

**Technical Report No. 152**

**DRUG USE AND DRIVING**

**AMONG**

**INJECTING DRUG USERS**

Shane Darke, Erin Kelly & Joanne Ross

National Drug and Alcohol Research Centre

University of New South Wales

Australia

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## EXECUTIVE SUMMARY

A sample of 300 injecting drug users (IDU) from the greater Sydney region were interviewed regarding drug driving. Specifically, the study examined the prevalence and frequency of drug driving, drug-related motor vehicle accidents, predictors of drug driving, and risk perceptions of drug driving among IDU.

### *Driving histories*

The overwhelming majority of the sample (95%) had driven a vehicle, and 74% had driven in the previous 12 months. There was no difference between the proportions of males and females who were current drivers.

### *Drug driving history*

Of those who had ever driven, 87% reported having driven soon after using drugs (“drug driving”), representing 83% of the total sample. Of current drivers, 87% reported drug driving in the previous 12 months, representing two thirds of the total sample. Fifty nine percent of current drivers reported having drug driven in the preceding month (44% of the total sample). There were no significant sex differences in drug driving prevalence.

The most common drugs used before driving in the preceding year were: cannabis (57%), heroin (56%), amphetamines (34%), cocaine (33%) and other opioids (32%). Of those who had driven in the previous 12 months, 22% reported having driven soon after using heroin on at least a weekly basis, and 21% reported having driven soon after using cannabis on at least a weekly basis. The most common reasons given for drug driving were: to get home after “scoring drugs” (28%), to get around (26%), to give others a lift (11%) and to “score drugs” (11%). Drug driving whilst carrying passengers was reported by the majority of drivers (88%), with 77% of current drivers reporting having drug driven with passengers in the previous 12 months.

### *Drug-related vehicle accidents*

One third of drivers (32%) reported having had an accident while drug driving, with a higher proportion of males reporting having done so (36% v 24%). One in ten current drivers (9%) reported having had an accident while drug driving in the previous year.

The most common drugs used before the last drug driving accident were heroin (53%), cannabis (46%) and alcohol (42%). The mean number of drugs used preceding that accident was 2.1.

Fifteen percent of drivers reported having been injured in an accident while drug driving, and 8% reported that another person had been injured. Almost half (47%) of those who had ever had a drug driving accident reported having been injured in one of these accidents, and 25% reported that another person had been injured in one of these drug driving accidents.

#### *Experience as a passenger of a drug driver*

The majority of respondents (89%) had been a passenger of a drug driver, with 30% having done so weekly or more often over the previous 12 months. Forty two percent of respondents had been involved in a vehicle accident whilst being driven by a drug driver, and one in ten (12%) had been involved in such an accident in the previous 12 months. Overall, 17% of respondents who had been a passenger of a drug driver in the preceding year had been involved in an accident.

#### *Risk perceptions of drug driving*

Alcohol was perceived by IDU to be the most dangerous substance in terms of driving performance, perceived to be “very dangerous” by 84% of respondents. The next most dangerous drugs were hallucinogens (71%) followed by benzodiazepines (68%) and heroin. The drug perceived as least dangerous was cannabis (perceived as very dangerous by 18%), followed by amphetamines (31%) and cocaine (37%).

There were differences in the perceived danger of drug driving according to whether or not the respondent had driven after using drugs in the previous 12 months. Generally, drug drivers perceived drug driving to be less dangerous than other IDU. Specifically, drug drivers reported significantly lower levels of danger than other IDU for heroin, opioids, cocaine and cannabis.

Forty one percent of the sample perceived it to be likely that they would be caught for drug driving, with no significant sex differences in this perception. Drug drivers perceived the risk of getting caught as lower than other IDU.



### *Factors associated with drug driving*

There were differences between drug drivers and other IDU according to their drug use patterns. Drug drivers had higher levels of dependence on their drug of choice, higher frequency of drug use and more extensive polydrug use. Drug use locations were related to drug driving. Drug-drivers were significantly more likely to have used a drug in the car in the previous 12 months, and to have injected in a car in the previous 12 months.

Drug drivers had driven significantly more frequently in the preceding 12 months than other drivers. Overall, the picture of a drug driver is of a heavily dependent polydrug user, who also drives frequently. Thus, if someone is using a drug frequently, and is also driving frequently, they will be more likely to drug drive, particularly if drugs are used in cars.

There were no significant age or sex differences between those who had driven after using drugs in the previous 12 months and those who had not. Drug-drivers were also not differentiated according to geographical region, with high proportions of IDU drug-drivers in the inner, middle and outer areas of Sydney.

There were no significant differences between drug drivers and other IDU in General Health Questionnaire (GHQ) scores, or the proportions meeting criteria for Borderline Personality Disorder or Antisocial Personality Disorder. Drug driving does not appear to be related to psychological distress, or to personality disorder.

It is apparent that drug driving is a significant issue for IDU, with a high risk of injury from drug-related vehicle accidents. Drug driving is an illegal behaviour, and the current data indicate it is a significant issue for other road users and the police. Education campaigns could be directed at IDU in order to reduce drug driving prevalence. Such interventions should attempt to alter the risk perceptions of IDU, informing users of the risks of drug driving and the risk of being a passenger of a drug driver. The use of public transport should also be encouraged.

## 1.0 INTRODUCTION

Motor vehicle accidents are a major cause of morbidity and mortality around the world. In Australia alone there are over 1700 road fatalities per annum, that account for a fifth of deaths due to external causes<sup>(1, 2)</sup>. The annual financial cost of vehicle accidents in Australia has been estimated at A\$15 billion<sup>(2)</sup>, with alcohol use estimated to account for A\$1.3 billion of this cost, and other drugs A\$0.5 billion.

It is clear from the above figures that substance use is a major contributor to vehicle accident trauma. Internationally, studies have reported alcohol in excess of legal limits in 10-50% of accident involved drivers, and other drugs in 5-30% of cases<sup>(3-12)</sup>. The most common drugs detected among accident victims are: cannabis (3-23% of cases), benzodiazepines (2-15%), cocaine (4-11%), amphetamines (2-6%), and opioids (3-5%)<sup>(5, 7, 13-17)</sup>. Multiple drug use is commonly detected in these studies, as is alcohol in combination with other drugs. Internationally, between 5-20% of killed or injured drivers have alcohol/drug combinations detected<sup>(5, 9, 11, 15, 16, 18)</sup>. Population surveys indicate that, in a 12 month period, between 5-13% of drivers report having driven under the influence of alcohol and 2-4% under the influence of other drugs<sup>(19-26)</sup>.

Injecting drug users (IDU) are a group that engage in frequent and extensive polydrug use, and have high levels of psychopathology, self-harm, impulsivity, criminality and mortality<sup>(27, 28)</sup>. Recent evidence indicates that drug use in cars by IDU may be common. In a study examining injecting locations of Australian IDU, cars were the third most common place to inject, and the most common public place to inject<sup>(29)</sup>. Two thirds of these IDU had injected drugs in a car in the preceding six months. Furthermore, approximately one in twenty fatal heroin overdoses in Australia occur in motor vehicles<sup>(30, 31)</sup>. Widespread use of drugs in cars presents frequent opportunities for drug driving, or to be put at risk of being driven by a drug driver. The potential impact of drug driving among IDU is illustrated by a recent longitudinal study of Italian IDU<sup>(32)</sup>. As in all studies of IDU, death rates were far in excess of population norms (13 times the expected rate). Road accidents were the third most common cause of death (9% of cases), after overdose and AIDS.

Despite their high risk behaviours in other areas, and their frequent drug use, few published studies have specifically examined drug driving among general samples of IDU<sup>(33-35)</sup>. In the 1970s Blomberg & Preusser<sup>(35)</sup> examined self-reported heroin intoxicated driving among New York methadone maintenance patients. Almost all (95%) reported having ever driven within an hour of heroin use, and two thirds reported this as a daily occurrence. Recently, Albery et al<sup>(34)</sup> reported that a third of a sample of out of treatment illicit drug users in the UK had driven a vehicle in the preceding 12 months. Of these, 82% had driven in that period shortly after consuming illicit drugs, of which the most common were heroin and cannabis. A fifth reported having had an accident in the preceding year whilst driving under the influence of illicit drugs. In an exploratory study of driving among Australian IDU, Aitken et al<sup>(33)</sup> reported that a half of their sample had driven at least twice in the preceding week. Two thirds of drivers reported having driven in the preceding week shortly after having injected drugs. A third of drivers reported that they had injected a drug shortly before their most recent vehicle accident.

The above data indicate that the driving behaviour of IDU is a public health issue worthy of exploration. Drug driving is an illegal behaviour, and the above data also indicate that it may be a significant issue for other road users and for the police. The current study aimed to examine the prevalence of drug driving among a large, geographically diverse sample of Sydney IDU, and the circumstances associated with such behaviours. In particular, the study aimed to ascertain the role of different drug classes in drug driving and in road accidents among IDU, the frequency of being a passenger of a drug driver, IDU risk perceptions of the dangers of driving after having used various drugs, and factors associated with drug driving.

## **1.1**    *Study Aims*

1. To examine the prevalence and frequency of drug driving among IDU;
2. To examine the prevalence of drug-related motor vehicle accidents among IDU;
3. To ascertain factors that predict drug driving; and
4. To determine risk perceptions of drug driving among IDU.

## **2.0 METHOD**

### **2.1 Procedure**

All respondents were volunteers who were paid A\$20 for participation in the study. Recruitment took place from April to November 2002, by means of advertisements placed in needle exchanges, local newspapers, word of mouth and entrants to inner city therapeutic communities.

Approximately equal numbers of subjects were recruited from sites in inner (<2km from the city centre eg. Redfern and Kings Cross), middle (approximately 10km from the city centre eg. Kogarah and Canterbury) and outer (>30km from the city centre eg. Cabramatta and Campbelltown) regions of Sydney. A geographically diverse sample was recruited so as to obtain variations in the 'need to drive', e.g. access to public transport, distance to facilities/services.

Respondents were directed to the researcher via reception staff at the agency, contacted the researchers by telephone, or were approached by the researcher. Upon presentation the respondent was screened for eligibility to be interviewed for the study. To be eligible for participation the respondent had to be aged 18 or over and to have injected a drug in the previous six months.

Interviews were conducted in various locations, such as needle exchanges, cafés, fast food outlets and parks. All respondents were guaranteed that any information they provided would be kept strictly confidential and anonymous. All interviews were conducted by a member of the research team (EK, SD) and took approximately 30 minutes to complete.

### **2.2 Structured Interview**

#### **2.2.1 Demographic characteristics**

The demographic details obtained included: gender, age, marital status, suburb of residence, level of high school education, tertiary education, employment status, drug treatment history and prison record.

### **2.2.2 Drug use history**

In order to gain an indication of overall drug use, respondents were asked which drug classes they had ever used, which ones they had ever injected and which ones they had injected in the preceding six months. An estimation of how many days they had used each of the drug classes during the six months preceding interview was also obtained. Further questions were asked about their main drug of choice, how old they were when they were first intoxicated, the first drug ever injected, how old they were when they first injected, how old they were when they first injected regularly and how frequently they had injected over the preceding month.

### **2.2.3 Drug use locations**

Respondents were asked the places in which they had injected drugs in the preceding 12 months. More particularly, respondents were asked which drugs they had ever used in a car, which drugs they had used in a car in the preceding 12 months and how frequently they had used each drug in a car over this time period.

### **2.2.4 Psychological functioning**

The Severity of Dependence Scale (SDS)<sup>(36)</sup> was used to gain an indication of the respondent's degree of dependence on their main drug of choice. Scores range from 0 to 15, with higher scores indicating greater drug dependence. In order to measure overall psychological distress, the 12 item version of the General Health Questionnaire (GHQ-12)<sup>(37)</sup> was administered. Scores range from 0 to 12, with greater psychological dysfunction associated with higher scores.

International Classification of Diseases (10th edition) (ICD-10) diagnoses of Borderline Personality Disorder (BPD) were screened for using the National Study of Mental Health and Well Being (NSMHWB) version of the composite international diagnostic instrument (CIDI)<sup>(38)</sup>. Diagnostic and Statistical Manual (4th edition) diagnoses (DSM-IV) of Conduct Disorder (CD) and Antisocial Personality Disorder (ASPD) were obtained using a modified version of the Diagnostic Interview Schedule<sup>(39)</sup>.

### **2.2.5 Driving history**

Respondents were asked: whether they had ever driven a vehicle, at what age they first drove a vehicle, whether they had ever had a driver's licence, at what age they received their driver's license and whether they had driven without a valid licence in the preceding 12 months, and how often they had driven over the previous 12 months (not at all, less than monthly, monthly, less than weekly, weekly, more than weekly or daily). Respondents were also asked when they had last been random breath tested, and for those who had been breath tested, how many times this had occurred in the preceding 12 months.

### **2.2.6 Drug use and driving**

Respondents were asked whether they had ever driven a vehicle soon after (within an hour) having used various drugs ('drug driving'). Specifically, respondents were asked about driving within an hour of the use of: heroin, other opiates, amphetamines, cocaine, hallucinogens, benzodiazepines, antidepressants, cannabis, inhalants and alcohol (more than 3 drinks within 2 hours of driving). It should be noted that the legal driving limit for alcohol in all Australian jurisdictions is 0.05g/100ml. Respondents were then asked whether they had driven soon after using these particular drugs in the preceding year, and if so, at what frequency (< monthly, monthly, =<weekly, weekly, >weekly, daily). In order to ascertain the recency of such behaviour, respondents were asked how long it had been since they had last engaged in drug driving. Those respondents who reported having driven a vehicle after having used drugs in the preceding year were asked what had been their main reason for doing so.

Questions were also included to obtain information about the presence of passengers whilst drug driving, including whether the respondent had ever driven with passengers in the car soon after having used drugs, how long it had been since they had done so, and who had been the passengers in the car when they had engaged in drug driving in the preceding 12 months.

### **2.2.7 Accident history**

Respondents were asked if they had ever had an accident while driving, and if so, how long since their last accident. Those who had had an accident were asked whether

they had ever had an accident while driving under the influence of drugs (DUID), and if so, how long since their last DUID accident. Alcohol may have been reported in relation to an accident, but the person had to have used other drugs for the accident to be considered a *drug* driving accident, in order to differentiate drug driving accidents from drink driving accidents. Respondents were asked how many DUID accidents they had had as a driver, whether they or another person had been injured in any of these accidents, if anyone was admitted to hospital and whether anyone had died. In order to ascertain the types of drugs commonly implicated in intoxicated accidents, respondents were asked what drug(s) they had used shortly before their last intoxicated accident. Respondents were also asked if they had been in treatment for drugs at the time of their last accident, and if so, what form of treatment.

### **2.2.8 Driving offence history**

An overview of the respondent's driving offence history was obtained, including: types of driving offences committed, whether they had ever had their licence cancelled, the length of licence cancellation, and whether they had ever been jailed for driving offences.

### **2.2.9 Involvement as a passenger with a drug driver**

Questions were included about the respondent's involvement as a passenger with a driver who had used drugs before driving ('drug driver'). Respondents were asked whether they had ever been a passenger with a drug driver, how long it had been since the most recent occasion and how frequently they had been a passenger with a drug driver in the preceding 12 months. Respondents were also asked if they had ever been involved in an accident as a passenger in a vehicle driven by a drug driver, and how long since their most recent accident.

### **2.2.10 Risk perceptions related to impaired driving**

In order to gain information about the sample's risk perceptions regarding DUID, respondents were asked how dangerous they think it is for someone to drive if intoxicated with individual drug classes (heroin, other opiates, amphetamines, cocaine, hallucinogens, benzodiazepines, antidepressants, alcohol, cannabis and inhalants). The respondents rated the level of danger according to a 1-4 Likert scale: 1 (not dangerous), 2 (not very dangerous), 3 (quite dangerous) and 4 (very dangerous).



Respondents were also asked how likely they thought it was that they would be caught for driving after having used illicit drugs, and what they perceived to be the most likely way of being caught for this offence.

### **2.3 *Statistical Analyses***

T-tests are used for continuous data. Where distributions are highly skewed medians are reported. For dichotomous categorical variables Odds Ratios (OR) and 95% Confidence Intervals (95% CI) are reported. Chi square analyses are reported for non-dichotomous categorical variables. All analyses were conducted using SPSS (version 11.0)<sup>(40)</sup>.

### **3.0 Results**

#### **3.1 *Sample Characteristics***

The sample consisted of 300 regular IDU, recruited from inner (34%), middle (33%) and outer (33%) areas of Sydney. The mean age of subjects was 31.8 years (SD 8.2, range 18-56 years), with 63% being male (Table 1). Males were significantly older than females (33.1 v 29.6 yrs,  $t_{298}=3.6$ ,  $p<.001$ ).

The mean years of formal school education was 9.8 (SD 1.4, range 5-12 years). Forty one percent of subjects had completed a trade or technical course, and five percent had completed a university course. The majority of subjects (77%) were currently unemployed, with five percent in fulltime employment, and a further ten percent in part time or casual employment.

Fifty three percent of subjects were currently enrolled in a drug treatment program, having been so for a median length of 14 months (range 0.25-288 months). The most common drug treatment type was methadone maintenance (44% of sample), with the median dose being 65 mg (range 5-180 mgs). Sixty percent of subjects reported ever having been imprisoned, which was significantly more likely for males (65% v 51%, OR=0.55, CI=0.34-0.89). One quarter of subjects (26%) reported having been imprisoned in the previous 12 months (no significant gender difference). Males were significantly less likely to have been involved in drug treatment (49% v 66%, OR=2.01, CI=1.24-3.28) and females were significantly more likely to have been involved in methadone maintenance (56% v 37%, OR=0.44, CI=0.28-0.71).

**Table 1: Demographic characteristics of the sample**

<b>Variable</b>	<b>Males (N=190)</b>	<b>Females (N=110)</b>	<b>Total (N=300)</b>
Age (yrs.)*	33.1	29.6	31.8
School (yrs.)	9.8	9.7	9.8
<i>Tertiary education (%)</i> :			
University	5	5	5
Trade/technical	40	44	41
None	56	52	54
<i>Employment (%)</i> :			
Unemployed	81	70	77
Full time	8	1	5
Part time/casual	10	10	10
Student	1	4	2
Home duties	1	16	6
<i>Geographical region (%)</i> :			
<b>Inner</b>	34	35	34
Middle	32	36	33
Outer	34	30	33
<i>Treatment status (%)</i> :			
Methadone*	37	56	44
Detoxification	1	0	0
TC	2	4	3
NA	1	1	1
Drug counselling	2	4	2
Other	7	3	6
None*	51	34	44
<i>Prison record (%)</i> :			
Ever*	65	51	60
12 months	29	20	26

\* Significant difference between groups

\*\*  $F_{298}=.910, p<.001$

### **3.2 Psychopathology**

The sample had high levels of psychological dysfunction. The mean GHQ-12 score was 4.8, with 70% exceeding the cut-off for distress sufficient to be termed a psychiatric case requiring attention. (Table 2). Significantly more females met the criteria for a BPD diagnosis (54% v 31%, OR 0.39, CI 0.24-0.63), while significantly more males met the criteria for a diagnosis of ASPD (65% v 53%, OR 1.70, CI 1.05-2.74). There was no gender difference in regards to Conduct Disorder.

**Table 2: Psychopathology**

<b>Variable</b>	<b>Males (N=190)</b>	<b>Females (N=110)</b>	<b>Total (N=300)</b>
<b><i>GHQ-12</i></b> Mean score	4.6	5.2	4.8
<b><i>BPD</i></b> Caseness*	31%	54%	39%
<b><i>CD</i></b> Caseness	67%	56%	63%
<b><i>ASPD</i></b> Caseness*	65%	53%	61%

\* Significant difference between groups

### **3.3 Drug Use**

The mean age of first intoxication was 13.7 years (SD 3.4, range 5-41 years) and the mean age of first injection was 19.4 years (SD 5.9, range 9-41 years) (Table 3). Heroin was the first drug injected by 54% of subjects, with 38% having first injected amphetamines, four percent cocaine and two percent other opioids. Heroin (and other opioids) was the current drug of choice of 67% of the sample, with 14% preferring cannabis, 11% cocaine and seven percent amphetamines. Forty four percent of subjects had injected drugs once a day or more in the preceding month. The mean SDS score was 8.8 (SD 3.9, range 0-15), with females reporting higher levels of dependence than males (9.7 v 8.2,  $t_{298}=-3.7$ ,  $p<0.05$ ).

**Table 3: Drug use characteristics**

<b>Variable</b>	<b>Males (N=190)</b>	<b>Females (N=110)</b>	<b>Total (N=300)</b>
Mean age first intoxicated (yrs)	13.8	13.7	13.7
Mean age first injected (yrs)	19.8	18.8	19.4
<i>Drug first injected (%)</i> :			
Heroin	55	53	54
Other opioids	3	1	2
Amphetamines	36	42	38
Cocaine	4	5	4
Hallucinogens	1	0	0.3
Other	1	0	0.3
Mean age first regular use (yrs)	21.2	20.0	20.8
<b>Drug of choice (%)</b> :			
Heroin/other opioids	70	61	67
Cocaine	9	16	11
Amphetamines	7	6	7
Benzodiazepines	1	1	1
Alcohol	1	0	0.3
Cannabis	12	16	14
<i>Injecting frequency in previous month (%)</i> :			
Not at all	3	3	3
≤ Once a week	26	29	27
> Once a week	31	17	26
Daily	12	12	12
2-3 times a day	20	23	21
> 3 times a day	8	16	11
SDS (mean score)*	8.2	9.7	8.8

\* Significant difference between groups

The sample engaged in a wide variety of polydrug use (Table 4). The mean number of drug classes used was 8.9 (SD 1.9, range 1-11), with 5.9 (SD 1.8, range 1-10) classes having been used in the last six months. A mean of 3.8 (SD 1.4, range 1-7) classes had been injected, 2.3 (SD 1.2, range 0-6) classes in the preceding six months. The most commonly used drug classes over the preceding six months were: tobacco (97%), heroin (87%), cannabis (78%), alcohol (63%), other opioids (63%), cocaine (57%) and benzodiazepines (56%).

**Table 4: Drug use history**

<b>Class</b>	<b>Ever used</b>	<b>Drug ever injected</b>	<b>Used last 6 months</b>	<b>Injected last 6 months</b>	<b>Days used last 6 months#</b>
Heroin	98	98	87	86	72
Other opioids	79	52	63	26	180
Amphetamines	89	82	47	46	6
Cocaine	91	85	57	54	12
Hallucinogens	77	28	14	4	2
Benzodiazepines	76	29	56	14	14
Antidepressants	39	0	20	0	120
Alcohol	97	2	63	0	24
Cannabis	98	n/a	78	n/a	180
Inhalants	44	n/a	6	n/a	2
Tobacco	98	n/a	97	n/a	180
Mean no. drug classes	8.9	3.8	5.9	2.3	n/a

# Median days used among those who used drug in last six months

### **3.4 Drug Use Locations**

The most common places to inject were the home (88%), a car (66%), at a friend's place (65%) and a street/park/beach (60%) (Table 5). Eighty one percent of the sample had injected in a public place in the preceding 12 months, with the car being the most common public place to inject.

**Table 5: Injecting locations (previous 12 months)**

<b>Location</b>	<b>Males (N=190) %</b>	<b>Females (N=110) %</b>	<b>Total (N=300) %</b>
Home	87	91	88
Car	65	66	66
Friend's place	65	66	65
Street/park/beach	61	58	60
Public toilet	36	51	41
Shooting gallery	24	27	25
Pub/club	22	26	24
Train	17	15	16
Other	3	4	3

The majority of respondents (95%) had ever used a drug in a car, and 86% had used a drug in a car in the previous 12 months (no gender differences). The most common

drugs used in a car in the preceding year were heroin (61%), cannabis (49%), alcohol (35%), cocaine (35%) and amphetamines (30%) (Table 6). Almost one quarter of subjects (23%) had used heroin in a car once a week or more in the preceding year.

**Table 6: Proportion of respondents who have used each drug in a car**

Drug	Ever %	12 months %	>= Weekly %
Heroin	86	61	23
Cannabis	74	49	17
Alcohol	63	35	11
Amphetamines	55	30	6
Cocaine	52	35	8
Benzodiazepines	32	24	7
Hallucinogens	29	7	0
Other opioids	23	13	4
Inhalants	5	1	0
Any drug	95	86	-

### 3.5 *Driving History*

The overwhelming majority of the sample (95%) had driven a vehicle, with significantly more males than females having ever driven (OR=30.27, CI=8.66-105.77) (Table 7). Respondents reported having first driven at a mean age of 14.7 years (SD 3.7, range 6-32). Three quarters (74%) of the sample were classified as “current drivers”, having driven in the previous 12 months. There was no difference between the proportions of males and females who were current drivers. Current drivers had a mean age of 31.3 years (SD=7.8, range 18-52), and did not significantly differ in age from those who had not driven in the previous 12 months.

Although the majority of the sample had driven, less than two thirds (60%) had ever had a licence, with males more likely to have ever had a licence (65% v 52%, OR=1.71, CI=1.06-2.75). Less than one quarter of the sample had a current licence, again with males more likely to be licensed (27% v 16%, OR=2.01, CI=1.09-3.69). Given that females were equally likely to have driven in the previous 12 months, but less likely than males to have a current license, it is not surprising that significantly more females had driven unlicensed in the previous 12 months (66% v 50%, OR=0.52, CI=0.32-0.84). Three quarters of current drivers (74%) had driven



unlicensed within the preceding 12 months, which was significantly more common for males (67% v 87%, OR=3.24, CI=1.57-6.69).

**Table 7: Driving history**

<b>Variable</b>	<b>Males (N=190)</b>	<b>Females (N=110)</b>	<b>Total (N=300)</b>
Ever driven (%)*	97	92	95
Driven in previous 12 months (%)	73	75	74
Age first drove (yrs)	14.5	15.2	14.7
Ever had licence (%)*	65	52	60
Current licence (%)*	27	16	23
Driven unlicensed (12 mths) (%)*	50	66	55
<i>Driving frequency (12 mths) (%)</i> :	27	25	23
Not driven	25	35	30
< monthly	11	6	9
Monthly	2	6	4
< weekly	6	6	7
Weekly	8	10	9
> weekly	21	13	19
Daily			

\* Significant difference between groups

### **3.6 Drug Driving History**

Of those who had ever driven, 87% reported having driven soon after using drugs (not including alcohol), representing 83% of the total sample. Eighty seven percent of current drivers reported having driven soon after using drugs in the previous 12 months, representing 64% of the total sample. Fifty nine percent of current drivers reported having driven after using drugs in the preceding month (44% of the total sample). There were no significant sex differences for DUID frequency.

Of those who had ever driven, 51% reported ever having driven after drinking alcohol (driving within within two hours of consuming more than three drinks), representing 49% of the total sample. Male drivers were more likely to have ever driven after drinking alcohol than female drivers (57% v 41%, OR=1.96, CI=1.20-3.21). Twenty seven percent of current drivers reported having driven after drinking alcohol in the previous 12 months, representing 20% of the total sample.

Among current drivers, the most common drugs used before driving in the preceding year were: cannabis (57%), heroin (56%), amphetamines (34%), cocaine (33%) and other opioids (32%) (Table 8). Of those who had driven in the previous 12 months, 22% reported having driven soon after using heroin on a weekly or more frequent basis, and 21% reported having driven soon after using cannabis weekly or more often in this time period. The only significant sex differences in impaired driving prevalence were for the proportion having ever driven after using hallucinogens (28% males v 15% females, OR=2.26, CI=1.20-4.26) and the proportion having ever driven after drinking alcohol (52% males v 27% females, OR=1.99, CI=1.21-3.26) (Table 9).

**Table 8: Proportion of drivers who have driven after using drugs**

<b>Drug</b>	<b>Ever# (N=286) %</b>	<b>12 mths## (N=222) %</b>	<b>&gt;= Weekly %</b>
Cannabis	74	57	21
Heroin	71	56	22
Amphetamines	53	34	9
Alcohol (> 3 drinks within 2hrs of driving)	51	27	5
Other opioids	41	32	14
Cocaine	39	33	9
Benzodiazepines	32	25	5
Hallucinogens	24	5	1
Inhalants	5	1	0
Any drug	87	87	-

# Of those who had ever driven

## Of those who had driven in previous 12 months

**Table 9: Lifetime and 12 month prevalence of drug driving by gender**

Drug	Ever		12 months	
	Males# (N=184) %	Females# (N=101) %	Males## (N=139) %	Females## (N=83) %
Cannabis	77	67	58	55
Heroin	75	64	60	49
Alcohol (> 3 drinks within 2hrs of driving)	58	41*	29	23
Amphetamines	55	49	34	34
Cocaine	43	33	35	29
Other opioids	40	44	28	37
Benzodiazepines	33	30	24	27
Hallucinogens	28	15*	6	4
Inhalants	6	2	1	0
Any drug	89	84	89	83

# Of those who had ever driven

## Of those who had driven in previous 12 months

\* Significant difference between groups

Of those drivers who had driven after using drugs in the previous 12 months, the most common reasons given for driving after having used drugs were: to get home after ‘scoring drugs’ (28%), to get around (26%), to give others a lift (11%) and to ‘score drugs’ (11%). Fifteen percent reported ‘other’ reasons, including attempting to avoid police, for ‘fun’ and to get methadone.

Drug driving whilst carrying passengers was reported by the majority of drivers (88%) (Table 10). Seventy seven percent of current drivers had driven with passengers in the car whilst drug driving in the previous 12 months, and 50% had driven with passengers in the car whilst drug driving in the preceding month. Friends were the most common type of passenger reported (whilst drug driving over the preceding 12 months) (65% of current drivers), followed by a partner (37%), a stranger (14%), children (13%) and other family members (12%).

**Table 10: Proportion of drivers who have driven with passengers whilst drug driving**

Time period	Males %	Females %	Total %
Ever#	87	91	88
Previous months##	77	77	77
Previous month##	51	47	50

# Of those who had ever driven (males: n=184; females: n=101)

## Of those who had driven in previous 12 months (males: n=139; females: n=83)

### 3.7 Accident History

Fifty nine percent of drivers reported ever having had an accident, with a significantly higher proportion of males having done so (64% v 49%, OR=1.91, CI=1.17-3.13) (Table 11). One third of drivers (32%) reported ever having had an accident while “driving under the influence of drugs”, again with a significantly higher proportion of males reporting having done so (36% v 24%, OR=1.78, CI=1.03-3.08). Of those drivers who reported having had a drug driving accident, there was a mean of 2.4 accidents (SD=2.1, range 0-12). One in ten current drivers (9%) reported having had an accident while driving under the influence of drugs in the previous year. As noted in the method, accidents which involved alcohol alone were not considered drug driving accidents. That is, if a driver reported having consumed alcohol before their last drug driving accident, but no other drugs, this accident was not included as a drug driving accident.

Fifteen percent of drivers reported having been injured in an accident while drug driving. Eight percent reported that another person (such as a passenger, other vehicle occupant or pedestrian) had been injured in a vehicle accident in which they (the respondent) were drug driving, with a significantly higher proportion of males reporting this occurrence (11% v 4%, OR= 2.94, CI=0.98-8.85). One percent of drivers reported that someone had been killed in a vehicle accident in which they (the respondent) were drug driving. Almost half (47%) of those who had ever had a drug driving accident reported having been injured in one of these accidents and one quarter (25%) of drug driving accident involved drivers reported that another person had been injured in one of these accidents.

**Table 11: Accident history of drivers (including only accidents whilst the driver)**

<b>Variable</b>	<b>Males</b>	<b>Females</b>	<b>Total</b>
<i>Accident (%)</i> :			
Ever #*	64	49	59
12 months ##	15	19	17
<i>Drug driving accident (%)</i> :			
Ever #*	36	24	32
12 months ##	9	10	9
Mean number of drug driving accidents ###	2.3	2.7	2.4
Been injured in a drug driving accident (%) #	17	10	15
Others injured in a drug driving accident (%) #*	11	4	8
Anyone taken to hospital after drug driving accident (%) #	14	8	12
Anyone killed in/resulting from drug driving accident (%) #	1	1	1

# Of those who have ever driven (males: n=184; females: n=101)

## Of those who have driven in previous 12 mths (males: n=139; females: n=83)

### Of those who have had a drug driving accident (males: n=66; females: n=24)

\* Significant difference between groups

The most common drugs used before the last impaired driving accident were heroin (53%), cannabis (46%) and alcohol (42%) (Table 12). The only significant sex difference in the type of drug used before the last drug driving accident was for prescribed methadone (38% females v 6% males, OR= 9.30, CI=2.52-34.33). The mean number of drugs involved in last drug driving accident was 2.1 (SD 1.1, range 1-5). Sixty six percent of those reporting a drug driving accident reported using two or more drugs prior to the accident, 28% reported using three or more drugs and 12% reported using 4 or more drugs. The majority (73%) of those reporting a drug driving accident were not in any form of drug treatment at the time of the accident. Of those who did report being in some form of drug treatment, the most common type of treatment was methadone (21%).

**Table 12: Drugs used before last drug driving accident#**

<b>Drug</b>	<b>Males (N=66) %</b>	<b>Females (N=24) %</b>	<b>Total (N=90) %</b>
Heroin	52	58	53
Cannabis	42	54	46
Alcohol	46	33	42
Benzodiazepines	24	29	26
Methadone – prescribed*	6	38	14
Amphetamines	11	8	10
Cocaine	8	13	9
Methadone – illicit	2	4	2
Hallucinogens	2	4	2
Other opioids	2	0	1
Inhalants	0	0	0

# Including only those drivers who had had a drug driving accident

\* Significant difference between groups

### **3.8 Driving Offence History**

The majority of drivers (77%) had committed some form of driving offence, with males more likely to have done so (80% v 64%, OR=2.22, CI=1.29-3.82). The most common driving offences reported were unlicensed driving (51%), speeding (50%) and driving an unregistered car (39%). Approximately one third of drivers (32%) had had their licence cancelled at some stage in their driving history, which was significantly higher for males (36% v 24%, OR=0.55, CI=0.32-0.95). One in ten (11%) drivers had been jailed for a driving offence, which was also significantly higher for males (14% v 6%, OR=0.39, CI=0.15-0.97).

Sixteen percent of those who reported ever having driven after using drugs reported having received a ticket for or being convicted of DUID, with males more likely to have been charged for DUID (20% v 9%, OR=2.33, CI=1.02-5.32). Forty nine percent of those who reported ever having driven after drinking alcohol reported ever having received a ticket for or being convicted of drunk driving.

**Table 13: Driving offence history#**

<b>Variable</b>	<b>Males (N=185) %</b>	<b>Females (N=101) %</b>	<b>Total (N=286) %</b>
Unlicensed driving	55	45	51
Speeding	57	37	50
Driving unregistered car	41	34	39
Drink driving	32	21	28
Dangerous/negligent driving	33	17	27
Running a red light	21	14	18
DUID	17	8	14
No right turn violation	10	6	9
Overtaking illegally	10	6	9
Failing to stop at a pedestrian crossing	4	2	4
Other	16	10	14
Any offence*	80	64	74
Licence cancelled*	36	24	32
Jailed for driving offence*	14	6	11

# Of those who have ever driven

### **3.9 Experience As a Passenger of a Drug Driver**

The majority of respondents (89%) had been a passenger with someone who had used drugs before driving, with almost a third (30%) having done so weekly or more often over the previous 12 months. Forty two percent of respondents had been involved in a vehicle accident whilst being driven by a drug-intoxicated driver, and twelve percent had been involved in such an accident in the previous 12 months.

**Table 14: Experience of being a passenger of a drug driver**

<b>Variable</b>	<b>Males (N=190) %</b>	<b>Females (N=110) %</b>	<b>Total (N=300) %</b>
<i>Passenger with a drug driver:</i>			
Ever	90	97	89
Previous 12 months	70	72	71
>= Weekly (12 mths)	27	35	30
<i>Passenger in an accident with a drug-intoxicated driver:</i>			
Ever	42	43	42
Previous 12 mths	11	14	12

### **3.10 Risk Perceptions Related to Drug Driving**

Alcohol was perceived to be the most impairing substance in terms of driving performance, perceived to be ‘very dangerous’ by 84% of respondents (Table 15). The next most dangerous drugs were hallucinogens (71%), followed by benzodiazepines (68%). The drug perceived as least dangerous was cannabis (perceived as very dangerous by 18%), followed by amphetamines (31%) and cocaine (37%).

In an examination of the mean score (ranging from 1, ‘not dangerous’ to 4, ‘very dangerous’), there was no significant difference between the scores for alcohol (highest mean score) and hallucinogens (second highest score). Alcohol was perceived to be significantly more dangerous than benzodiazepines (3.83 v 3.66,  $t_{277} = -4.6$ ,  $p < .001$ ), the third most dangerous drug and heroin (3.83 v 3.47,  $t_{294} = -8.5$ ,  $p < .001$ ), the fourth most dangerous drug. In contrast, cannabis, with the lowest score (2.31, SD=1.06, range 1-4) was perceived to be significantly less dangerous than amphetamines (2.31 v 2.83,  $t_{272} = 7.6$ ,  $p < .001$ ), the second least dangerous drug.



**Table 15: Perception of how dangerous it is for someone to drive while intoxicated by particular drugs**

Variable	Mean score	Very dangerous %	Quite dangerous %	Not very dangerous %	Not dangerous %	Don't know %
Alcohol	3.83	84	13	2	0	1
Hallucinogens	3.75	71	15	3	1	10
Benzodiazepines	3.66	68	19	4	2	7
Heroin	3.47	58	32	8	1	0
Inhalants	3.45	45	16	4	4	30
Other opioids	3.29	47	28	13	4	8
Cocaine	3.02	37	29	19	8	7
Amphetamines	2.83	31	27	23	12	8
Cannabis	2.31	18	19	34	26	3

There were differences in the perceived danger associated with particular drugs according to whether or not the respondent had driven after using drugs in the previous 12 months (DUID 12 months) (Table 16). Generally, DUID 12 months subjects perceived DUID to be less dangerous than non-DUID 12 months subjects. DUID 12 months subjects reported a significantly lower level of danger than non-DUID 12 months subjects for heroin (3.38 v 3.64,  $t_{252.067} = -3.3$ ,  $p < .05$ ), opioids (3.18 v 3.49,  $t_{273} = -2.8$ ,  $p < .05$ ), cocaine (2.91 v 3.23,  $t_{278} = -2.6$ ,  $p < .05$ ) and cannabis (2.16 v 2.57,  $t_{289} = -3.2$ ,  $p < .05$ ).

Forty one percent of the sample perceived it to be likely that they would be caught for drug driving, with no significant sex differences in this perception. DUID 12 months subjects perceived it to be less likely to be caught for drug driving than non-DUID 12 months subjects (35% v 54%, OR=2.17, CI=1.34-3.52). The most common responses given for the most likely way of getting caught for driving after having used drugs were erratic driving (28%), random breath testing (22%), being involved in an accident (16%) and if police knew you were a drug user (13%).

**Table 16: Perception of how dangerous it is for someone to drive while intoxicated by particular drugs according to drug driving experience**

Perceived danger	DUID 12 months Subjects	Non-DUID 12 months Subjects
Alcohol	3.80	3.89
Hallucinogens	3.76	3.72
Benzodiazepines	3.61	3.75
Inhalants	3.39	3.56
Heroin*	3.38	3.64
Other opioids*	3.18	3.49
Cocaine*	2.91	3.23
Amphetamines	2.77	2.94
Cannabis*	2.16	2.57

\* Significant difference between groups

### ***3.11 Factors Associated With Drug Driving***

There were no significant age or sex differences between those who had driven after using drugs in the previous 12 months and those who had not. There were no significant differences in drug driving rates according to geographical region, with high proportions of IDU drug-drivers in the inner, middle and outer areas of Sydney.

There was a significant difference between those who had driven after using drugs in the previous 12 months and those who had not according to driving frequency ( $\chi^2_5=22.4$ ,  $p<.001$ ). Thus, 33% of drug-drivers had driven less than once a month in the previous 12 months, compared to 77% of non-drug-drivers.

There were differences between drug drivers and other IDU according to their drug use patterns. Drug-drivers had significantly higher levels of dependence on their drug of choice as measured by the SDS (9.3 v 6.5,  $t_{220}= 3.8$ ,  $p<.001$ ), higher frequency of use of their drug of choice (111.8 days v 83.9 days,  $t_{220}= 2.0$ ,  $p<.05$ ) and more extensive polydrug use (6.3 v 5.3 classes,  $t_{220}= 3.0$ ,  $p<.05$ ). Drug-drivers were also significantly more likely to have used a drug in the car in the previous 12 months (94% v 73%, OR=5.45, CI=2.01-14.80) and to have injected a drug in a car in the previous 12 months (76% v 47%, OR=3.53, CI=1.60-7.76). There were no differences between drug-drivers and non-drug-drivers in injecting frequency or having been enrolled in drug treatment for the entire previous 12 months.

There were no drug driving group differences in psychopathology, with no significant differences in GHQ scores, or the proportions meeting criteria for BPD or ASPD.

**Table 17: Factors associated with drug driving (previous 12 months)#**

<b>Variable</b>	<b>Drug drivers (N=192)</b>	<b>Non-Drug drivers (N=30)</b>
<b>Demographics:</b>		
Age (yrs)	31.4	31.0
Sex (% male)	64	53
<i>Geographical region (%)</i> :		
Inner	33	30
Middle	38	37
Outer	29	33
<b>Driving frequency* (%)</b> :		
< Monthly	33	77
1/Month to < weekly	18	7
>= Weekly (< once/day)	23	7
Daily	26	10
<b>Drug Use:</b>		
SDS (mean score)*	9.3	6.5
<i>Injecting frequency (previous month)</i> (%)		
Not at all	2	7
<= Weekly	29	37
> Weekly (< once/day)	23	30
>= Once/day	47	27
DOC frequency (6 months)*	111.8	83.9
Number of drug classes (6 months)*	6.3	5.3
In drug treatment entire 12 month period	31	40
Used a drug in a car (12 months)*	94	73
Injected a drug in a car (12 months)*	76	47
<b>Psychopathology:</b>		
GHQ-12 (mean score)	4.8	4.1
ASPD (%)	63	63
BPD (%)	42	30

#Current drivers

\*Significant difference between groups

DOC = drug of choice

## **4.0 DISCUSSION**

### **4.1 *Major Findings***

The major finding of the current study was the high prevalence of drug driving amongst IDU. The overwhelming majority of drivers reported having driven shortly after having used drugs, both in their lifetime and in the preceding year. Drug driving was not only widespread, but was also a frequent occurrence among a large proportion of the sample. Heroin and cannabis were the two drugs most frequently related to drug driving, but a wide range of other drugs were also implicated.

The second major finding concerned the high rate of drug driving motor vehicle accidents of IDU drivers. A third of IDU drivers reported having had a motor vehicle accident soon after having used drugs, with heroin being the most common drug involved. Furthermore, a large proportion of these accidents resulted in injury to the driver and/or others. The drug driving of this group was clearly having negative consequences for the drivers and for others.

The third major finding of the study was the frequent risk to IDU due to being a passenger of a drug driver. Nearly all of the sample reported having been driven by a drug driver, and a half of those had been involved in an accident. IDU are thus at risk from the drug driving behaviours of their drug using peers.

Finally, several major factors associated with drug driving were identified. Drug driving was associated with heavier, dependent drug use, and more extensive polydrug use. Those who drove more frequently were more likely to engage in drug driving. Finally, drug drivers were substantially more likely to have used drugs in cars in the preceding year, and to have injected in a car.

### **4.2 *Drug Use in Cars***

Consistent with previous work<sup>(29)</sup>, and with data on overdose fatalities<sup>(30, 31)</sup>, the injection and general use of drugs in cars was common. Two thirds of respondents had injected in a car in the preceding 12 months, making it the most common place to inject after the person's own home. The two drugs most commonly and frequently used in cars by the sample were heroin and cannabis. Heroin had been used in a car by 61% of respondents over the preceding year. The range of drugs used in cars was

extensive, with large proportions reporting the use of cocaine, alcohol, amphetamines and benzodiazepines. The extent of car based drug use is further illustrated by the finding that a quarter of the sample had used heroin in cars on a weekly or more frequent basis over the preceding year. Such a high prevalence of drug use in cars provides frequent opportunity for drug driving, as demonstrated by the strong relationship between drug use in cars and drug driving.

### **4.3 *Driving Histories***

Driving was highly prevalent among the sample. Almost all (95%) had driven a vehicle at some time, and three quarters had driven a vehicle in the preceding year. Over a third had driven on at least a weekly basis over that period. These figures are far in excess of those reported in the Albery et al<sup>(34)</sup> study conducted in the UK, where geographical distances are likely to be substantially less, and with consequently less need to drive. The figures from this study are more akin to those reported in the Melbourne based study of Aitken et al<sup>(33)</sup>.

Unlicensed driving was common. Thus, while 95% of the sample had ever driven, only 63% had ever had a licence. In the preceding 12 months over a half of all subjects had driven unlicensed, representing three quarters of current drivers. Females were significantly more likely than males to have driven unlicensed in the preceding year. This is due to the fact that while males and females were equally likely to have driven in the preceding year, females were substantially less likely to have a current license.

### **4.4 *Drug Driving***

Drug driving was highly prevalent, with nine out of ten who had ever driven having done so shortly after using drugs. In terms of the overall prevalence among IDU, these drivers represented 83% of the entire sample. Drug driving was not merely historical, with 87% of current drivers having driven in the preceding year shortly after using drugs. By comparison, only 2-4% of the driving population in Australia and elsewhere report drug use prior to driving in a 12 month period<sup>(19-26)</sup>. These extremely high rates of drug driving are consistent with those reported by Albery et al<sup>(34)</sup> in the UK, and Aitken et al<sup>(33)</sup> in Australia. There were no gender differences for drug driving

prevalence, with males and females equally likely to have ever driven after the use of drugs, and to have drug driven in the preceding year.

Consistent with the drug use patterns of the sample, the drugs most commonly used prior to driving were heroin and cannabis. Over a half of current drivers had driven after using heroin and/or cannabis in the preceding year. Substantial proportions reported driving after using amphetamines, other opioids, cocaine, alcohol and benzodiazepines. The range of drugs reported in drug driving clearly reflects the broad polydrug use of the sample.

While the overall extent of drug driving is worrying, the frequency of these behaviours is further cause for concern. A fifth of current drivers reported driving on at least a weekly basis over the preceding year after the use of heroin and/or cannabis. Weekly driving after the use of amphetamines and/or cocaine was reported by one in ten current drivers. Drug driving was not only a widespread phenomenon among these IDU, it was also a frequent occurrence.

The risks of drug driving were not restricted to the respondents themselves, with the carrying of passengers being common. Approximately nine in ten drivers had carried passengers whilst drug driving, three quarters had done so in the preceding year, and a half in the preceding month. Most commonly passengers were friends or partners, although a substantial proportion reported having driven children whilst drug driving. Only 16% of those who had driven under the influence of drugs had ever been charged with drug affected driving.

Why do IDU drive after having used drugs? The major reasons given by IDU who had done so were rather prosaic. IDU did not enjoy drug driving, with only 6 respondents stating that they drug drove for "fun". The major reasons given revolved around scoring drugs, either driving to get them, or driving home after having scored. Simply "getting around" or "giving others a lift" were the other main reasons. The prosaic nature of these reasons are consistent with those reported among illicit drug users in a recent qualitative study conducted in Queensland<sup>(41)</sup>. Overall, the drug driving of these IDU appeared circumstantial and logistical, rather than a deliberate policy on their behalf. Again, the large geographical distances in Australia and Australian cities should be borne in mind in terms of a 'need to drive'.

#### 4.5 Accident Histories

The driving of IDU, intoxicated or otherwise, might be of little public health interest if they were rarely involved in accidents. This does not appear to be the case. Over a half of drivers reported having ever had an vehicle accident, with males more likely to have had an accident. Nearly a fifth (17%) of current drivers had been involved in an accident in the preceding 12 months. In comparison, it is estimated that approximately 1% of drivers in NSW are involved in a traffic accident in a 12 month period<sup>(42)</sup>. The overall accident rate of IDU is thus many times that of the general population. It should be borne in mind, however, that IDU are a young, male-dominated population, both factors associated with a higher risk of vehicle accident<sup>(43-45)</sup>.

Drug intoxication would appear to play a major role in accidents among these IDU. A third of drivers reported having had a drug driving accident, on an average of two occasions. One in ten current drivers reported a drug driving accident during the preceding 12 months, representing over a half of those who had an accident in that period. Males were more likely to have *ever* had a drug driving accident, and to have done so in the preceding 12 months. The rate of drug involved accidents is far higher than the lifetime rate of 21% reported by Albery et al<sup>(34)</sup> in the UK. Again, this may well reflect the vastly larger distances involved in travelling in Australia compared to smaller countries, and perhaps better access to public transport in the UK.

Not surprisingly, given the extent of heroin use among the sample, heroin was the drug most commonly reported as having been used prior to the last drug driving accident. Over a half of most recent drug driving accidents among the sample involved heroin. The next most common drugs reported were cannabis and alcohol, both present in nearly a half of drug driving accidents. Benzodiazepines, widely used among IDU<sup>(27)</sup>, were present in a quarter of most recent drug driving accidents. The patterns of drug involvement in accidents reported by this sample reflect their overall drug consumption patterns, and their general patterns of drug driving. In this, they diverge from the broader toxicology of road accidents, in which, after alcohol, cannabis and benzodiazepines predominate<sup>(7, 13-17)</sup>. Thus, a heavy heroin using group, who frequently drive after using heroin would be likely to have this reflected in their accidents. The polydrug use of the sample is also reflected in their drug driving

accident histories, with an average of two classes having been used prior to the most recent accident.

A large proportion of the drug driving accidents of the sample resulted in injury. One in seven of those who had ever driven had been injured in a drug driving accident, meaning that about a half of those who reported a drug driving accident had been injured in one. Nearly one in ten of all drivers reported a drug driving accident in which others were injured, and one in eight reported an accident in which someone was hospitalised. The drug driving of IDU would appear to have demonstrable consequences, both for themselves and others.

#### **4.6 *Passengers of Drug Drivers***

The risks associated with drug driving were not restricted to the driving behaviours of the respondent themselves. Given that the social circles of IDU are likely to include a large proportion of other IDU, and that the frequency of drug use in cars is high, it is likely that IDU will be exposed to risk through being driven by drug drivers. The results of this study indicate that there is widespread exposure to such risks, and that the risks are considerable. Nearly all of the sample (89%) reported that they had been a passenger of a drug driver. In the preceding year, nearly three quarters of the sample had been a passenger of a drug affected driver, and 30% had done so on at least a weekly basis over that period.

Passengers of drug affected drivers appeared to be at high risk of being involved in accidents. Nearly a half of respondents had been involved in an accident whilst being driven by a drug driver, and one in eight had done so in the preceding year. Overall, a half of respondents who had driven with a drug driver had been involved in an accident whilst the driver was intoxicated, nearly a fifth in the preceding year. It is clear that IDU are at great risk of accident exposure whilst being driven by their drug using peers, over and above the risk involved in relation to their own driving.

#### **4.7 *Risk Perceptions***

IDU made clear distinctions between the dangers intoxication with different drugs posed for driving. Alcohol was rated as the most dangerous substance for driving, and was considered as dangerous as hallucinogens. Alcohol was perceived as being



significantly more dangerous than benzodiazepines, the next perceived most dangerous drug class. Heroin, which this study has demonstrated to be widely involved in drug driving accidents, was rated as only the fourth most dangerous drug for driving. Thus, while 84% of IDU rated alcohol as very dangerous for driving, only 58% rated heroin as such.

A clear distinction was made between psychostimulants, hallucinogens and sedative drugs (alcohol, benzodiazepines, opioids). Amphetamines and cocaine were regarded as substantially less dangerous than hallucinogens or sedatives. For instance, whilst only 9% of IDU regarded heroin as not particularly dangerous, the equivalent figure for amphetamines was 35%. Anecdotally, IDU made a distinction between sedatives, and drugs they perceived as increasing alertness.

Cannabis was perceived to be the least dangerous drug to drive on, with less than a fifth of IDU regarding it as very dangerous. Cannabis was rated significantly less dangerous than the psychostimulants. This is in line with the view of other drug users, with cannabis widely regarded as posing little or no driving danger<sup>(34, 46-48)</sup>. DUI of cannabis has also been perceived to be less dangerous than DUI of other drugs by a sample from the general population in Fremantle, Western Australia<sup>(49)</sup>.

IDU who had recently driven after having used a drug rated drug driving as less dangerous than those who had not done so. Drug driving IDU rated drug driving after using heroin, other opioids, cocaine or cannabis as less dangerous than non-drug driving IDU. These data suggesting drug drivers regard their behaviours as less dangerous than others are consistent with population studies on risk perceptions. Both Albery et al.<sup>(34)</sup> and Lobmann and Kruger<sup>(50)</sup> reported that drug drivers were less likely than non-drug drivers to perceive drugs to impair driving performance. Similarly, those who have reported DUIA or have been arrested for DUIA have been found to have more permissive attitudes regarding DUIA than non-DUIA drivers<sup>(51, 52)</sup>.

The sample were divided on the risk of getting caught for drug driving. Less than a half, however, thought it likely they would be caught driving after having used drugs. Recent drug drivers rated the risk of getting caught as significantly lower than did

non-drug drivers. Thus, drug drivers believed it safer than other drivers to drive on drugs, and perceived their risk of detection as lower than that of non-drug drivers. Overall, the perceived risk of getting caught was not high, and was less so among those who practised drug driving. While there has been little other research on the risk perceptions regarding drug driving, there have been a number of studies that have found that those who perceive it to be unlikely to be caught for DUIA are more likely to perform this behaviour<sup>(53-55)</sup>. However, in the only other study found that has examined risk perceptions related to drug driving, dance party attendants in Germany who reported driving after using drugs did not differ in their perception of the likelihood of being caught for DUID from those who reported avoiding driving after using drugs. This may be due to the slight difference in definition, with the current study looking at those who had drug driven in the previous 12 months, versus those who had ever drug driven in Lobmann and Kruger's<sup>(50)</sup> study.

#### **4.8 Factors Associated With Drug Driving**

Three major groups of risk factors were associated with drug driving in this study. Firstly, heavier drug use was strongly associated with a higher likelihood of drug driving. Drug drivers had higher levels of dependence on their drug of choice, had used their drug of choice more frequently, and had more extensive polydrug use. Overall, the pattern is of a heavily dependent polydrug user. These results support those of Lobmann and Kruger<sup>(50)</sup>, who found an association between amount of substance consumption and DUID. However, they differ from the results of Albery et al<sup>(34)</sup>, who found no relationship between frequency of DUID (never, sometimes or frequently) and frequency of drug use, amount of drugs used, or severity of dependence.

The second major factor was frequency of driving. Those who drove more frequently were more likely to engage in drug driving. Taken together with drug use, the picture of a drug driving IDU is of a heavy polydrug user, who is driving frequently. Thus, if you frequently use drugs, and you frequently drive, you are more likely to drug drive. These results differ from the results of Macdonald and Dooley (52) and Wilson(43), who found no difference between the driving frequency of DUIA and non-DUIA drivers. However, no studies have been found that have examined the association between driving frequency and DUID.

Finally, the circumstances of drug use appear relevant. It was argued above that drug use in cars gives rise to opportunities to drug drive. This study showed drug use and injecting in cars to be extremely widespread, and that this did increase risk. Drug drivers were substantially more likely to have used drugs in cars in the preceding year, and to have injected in a car.

It is important to examine what was not associated with drug driving. There were no demographic differences between drug drivers and other IDU in either age or sex. Females were as likely as males to have drug driven. Although the majority of studies in the drug driving literature have found males to be more likely to DUID, a number of studies have failed to find sex differences in drug driving prevalence, according to both self-report and drug testing (due to suspicion of drug driving or accident-involvement)<sup>(5, 19, 20, 22, 50, 56-58)</sup>. It should be remembered that females had higher levels of dependence than males in the current study, which may negate any inherent gender differences.

Importantly, enrolment in drug treatment did not reduce the rate of drug driving, with drug drivers as likely to have been enrolled in treatment for the entire previous twelve months as non-drug drivers. The beneficial effects of treatment *per se* on many forms of harms do not appear to extend to driving behaviours.

Levels of drug driving did not significantly differ by geographical region. Rates were high in the inner, middle and outer rings of Sydney. This is a ubiquitous behaviour among IDU that is not restricted to the outer regions.

Importantly, psychopathology did not predict drug driving. In particular, diagnoses of BPD and ASPD, both of which contain heavy elements of impulsive risky behaviours, did *not* predict drug driving. Drug driving does not appear to arise from psychopathology, but from drug use and circumstantial factors. This is in line with other research that has found that although DUIA and DUID have been associated with various psychological characteristics, such as low constraint, sensation-seeking and aggression, such factors are actually predictive of substance use problems and are only indirectly related to impaired driving<sup>(50, 59-66)</sup>.

#### **4.9 Implications**

The current study indicates that drug driving and drug-related accidents are large scale problems among IDU, and a significant safety issue for other road users. Drug driving is an illegal behaviour, and the above data also indicate that it constitutes a major policing problem. What types of interventions could be undertaken to reduce the prevalence of these behaviours? Firstly, education campaigns could be directed at IDU regarding the risks of drug driving, as has been done in the case of heroin overdose and blood borne diseases. As noted above, the behaviour is so widespread as to almost have been normalised among this group. The high proportion who have accidents whilst drug driving could, for example, be emphasised. Currently, no data on the risk of drug driving have been presented to IDU. In particular, heavily dependent users who drive would appear to be most at risk, and should be targeted. Similarly, a campaign would need to also focus on getting IDU to avoid being a passenger of a drug driver. The data from the current study indicate this to be a highly prevalent, and highly risky behaviour.

Such campaigns would clearly have to change the risk perceptions of IDU on drug driving. In particular, the perceptions of those who do drug drive would need to be addressed. This group has a lower view of the risks involved than non-drug drivers. The data from the current study support the view that drug driving is a high risk behaviour, and IDU need to be made aware of the risks to themselves and others.

Finally, a crucial component of any intervention aimed at IDU drug driving would be to encourage the use of public transport.

#### **4.10 Summary**

In summary, the current study indicates that drug driving, and drug-related road accidents are large scale public health problems among IDU. Such behaviours pose serious risks to IDU themselves, and to the broader community. It is clear that drug driving is a harm associated with drug use, and has become so widespread that it is almost a "normal" activity among this group. Given the extent of the problem, drug driving warrants further research attention, and interventions specifically aimed at this group.

## 5.0 REFERENCES

1. Australian Transport Safety Bureau. (2002). *Benchmarking Road Safety: The 1999 Report*. Canberra: Commonwealth of Australia.
2. House of Representatives Standing Committee on Family and Community Affairs. (2001). *Where to next? A discussion paper. Inquiry into substance abuse in Australian communities*. Canberra: The Parliament of the Commonwealth of Australia.
3. Athanaselis S, Dona A, Papadodima S, Papoutsis G, Maravelias C & Koutselinis A. (1999). The use of alcohol and other psychoactive substances by victims of traffic accidents in Greece. *Forensic Science International*, 102, 103-109.
4. Cimbura G, Lucas DM, Bennett RC, Warren RA & Simpson HM. (1982). Incidence and toxicological aspects of drugs detected in 484 fatally injured drivers and pedestrians in Ontario. *Journal of Forensic Sciences*, 27, 855-867.
5. Del Rio CM, Gomez J, Sancho M & Alvarez FJ. (2002). Alcohol, illicit drugs and medicinal drugs in fatally injured drivers in Spain between 1991 and 2000. *Forensic Science International*, 127, 63-70.
6. Drummer OH. (1994). *Drugs in drivers killed in Australian road traffic accidents: the use of responsibility analysis to investigate the contribution of drugs to fatal accidents* (Report No. 0594). Clayton: Victorian Institute of Forensic Pathology, Monash University.
7. Longo M, Hunter C, Lokan R, White J & White M. (2000). The prevalence of alcohol, cannabinoids, benzodiazepines and stimulants amongst injured drivers and

their role in driver culpability. Part 1: the prevalence of drug use in drivers, and characteristics of the drug-positive group. *Accident, Analysis and Prevention*, 32, 613-622.

8. Longo MC (Ed.). (2001). *The prevalence and role of alcohol, marijuana, benzodiazepines and stimulants in drivers injured in road crashes*. Adelaide: University of Adelaide.

9. Seymour A & Oliver JS. (1999). Role of drugs and alcohol in impaired drivers and fatally injured drivers in the Strathclyde police region of Scotland, 1995 - 1998. *Forensic Science International*, 103, 89-100.

10. Sjogren H, Bjornstig U, Eriksson A, Ohman U & Solarz A. (1997). Drug and alcohol use among injured motor vehicle drivers in Sweden: prevalence, driver, crash, and injury characteristics. *Alcoholism: Clinical & Experimental Research*, 21, 968-973.

11. Waller PF, Blow FC, Maio RF, Singer K, Hill EM & Schaefer N. (1997). Crash characteristics and injuries of victims impaired by alcohol versus illicit drugs. *Accident, Analysis and Prevention*, 29, 817-827.

12. Williams A, Peat M, Crouch D, Wells J & Finkle B. (1985). Drugs in fatally injured young male drivers. *Public Health Reports*, 100, 19-25.

13. 'Benzodiazepine/Driving' Collaborative Group. (1993). Are benzodiazepines a risk factor for road accidents? *Drug and Alcohol Dependence*, 33, 19-22.

14. Marzuk P, Tardiff K, Leon A, Stajic M, Morgan E & Mann J. (1990). Prevalence of recent cocaine use among motor vehicle fatalities in New York City. *Journal of the American Medical Association*, 263, 250-256.
15. Mercer GW & Jeffery WK. (1995). Alcohol, drugs, and impairment in fatal traffic accidents in British Columbia. *Accident, Analysis and Prevention*, 27, 335-343.
16. Stoduto G, Vingilis E, Kapur B, Sheu W-J, McLellan B & Liban C. (1993). Alcohol and drug use among motor vehicle collision victims admitted to a regional trauma unit: demographic, injury, and crash characteristics. *Accident, Analysis and Prevention*, 25, 411-420.
17. Sugrue M, Seger M, Dredge G, Davies DJ, Ieraci S, Bauman A, Deane SA & Sloane D. (1995). Evaluation of the prevalence of drug and alcohol abuse in motor vehicle trauma in South Western Sydney. *Australian and New Zealand Journal of Surgery*, 65, 853-856.
18. Mason AP & McBay AJ. (1984). Ethanol, marijuana, and other drug use in 600 drivers killed in single-vehicle crashes in North Carolina, 1978-1981. *Journal of Forensic Sciences*, 29, 987-1026.
19. Albery I & Guppy A. (1995). Drivers' differential perceptions of legal and safe driving consumption. *Addiction*, 90, 245-254.
20. Alvarez FJ, Prada R & Del Rio MC. (1991). 'Illegal' drugs and driving in Spain. *Accident, Analysis and Prevention*, 19, 491-492.
21. Australian Institute of Health and Welfare. (2002). *2001 National drug strategy household survey: first results* (Drug Statistics Series Number 9). Canberra.

22. Del Rio CM & Alvarez F. (1995). Illegal drug taking and driving: patterns of drug taking among Spanish drivers. *Drug and Alcohol Dependence*, 37, 83-86.
23. Substance Abuse and Mental Health Services Administration. (2002). *Results from the 2001 National Household Survey on Drug Abuse: Volume 1. Summary of national findings* (DHHS Publication No. SMA 02-3758). Rockville, MD: Office of Applied Studies, NHSDA Series H-17.
24. Roeper P & Voas RB. (1998). Alcohol consumption measured at roadside surveys and variations in traffic injury crashes. *Accident, Analysis and Prevention*, 30, 409-416.
25. Voas RB, Wells J, Lestina D, Williams A & Greene M. (1998). Drinking and driving in the United States: the 1996 national roadside survey. *Accident, Analysis and Prevention*, 30, 267-275.
26. Walsh GW & Mann RE. (1999). On the high road: driving under the influence of cannabis in Ontario. *Canadian Journal of Public Health*, 90, 260-263.
27. Darke S & Ross J. (1997). Polydrug dependence and psychiatric comorbidity among heroin injectors. *Drug and Alcohol Dependence*, 48, 135-141.
28. Dinwiddie SH, Cottler L, Compton W & Abdallah AB. (1996). Psychopathology and HIV risk behaviours among injection drug users in and out of treatment. *Drug and Alcohol Dependence*, 43, 1-11.
29. Darke S, Kaye S & Ross J. (2001). Geographical injecting locations among injecting drug users in Sydney, Australia. *Addiction*, 96, 241-246.



30. Darke S, Ross J, Zador D & Sunjic S. (2000). Heroin-related deaths in New South Wales, Australia, 1992 - 1996. *Drug and Alcohol Dependence*, 60, 141-150.
31. McGregor C, Ali R, Lokan R, Christie P & Darke S. (2002). Accidental fatalities among heroin users in South Australia, 1994-1997: toxicological findings and circumstances of death. *Addiction Research and Theory*, 10, 335-346.
32. Quaglio G, Talamini G, Lechi A, Venturini L, Lugoboni F, Gruppo Intersert Di Collaborazione Scientifica & Mezzelani P. (2001). Study of 2708 heroin-related deaths in north-eastern Italy 1985-98 to establish the main causes of death. *Addiction*, 96, 1127-1137.
33. Aitken C, Kerger M & Crofts N. (2000). Drivers who use illicit drugs: behaviour and perceived risks. *Drugs: Education, Prevention and Policy*, 7, 39-50.
34. Albery I, Gossop M, Strang J & Griffiths P. (2000). Illicit drugs and driving: prevalence, beliefs and accident involvement among a cohort of current out-of-treatment drug users. *Drug and Alcohol Dependence*, 58, 197-204.
35. Blomberg R & Preusser D. (1974). Narcotic use and driving behaviour. *Accident, Analysis and Prevention*, 6, 23-32.
36. Gossop M, Darke S, Griffiths P, Hando J, Powis B, Hall W & Strang J. (1995). The Severity of Dependence Scale (SDS) in English and Australian samples of heroin, cocaine and amphetamine users. *Addiction*, 90, 607-614.
37. Goldberg D & Williams P. (1988). *A User's Guide to the General Health Questionnaire*. Windsor: Nfer-Nelson.

38. Andrews G, Hall W, Teeson M & Henderson S. (1999). *The mental health of Australians: National survey of Mental Health and Wellbeing*. Canberra: Commonwealth Department of Health and Aged Care.
39. Robins LN, Helzer JE, Croughan J & Ratcliff KS. (1981). National Institute of Mental Health Diagnostic Interview Schedule: its history, characteristics and validity. *Archives of General Psychiatry*, 38, 381-389.
40. SPSS inc. (2001). *SPSS for Windows, 11.0*. Chicago.
41. Davey J, Williams C & Davies A. (2001). *Ripped and driving down under: drug driving and the culture of drug use in Australia*. Paper presented at the 4th International Conference on Accident Investigation, Reconstruction, Interpretation and the Law, Vancouver.
42. Roads and Traffic Authority. (2001). *Road Traffic Accidents in NSW - 2000*. Sydney: Roads and Traffic Authority.
43. Wilson J. (1992). Convicted impaired drivers and high-risk drivers: how similar are they? *Journal of Studies on Alcohol*, 53, 335-344.
44. Elder RW & Shults RA. (2002). Involvement by young drivers in fatal alcohol-related motor-vehicle crashes - United States, 1982-2001. *MMWR Weekly*, 51, 1089-1091.
45. Popkin CL. (1993). A consideration of factors influencing drinking and driving by women. *Alcohol, Drugs, and Driving*, 9, 197-209.
46. Lenne MG, Fry CLM, Dietze P & Rumbold G. (2001). Attitudes and experiences of people who use cannabis and drive: implications for drugs and driving

legislation in Victoria, Australia. *Drugs: Education, Prevention and Policy*, 8, 307-313.

47. Lenton S & Davidson P. (1999). Raves, drugs, dealing and driving: qualitative data from a West Australian sample. *Drug and Alcohol Review*, 18, 153-161.

48. Reilly D, Didcott P, Swift W & Hall W. (1998). Long-term cannabis use: characteristics of users in an Australian rural area. *Addiction*, 93, 937-846.

49. McLeod R, Stevens M, Stockwell T & Phillips M. (1998). *Drug use and driving in Western Australia: a survey of attitudes, beliefs and behaviours*. Perth: National Centre for Research into the Prevention of Drug Abuse, Curtin University of Technology.

50. Lobmann R & Kruger H-P. (2000). *Factors predicting driving under the influence of illegal drugs*. Paper presented at the International Conference on Alcohol, Drugs and Traffic Safety, Stockholm.

51. Baum S. (2000). Drink driving as a social problem: comparing the attitudes and knowledge of drink driving offenders and the general community. *Accident, Analysis and Prevention*, 32, 689-694.

52. Macdonald S & Dooley S. (1993). A case-control study of driving-while-impaired offenders. *Drug and Alcohol Dependence*, 33, 61-71.

53. Aberg L. (1993). Drinking and driving: intentions, attitudes, and social norms of Swedish male drivers. *Accident, Analysis and Prevention*, 25, 289-296.

54. Stevenson M, Palamara P, Rooke M, Richardson K, Baker M & Baumwol J. (2001). Drink and drug driving: what's the skipper up to? *Australian and New Zealand Journal of Public Health*, 25, 511-513.
55. Turrisi R & Jaccard J. (1992). Cognitive and attitudinal factors in the analysis of alternatives to drunk driving. *Journal of Studies on Alcohol*, 53, 405-414.
56. Beerman KA, Smith MM & Hall RL. (1988). Predictors of recidivism in DUIs. *Journal of Studies on Alcohol*, 49, 443-449.
57. Everest JT, Tunbridge RJ & Widdop B. (1989). *The incidence of drugs in road accident fatalities* (202). Berkshire: Transport and Road Research Laboratory, Department of Transport.
58. Skurtveit S, Christophersen AS & Morland J. (1995). Female drivers suspected for drunken or drugged driving. *Forensic Science International*, 75, 139-148.
59. Macdonald S & Mann RE. (1996). Distinguishing causes and correlates of drinking and driving. *Contemporary Drug Problems*, 23, 259-290.
60. Windle M & Miller BA. (1989). Alcoholism and depressive symptomatology among convicted DWI men and women. *Journal of Studies on Alcohol*, 50, 406-413.
61. Lapham SC, Smith E, C'de Baca J, Chang I, Skipper BJ, Baum G & Hunt WC. (2001). Prevalence of psychiatric disorders among persons convicted of driving while impaired. *Archives of General Psychiatry*, 58, 943-949.

62. McMillen DL, Pang MG, Wells-Parker E & Anderson BJ. (1992). Alcohol, personality traits, and higher risk driving: a comparison of young, drinking driver groups. *Addictive Behaviours*, 17, 552-532.
63. Skurtveit S, Abotnes B & Christophersen AS. (2002). Drugged drivers in Norway with benzodiazepine detections. *Forensic Science International*, 125, 75-82.
64. Mann RE, Anglin L, Vingilis ER & Larkin E. (1993). Self-reported driving risks in a clinical sample of substance users. In Utzelmann HD, Berghaus G, Kroj G (Eds.), *Alcohol, Drugs and Traffic Safety* (pp. 860-865). Cologne: Verlag TUV Rheinland.
65. Jonah BA. (1997). Sensation seeking and risky driving: a review and synthesis of the literature. *Accident, Analysis and Prevention*, 29, 651-665.
66. Begg DJ, Langley JD & Stephenson S. (2002). Identifying factors that predict persistent driving after drinking, unsafe driving after drinking, and driving after using cannabis among young adults. *Accident, Analysis and Prevention*, in press.