking pattern are most likely to indicate alcohol involvement.

7.2 STATISTICAL METHOD

7.2.1 Introduction

In all these analyses, the dependent variable indicates either the presence of a high BAC (.080 g/100mL or above) on admission to hospital, or a BAC of zero at that time. Logistic regression, which accommodates a dichotomous variable as the dependent variable, was used to calculate the odds of having a high BAC, defined as the probability of having a high BAC, divided by the probability of having a BAC of zero. It should be emphasized that, for the purpose of the analyses reported in this chapter, the study design is assumed to be case-control, with cases being individuals with a high BAC at the time of admission to hospital, and controls being individuals with a BAC of zero at that time.

The BMDP stepwise logistic regression programme was used to compute the β or coefficient values and the constant value α of the linear logistic model

$$\log_e \text{(odds of having a high BAC)} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n$$

where the X_i are independent variables entered into the model. Moreover, the value obtained by dividing the absolute value of the coefficient by its standard error can be interpreted approximately as a t-statistic, whereby values less than about 2.0 indicate that the size of the associated coefficient does not differ significantly from zero.

7.2.2 Stepwise logistic regression

In each of the following sections, the initial analysis involved a stepwise logistic regression which examined a number of variables for possible inclusion in the logistic regression model. Each analysis used the maximum likelihood ratio (MLR) method of selecting the variable to be removed or entered at each step, and the limits of p-values to remove and enter variables at each step were set at relatively liberal levels of $p>.30$ and $p<.25$, respectively. The stepping process ended when no variable passed these remove and enter limits. The programme outputs an improvement chi-square value which indicates whether prediction is significantly improved by the addition of the variable at that step: the smaller the p-value the more significant the improvement of the model. Of the examined variables, the variables in the model prior to the first nonsignificant p-value (ie $p>.05$) associated with the improvement chi-square are interpreted to be statistically most strongly associated with the prediction of having a high BAC within the present sample.

7.2.3 Goodness of fit

After the selection of the appropriate variables, using the process outlined above, a further logistic regression was performed to test the goodness of fit of the model containing these variables. The selected variables were forced into the model, and no other variables were considered in the analysis.

The BMDP logistic regression programme outputs several goodness of fit statistics, one of which is Lemeshow and Hosmer's (1982) $\hat{H}_g^*$ statistic. $\hat{H}_g^*$ is computed from the observed and expected frequencies of those in each BAC group, distributed over strata according to the estimated probability of having a high BAC. The distribution of $\hat{H}_g^*$ is approximated by chi-square, with g-2 degrees of freedom, where g reflects the number of cells used in the derivation of the statistic. The interpretation of this statistic is such that the higher the associated probability, the better the model's goodness of fit.

7.2.4 Odds ratios

An adjusted odds ratio reflects the independent contribution of a specific variable to the prediction of, in this instance, having a high BAC, whilst simultaneously controlling for the effects of the remaining variables. On the other hand, a crude or unadjusted odds ratio considers each variable only in isolation. Provided variables have been structured to produce design variables of zero and one, as has been done in these analyses, the adjusted odds ratio, defined as e^{β}, is output by the BMDP programme.

7.3 CRASH CHARACTERISTICS RELATED TO ALCOHOL INVOLVEMENT

Variables which may influence the likelihood of a crash being alcohol-related were included in this analysis. Briefly, these variables reflect aspects of the type of driver, the type of crash, and where and when the crash occurred. The variables are described in Table 7.1, and the results of univariate comparisons between the zero and high BAC groups are presented in Table 7.2.

Table 7.1
Description of variables relating to the nature of the crash

Variable Name	Description	Code
ACCLOC	accident location	rest of State/Adelaide
TIME	time of day of accident (night: 1800-0559)	night/day
AGE25	age of driver or rider	<25/≥25 years old
CARBIKE	type of vehicle	car/motorcycle
SEX	sex of driver or rider	male/female
PASSENGER	presence or absence of passengers	passenger(s)/no passengers
VEHNUM	presence or absence of other vehicles	single vehicle accident (SVA)/ not SVA

Table 7.2
Univariate comparisons for crash variables between drivers and riders with zero and high blood alcohol concentrations

Variable	Code	Zero BAC (n=244)	High BAC (n=91)	X^2 (1df)	p	Odds Ratio
ACCLOC	rest of State	36.2% (243)[1]	42.7 (89)	1.2	.281	1.3
TIME	night	32.4	83.1 (89)	67.7	<.001	10.3
AGE25	<25 years old	50.4	50.5	0.0	.982	1.0
CARBIKE	car	50.4	63.7	4.7	.029	1.7
SEX	male	81.1	85.7	1.0	.329	1.4
PASSENGER	with pass.	21.4 (243)	28.4 (88)	1.8	.182	1.5
VEHNUM	SVA	29.2 (240)	73.8 (84)	51.4	<.001	6.8

[1] number of cases

As in previous chapters, the sample comprised male and female drivers of cars, car derivatives or vans and male motorcycle riders. Although 244 drivers and riders recorded a BAC of zero and 91 had a high BAC, the sample used in determining the most appropriate logistic regression model was reduced to 240 and 84 respectively, because of the exclusion of those with missing values for any of the variables under consideration.

Table 7.3 shows the variables entered at each step of the logistic regression, as well as the values of the improvement chi-square and associated probability.

Table 7.3
Summary of stepwise addition of crash variables into the logistic regression model

Step No.	Variable Entered	Improvement Chi-Square	p
1	TIME	64.9	.000
2	VEHNUM	49.0	.000
3	AGE25	2.4	.121

Thus, at the point at which the further addition of variables does not statistically significantly improve the prediction of having a high BAC, the model contains the variables TIME and VEHNUM. This suggests that when the effects of other variables (ie those described previously in Table 7.1) are simultaneously considered, having a crash between 6pm and 6am and being the driver or rider of the only vehicle involved are most strongly associated with the prediction of having a BAC of .080 or above within the present sample.

A further logistic regression was performed to test the goodness of fit of a model containing only the variables TIME and VEHNUM. The sample size remained the same, as individuals with missing values for any of the variables used in the earlier analysis also had missing values for the variables used in this analysis.

Table 7.4 provides information on the coding of the variables, as well as the β coefficients and standard errors output by the programme.

Table 7.4
Crash variables included in the model which best differentiates between drivers and riders with zero and high blood alcohol concentrations

Variable	Codes	Design Variables	Coefficient	Standard Error	Coef/SE
TIME	1 day	0	2.434	0.350	6.95
	2 night	1			
VEHNUM	1 not SVA	0	2.116	0.328	6.46
	2 SVA	1			

The model arising from this analysis is:

$$\log_e (\text{odds of a high BAC}) = \alpha + 2.434\ (\text{TIME}) + 2.116\ (\text{VEHNUM})$$

It should also be noted that, in accordance with the interpretation of the value of coef/SE mentioned earlier, the coefficients of both variables in the model are significantly different from zero.

For the above model, the Hosmer-Lemeshow goodness of fit statistic is 0.458 which, with 2df, has a p-value of .795; this suggests that the two variables included in the model provide an adequate differentiation between those with a zero and high BAC.

Table 7.5
Odds ratios for crash variables in the logistic regression model differentiating between zero and high blood alcohol concentrations

Variable	Odds Ratio	
	Crude	Adjusted
TIME	9.6[1]	11.4 (5.7-22.7)[2]
VEHNUM	6.8	8.3 (4.4-15.8)

[1] differs from value in Table 7.2 due to exclusion of cases with VEHNUM unknown
[2] 95% confidence interval

The crude and adjusted odds ratios for each of the two variables in the model are shown in Table 7.5. These are similar, indicating that the multivariable findings support those of the univariate analyses. The results show that the odds of having a BAC of .080 or above are 11.4 times greater among drivers and riders involved in a crash at night, rather than during the day, given identical scores on the other variable (ie whether or not the crash involved only one vehicle). Similarly, the odds of having a high BAC is 8.3 times higher for those involved in a single vehicle accident, as opposed to those involved in a multi-vehicle accident, if time of crash is held constant.

7.4 DEMOGRAPHIC CHARACTERISTICS RELATED TO ALCOHOL INVOLVEMENT

The results presented in Chapter 3 indicated some demographic differences between male drivers and riders, and between male drivers and female drivers. Therefore, in this section, male drivers and male riders are examined separately. However, the relatively small number of female drivers precluded logistic regression analyses with that group.

Table 7.6 provides a description of demographic variables that were initially considered. Several variables showed at least a moderate correlation (ie Pearson's $r \geq 0.5$) with other variables. Specifically, such correlations were found between the variables MARITAL and AGE25 (r=-0.5), MARITAL and CHILDREN (-0.6), CHILDREN and AGE25 (0.6), and EDUCATION and OCCUPATION (0.5). Therefore the variables MARITAL, CHILDREN and EDUCATION have been excluded from consideration in the logistic regression models.

Table 7.6
Description of demographic variables

Variable Name	Description	Code
ETHNICITY	ethnic background	Anglo-Saxon/not Anglo-Saxon
MARITAL	marital status	single, sep, div, wid/ married, de facto
AGE25	age	<25/≥25 years old
CHILDREN	number of children	one or more/none
RESIDES	area of residence	rest of State/Adelaide
HOUSING	type of housing	house,townhouse/ unit, flat, other
EDUCATION	highest level of education	primary, secondary/tertiary
OCCUPATION	type of occupation	blue collar/ white collar,student,homemaker
EMPLOYMENT	current employment status	unemployed/ employed, not in labor force
NUMJOBS	number of full-time jobs in last five years	four or more/up to three

7.4.1 Male drivers

Comparisons between the 77 male drivers with a zero BAC and the 45 with a high BAC relating to each of the demographic variables described above are shown in Table 7.7. As already noted, the variables MARITAL, CHILDREN and EDUCATION were eliminated from further consideration.

Table 7.7
Univariate comparisons for demographic variables between male drivers with zero and high blood alcohol concentrations

Variable	Code	Zero BAC (n=77)	High BAC (n=45)	X^2 (1df)	p	Odds Ratio
ETHNICITY	Anglo-Saxon	68.8%	86.7	4.9	.027	2.9
MARITAL	single,sep, div,wid	63.6	66.7	0.1	.735	1.1
AGE25	<25 years old	45.5	48.9	0.1	.714	1.2
CHILDREN	one or more	44.2	44.4	0.0	.975	1.0
RESIDES	rest of State	28.0 (75)[1]	37.8	1.2	.265	1.6
HOUSING	house, townhouse	84.4	91.1	1.1	.290	1.9
EDUCATION	primary, secondary	87.0	88.9	0.1	.761	1.2
OCCUPATION	blue collar	62.3	86.7	8.2	.004	3.9
EMPLOYMENT	unemployed	13.0	24.4	2.6	.106	2.2
NUMJOBS	four or more	6.5	17.8	3.8	.051	3.1

[1] number of cases

Table 7.8
Summary of stepwise addition of demographic variables into the logistic regression model for male drivers

Step No.	Variable Entered	Improvement Chi-Square	p
1	OCCUPATION	7.8	.005
2	ETHNICITY	4.7	.030
3	EMPLOYMENT	1.6	.213

The results of a stepwise logistic regression analysis (Table 7.8) indicated that a statistically significant improvement in the prediction of a male driver having a high BAC was achieved by examining whether the driver was a blue-collar worker and whether his background was Anglo-Saxon. A further logistic regression was done, forcing the variables OCCUPATION and ETHNICITY into the model. This output is summarized in Table 7.9.

Table 7.9
Demographic variables included in the model which best differentiates between male drivers with zero and high blood alcohol concentrations

Variable	Codes	Design Variables	Coefficient	Standard Error	Coef/SE
OCCUPATION	1 not blue collar	0	1.362	0.505	2.70
	2 blue collar	1			
ETHNICITY	1 not Anglo-Saxon	0	1.071	0.516	2.08
	2 Anglo-Saxon	1			

This information enables the derivation of the following model:

$$\log_e \text{(odds of a high BAC)} = \alpha + 1.362\ \text{(OCC.)} + 1.071\ \text{(ETHNIC.)}$$

Although the coefficients of both variables in this model are significantly different from zero, the value of the Hosmer-Lemeshow goodness of fit statistic ($\hat{H}_g^*$=2.623, 2df, p=.269) suggests that the combination of these two demographic variables provides a less than adequate model for predicting a high BAC within this sample of male drivers.

Table 7.10
Odds ratios for demographic variables in the logistic regression model differentiating between male drivers with zero and high blood alcohol concentrations

Variable	Odds Ratio	
	Crude	Adjusted
OCCUPATION	3.9	3.9 (1.4-10.6)[1]
ETHNICITY	2.9	2.9 (1.1-8.1)

[1] 95% confidence interval

Table 7.10 shows that the crude and adjusted odds ratios for the two variables in the model are identical, suggesting that multivariable analysis adds little to the findings of the univariate analyses.

7.4.2 Male riders

Table 7.11 shows the outcome of univariate comparisons between the 121 male riders with a BAC of zero and the 33 with a BAC of .080 or above.

Table 7.11
Univariate comparisons for demographic variables between male riders with zero and high blood alcohol concentrations

Variable	Code	Zero BAC (n=121)	High BAC (n=33)	X^2 (1df)	p	Odds Ratio
ETHNICITY	Anglo-Saxon	84.3%	87.9	0.3	.609	1.4
MARITAL	single,sep, div,wid	74.4	84.8	1.6	.208	1.9
AGE25	<25	60.3	54.5	0.4	.549	0.8
CHILDREN	one or more	23.1	18.2	0.4	.543	0.7
RESIDES	rest of State	18.5 (119)[1]	33.3	3.4	.067	2.2
HOUSING	house, townhouse	81.8	81.8	0	1.0	1.0
EDUCATION	primary, secondary	89.3	87.9	0.1	.823	0.9
OCCUPATION	blue collar	84.3	78.8	0.6	.454	0.7
EMPLOYMENT	unemployed	15.7	12.1	0.3	.609	0.7
NUMJOBS	four or more	19.8	12.1	1.0	.309	0.6

[1] number of cases

As before, the variables MARITAL, CHILDREN and EDUCATION were excluded from consideration. When the remaining seven variables were examined, only the variable RESIDES was entered under the predetermined enter and remove criteria. However, because the addition of this variable did not statistically significantly improve a model containing only a constant (improvement x^2=3.1, p=.077), no further analyses were undertaken.

7.5 DRINKING PATTERN CHARACTERISTICS RELATED TO ALCOHOL INVOLVEMENT

As in Chapter 6, analyses relating to the drinking patterns of male drivers and riders were restricted to those individuals who drank alcohol in the month preceding the crash; the data from these drivers and riders has been combined. Logistic regressions were not undertaken using data from female drivers because of the small sample size.

Data were obtained on a large number of variables relating to the frequency of where, with whom, and why each individual drank alcohol in the month prior to the crash (see Tables 6.8 to 6.10). To help identify which of these variables should be considered for possible inclusion in the logistic regression models, three preliminary stepwise logistic regressions were undertaken. These analyses suggested that, with respect to where drinking occurred, drinking at least occasionally in a hotel or in a vehicle best discriminated between male drivers and riders with zero and high BACs (ie the variables HOTEL and VEHICLE as described in Table 7.12) whereas, in terms of drinking company, drinking with strangers, casual acquaintances or work associates (the variable OTHERS), or alone (ALONE) were the best predictors of having a high BAC. In relation to reasons for drinking, drinking at least occasionally because of loneliness or boredom (LONEBORE) or anger (ANGER), or to get drunk (GETDRUNK) or be sociable (SOCIAL) was most likely to differentiate between the two BAC groups. Therefore, out of these three sets of variables, only those variables identified above were considered for inclusion in the later analyses.

A description of the drinking pattern variables is provided in Table 7.12, and Table 7.13 shows the results of univariate analyses of these variables. However, as in the preceding section, one of each pair of correlated variables (ie Pearson's $r \geq 0.5$) was excluded from the modelling process. The variable RISK was correlated with the variables DRINKDAYS, AMOUNT, EXCESSDR, HOTEL (all r=0.5), INTOX (0.6) and GETDRUNK (0.5). The latter variable was in turn correlated with INTOX (0.5) and EXCESSDR (0.6). Correlations were also found between the variables BINGEDR and EXCESSDR (0.5), and between DRINKDAYS and DRINKDRIVE (0.5). Therefore the variables RISK, BINGEDR, GETDRUNK and DRINKDAYS were excluded from further consideration.

After the exclusion of these four variables, 13 of the 17 variables described in the tables were considered for inclusion in the logistic regression model. The sample used in determining this model comprised 149 male drinkers with a BAC of zero and 67 with a BAC of .080 or above. Table 7.14 provides a summary of the modelling process: the addition of each of the first six variables shown in the table significantly improved the prediction of having a high BAC.

Table 7.12
Description of drinking pattern variables

Variable Name	Description	Code
DRINKDAYS	no. of days on which alcohol consumed in past month	≥9 days/<9 days
RISK	risk of developing alcohol-related problems	at least some/none
AMOUNT	g of alcohol most commonly consumed in past month	>40g/≤40g
INTOX	no. of times intoxicated in past month	one or more/none
EXCESSDR	frequency of drinking to excess	at least once a month/less often
BINGEDR	frequency of binge drinking	at least once a year/less often
BEVERAGE	preferred type of alcohol	beer/other,any
HOTEL	frequency of drinking in a hotel	at least occasionally/never
VEHICLE	frequency of drinking in a vehicle	at least occasionally/never
ALONE	frequency of drinking alone	at least occasionally/never
OTHERS	frequency of drinking with strangers, casual acquaintances or work associates	at least occasionally/never
LONEBORE	frequency of drinking to relieve loneliness or boredom	at least occasionally/never
ANGER	frequency of drinking because of anger	at least occasionally/never
GETDRUNK	frequency of drinking to get drunk	at least occasionally/never
SOCIAL	frequency of drinking to be sociable	at least occasionally/never
DRINKDRIVE	no. of occasions drove within two hours of drinking in past month	≥4 occasions/<4 occasions
SUSPENSIONS	no. of alcohol-related licence suspensions	one or more/none

These six variables were then inserted into a logistic regression model. Due to the smaller number of variables in use, the sample in this analysis increased to 152 male drinkers with a zero BAC and 73 with a high BAC. The outcome of this analysis is summarized in Table 7.15.

Table 7.13
Univariate comparisons for drinking pattern variables between males with zero and high blood alcohol concentrations

Variable	Code	Zero BAC (n=153)	High BAC (n=76)	X^2 (1df)	p	Odds Ratio
DRINKDAYS	≥9 days	39.9%	75.0	25.1	<.001	4.5
RISK	at least some	47.7 (151)[1]	89.3 (75)	36.7	<.001	9.2
AMOUNT	>40g	56.2	80.0 (75)	12.4	<.001	3.1
INTOX	one or more	63.4	89.3 (75)	16.8	<.001	4.8
EXCESSDR	at least once/month	17.3 (150)	50.0 (70)	25.4	<.001	4.8
BINGEDR	at least once/year	11.8 (152)	43.8 (73)	29.2	<.001	5.8
BEVERAGE	beer	58.8	84.2	14.9	<.001	3.7
HOTEL	at least occasionally	58.2	92.1	27.6	<.001	8.4
VEHICLE	at least occasionally	11.1	39.5	25.0	<.001	5.2
ALONE	at least occasionally	22.9	40.8	7.9	.005	2.3
OTHERS	at least occasionally	16.3	46.1	23.2	<.001	4.4
LONEBORE	at least occasionally	14.4	41.3 (75)	20.5	<.001	4.2
ANGER	at least occasionally	9.8	32.0 (75)	17.5	<.001	4.3
GETDRUNK	at least occasionally	30.1	56.0 (75)	14.3	<.001	3.0
SOCIAL	at least occasionally	90.2	94.7 (75)	1.3	.251	1.9
DRINKDRIVE	≥4 occasions	30.3 (152)	67.6 (74)	28.4	<.001	4.8
SUSPENSIONS	one or more	7.8	33.8 (77)	25.0	<.001	6.0

[1] number of cases

An examination of the values of coef/SE for the variables in Table 7.15 suggests that for every variable except INTOX, the coefficients are significantly different from zero.

The Hosmer-Lemeshow goodness of fit statistic for the above model is 3.555 which, with 8df, has a p-value of .895. Hence, as a set, the six variables included in the model provide a satisfactory distinction between male drivers and riders admitted to hospital with zero and high BACs.

Table 7.14
Summary of stepwise addition of drinking pattern variables into the logistic regression model for males

Step No.	Variable Entered	Improvement Chi-Square	p
1	HOTEL	30.5	.000
2	SUSPENSIONS	16.5	.000
3	DRINKDRIVE	15.9	.000
4	VEHICLE	10.4	.001
5	BEVERAGE	6.3	.012
6	INTOX	4.1	.042
7	ANGER	2.9	.091
8	AMOUNT	2.5	.114
9	ALONE	1.4	.239

Table 7.15
Drinking pattern variables included in the model which best differentiates between males with zero and high blood alcohol concentrations

Variable	Codes	Design Variables	Coefficient	Standard Error	Coef/SE
HOTEL	1 never	0	1.365	0.546	2.50
	2 at least occasionally	1			
SUSPENSIONS	1 none	0	2.014	0.483	4.17
	2 one or more	1			
DRINKDRIVE	1 <4 occasions	0	1.304	0.374	3.49
	2 ≥4 occasions	1			
VEHICLE	1 never	0	1.053	0.421	2.50
	2 at least occasionally	1			
BEVERAGE	1 not beer, any	0	1.038	0.417	2.49
	2 beer	1			
INTOX	1 none	0	0.712	0.491	1.45
	2 one or more	1			

Table 7.16 shows the crude and adjusted odds ratios for each of the six variables in the model. For some of these variables, the decrease in value of the adjusted odds ratio, compared to the crude ratio, indicates a lesser contribution once the effects of other variables are taken into account. It also becomes apparent that if identical characteristics on other variables are assumed, the odds of having a high BAC are increased most by a

history of one or more alcohol-related licence suspensions.

Table 7.16
Odds ratios for drinking pattern variables in the logistic regression model differentiating between males with zero and high blood alcohol concentrations

Variable	Odds Ratio	
	Crude	Adjusted
HOTEL	9.6	3.9 (1.3-11.5)[1]
SUSPENSIONS	6.1	7.5 (2.9-19.4)
DRINKDRIVE	4.7	3.7 (1.8-7.7)
VEHICLE	4.9	2.9 (1.3-6.6)
BEVERAGE	3.6	2.8 (1.2-6.4)
INTOX	4.6	2.0 (0.8-5.4)

Note: crude odds ratios may differ from those in Table 7.13 due to exclusion of cases with missing values on any of these variables

[1] 95% confidence interval

7.6 DISCUSSION

The analyses presented in this chapter have shown that, of various factors used to describe the characteristics of a crash, time of occurrence and whether or not other vehicles were involved are not only the best predictors of alcohol involvement, but also adequately differentiate between drivers and riders with zero and high BACs. This finding validates the use of night-time single vehicle accidents as a surrogate measure of alcohol involvement.

When the effects of other demographic variables were controlled, no demographic characteristic was found to differentiate effectively between those with zero and high BACs, either among the male driver or male rider samples.

An examination of male drivers and riders who had consumed alcohol during the month before the crash revealed that combinations of various characteristics of drinking and drink-driving were able to distinguish between individuals with a BAC of zero and those having a BAC of at least .08 g/100mL. Specifically, the odds of having a high BAC were increased among those who had previously lost their licence because of alcohol (relative to those who had not), drank beer in preference to other types of alcohol, drove within two hours of drinking on average at least weekly, reported at least one episode of intoxication in the past month and, during that time, drank at least occasionally in hotels and in motor vehicles. Moreover, when the effects of these six variables were considered simultaneously, a previous alcohol-related licence suspension was the best predictor of a high BAC: the odds of having a high BAC at the time of admission to hospital were more than seven times higher among those males who had lost their licence, compared to those who had not, while controlling for the other five variables.

Finally, it must be emphasized that this study was based on interviews of drivers and riders who were admitted to a major trauma hospital after being involved in a crash. Fatally injured drivers and riders and those too severely injured to be interviewed were not included for obvious reasons; nor were those drivers and riders whose injuries were not of sufficient severity to warrant admission to hospital. Moreover, individuals with a BAC between zero and .08 were excluded from the series of analyses reported in this chapter. Therefore, the extent to which the results of this study apply to the whole population of injured drivers and riders has not been determined and, until further verification, caution is advised in generalizing from these results.

8. STUDY CONCLUSIONS

8.1 INTRODUCTION

The major differences between groups that were reported in each of the chapters are summarised below. Apparent differences are highlighted, without placing undue emphasis on statistical significance.

8.2 DEMOGRAPHIC CHARACTERISTICS

After the hospitalised drivers and riders were divided into three groups, namely, male drivers, female drivers and male riders, relatively few demographic differences were apparent.

8.2.1 Male drivers versus female drivers

Male drivers were significantly more likely to have positive blood alcohol concentrations (BAC) than female drivers. However, there was no statistically significant difference between the mean BACs of the two groups when only those with positive BACs were compared.

Two other sex differences were found. Fewer females were in the work-force, as would be expected, but of those who were in the work-force, the females were more likely than the males to have occupations classified as being of a higher social class. It should be noted, however, that two jobs commonly undertaken by females, namely nursing and teaching, are allocated to the highest social class category.

8.2.2 Male drivers versus male riders

The differences that were evident between the male drivers and male motorcycle riders were, in fact, age related: male motorcycle riders were significantly younger, as a group, than male drivers. The major difference that remained when age was taken into account was BAC. The mean BAC of male riders was significantly lower than that of male drivers, even when only drinking drivers and riders were considered. The reasons for this difference are unclear, but it does appear that alcohol is not as great a problem among motorcycle riders than among drivers.

8.3 DEMOGRAPHIC CHARACTERISTICS AND BLOOD ALCOHOL CONCENTRATION

The demographic characteristics of individuals with zero BACs and high BACs (0.08 g/100mL or above) were compared within each of three groups: male drivers, male riders and female drivers. The outcomes of these comparisons are outlined below.

8.3.1 Male drivers

High BACs were less likely to be represented at either end of the age spectrum within this sample of male drivers.

Male drivers with a high BAC on admission to hospital were more likely to have been born in Australia and significantly more likely to have an Anglo-Saxon origin than were male drivers with a zero BAC. They were also less likely to have children.

Compared to the zero BAC drivers, those with a high BAC were more likely to be unemployed and to have had a greater number of jobs in the past five years. They were also significantly more likely to work in blue collar rather than white collar occupations.

8.3.2 Male riders

No statistically significant differences were found between male riders with zero and high BACs.

However, the latter were somewhat less likely to be aged in their teens and to live in Adelaide rather than elsewhere in the State. A smaller proportion of those with a high BAC were married or in a de facto relationship and those that were, were less likely to have children.

8.3.3 Female drivers

Female drivers with zero BACs were significantly older than those with high BACs. All of the high BAC females were in the 20 to 40 year age group and half of them were less than 25 years of age.

It was also found that high BAC females were more likely to have an Anglo-Saxon background, to be single and to be in the work-force, albeit in jobs of lower social status.

8.4 PRE-CRASH DRINKING BEHAVIOUR AND BLOOD ALCOHOL CONCENTRATION

The self-reported drinking behaviour just prior to the crash of all individuals with positive BACs on admission to hospital were analysed. Those with a high BAC were similar to those with a low BAC in terms of drinking company, drinking location and type of alcohol consumed. However, individuals with a high BAC were somewhat more likely to report having consumed a greater quantity of alcohol prior to the crash, relative to the highest quantity typically consumed at least once a month.

A significantly larger proportion of the high BAC drivers and riders than of those with low BACs thought that their BAC had exceeded the legal limit of .08. They were also significantly more likely to indicate that alcohol was a cause of the crash. These differences were also evident when individuals with BACs of .150 or above were compared to those having a BAC in the .080-.149 range.

8.5 ATTITUDES, BEHAVIOUR AND BLOOD ALCOHOL CONCENTRATION

A large range of variables relating to usual drinking and drink driving behaviour, as well as attitudes towards drink driving, were examined separately for males and females. Those with a zero BAC were compared to those with BACs over the then legal limit of .08 g/100mL (high BAC).

8.5.1 Males

Individuals with high BACs were found to differ significantly from those with a BAC of zero. In particular, they drank more frequently and in greater quantities. They also drank to excess more often, reported more binge drinking and had a higher risk of developing alcohol-related problems. They reported drinking more often in public places such as at hotels, discos, parties and public functions, and in a vehicle. However, they also drank on their own and with strangers more often than did the zero BAC group.

The high BAC group differed significantly from the zero BAC group in their reasons for drinking. They tended to use alcohol more often as a coping mechanism to deal with stress, loneliness, anger and boredom, among other reasons. Both groups drank to be sociable, to celebrate and for the enjoyment of the taste.

Beer was the preferred type of alcoholic beverage for a significantly greater proportion of the high BAC group compared to the zero BAC group. The ages at first social drinking, intoxication and hangover were similar for the two BAC groups. Liver enzyme levels were found to be unrelated to BAC group.

Previous alcohol related licence suspension was found to be highly related to BAC at the time of admission with one third of those with a BAC of at least .08 having had a previous suspension of this type. This brings into question the deterrent value of licence suspension upon drink driving.

The high BAC group was significantly less likely to report impairment from given amounts of alcohol than was the zero BAC group. They also reported driving after drinking significantly more often and admitted to driving at a presumed illegal BAC significantly more often. In fact 62% of those with a BAC of at least .15 reported driving drunk at least once per week, on average. They were also significantly more likely to report having a larger number of friends who drink and drive.

Being breath-tested, having seen random breath testing stations and having friends who had been random breath tested were found not to differ between the two groups.

Finally, the high BAC group was found to hold attitudes consistent with their drinking and driving behaviour relative to the zero BAC group. That is, they were significantly less likely to want a reduced BAC limit and to believe that one should not drive after drinking any amount of alcohol. They were also significantly less likely to modify their drinking or driving behaviour based on whether they had to drive or how much they had had to drink.

There are many possible definitions of alcohol dependence. Based on the measures described in Chapter 6, about one fifth of the male drivers and riders who had a BAC of at least .150 on admission to hospital could be considered to be alcohol dependent. However, those in the lower range of the high BAC group (from .080 to .149) appeared to be no more likely than those with zero BACs to show signs of alcohol dependence.

8.5.2 Females

It should be emphasised that statistical analyses were not undertaken to compare these two groups because of the relatively small sample sizes.

The high BAC group reported drinking a higher quantity of alcohol, as well as more occurrences of intoxication and excessive drinking. Also, a bar or hotel as the place of drinking was more popular among the high BAC group than among the zero BAC group, who most commonly reported drinking in a private home. Women with a high BAC were somewhat more likely to drink alone. The reported reasons for drinking suggest tentatively that women with a high BAC may have been more likely to use alcohol as a coping mechanism.

Although both groups of female drivers reported a similar number of sightings of RBT operations, the high BAC group were however somewhat less likely to have been tested in the previous year.

No marked differences were found between the zero and high BAC groups with respect to their reported drinking and driving behaviour. The high BAC group showed some differences in attitudes from the zero BAC group: they were less likely to condemn drinking and driving, and less likely to support a reduction in the legal BAC limit.

8.6 MULTIVARIABLE ANALYSIS OF BLOOD ALCOHOL CONCENTRATION

The variables from the previous sections, along with variables dealing with the crash itself, were analysed using logistic regression in an attempt to differentiate between individuals with zero and high BACs at the time of admission to hospital. This approach allowed the effects of the variables to be looked at together rather than in isolation. Three analyses were done dealing with the characteristics of the crash itself, the demographic characteristics of the people involved and, finally, drinking patterns of the drivers and riders.

8.6.1 Crash characteristics

The two variables found to be good predictors of a high BAC were time of day and number of vehicles involved. Thus, night-time single vehicle crashes were found to be highly associated with high BACs, confirming the validity of their use as a surrogate measure of alcohol involvement.

8.6.2 Demographic characteristics

Multivariable analyses indicated that when the effects of other demographic variables were controlled, no demographic characteristics effectively differentiated between those with zero and high BACs in either the male driver or male rider groups. There were too few female drivers to permit a meaningful analysis.

8.6.3 Drinking and drink-driving behaviour

Six variables relating to patterns of drinking and drink-driving significantly improved the prediction of having a high BAC within a combined sample of male drivers and riders. The odds of having a high BAC were greater among those who previously lost their licence because of alcohol (relative to those who had not), drank at least occasionally in hotels and in motor vehicles, preferred beer, drove within two hours of drinking at least once a week, on average, and reported at least one episode of intoxication in the month prior to the crash. When these factors were considered simultaneously, a previous alcohol-related licence suspension was the best predictor of having a high BAC on admission to hospital.

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Table A1
Age by blood alcohol concentration and type of road user (number of cases)

Age (years)	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
10-19	2	1	5	5	-	4	1	-	2
20–24	3	1	5	4	5	6	12	1	6
25–49	2	-	7	7	4	6	9	3	9
50–64	1	-	-	3	-	-	2	-	-
65+	1	-	-	1	-	-	1	-	-
Total	9	2	17	20	9	16	25	4	17

Note: MD = male drivers
FD = female drivers
MR = male riders

Table A2
Self-reported twelve hour pre-crash alcohol consumption by blood alcohol concentration and type of road user (number of cases)

Quantity (g)	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
None	1	-	1	-	1	1	1	-	-
1–20	2	-	1	-	-	1	-	-	-
21–40	-	-	5	1	1	2	-	-	-
41–80	3	2	7	8	5	4	1	2	2
81–120	1	-	2	5	-	3	5	1	6
121–200	-	-	-	3	-	4	5	-	5
201+	1	-	-	1	-	-	8	1	1
Total	8	2	16	18	7	15	20	4	14
Unknown	1	-	1	2	2	1	5	-	3

Note: MD = male drivers
FD = female drivers
MR = male riders

Table A3
Self-reported quantity of pre-crash alcohol consumption relative to highest quantity typically consumed at least once a month by blood alcohol concentration and type of road user (number of cases)

Quantity	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
Greater	2	1	-	5	3	4	9	2	1
Equivalent	3	-	-	1	2	2	3	-	4
Less	2	1	15	12	1	9	8	1	9
Total	7	2	15	18	6	15	20	3	14
Unknown	1	-	1	2	2	1	4	1	3

Note: MD = male drivers
FD = female drivers
MR = male riders

Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

Table A4
Self-reported frequency of alcohol consumption at the pre-crash level by blood alcohol concentration and type of road user (number of cases)

Frequency	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
At least once/week	4	1	14	12	2	10	8	-	11
At least once/month	1	-	1	1	1	1	3	1	2
Rarely	2	1	-	5	3	4	4	2	1
Never	-	-	-	-	-	-	4	-	-
Other	-	-	-	1	-	-	1	1	-
Total	7	2	15	19	6	15	20	4	14
Unknown	1	-	1	1	2	1	4	-	3

Note: MD = male drivers
FD = female drivers
MR = male riders

Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

Table A5
Self-perception of having exceeded the .08 limit by blood alcohol concentration and type of road user (number of cases)

Exceeded	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
Yes	1	1	4	8	-	6	20	2	12
No	6	1	10	11	5	8	2	1	2
Don't know	-	-	2	1	3	1	-	1	2
Total	7	2	16	20	8	15	22	4	16
Unknown	1	-	-	-	-	1	2	-	1

Note: MD = male drivers
FD = female drivers
MR = male riders

Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

Table A6
Self-perception of own alcohol consumption contributing to the crash by blood alcohol concentration and type of road user (number of cases)

Perception	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
Yes - a lot	-	1	1	2	1	2	10	2	3
Yes - somewhat	1	-	1	5	3	6	7	1	6
No	6	1	13	12	2	7	2	-	3
Don't know	-	-	1	1	2	-	3	1	4
Total	7	2	16	20	8	15	22	4	16
Unknown	1	-	-	-	-	1	2	-	1

Note: MD = male drivers
FD = female drivers
MR = male riders

Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

Table A7
Self-reported pre-crash drinking location by blood alcohol concentration and type of road user (number of cases)

Location	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
Bar, tavern, disco etc	2	1	7	7	5	8	12	-	10
Own home	-	-	1	2	-	1	-	1	-
Other person's home	1	-	4	5	1	5	3	-	3
Private club	1	-	1	2	-	-	3	-	1
Other	3	1	2	4	-	1	4	3	-
Total	7	2	15	20	6	15	22	4	14
Unknown	1	-	1	-	2	1	2	-	3

Note: MD = male drivers
FD = female drivers
MR = male riders

Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

Table A8
Self-reported pre-crash drinking company by blood alcohol concentration and type of road user (number of cases)

Company	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
Alone	-	-	1	1	-	-	-	-	-
Partner, relatives	-	-	1	-	-	1	1	1	-
Friends of same sex	3	-	7	11	1	9	6	-	10
Friends of opposite sex	-	-	-	1	1	-	-	1	-
Friends of both sexes	4	2	5	6	4	5	13	1	4
Other	-	-	1	1	-	-	2	1	-
Total	7	2	15	20	6	15	22	4	14
Unknown	1	-	1	-	2	1	2	-	3

Note: MD = male drivers
FD = female drivers
MR = male riders

Four individuals who denied any pre-crash alcohol consumption have been excluded from this table

Table A9
Self-reported pre-crash beverage type by blood alcohol concentration and type of road user (number of cases)

Alcohol type	BAC (g/100mL)								
	.001–.079			.080–.149			.150+		
	MD	FD	MR	MD	FD	MR	MD	FD	MR
Beer	7	1	12	14	2	14	16	-	12
Spirits	-	1	3	4	3	-	4	1	1
Wine	-	-	-	1	1	1	-	3	1
Total	7	2	15	19	6	15	20	4	14
Unknown	1	-	1	1	2	1	4	-	3

Note: MD = male drivers
FD = female drivers
MR = male riders

Four individuals who denied any pre-crash alcohol consumption have been excluded from this table