THE IMPACT OF ALCOHOL SALES ON VIOLENT CRIME, PROPERTY DESTRUCTION AND PUBLIC DISORDER

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PREFACE

Latest estimates from the New South Wales Crime and Safety survey 1995 place the number of persons assaulted annually in New South Wales at over 125,000 or about 2.1 per cent of the New South Wales population aged 15 and over. The survey figures indicate that the vast majority of victims of assault are young and male. In fact 1 in every 10 males aged 15-24 and resident in New South Wales in 1995 was assaulted in the preceding twelve month period. The incidence and pattern of assaults found in New South Wales are not atypical of Australian States and Territories. The 1993 Australian Bureau of Statistics national crime survey indicated that 2.5 per cent of Australians aged 15 years and over (i.e. 334,000 persons) experienced an assault in the previous 12 month period. For Australian males aged 15-24 the estimated annual assault victimisation rate in 1993 was 9.3 per cent.

A large number of studies have provided data suggestive of the possibility that alcohol consumption increases the likelihood of assault. To date, however, very few studies have examined the question of whether the level of alcohol consumption in a neighbourhood influences its rate of violent crime. Those who regularly deal directly with violent offenders (or their victims) might wonder at the need to demonstrate such a relationship. Experienced police would be the first to point out that alcohol appears to be a factor not only in generating assaults but also in generating other crime problems, such as malicious damage to property and offensive behaviour. Evidence that offenders are often drunk at the time of offending, however, is not sufficient to vouchsafe the conclusion that alcohol consumption causes crime. That conclusion requires evidence which excludes other possible explanations.

The present study was undertaken in order to provide a rigorous assessment of the extent to which the level of alcohol sales in a neighbourhood influence its rate of assault. It also sought to examine the extent to which alcohol sales influence rates of malicious damage to property and offensive behaviour. The results provide compelling evidence that alcohol sales influence the rate of these offences, even after other factors which are known to influence them have been controlled for. These results suggest that a reduction in the level of alcohol consumption offers one means of reducing crime rates in at least three different areas (namely, assault, malicious damage to property and offensive behaviour). Since these three offences represent a significant drain on police, health and local government resources, the social benefits of policies which reduce the level of alcohol consumption in the Australian community are likely to be substantial.

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EXECUTIVE SUMMARY

(1) In agreement with many previous studies, this research has identified strong and significant relationships between alcohol sales volume (litres) and crime, even when controlling for socio-economic and demographic variables.

(2) Total alcohol sales volume was significantly and positively correlated with the rates of three crime types in NSW: malicious damage to property, assault and offensive behaviour.

(3) The strong positive correlations between the sales volumes of the four alcohol types (beer, low alcohol beer, wine, spirits) broadly result in any alcohol type being an equally good predictor of crime rates.

(4) One exception was the significant positive correlation between beer sales volume and assault. This relationship was unique to beer and was not shared with other alcohol types.

(5) When the alcohol data were analysed by sales volumes from different outlet types the study observed a significant positive correlation between: hotel alcohol sales volume and assault; off-licences, clubs and hotels alcohol sales volume and offensive behaviour; sales volume of alcohol by off-licences, hotels and restaurants and malicious damage to property.

(6) The relationship between restaurants and malicious damage to property probably reflects the operation of other contextual variables, such as the close proximity of attractive targets for malicious damage.

(7) For the interactions between outlet and alcohol type sales volumes there were few specific effects. The most notable was evidence of a significant positive correlation between hotel beer sales volume and assault. However, this latter result has to be regarded as indicative rather than as proven, as one of the underlying assumptions of the analysis had to be violated.

(8) If the 50 postcodes with the highest alcohol sales in NSW had their sales reduced to the Statewide mean, this would result in at least a 22 per cent reduction in offensive behaviour, a nine per cent reduction in malicious damage to property and a six per cent reduction in assault in these postcodes.

(9) In terms of incidents, this would mean at least 324 fewer events of offensive behaviour, 1,744 fewer events of malicious damage to property and 635 fewer assaults per annum. The true magnitude of the reduction in crime would undoubtedly be larger than this because a reduction in alcohol sales would also exert downward pressure on crime not normally reported to police.

1. INTRODUCTION

Perhaps the most convincing evidence that alcohol directly induces aggression and, by logical consequence, an increased propensity for violence, may be found in the large body of experimental reports. Bushman and Cooper (1990), in a meta-analytic review of this literature, found strong support for the contention that alcohol causes an increase in aggression. Though laboratory studies can ascertain causal relations under controlled conditions, they do not identify the wider and more complex role that alcohol plays in the origin of violent offending in the outside world. This particular study addresses this latter issue, by examining the relationship at a postcode level in New South Wales (NSW), between detailed alcohol consumption patterns and violent crime.

Over 76 per cent of the adult Australian populace are 'current drinkers' (Commonwealth Department of Health and Family Services 1996, National Drug Strategy, Household Survey [conducted May-June 1995]; hereafter referred to as the CDHFS-NDS). Though the majority are responsible users of alcohol, a significant minority are involved in alcohol-related crime. In fact the CDHFS-NDS survey notes that, for Australia as a whole, eight per cent of 14–19 year olds reported that they had physically abused someone whilst affected by alcohol in the preceding year. In NSW,[1] this translates into approximately 34,000 violent incidents where alcohol is involved - just for this age group. For those aged 20–34, the figure was four per cent, which translates to over 57,000 violent incidents involving alcohol in NSW - a total for both age groups of 91,000 incidents. Though these figures are disturbing, the problem is far worse when viewed from the victim's perspective. Again, translating the findings for Australia to NSW,[2] the CDHFS-NDS survey indicates that around 1.5 million people aged 14 or more were verbally abused by someone affected by alcohol, just under 1.0 million were 'put in fear', 0.6 million had property damaged and over 0.4 million were physically abused in the preceding year. Needless to say, the social and economic costs of these alcohol-related incidents are large (see NSW Drug and Alcohol Directorate 1995, for cost estimates) and this makes identifying the precise nature of the relationship between alcohol and violent crime an important issue.

The quantitative scientific literature that explores the relationship of alcohol and violence outside of the laboratory can be loosely grouped into three categories. These three categories can be ordered by methodological soundness. The most open to criticism are the studies of convicted offenders. These examine the drinking habits of offenders prior to the commission of their major offence. A second group of investigations, illuminating, but not without their shortcomings, are the arrest/caution studies, where detainees are judged or asked whether they had been drinking just prior to their arrest or caution. A third group of studies, of which this present research is a part, examine relationships between violent offending and alcohol consumption over geographical space. This final group of studies are amongst the most methodologically elegant and useful.

1.1 CONVICTED OFFENDER STUDIES

Studies of convicted criminals typically ask the offenders whether they had been drinking before they committed their most serious offence. In Kevin's (1992) sample of adult NSW offenders, 34 per cent fell into this category. Of these 34 per cent, 67 per cent had consumed more than 12 standard drinks. Furthermore, the majority of offenders convicted of assault admitted to being under the influence of alcohol at the time they committed their offence. In another study, Indermaur (1990) reported that 34 per cent of his adult Western Australia (WA) prisoner sample had consumed at least 10 standard

drinks before committing their last offence. Of this group, just under one-third had committed offences against the person. Yet again, in a US adult offender study, Collins and Schlenger (1987) established that alcohol consumed before offending played a significant role in the commission of violent offences, even when other associated factors (e.g. age, race, education, criminal history) were controlled for. This relationship between alcohol and offending is not just limited to adult convicted offenders. High rates of drinking prior to offending have also been obtained with juvenile detainees in the UK (e.g. McMurran & Hollin 1989; Cookson 1992). Overall, the convicted offender studies and others like them (see Greenberg 1982) conclude that alcohol is frequently consumed before offending and particularly so in cases of violent crime.

The convicted offender studies are subject to a number of alternative interpretations. A significant problem is the reliance on recall of alcohol consumed. With recall, particularly over protracted periods of time, it is well established that memory is subject to a number of biases. For example, prisoners may be more inclined to amplify 'that' single drink into many drinks, as this might provide a convenient excuse for their offending behaviour - rather than having to accept responsibility for it themselves (see, for example, National Symposium on Alcohol Misuse and Violence 1993, p.96). Alternatively, because the researcher is unlikely to be able to disguise the nature of his/her questions, anyone who cannot remember whether they had drunk before offending might be inadvertently cued into responding that they had (see, for example, Rosenthal 1966). As for the nature of the sample, it may of course be only those that drank who got caught.

A further problem is in ascribing any form of causality between the pre-offence drink and the commission of the offence. As much social life in criminals and crucially non-criminals involves drinking, the crime may simply have been planned over a drink and then executed. Thus the involvement of a drink may be incidental rather than causal. However, the most difficult problem in interpreting what these studies mean (and this applies equally as well to arrest/caution studies, which are discussed below) is that even if all violent offenders were found to be drunk at the time of attack, this could not logically lead to the conclusion that alcohol causes violent behaviour. This is because it is necessary to look at patterns of violence in all alcohol consumers not just patterns of drinking in violent offenders (Weatherburn 1990). So, however strongly the convicted offender studies suggest a link between alcohol and violent crime, they are open to numerous criticisms that weaken the conclusions that can be drawn from them.

1.2 ARREST/CAUTION STUDIES

In a further type of study, police observations of the use of alcohol in those that they arrest or caution for various offences are assessed. Ireland and Thommeny (1993) observed that over a four-week period in six Sydney NSW police patrols, 77 per cent of street offences (assault, offensive behaviour and language, malicious damage, domestic violence, drink driving and noise complaints) involved alcohol. Also, a high proportion of offences occurred in or near hotels and 91 per cent of all alcohol-related incidents occurred between 10pm and 2am, that is the time span most likely to capture intoxicated revellers departing hotels and similar venues. A further study, this time in a UK seaside resort (Jeffs & Saunders 1983), found that 88 per cent of those arrested for criminal damage, 83 per cent for breach of the peace and 78 per cent for assault, had consumed alcohol in the four hours preceding arrest. As with the convicted offender data, it is difficult not to infer that alcohol bears at least some relationship with street offences, and particularly violent ones.

As convincing as these types of arrest/caution studies may be, they are also open to alternative interpretation. For example, it could be argued that the offences took place not because of any alcohol consumed, but because the consumption of alcohol generally took place in a social context. Thus it might be the density and proximity of other people

that produces the apparent relationship between alcohol and offending, not the alcohol per se. A further problem is judging whether or not the offenders had in fact been drinking. Though the police are proficient observers, these types of studies do not accurately assess either the degree of intoxication or the amount of alcohol consumed. There may also be an innocent inclination to over-report alcohol's involvement, if it is known that this is the purpose of the study.

1.3 GEOGRAPHIC STUDIES

Perhaps the most convincing evidence for a relationship between alcohol and violent crime stems from geographic studies. These attempt to explain variations in the crime rate between areas by the variations in alcohol consumption, or relate variations in the temporal pattern and distribution of crime within an area to particular causes. These type of studies are not more convincing because of the size of the relationships between alcohol and violent crime that they generally uncover, but because they are less open to the types of methodological criticism levelled at the preceding studies.

Cook and Moore (1993) estimated the effect of a 10 per cent increase in per capita alcohol consumption for the 48 mainland States of the USA, on rates of homicide, assault, rape and robbery. Such a hypothetical change, based on extrapolating from the regression line of actual alcohol consumption and crime type by State, was associated with a 6.5 per cent increase in rape, 0.9 per cent increase in homicide, a 5.9 per cent increase in assault and a 9.1 per cent increase in robbery. Though the magnitude of these increases may sound small, when the actual size of the US crime rate is considered, these constitute large positive changes. In a further study, this time based on the 74 larger cities within Los Angeles County, Scribner, MacKinnon and Dwyer (1995) observed that each additional liquor outlet was associated with an extra 3.4 violent assaults per year. This was calculated from the significant observed relationship between alcohol outlet density and crime rate across cities.

In a somewhat different type of study, where no direct measure of alcohol was used, Devery (1992) studied the spatial and temporal distribution of crime in the Local Government Area of Waverley in Sydney, NSW. Devery (1992) found that most assaults not only took place in the area where the majority of clubs, hotels and restaurants were located, but that they were clustered temporally between 9pm and 3am - hotel/club closing times. Assaults also occurred more frequently during this period of time over weekends than on weekdays. This close temporal and geographical relationship between alcohol outlets and assault has also been identified in UK studies (see Hope 1985). It was also interpreted in a similar manner.

One of the most relevant geographic studies so far was completed by Stockwell, Masters, Philips, Daly, Gahegan, Midford and Philp (1996). They examined the relationship between per capita liquor sales by type (beer etc.) and a number of harm indicators: night-time assaults, minor night-time crashes and alcohol-related morbidity. Their analysis was made across 130 regions of WA and controlled for other relevant social and demographic variables known to be associated with their harm indicators. A feature of special interest in this study was that it took into account the volumes of different types of alcohol sold in each region, thus allowing more detailed conclusions to be drawn about the origin of different alcohol-related problems. They found, for example, significant relationships between consumption rates of: cask wine and full and low strength beer with night-time assaults; full strength beer and minor night-time crashes; and full strength beer and cask wine with alcohol-related morbidity. The relationships involving cask wine were particularly notable. In WA this is one of the cheapest forms of available alcohol, an issue with obvious policy implications. It suggests a liquor pricing strategy which perhaps should be based on alcohol content rather than type of alcohol.

1.4 RATIONALE FOR THIS RESEARCH

The geographic data discussed above are considerably harder to refute than the data discussed in the convicted offender or arrest/caution studies. The geographic studies are not subject to the sampling problems, memory/recall difficulties and experimenter biases of the other approaches. However, the problem faced by all associational data, of which geographic data is commonly a part, is in interpreting the meaning of the observed relationships. Though an association between events does not imply causality, this does not mean that it is incorrect to impute causality between such events, particularly when other evidence is present. This crucial distinction is often lost on critics of such associational studies.

Perhaps a more difficult problem for the geographic studies is in pinpointing particular foci of the relationship between alcohol and violent crime. For example, one strength of the Stockwell et al. (1996) study was their ability to identify specific alcohol-crime relationships, such as the relationship of cheap liquor with assault. To further build on this approach would require using a data set that identified liquor outlet types and alcohol types (for an example of this see the full report on Stockwell et al.'s 1996 data, in Stockwell 1995). To date in NSW, this type of information has not been available. However, due to the kind cooperation of the NSW Department of Gaming and Racing, the NSW Bureau of Crime Statistics and Research has been given access to such a unique data set. This data set contains a detailed breakdown, by postcode, of sales volumes in litres of beer, low alcohol beer, wine and spirits from hotels, off-licences, clubs and restaurants for the whole of NSW (see Method section for more detailed descriptions etc.). This alcohol data set allows for a detailed examination of relationships between different liquor and outlet types with violent crime.

Though ideally all violent crime types would be included in a report such as this, the limiting factor is the number of offences for each crime type, per year, per postcode. For example, there were 1,397 incidents of sexual assault in NSW in 1994/95 (NSW Bureau of Crime Statistics and Research 1996). This would translate, on average, to only 2.5 sexual assaults per postcode (based on 569 postcodes) - probably too few to detect any discernible effect of alcohol. A similar argument applies to homicide and robbery (for the relationship of homicide to alcohol see Strang 1993 and Gallagher, Da Huong & Bonney 1994). For this reason, the study focuses on three types of more common violent offences: (1) physical violence to the person, as indexed by assault; (2) physical violence to property, as indexed by malicious damage; and (3) verbal and gestural aggression, as indexed by offensive behaviour (for precise definitions of the offences which fall within each of these classifications see Method section 2.1). Each of these offence types and their known relationship with alcohol is discussed below.

1.5 ASSAULT AND ALCOHOL

Assault is an offence that frequently co-occurs with the presence of alcohol, a contention supported by a variety of findings: (1) such offences are often located near to, or in, alcohol outlets and are temporally located around the exit time from such outlets (e.g. Hope 1985, Devery 1992, Ireland & Thommeny 1993); (2) in a UK study, over 70 per cent of male victims of assault had consumed alcohol in the six hours preceding their assault, indicating at least some involvement of alcohol or the drinking context with this offence (Shepherd, Irish, Scully & Leslie 1989); (3) Stockwell et al. (1996) found that beer and cask wine consumption were related to night-time assault rates; and (4) Robb (1988), in NSW, found that 20 per cent of all serious assaults occurred within hotels or other licensed premises.

A further logical step is to identify - and to some extent confirm - which types of liquor outlet are associated with assault and whether consumption of a particular alcohol type within a particular type of outlet, can provide an even better insight into the relationship between alcohol and assault. This is particularly pertinent given the strong suspicion that hotels and/or beer consumption may have a special part to play in the aetiology of assault. For example, Field (1990) found that variations in beer consumption in the UK were significantly related to offences of violence against the person. Furthermore, numerous authors (e.g. Homel & Tomsen 1991, Ramsay 1996, Jeffs & Saunders 1983) have suggested that hotels are often the focus for assaultive violence, either within or near their premises. It might therefore be expected that assault rates would be related to: (1) alcohol sales in general; (2) beer sales; (3) sales of alcohol from hotels; and (4) beer sales from hotels.

1.6 MALICIOUS DAMAGE AND ALCOHOL

A further type of violence, this time with a greater economic rather than personal focus, is that directed at objects - malicious damage to property. The Victorian State Committee on Vandalism (1981) suggested that alcohol was a catalyst for malicious damage to property. Furthermore, temporal profiles of this offence also reveal a pattern that is suggestive of the involvement of alcohol. In NSW, Bonney (1992) found that the majority of malicious damage occurred between 9pm and midnight and, yet again, predominantly at the weekend. At a minimum this profile is consistent with certain intoxicated patrons exiting from hotels, clubs or other licensed premises. In fact, the NSW Local Court statistics (NSW Bureau of Crime Statistics and Research 1995) show that many property damage offences (which include malicious damage) are commonly perpetrated by 20-24 year olds - among the most frequent users of clubs and hotels. Taken together, it may be that liquor sales volume from hotels and clubs are related to the rate of this offence.

Take-away alcohol has been identified by other researchers (see Arnold & Laidler 1994) as another catalyst for malicious damage. However, it is likely that in this case the age profile of the offender population is much wider than that suggested for hotels and clubs. Malicious damage is an offence also widely perpetrated by juveniles (Victorian State Committee on Vandalism 1981, Clarke 1978). Juveniles predominantly purchase liquor from off-licences (NSW Department of Health 1990) and commonly consume the liquor in public places (Egger & Champion 1978; see also CDHFS-NDS 1996, where 10 per cent of 14–19 year olds report parks and other public places as their drinking location). In fact, police reported in the Eastern Suburbs of Sydney a reduction in vandalism after they were given powers to seize alcohol from juveniles in public places (see Brown, Neal, Farrier & Weisbrot 1990). Thus total alcohol sales volume from off-licences may also play a role in facilitating malicious damage.

1.7 OFFENSIVE BEHAVIOUR AND ALCOHOL

Both the Police (see Justice Under Scrutiny 1994) and researchers (e.g. Pirie & Cornack 1993) have identified intoxication by alcohol as an important factor in many offensive language and behaviour charges. In Bonney's (1989) study of the NSW Summary Offences Act, 15 per cent of incidents charged under the Act (the majority being for offensive behaviour) took place in and around alcohol dispensing venues. Though this figure is large, it does not include many other incidents where alcohol was likely to be related, but no direct evidence was present (e.g. urinating in public might be one expected concomitant of excessive alcohol consumption, but could not be directly related to alcohol consumption unlike an incident occurring in or just outside licensed premises). Furthermore, in many cases - 43 per cent during 1994/95 (see Jochelson manuscript in

preparation) - the offensive behaviour or offensive conduct charge was often an adjunct to a more serious charge generally involving violence. Thus these charges are often used in cases where individuals demonstrate verbal aggression alone or in conjunction with actual physical violence. Taken together, there should be an association between the report of these offences and total alcohol consumption. It would be too speculative to identify any particular type of outlet.

1.8 ALCOHOL, CRIME, POVERTY AND YOUNG MALES

One difficulty in assessing the relationship between alcohol and violent crime is the relationship that each of these variables share with many others, most notably socio-economic and demographic variables. For example, low socio-economic status is a known positive correlate of many types of offending, even though the relationship is acknowledged to be a complex one (Weatherburn 1992). Furthermore, socio-economic factors are also widely believed to be linked to certain types and patterns of alcohol consumption (e.g. Field 1990; Klatsky, Armstrong & Kipp 1990). To complicate matters further, young males form a predominant fraction of heavy drinkers (CDHFS-NDS 1996). Needless to say, young males also form the predominant pool of offenders for many of the crimes being considered in this study (see, for example, Walker & Henderson 1991).

To take into account these interrelationships between alcohol, crime, demography and socio-economic factors, two types of control variables were used in the analyses. The first was to take into account the difference in the young male population between postcodes. The second was to take into account differences in socio-economic class between postcodes, by using a composite index of variables known to be indicators of social disadvantage. The implications of this strategy, though designed to clarify the role of alcohol in violent crime, are quite complex and are discussed more fully in the Method section. Suffice it to say that this strategy will produce a considerable underestimate of the probable true relationship between alcohol and violent crime.

1.9 SUMMARY

Across a number of different research strategies reviewed above, the consistent finding is that alcohol is a frequent concomitant of many types of offending, particularly those involving violence. This study examines the relationship between three violent types of crime and the consumption patterns of alcohol, by outlet and liquor type, across postcodes in NSW. The literature reviewed in the Introduction leads to a number of predictions: (1) that all three violent crime types will be more frequent in areas with higher alcohol sales; (2) that areas with large sales of alcohol through hotels and/or large sales of beer will have higher assault rates; (3) that the incidence of malicious damage will be higher in areas with greater sales of alcohol through off or on-licensed (hotels, clubs) premises. All of these relationships should be demonstrable even whilst controlling for socio-economic and demographic differences between areas.

2. METHOD

2.1 THE DATA SETS

Four discrete sets of data were used in the analysis, each of which provided information at a postcode level for NSW. These were the alcohol data set, the SEIFA, the C-PROFILE and the crime data set (from the NSW Police Service's Computerised Operational Policing System [COPS]). The alcohol data set was provided by the NSW Department of Gaming and Racing and covered the period from July 1994 to June 1995. It contained the quantity sold, in litres, of beer, low alcohol beer (henceforth L.A. beer), wine and spirits, for hotels, clubs, off-licences and restaurants (including restaurants in motels) in NSW.[3] To correct for differences in population between postcodes, all the alcohol data were adjusted to a per capita rate. The population used for this adjustment was based on all individuals aged 15 years or over.[4] Table 1 illustrates the total volumes sold by outlet and liquor type for the study period.

Table 1: Sales of liquor by volume (millions of litres) in NSW for the period July 1994 to June 1995

	Type of alcohol				
Type of outlet	*Beer*	*L.A. beer*	*Spirits*	*Wine*	*Total*
Hotels	207.1	17.4	8.4	24.9	257.8
Clubs	119.6	19.5	2.6	7.2	148.9
Off-licences	164.6	24.7	11.7	78.7	279.7
Restaurants	9.8	2.1	0.7	7.1	19.7
Total	501.1	63.7	23.4	117.9	706.1

Source: Adapted from data provided by NSW Department of Gaming and Racing.

The alcohol data set was combined in four main ways, thus allowing the various research questions to be addressed. The relationship between these four types of data can be seen in Table 1: firstly, by total alcohol sold in each postcode (total in Table 1); secondly, by alcohol type sold in each postcode (beer, L.A. beer, wine, spirits; column totals of Table 1); thirdly, by the total alcohol sold in each type of outlet in each postcode (hotels, clubs, off-licences, restaurants; row totals of Table 1); fourthly, by the alcohol type sold by each outlet type in each postcode (cells in the first 4 rows and 4 columns of Table 1).

Four considerations need to be made with regards to the alcohol data. The first concerns the nature of the data provided by the Department of Gaming and Racing. The data were collected from the liquor returns of licensed 'wholesalers' (e.g. brewers, wholesalers, vignerons) of their sales - by litres - to licensed outlets. The data are broadly accurate for beer, L.A. beer and spirit sales, as these are sold from comparatively few wholesale outlets. The data in respect to wine are likely to be less accurate due to the greater number of wholesale outlets and, consequently, the greater possibility of various recording errors.

The second consideration is the decision to use 'raw' volume of each of the four types of alcohol, rather than converting them to actual absolute alcohol consumed. This was based on the contention that the volume consumed by type of alcohol may be more

important than the amount of absolute alcohol consumed. This is because consumption of certain types of alcohol are broadly associated with certain lifestyles (see Field 1990, Klatsky et al. 1990). Thus the alcohol data reported here in their raw form contain two pieces of information, lifestyle and alcohol. It is suggested here that this interaction between lifestyle and alcohol is more informative than either factor alone. Needless to say, the same argument applies to alcohol outlets as well as to alcohol types.

A third consideration is the relationship between alcohol sales in a postcode and alcohol consumption in a postcode. The measures available here refer only to sales and can only be considered as a proxy measure of consumption within a postcode. This is particularly pertinent for the postcodes that had no alcohol outlets and thus no recorded level of alcohol use. It would be reasonable to expect that in these postcodes the population would simply purchase alcohol from another postcode (or consume it in another one). A fourth consideration is that of take-away alcohol sales. Though the data from the NSW Department of Gaming and Racing provide figures for off-licence sales, they do not distinguish between hotel bar sales and hotel bottleshop sales, which are included in one global figure for hotels, nor between club bar sales and club off-premises sales which are also combined. Thus the measure of total take-away alcohol is reduced and the measure of total alcohol consumed on hotel and club premises is increased.

The SEIFA and C-PROFILE are Australian Bureau of Statistics (ABS) derivative products from the 1991 census. The SEIFA is composed of 5 indices of which one was used in the present study: the Index of Relative Socio-Economic Disadvantage, hereafter referred to generically as the SEIFA. This index is composed of a variety of measures, which include indicators of social and economic disadvantage (see Australian Bureau of Statistics 1993, for more details). C-PROFILE was used to calculate adult population data (15+) and the proportion of males aged 15–24 in each postcode in NSW.

The crime data used here were extracted from COPS by the Bureau of Crime Statistics and Research and covers the period January to December 1995. These data record all incidents reported to the police. Three offence types were used: (1) Assault - composed of actual bodily harm, grievous bodily harm, malicious wounding, assault officer, common assault and shoot with intent other than murder; (2) Malicious damage - composed of malicious damage to property, graffiti, public place - damage to fountain/wall, public place - damage to shrine/monument; (3) Offensive behaviour - composed of offensive conduct and offensive language. As with the alcohol data set, offences were corrected for differences in population between postcodes by adjusting to a per capita rate. The same population values were used as for the alcohol data set.

2.2 POSTCODES

Postcode level data offers the advantage of a fine grain of analysis. Their main shortcoming is that postcode areas change from year to year as Australia Post adds or combines postcodes according to its needs. As the data sets originated from two main time periods (i.e. 1991 and 1994/5) six postcodes created since 1991 had to be combined back into their original four postcodes. Also, a further seven postcodes which have no mappable boundaries had to be combined into their most appropriate regional postcode.[5] As well as this, one further postcode was combined with its geographical neighbour, because, even though it had a discrete location, it contained no resident population.

A number of postcodes were deleted. These postcodes solely contained: universities (5), military bases (8), hospitals (1) and islands off the coast of NSW (2). It was felt that universities and military bases contained an unusually high and transient population of

young people and that the hospitals, and Norfolk and Lord Howe Islands formed distinct communities which made them atypical when compared with other NSW postcodes. A number of other postcodes were also deleted, namely those from the Australian Capital Territory (2) and a further 10 NSW postcodes for which population statistics could not be obtained. The final set was composed of 569 NSW postcodes.

2.3 ANALYSIS

For clarity of exposition this section has been divided into five parts. To gain a basic understanding of what the statistics used in the Results section mean, it is only necessary to read sections 2.3.1 and 2.3.2. These briefly outline the key points. A more detailed description of the data screening, analysis procedure and assumptions of the analyses are provided in sections 2.3.3 to 2.3.5.

2.3.1 Basic aim and measures of the analyses

The basic aim was to determine whether variations across postcodes in the amount of alcohol sold accounted for variations in the level of violent offences across postcodes, whilst controlling for socio-economic and demographic variables. The variability in crime rate that can be accounted for by alcohol can range between 0 and 100 per cent. Zero would indicate no relationship between alcohol and crime. Values above this would indicate progressively stronger relationships, that is, more of the variability in crime rate would be accounted for by alcohol.

2.3.2 Basic interpretation of the results

The Results section uses two methods of data presentation. In the first, which is relevant only to the relationship between total alcohol sold and crime (section 3.2), two estimates of the variability in crime rate that can be accounted for by alcohol are used. The first is S_r^2, which is the most conservative estimate of the variability in crime rates accounted for by alcohol. The second statistic is r^2, which is the most liberal estimate of the variability in crime rates accounted for by alcohol.

In all other analyses (sections 3.3 to 3.5) two sets of measures are used. This is because these analyses examine the effects together and individually, of different types of alcohol variable (e.g. beer, L.A. beer, wine and spirits together or individually). When examining the effect of these alcohol variables together, the R^2 statistic is used. This statistic is used to provide estimates of the variability in crime rate accounted for by: (1) the control variables alone; (2) the control plus alcohol variables; and (3) the alcohol variables alone - this last value being: (a) the most interesting; and (b) a conservative estimate of the variability in crime accounted for by the alcohol variables together.

The second set of measures are used to evaluate the contribution of each alcohol variable individually and are identical to the measures described above as S_r^2 and r^2. The role of these different statistics can be most clearly seen by examining the tables in the Results section and by then referring back to the text here.

2.3.3 Data screening

All the variables were screened for normality (see, for example, Tabachnick & Fidell 1989, for a fuller description of the procedure). This was carried out for two reasons. Firstly, squared bivariate correlations of the sort used here (Pearson's r^2) require normally distributed data. Secondly, ensuring that the data are normally distributed before beginning the regression procedure goes some way to ensure that the residual error from

the regression procedure will be normally distributed - a requirement for using this statistical technique. With the exception of the SEIFA data, which were already normalised by the ABS, all other variables were found to be non-normal. A variety of transformations - log, log log, square and cube roots - were tried on each variable to see which produced the best correction. The success of the transformation was evaluated using the Shapiro-Wilks statistic (see, for example, Conover 1980) and by examining various parameters of the resulting distribution. Appendix A describes the transformations necessary to normalise each variable.

2.3.4 Description of the regression analyses

The data were analysed by fitting linear regression models. A linear regression model expresses a response variable (e.g. crime rate) as a linear function of predictor variables (e.g. alcohol sales, socio-economic and demographic measures). The goodness of fit of a linear regression model can be judged by the R^2 statistic. This statistic measures the proportion of the variation in the response variable which is explained by the predictor variables. In the special case of a simple linear regression, with only one predictor variable, the R^2 statistic is equivalent to the square of the Pearson correlation coefficient (r^2) which measures the correlation between the response variable and the predictor variable.

In general, three types of model were fitted to the data. They were as follows:

(1) crime rates as a function of alcohol sales;

(2) crime rates as a function of the socio-economic and demographic control variables;

(3) crime rates as a function of both alcohol sales and the socio-economic and demographic control variables.

The type (1) model indicates the strength of the relationship between alcohol sales and crime rates without controlling for the effect of any other variables (i.e. r^2). The type (2) model indicates the strength of the relationship between crime rates and the control variables (i.e. R^2). (Note that we expect models of this type to fit well as the purpose of the control variables is to control for their known effects on crime rates.) Comparison of the type (3) model with the type (2) model indicates the strength of the relationship between alcohol sales and crime rates after controlling for the effect of the control variables. The difference between the two values of R^2 resulting from fitting model types (2) and (3) can be tested for significance using an F test (see, for example, Tabachnick & Fidell 1989).

In some cases, the type (3) model included only one variable in addition to those in the type (2) model. In other cases, the type (3) model included more than one variable (e.g. sales of different types of alcohol) in addition to those in the type (2) model. In this latter case, testing the significance of R^2 statistics for the two models is equivalent to a test of the joint effects of the additional variables, without identifying which of the additional variables is important.

To assess the importance of each of a number of alcohol sales variables, another statistic is relevant, namely the semipartial correlation coefficient. The semipartial correlation coefficient measures the correlation of a specified predictor variable with the response variable, after taking into account (i.e. 'partialling out') the effects on that predictor variable of all other predictor variables present. The squared semipartial correlation coefficient is equivalent to the increase in R^2 resulting from fitting two models when only one additional variable is included in the second model. It is identified in the Results section by the label S_r^2.

In cases where more than one alcohol sales variable was included with the control variables in a type (3) model, the squared semipartial correlation coefficient for a specified alcohol sales variable measures the proportion of variation in crime rates explained by that alcohol sales variable after taking into account the effects on crime rates of all other predictor variables present in the model, both the control variables and the remaining alcohol sales variables.

2.3.5 Assumptions and validity of the regression procedure

The validity of the regression procedures described above depend on meeting certain assumptions. The first assumption concerns the effect of highly unusual individual, or combinations of, values of the independent variables, termed univariate or multivariate outliers. Such unusual combinations can exert undue influence on the outcome. This problem was dealt with in three ways: (1) by initially normalising the independent variables before commencing the analysis (see above); (2) by screening the residuals - that is, the crime rate predicted by the regression model subtracted from the real crime rate - for normality; and (3) by using a technique to identify multivariate outliers. These outliers are detected by using the Studentised residual,[6] which is a statistical measure used to identify such outlying observations (note that these outlying observations amongst the residuals are in fact departures from normality). In cases where two models were used - a control and a control plus other variables - outliers were initially identified and deleted in the control model. This set of data then formed the input for the control plus other variables model. The outliers were then identified and deleted from this model. This set of data was then fed back into the control model and the same process was repeated again until neither the control nor control plus other variables model contained any remaining outliers. In fact, in the majority of cases, the models were so robust that deletion of these outliers made little difference to the overall result.

A second concern, specific to this type of analysis, is whether each postcode can be considered independent. Clearly, adjacent postcode areas are likely to be more similar than non-adjacent areas. The impact of this similarity, termed spatial auto-correlation (see, for example, Cliff & Ord 1981) was assessed for one analysis and found to exert little or no discernible impact on the results.[7] A similar conclusion was reached in an analogous geographical based analysis (Stockwell et al. 1996, Stockwell 1995). For this reason, no further attention was paid to this issue.

A final concern is that of multicollinearity. Multicollinearity exists if two or more of the predictor variables are highly correlated. The effect of multicollinearity is to increase the variance of the estimated regression coefficients, hence making their estimated values less reliable. The result is that the unique effect of a particular variable, in the presence of other variables (with some of which it is highly correlated), is poorly estimated. It is important to note, however, that multicollinearity does not affect the overall fit of a model containing a number of predictor variables correlated with each other.

The extent of the increase in the variance of an estimated regression coefficient, due to the presence of multicollinearity, can be measured by the variance inflation factor (VIF). Montgomery and Peck (1992) note that a VIF in excess of 5 or 10 is an indication that the regression coefficient is poorly estimated as a result of multicollinearity. (A VIF of 5 results when 80 per cent of the variation in the associated predictor variable can be explained by the other predictor variables present. A VIF of 10 results when 90 per cent of the variation in the associated predictor variable can be explained by the other predictor variables present.) Only when the VIF for a variable exceeds 5 is it mentioned in the Results.

3. RESULTS

3.1 INTRODUCTION

The results presented here describe the regression analyses conducted for each of the types of alcohol data for each crime type. The key statistics from all the analyses are reported in tabular form and the important findings are highlighted in the accompanying text. All results reported in the tables and text are significant at the 5 per cent level, unless labelled non-significant (NS). Tables of Pearson r^2 for all variables can be found in Appendix B. It is also useful to note that all the Pearson r^2s reported in Tables 2–20 were derived from Pearson r's with positive sign.

3.2 TOTAL ALCOHOL

Tables 2 shows the results of the regression analyses for total alcohol sales against offensive behaviour, assault and malicious damage. Figures 1, 2 and 3 are scatterplots of normalised data for assault and total alcohol sales, malicious damage and total alcohol sales and offensive behaviour and total alcohol sales.

Table 2: Variation explained in crime type by total alcohol sales

	In presence of other variables[b]	*Alone*[c]
Type of offence (n)[a]	S_r^2 (%)	r^2 (%)
Offensive behaviour (566)	6.9	13.6
Assault (528)	5.4	17.6
Malicious damage (544)	13.0	17.2

a The number in brackets (n) is the number of postcodes used in the analysis.

b The values in this column are the additional R^2 resulting from adding total alcohol sales to a model already containing the control variables.

c The values in this column are the squared Pearson correlation coefficients measuring the correlation between the particular offence rate and the sales of total alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing total alcohol as the only predictor variable.)

3.2.1 Relationship of total alcohol sales to crime

Variations amongst postcodes in total alcohol sales volume were strongly related to variations in all three crime types (see Figures 1–3). Thus postcodes with higher total alcohol sales volume also tended to have higher rates of offensive behaviour, assault and malicious damage. The strength of the relationship between alcohol and crime varied. When the strength was estimated under liberal conditions (see Table 2, r^2 column), that is, without control variables present, total alcohol sales volume was most strongly related to assault, then to malicious damage and offensive behaviour. When these relationships were estimated under conservative conditions (see Table 2, S_r^2 column), that is, in the presence of the control variables, the relationship between total alcohol sales volume and crime was attenuated for offensive behaviour and assault and somewhat so for malicious damage. However, even under these conditions of stringent control, the relationship between alcohol and crime was still substantial.

Figure 1: Scatter plot of assault against total alcohol sales (by postcode)

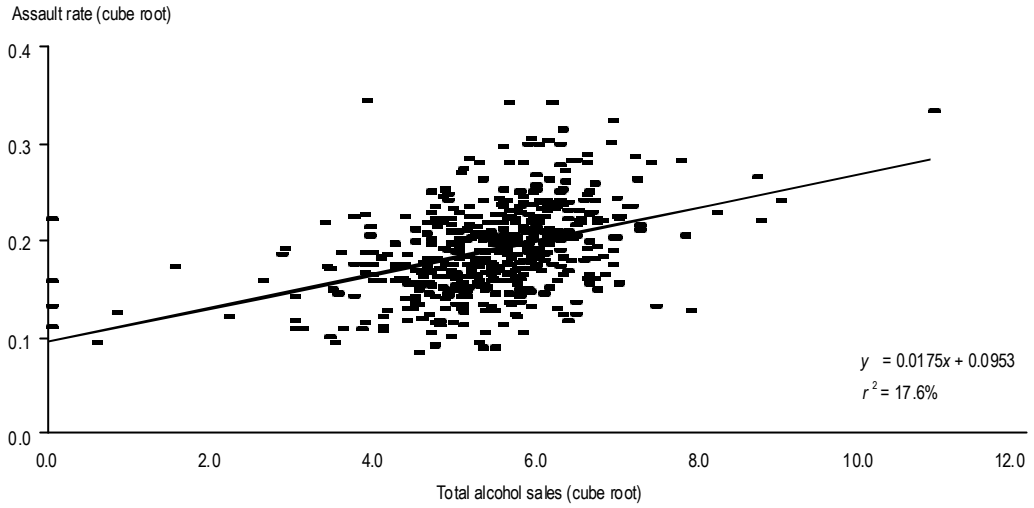

Figure 2: Scatter plot of offensive behaviour against total alcohol sales (by postcode)

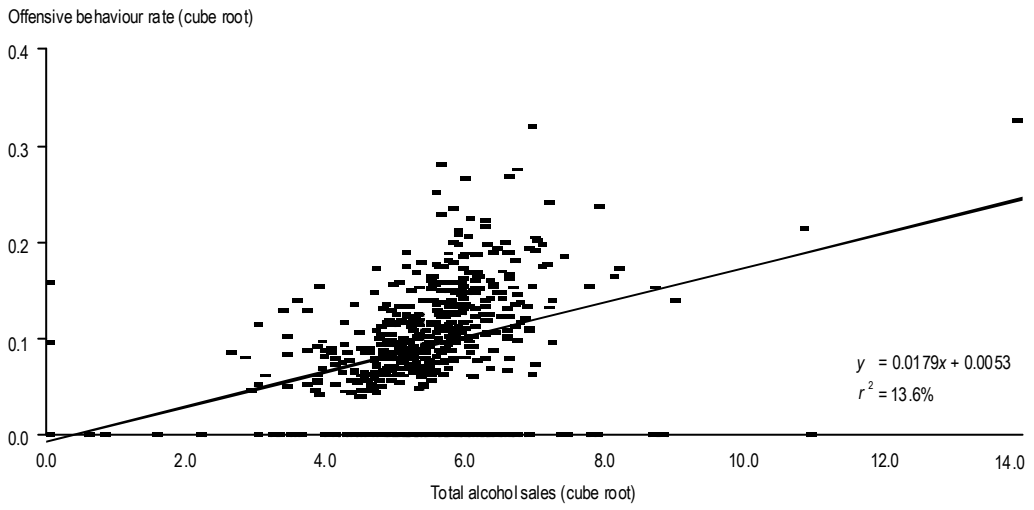

Figure 3: Scatter plot of malicious damage to property against total alcohol sales (by postcode)

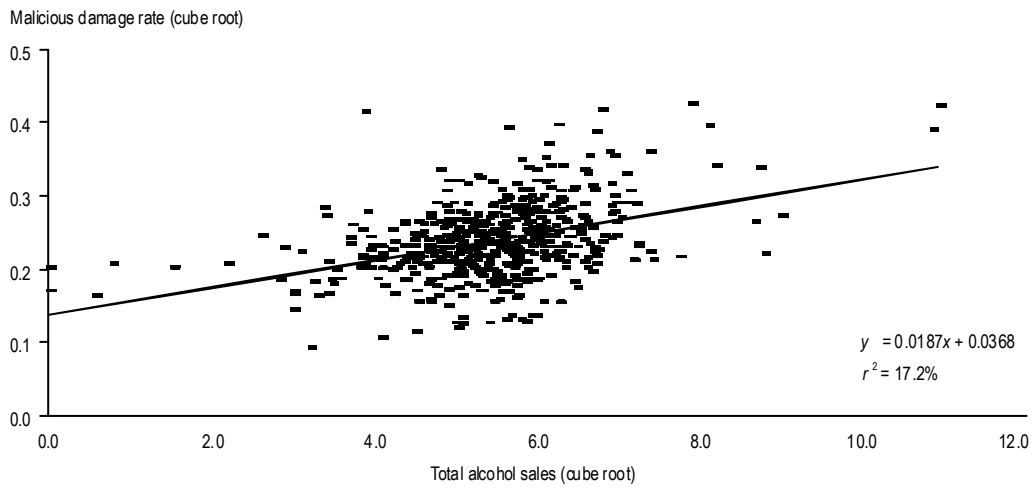

Table 3: Assault by type of alcohol

3.1 Variation explained by *all* types of alcohol (n = 525)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
43.7	49.1	5.4

3.2 Variation explained by *each* type of alcohol (n = 525)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	2.4	19.4
L.A. beer	0.6	7.5
Spirits	NS	5.5
Wine	NS	NS

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the assault rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Table 4: Offensive behaviour by type of alcohol

4.1 Variation explained by *all* types of alcohol (n = 564)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
13.5	22.0	8.5

4.2 Variation explained by *each* type of alcohol (n = 564)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	11.4
L.A. beer	0.9	11.6
Spirits	NS	8.1
Wine	NS	5.6

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the offensive behaviour rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

3.2.2 Accounting for differences in variation explained between liberal (r^2) and conservative (S_r^2) estimates

In many respects, the general reduction in variance explained when the control variables are present (S_r^2), when compared with the estimate in their absence (r^2), results from

the significant relationships between the variables used here (for full details see Tables B1 to B3, Appendix B). This is particularly so for assault, where the SEIFA accounted for a great deal of the variability of the assault rate, 41.1 per cent (see Table B2, Appendix B) and a significant degree of the variability of the total alcohol sold, 13.0 per cent (see Table B2, Appendix B). Thus when the control variables are present, because of their existing relationship with total alcohol sales, they inadvertently remove a proportion of the effect of total alcohol sales, before it is even added to the analysis. This implies that the estimate of variance accounted for under conditions where the control variables are present (S_r^2) is very conservative.

3.3 ALCOHOL TYPE

Tables 3, 4 and 5 show the results of the regression analyses for alcohol types. Table 3 shows the results for assault by type of alcohol. Table 4 shows the results for offensive behaviour by type of alcohol and Table 5, malicious damage by type of alcohol.

Table 5: Malicious damage by type of alcohol

5.1 Variation explained by *all* types of alcohol (n = 538)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
24.7	33.5	8.8

5.2 Variation explained by *each* type of alcohol (n = 538)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	8.1
L.A. beer	NS	4.8
Spirits	NS	11.2
Wine	1.5	10.2

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the malicious damage rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

3.3.1 Relationship to crime: alcohol type, combined

Yet again, the results indicate that postcodes with higher volume sales of alcohol, in general, experienced more malicious damage, assault and offensive behaviour, than postcodes with lower volume alcohol sales. These results are shown in the right-hand column of Tables 3.1, 4.1 and 5.1 Each R^2 value shown represents the estimate of the overall variability in crime rates accounted for by the combined effect of the four types of alcohol under conditions where the control variables are present.

3.3.2 Relationship to crime: alcohol type, separately

The central question that these results address is whether sales of any particular type of alcohol are uniquely related to any particular type of crime. The broad answer is no, but

with one important exception discussed later. This broad answer is based on two sets of findings. Firstly, examination of the column labelled S_r^2 in Tables 3.2, 4.2 and 5.2 reveal no compelling evidence of unique effects for any one alcohol type. This is indicated by the non-significance of most of the S_r^2 values and the small values of those that are significant. Secondly, the sales volumes of each type of alcohol were positively correlated with each other (see Tables B4 to B6, Appendix B). This may be taken to imply that each alcohol variable probably shares a similar relationship to crime. Thus, overall, these results suggest a general effect of alcohol, rather than an effect of a specific type of alcohol.

For assault, however, there is an exception to the general pattern of results. In the absence of any other variables, beer sales explained 19.4 per cent of the variation in assault rates across postcodes. In the presence of both the control variables and sales of other types of alcohol, beer sales still explain 2.4 per cent of the variation in assault rates. Though the amount of variability in assault rates explained by beer in this analysis appears small, this almost certainly results from the relationships between the variables. The variance accounted for by the correlation between beer and SEIFA was 19.8 per cent and SEIFA and assault was 41.9 per cent (see Table B4, Appendix B). The strong relationships between these variables are the probable cause of the attenuation of the beer-assault relationship, as the SEIFA effectively removes some of the effect of 'beer', before 'beer' is added to the analysis. Nevertheless, these results demonstrate that, even under stringent control conditions, the relationship between beer and assault is still present.

Two other significant results are worth noting although there was no a priori expectation about the relationships. In the presence of the controls and other alcohol types, L.A. beer sales explained a significant amount of the variation in offensive behaviour (0.9%) and wine sales explained a significant amount of the variation in malicious damage (1.5%).

3.4 OUTLET TYPE

Tables 6, 7 and 8 show the results of the regression analyses for outlet types. Table 6 shows the results for assault by type of outlet. Table 7 shows the results for offensive behaviour by type of outlet and Table 8, malicious damage by type of outlet.

3.4.1 Relationship to crime: outlet type, combined

As before, areas with higher volume sales of alcohol, had higher rates of assault, offensive behaviour and malicious damage, than areas with lower volume alcohol sales. These results are illustrated in the right-hand column of Tables 6.1, 7.1 and 8.1. Each R^2 value shown there represents the conservative estimate of the overall variability in crime rates accounted for by alcohol sales of the outlet types, under conditions where the control variables are present.

3.4.2 Relationship to crime: outlet type, separately

As with alcohol type, the most important question is whether type of outlet has any special relationship with a particular type of offence. The answer this time is yes. This is supported by two sorts of observations. Firstly, examination of the column labelled S_r^2 of Tables 6.2, 7.2 and 8.2 reveal evidence of a number of unique effects of outlet types, indicated by the significance of the S_r^2 values. Secondly, the correlations between different outlet types are far weaker than those observed for alcohol types (see Appendix B, Tables

B7 to B9). Though this does not imply that unique effects between particular outlets and crime will be observed, it does suggest that they can at least be detected. The relationship of each crime type to outlet alcohol sales is discussed below.

Table 6: Assault by type of outlet

6.1 Variation explained by *all* types of outlet (n = 526)

Model with controls only R^2 (%)	*Model with controls plus outlet* R^2 (%)	*Difference (outlet only)* R^2 (%)
44.3	51.3	7.0

6.2 Variation explained by *each* type of outlet (n = 526)

	In presence of other variables[a]	*Alone*[b]
Type of outlet	S_r^2 (%)	r^2 (%)
Hotels	2.4	12.8
Clubs	0.5	2.3
Off-licences	0.4	1.7
Restaurants	2.2	1.9

a The values in this column are the additional R^2 resulting from adding the specified type of outlet to a model already containing the control variables and all other types of outlet.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the assault rate and the sales of the specified type of outlet. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of outlet as the only predictor variable.)

Table 7: Offensive behaviour by type of outlet

7.1 Variation explained by *all* types of outlet (n = 563)

Model with controls only R^2 (%)	*Model with controls plus outlet* R^2 (%)	*Difference (outlet only)* R^2 (%)
14.1	33.1	19.0

7.2 Variation explained by *each* type of outlet (n = 563)

	In presence of other variables[a]	*Alone*[b]
Type of outlet	S_r^2 (%)	r^2 (%)
Hotels	3.4	8.3
Clubs	3.2	13.4
Off-licences	5.4	10.0
Restaurants	0.5	3.7

a The values in this column are the additional R^2 resulting from adding the specified type of outlet to a model already containing the control variables and all other types of outlet.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the offensive behaviour rate and the sales of the specified type of outlet. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of outlet as the only predictor variable.)

3.4.2.1 Assault by outlet type

The S_r^2 values in Table 6.2 show that alcohol sales from all types of outlet explained significant amounts of variation in assault rates in the presence of both the control variables and other outlet types. In all cases the amount of variation explained was quite small. The most interesting result is for hotels. For all other outlet types the r^2 values are also small, indicating that, in the absence of all other variables, the outlet type explained only a small amount of the variation in assault rates. Alcohol sales from hotels, however, explained 12.8 per cent of the variation in assault rates under these conditions, suggesting a strong relationship between assault and hotels that becomes attenuated by the presence of the control variables, hence reducing the size of the relationship indicated by the S_r^2 value. This attenuation again results from the correlations that exist between SEIFA and assault (r^2 =42.9 per cent; see Table B7, Appendix B) and SEIFA and hotel alcohol sales (r^2 =11.8 per cent; see Table B7, Appendix B). Thus the control variables remove a portion of the 'hotel' effect, before 'hotels' are added to the analysis.

3.4.2.2 Offensive behaviour by outlet type

The S_r^2 values in Table 7.2 show that, in the presence of both the control variables and other outlet types, each type of outlet uniquely explained a significant amount of the variation in rates of offensive behaviour. The relationships were strongest for hotels, clubs and off-licences which all have moderately large r^2 values (indicating significant bivariate relationships between offensive behaviour and alcohol sales from these outlet types). As before, these estimates of variability were attenuated when the control variables were present, probably due to the relationships existing between variables (see Table B8, Appendix B).

Table 8: Malicious damage by type of outlet

8.1 Variation explained by *all* types of outlet (n = 539)

Model with controls only R^2 *(%)*	***Model with controls plus outlet*** R^2 *(%)*	***Difference (outlet only)*** R^2 *(%)*
24.1	35.5	11.4

8.2 Variation explained by *each* type of outlet (n = 539)

	In presence of other variables [a]	***Alone*** [b]
Type of outlet	S_r^2 *(%)*	r^2 *(%)*
Hotels	1.5	3.6
Clubs	NS	NS
Off-licences	3.4	9.7
Restaurants	2.6	7.5

a The values in this column are the additional R^2 resulting from adding the specified type of outlet to a model already containing the control variables and all other types of outlet.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the malicious damage rate and the sales of the specified type of outlet. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of outlet as the only predictor variable.)

3.4.2.3 Malicious damage by outlet type

Off-licences and restaurants and, to a lesser extent hotels, each accounted for a significant and unique degree of the variability in rates of malicious damage. These conclusions are

again based on two types of result. Firstly, the significant S_r^2 values illustrated in Table 8.2, which indicate that the effect survived the control procedure and that the effect was unique to that particular variable. Secondly, the r^2 values for off-licences and restaurants are moderately large, indicating significant bivariate relationships between these outlet types and malicious damage. As before, these estimates of variability were attenuated when the control variables were present, probably due to the relationships existing between variables (see Table B9, Appendix B).

3.5 OUTLET BY ALCOHOL TYPE

The key question in these analyses was whether sales of particular types of alcohol from particular types of outlet, were related to particular types of offence. Overall, they were not, except for some limited evidence for beer sales volume from hotels and assault, which is discussed below. For all of these analyses there were some problems with multicollinearity so the results need to be interpreted with some caution.

3.5.1 Hotels by alcohol type

Tables 9, 10 and 11 show the results of the regression analyses for alcohol types sold by hotels. Table 9 shows the results for malicious damage by alcohol sales from hotels. Table 10 shows the results for offensive behaviour by alcohol sales from hotels and Table 11, assaults by alcohol sales from hotels.

Alcohol sales from hotels, regardless of type of alcohol, accounted for a significant degree of the variability in rates of all three types of violent crime. These results are illustrated in the right-hand column of Tables 9.1, 10.1 and 11.1. Each R^2 value shown there represents the estimate of the overall variability in crime rates accounted for by hotels, under conditions where the control variables are present.

Table 9: Malicious damage by alcohol sales from hotels

9.1 Variation explained by *all* types of alcohol from hotels (n = 538)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
24.2	29.1	4.9

9.2 Variation explained by *each* type of alcohol from hotels (n = 538)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	3.1
L.A. beer	NS	1.8
Spirits	NS	5.7
Wine	0.8	6.9

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the malicious damage rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Table 10: Offensive behaviour by alcohol sales from hotels

10.1 Variation explained by *all* types of alcohol from hotels (n = 564)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
13.5	18.1	4.6

10.2 Variation explained by *each* type of alcohol from hotels (n = 564)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	7.6
L.A. beer	NS	6.3
Spirits	NS	7.7
Wine	NS	6.1

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the offensive behaviour rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Table 11: Assault by alcohol sales from hotels

11.1 Variation explained by *all* types of alcohol from hotels (n = 528)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
43.4	46.9	3.5

11.2 Variation explained by *each* type of alcohol from hotels (n = 528)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	0.5	12.2
L.A. beer	NS	7.3
Spirits	0.4	8.9
Wine	NS	6.2

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the assault rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Most of the S_r^2 values in Tables 9.2, 10.2 and 11.2 are not statistically significant. Those that are significant are very small. There is therefore little evidence of any unique effects of particular types of alcohol sold by hotels. It is of interest to note, however, that there is some evidence of a relationship between beer sales from hotels and assault. Beer sales

from hotels explained 12.2 per cent of the variation in assault rates in the absence of all other predictor variables and still explained a significant, though small, 0.5 per cent of the variation in assault rates in the presence of both the control variables and other types of alcohol. As before, this attenuation was probably due to the relationships existing between variables (see Table B12, Appendix B). However, this result has to be treated with some caution. The indicator of multicollinearity for beer exceeded five (VIF = 5.5; see Method section 2.3.5 for a discussion of this). Though it is unlikely that this would severely distort the observed relationship given that the multicollinearity indicator just exceeds the critical value, the result needs to be interpreted with some caution.

3.5.2 Clubs by alcohol type

Tables 12, 13 and 14 show the results of the regression analyses for alcohol types sold by clubs. Table 12 shows the results for malicious damage by alcohol sales from clubs. Table 13 shows the results for offensive behaviour by alcohol sales from clubs and Table 14, assaults by alcohol sales from clubs.

Table 12: Malicious damage by alcohol sales from clubs

12.1 Variation explained by *all* types of alcohol from clubs (n = 540)

Model with controls only R^2 (%)	***Model with controls plus alcohol*** R^2 (%)	***Difference (alcohol only)*** R^2 (%)
23.6	24.5	NS

12.2 Variation explained by *each* type of alcohol from clubs (n = 540)

	In presence of other variables [a]	***Alone*** [b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	NS
L.A. beer	NS	NS
Spirits	NS	1.1
Wine	NS	NS

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the malicious damage rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Alcohol sales from clubs, regardless of type of alcohol, accounted for a significant proportion of the variability in rates of offensive behaviour, but not assault or malicious damage. These results are illustrated in the right-hand column of Tables 12.1, 13.1 and 14.1. Each R^2 value shown there represents the estimate of the overall variability in crime rates accounted for by clubs, under conditions where the control variables are present.

There were no specific effects of sales of any one kind of alcohol type. Examination of the S_r^2 values in Tables 12.2, 13.2 and 14.2 reveals that most are either very small, non-significant or unreliable due to multicollinearity.

Table 13: Offensive behaviour by alcohol sales from clubs

13.1 Variation explained by *all* types of alcohol from clubs (n = 564)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
13.5	22.7	9.2

13.2 Variation explained by *each* type of alcohol from clubs (n = 564)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	12.8
L.A. beer	0.6	12.7
Spirits	NS	10.9
Wine	NS	8.5

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the offensive behaviour rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Table 14: Assault by alcohol sales from clubs

14.1 Variation explained by *all* types of alcohol from clubs (n = 526)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
43.6	44.2	NS

14.2 Variation explained by *each* type of alcohol from clubs (n = 526)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	7.7
L.A. beer	NS	9.5
Spirits	0.5	2.5
Wine	NS	4.9

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the assault rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

3.5.3 Off-licences by alcohol type

Tables 15, 16 and 17 show the results of the regression analyses for alcohol types sold by off-licences. Table 15 shows the results for malicious damage by alcohol sales from off-licences. Table 16 shows the results for offensive behaviour by alcohol sales from off-licences and Table 17, assaults by alcohol sales from off-licences.

Table 15: Malicious damage by alcohol sales from off-licences

15.1 Variation explained by *all* types of alcohol from off-licences (n = 539)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
23.4	29.4	6.0

15.2 Variation explained by *each* type of alcohol from off-licences (n = 539)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	10.0
L.A. beer	NS	7.9
Spirits	NS	7.4
Wine	NS	7.4

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the malicious damage rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Table 16: Offensive behaviour by alcohol sales from off-licences

16.1 Variation explained by *all* types of alcohol from off-licences (n = 563)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
13.4	24.0	10.6

16.2 Variation explained by *each* type of alcohol from off-licences (n = 563)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	10.6
L.A. beer	1.2	10.8
Spirits	1.2	3.4
Wine	NS	5.3

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the offensive behaviour rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Alcohol sales from off-licences, broadly regardless of type of alcohol, accounted for a significant degree of the variability in rates of malicious damage and offensive behaviour, but not assault. These results are illustrated in the right-hand column of Tables 15.1, 16.1 and 17.1. Each R^2 value shown there represents the conservative estimate of the overall

variability in crime rates accounted for by off-licences, under conditions where the control variables are present. There were no specific effects of sales of any one kind of alcohol type. Examination of the S_r^2 values in Tables 15.2, 16.2 and 17.2 reveals that most are either very small, non-significant or unreliable due to multicollinearity.

Table 17: Assault by alcohol sales from off-licences

17.1 Variation explained by *all* types of alcohol from off-licences (n = 527)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
43.5	44.3	NS

17.2 Variation explained by *each* type of alcohol from off-licences (n = 527)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	2.5
L.A. beer	NS	2.0
Spirits	NS	NS
Wine	NS	NS

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the assault rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Table 18: Malicious damage by alcohol sales from restaurants

18.1 Variation explained by *all* types of alcohol from restaurants (n = 536)

Model with controls only R^2 (%)	*Model with controls plus alcohol* R^2 (%)	*Difference (alcohol only)* R^2 (%)
24.1	33.0	8.9

18.2 Variation explained by *each* type of alcohol from restaurants (n = 536)

	In presence of other variables[a]	*Alone*[b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	9.2
L.A. beer	NS	7.4
Spirits	NS	9.0
Wine	NS	7.1

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the malicious damage rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

3.5.4 Restaurants by alcohol type

Tables 18, 19 and 20 show the results of the regression analyses for alcohol types sold by restaurants. Table 18 shows the results for malicious damage by alcohol sales from restaurants. Table 19 shows the results for offensive behaviour by alcohol sales from restaurants and Table 20, assaults by alcohol sales from restaurants.

Table 19: Offensive behaviour by alcohol sales from restaurants

19.1 Variation explained by *all* types of alcohol from restaurants (n = 562)

Model with controls only R^2 (%)	***Model with controls plus alcohol*** R^2 (%)	***Difference (alcohol only)*** R^2 (%)
13.6	22.8	9.2

19.2 Variation explained by *each* type of alcohol from restaurants (n = 562)

	In presence of other variables [a]	***Alone*** [b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	5.4
L.A. beer	NS	4.2
Spirits	2.0	6.6
Wine	1.4	2.1

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the offensive behaviour rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Table 20: Assault by alcohol sales from restaurants

20.1 Variation explained by *all* types of alcohol from restaurants (n = 527)

Model with controls only R^2 (%)	***Model with controls plus alcohol*** R^2 (%)	***Difference (alcohol only)*** R^2 (%)
13.6	22.8	9.2

20.2 Variation explained by *each* type of alcohol from restaurants (n = 527)

	In presence of other variables [a]	***Alone*** [b]
Type of alcohol	S_r^2 (%)	r^2 (%)
Beer	NS	2.5
L.A. beer	NS	1.1
Spirits	NS	2.1
Wine	NS	1.0

a The values in this column are the additional R^2 resulting from adding the specified type of alcohol to a model already containing the control variables and all other types of alcohol.

b The values in this column are the squared Pearson correlation coefficients measuring the correlation between the assault rate and the sales of the specified type of alcohol. (They are equivalent to the R^2 values which would result from a simple linear regression model containing the specified type of alcohol as the only predictor variable.)

Alcohol sales in general from restaurants, were related to all three offence types. These results are illustrated in the right-hand column of Tables 18.1, 19.1 and 20.1. Each R^2 value shown there represents the conservative estimate of the overall variability in crime rates accounted for by restaurants, under conditions where the control variables are present. There were no specific effects of sales of any one kind of alcohol type. Examination of the S_r^2 values in Tables 18.2, 19.2 and 20.2 reveals that most are non-significant.

4. DISCUSSION

4.1 SUMMARY OF RESULTS

In agreement with many previous studies, this research has identified strong and significant relationships between alcohol sales volume and crime, even when controlling for socio-economic and demographic variables. Total alcohol sales volume was significantly related to the rates of three crime types in NSW, malicious damage, assault and offensive behaviour. The strong positive correlations between alcohol types (beer, L.A. beer, wine, spirits), broadly result in any alcohol type being an equally good predictor of crime rates. One exception was the relationship between beer sales volume and assault. This relationship was unique to beer. When the alcohol data were analysed by outlet type, the weaker correlations between outlet sales volume resulted in the observation of a number of unique relationships. Important effects were those between: hotels and assault; off-licences, clubs and hotels with offensive behaviour; and malicious damage with off-licences, hotels and restaurants. For the interactions between outlet and alcohol type there were few specific effects. The most notable was evidence of a relationship between hotel beer sales volume and assault. However, this latter result has to be regarded as indicative rather than as proven, as one of the underlying assumptions of the analysis had to be violated.

4.2 THE GENERAL EFFECTS OF ALCOHOL

Overall, there were few effects of alcohol type, except that of beer, which is discussed in more detail below. In Stockwell et al.'s (1996) study, a number of specific alcohol type relationships emerged, notably between cask wine and assault, and beer and assault. This type of finding can be used to justify taxation of alcohol products not by type, but by alcohol content, as cask wine, at least in WA, is one of the cheapest forms of alcohol available. The data reported here neither strongly favour nor disfavour taxation based on alcohol content. However, it is interesting to note that L.A. beer generally shared relationships with crime of approximately equal magnitude with that of other types of liquor of much greater alcohol content. In agreement with this are the findings of Bushman and Cooper (1990). In their meta-analytic study of laboratory based alcohol-aggression research, they found that though aggression increased following consumption of alcohol, the effect did not appear to increase further as more alcohol was consumed - at least for the doses studied. Thus the expression of alcohol-induced aggression may well have more to do with the context in which the alcohol is consumed than either the dose or type. The consequence of this may be that classification by outlet better captures the interaction of lifestyle and alcohol, than classification by type.

4.3 ASSAULT

The relationship observed here between hotels and/or beer and assault, is further confirmation of an already acknowledged problem (Field 1990, Homel & Tomsen 1991, Ramsay 1996). The observations that beer alone, hotels alone, and beer sold in hotels have a relationship to assault, rather than being separate and unrelated findings can be linked together using evidence from other research. Firstly, beer is the most popular male drink, preferred more by the young than the old (CDHFS-NDS 1996, Klatsky et al. 1990). Secondly, hotels and similar outlets are the most popular places for males to drink outside their own home, particularly so when young (CDHFS-NDS 1996). Thirdly, hotel beer sales account for 41.3 per cent of all beer sales, 8.5 percentage points higher than the

next nearest category, off-licences (see Table 1). Fourthly, in hotels, 80.3 per cent of their total sales volume is in full strength beer (see Table 1). Thus the drinking habits of certain young males appear to be the common thread between beer and hotels.

In an unpublished study by Homel (see Homel, Tomsen & Thommeny 1992 for description), 16 per cent of his sample of hotels (n=34) were found to be responsible for 75 per cent of all the observed instances of physical violence. It is not therefore unreasonable to suggest that certain hotels have a 'violence problem'. The first task is to identify the places and occasions where alcohol-related assaultive violence takes place. Homel et al. (1992) identified four discrete places: (1) certain locations outside, but around hotels and clubs; (2) 'territorial' hotels; (3) 'workingmen's' hotels; and (4) popular, predominantly young patronage, live music, late trading hotels. Each of these locations is considered below.

Of the incidents occurring outside hotels, a number of factors are known to influence the incidence of offending (Arnold & Laidler 1994). In her Home Office study of non-metropolitan violence, Tuck (1989) noted that the speed with which individuals dispersed after closing time was an important factor in reducing the potential for conflict. A direct factor in dispersal speed was the efficiency with which public transport could move people out of the area. Thus speedily clearing individuals away from venues after closing is an important consideration in reducing assaultive violence around hotels and other liquor outlets.

A further consideration is the environment in which the hotels are situated. Certain environments may provide bottlenecks or gathering areas (see Hope 1985). Bottlenecks may, for example, force the mixing of patrons from a number of different hotels. Alternatively, gathering areas often include fast food restaurants/stalls or areas of public seating. Both of these lead to pooling of intoxicated persons, with the increased propensity for violence that this situation can lead to - mainly through the opportunity for conflict. Both of these preceding issues, and of transport as well, will be exaggerated if hotels disgorge their patrons at similar times.

As briefly described above, Homel et al. (1992) identified three broad classes of violent hotel. The first, described as 'territorial' were considered too 'dangerous' to be part of Homel et al's (1992), hotel-violence study. They were characterised by a regular clientele, often conforming to some particular dress or behavioural code (e.g. motorcycle gangs, punk rockers). Strangers therefore stood out and were regarded with suspicion. A second group were those described as workingmen's hotels. Though some violence was noted in these establishments, they were generally less violent than popular imagination might suggest. The third group were predominantly patronised by a young clientele, often being a music venue with extended trading hours (this forming the major group of hotels about which noise/disturbance complaints are received by the NSW Liquor Administration Board [see NSW Department of Gaming and Racing 1995]). Of these hotels, the ones found to be most violent had certain contextual features in common, such as low comfort, no food, overcrowding, poor quality entertainment, high levels of patron intoxication and aggressive staff. Homel et al. (1992) suggest that modification of these contextual features may go some way to reducing violence in these types of venues.

Two features of Homel et al.'s (1992) work are particularly worth comment. The first is the role of responsible serving practices, whereby trained bar staff attempt to regulate patrons' consumption of alcohol. Though it is against the law in NSW to serve alcohol to someone who is already intoxicated, enforcement of this law is very difficult, thus training the bar staff to serve responsibly might be expected to result in a reduction in violence by reducing levels of intoxication, without the necessity of increased policing.

However, Homel et al. (1992) note that these schemes on their own may contribute little to reducing violence, as they leave untouched many of the other contextual features that contribute to the problem. Certainly, in Lang's (1990) review of empirical tests of responsible serving practices (mainly in the US and Canada), there was in fact only weak support at best for their success when utilised in isolation.

A potential weakness of Homel's approach is that efforts to alter the whole environment of a hotel/club, may conflict with what certain consumers may actually desire. If it is the case that certain young patrons like noise, crowds, cheap drinks, drunkenness and a 'lively atmosphere', any attempt to curb these features might lead to patrons seeking similar features in other venues. The logical consequence of this would be a reduction in the level of assaultive violence in targeted venues as a result of patron displacement rather than because of the effects of the venue's features acting upon the same set of patrons. That there might be some validity in this argument is supported by Homel and Tomsen's (1991) own observations. They found that during the period of time that many of the changes based on their findings (described above) were implemented in Surfers Paradise, the overall crime rate actually increased in the larger surrounding area (Homel quoted in Raffaele 1995). The necessity here may be to actually examine patrons' preferences and their reasons for them and seek to reach some accommodation between clientele preferences and environmental re-design measures.

4.4 MALICIOUS DAMAGE

In the Introduction two broad hypotheses were advanced. The first, based in part on Bonney's (1992) data, suggested that a majority of malicious damage offences occurred in the late evening and particularly at weekends and thus by implication might involve intoxicated revellers from hotels and clubs (for a similar suggestion see Arnold & Laidler 1994). The second, was that off-licence sales might be related to malicious damage through the supply of take-away alcohol to juveniles. It was also suggested that the supply of take-away alcohol to young adults - given their level of involvement in this type of offence - might further strengthen the hypothesised relationship with off-licences.

Only weak support was present for the first hypothesis, though overall, a strong relationship was observed between alcohol consumption in general and variations in the rate of malicious damage. However, an unexpected relationship was observed between malicious damage and restaurants. Though it is possible that restaurants may generate some drunk patrons, it is difficult to believe that these liquor outlets are a major problem - at least they have not been identified as such in previous research. Furthermore, there are some indications that they are generally patronised by an older clientele,[8] not the primary group from which malicious damage offenders are drawn. For these reasons, it may be that the relationship between restaurants and malicious damage reflects the operation of other contextual variables (e.g. close proximity to attractive targets for malicious damage).

A large proportion of malicious damage offences are directed against personal property, notably cars. Restaurant patrons may often arrive by car, probably parking nearby. These 'unguarded' cars may provide tempting opportunities for vandals. This hypothesis is open to test in two ways. Firstly, by mapping incidents of damage to cars in relation to the location of restaurants. A second test is based on the expectation that there might also be a relationship between car theft and theft from a motor vehicle and restaurant alcohol sales - by applying the same rationale used above, that restaurants may provide a varied pool of 'opportunities' for thieves.

The second hypothesis was confirmed, to the extent that there was a relationship between total alcohol sales through off-licences and malicious damage. Both Victorian (Victorian

State Committee on Vandalism 1981) and British (Clarke 1978) studies suggest that property damage, of which malicious damage is a part, are offences commonly committed by juveniles and young adults. Although this study is not able to accurately pin down the principal offender group, it does highlight the role that off-licences may indirectly play in facilitating damage to public and private property through the supply of take-away alcohol. This raises two issues: how to effectively restrict access to alcohol by juveniles and what constraints should apply to drinking in public places.

The issue of juvenile drinking has received a lot of attention. One of the most notable findings is that juvenile offending increased by 20-25 per cent (for various offences), when compared with appropriate controls, as a result of lowering the drinking age in South Australia from 21 to 18 (Smith & Burvill 1986). Ireland (1990) notes that as the drinking age is lowered, the number of juveniles that this enables to purchase alcohol increases. Though it is yet to be seen whether the widespread introduction of proof of age cards in NSW will impact on juvenile drinking, at least prior to their introduction, regular drinking in teenage groups appeared not to have changed in recent years. The percentage of 16 year olds (males and females) in NSW drinking at a frequency of once a week or more, was 38 per cent in 1977 (Egger & Champion 1978) and 43 per cent in 1992 (Commonwealth Department of Human Services and Health 1994). It should be possible, to some extent, to track any reduction in juvenile drinking through such surveys in the future.

Prohibitions on public drinking are now widely used in Sydney (certain areas of Kings Cross, Coogee, Maroubra and Cronulla to name a few). Overall in NSW, there are some 100 alcohol-free zones (Cook 1994). Their success is difficult to gauge. Although they appear popular with both police and public, they do not appear, as far as the limited research in this area indicates, to have had much impact on alcohol-related crime (Burns 1992, Ramsay 1990). The UK research (Ramsay 1989, 1990) suggests that public fear was reduced as a consequence of the introduction of the alcohol-free zone in the test area (the centre of Coventry). However, the measures introduced in the UK study occurred simultaneously with the introduction of other initiatives, thus the success of the project may have resulted in part from other factors. The real question that the research to date does not address is whether changes in public perceptions, of the sort observed in the UK translate over the long term into reductions in crime as a result of increased activity in an area, due to greater use by a more confident public. That these changes may take years to manifest could explain the limited effects on crime observed in the short observation periods of the studies to date. However, the possibility has to be entertained that such schemes may simply not work. This might be because of poor enforcement, the ambiguity of the law or just local displacement of problem drinkers to areas outside of, but adjacent to, the alcohol-free zone.

4.5 OFFENSIVE BEHAVIOUR

Offensive behaviour was found to be related to alcohol sales volume from off-licences, hotels and clubs. This is perhaps to be expected. If offensive behaviour is used by the police to arrest threatening intoxicated persons or as an adjunctive charge for violent offenders, then all outlets might be expected to contribute to this offence type. The strongest relationship was with off-licences. If a patron becomes drunk in a hotel or club, the time of exposure on the street is likely to be less than someone sitting in a public place getting drunk. Thus the police may have more opportunity to observe drunken behaviour from take-away alcohol consumed in public, than from on-licence consumed alcohol. It might also be expected that many of the measures discussed above could impact on the frequency of these offences, particularly preventing gatherings following closure of hotels and clubs, preventing drinking in certain public places and altering the context of certain drinking environments to limit hotel violence.

4.6 CONCLUSION

Two principal findings have emerged from this research. The first is the strong relationship observed between alcohol sales volume and assault, malicious damage to property and offensive behaviour. This research indicates that these offences are more common in postcodes that have higher alcohol sales volume, even when other social and demographic variables are taken into account. The second is the specific role of beer and hotels in assaultive violence and the role of take-away alcohol in malicious damage to property and offensive behaviour. Overall, alcohol is seen to play at least a facilitating and probably a causal role, in a complex interaction of social class, age, sex and drinking context, the outcome of which can often be abuse, damage to property and, ultimately, physical violence.

Though this report was primarily aimed at investigating the relationship between alcohol and crime, it cannot escape from drawing at least some preliminary conclusions on how this problem might be tackled. One obvious solution is to reduce alcohol consumption. The regression models allow us to calculate the impact of this in terms of the percentage reduction in particular crime types. If the 50 highest alcohol sales volume postcodes in NSW had their sales reduced to the Statewide mean, this would result in a 22 per cent reduction in offensive behaviour, a nine per cent reduction in malicious damage to property and a six per cent reduction in assault in these postcodes.[9] Across all of these 50 postcodes, this would mean 324 fewer offensive behaviour incidents, 1,744 fewer malicious damage incidents and 635 fewer assaults (it would of course also reduce the hundreds of offences of these types which are never reported to the police). Thus, however a reduction might be achieved (by tax, education, restricting sales hours or outlet numbers) the result would be a tangible reduction in violent crime. Furthermore, any reduction in consumption would also reduce road accidents and deaths, general alcohol- related morbidity and many other types of property crime and crimes against the person, which are known to be associated with alcohol consumption (see Smith & Burvill 1986, Stockwell et al. 1996). Finally, it would also provide large cash savings in terms of time saved by police, other emergency services, social services and hospitals, with the added bonus of freeing these resources up to deal with other problems. In the present climate of public fiscal rectitude and concern over crime, reduction in alcohol consumption would offer many advantages.

NOTES

1. The CDHFS-NDS survey is well designed and conducted. There is every reason to be confident that its results apply in approximately equal measure to all States and Territories of Australia. Calculation of self-reported alcohol-related crime for NSW: 8 per cent of persons aged 14-19, which is 0.08 x 422,300 (15-19 year old population in NSW; Australian Bureau of Statistics [ABS] 1996) = 33,784 persons; 4 per cent of persons aged 20-34, which is 0.04 x 1,434,700 (20-34 year old population in NSW; ABS 1996) = 57,388 persons.

2. Calculation of victimisation by alcohol for NSW: 33 per cent aged 14 or more were verbally abused, which is 0.33 x 4,760,200 (14+ year old population in NSW; ABS 1996) = 1,570,866 persons; 21 per cent aged 14 or more were put in fear, which is 0.21 x 4,760,200 = 999,642 persons; 13 per cent aged 14 or more had property damaged, which is 0.13 x 4,760,200 = 618,826 persons; 9 per cent aged 14 or more were physically abused, which is 0.09 x 4,760,200 = 428,418 persons.

3. Definitions: hotels - licensee enabled to sell alcohol for consumption on or off premises; off-licences - licensee enabled to sell alcohol only for consumption off premises; club - a body of persons established for a common cause (e.g. RSL, Leagues etc.), enabled to sell alcohol for consumption on or off premises; restaurant - licensee enabled to sell alcohol for consumption on premises; beer - beverage brewed from malt, sugar, hops and water, with an alcohol content greater than 3.5 per cent by volume; low alcohol beer - beverage similar to beer, with an alcohol content 3.5 per cent or less by volume.

4. The decision to base the population age cut-off at 15 was based on findings from the 1989 Survey of Drug Use by NSW Secondary School Students (NSW Department of Health 1990). It showed that the largest increase in frequency of alcohol use (at least weekly use), when considered by successive age groups, was between 14 (18.6%) and 15 (30.0%). Thus 15 years was used as the lower limit in estimating the potential 'drinking' population for each postcode. The same population figures were also used in calculating per capita crime rates.

5. The ABS provides a list, on request, of postcodes that they have combined, called 'Secondary postcodes'. These Secondary postcodes do not have discrete mappable boundaries and are combined with their most appropriate Primary postcode.

6. For most analyses the number of Studentised residual statistics to screen was in excess of 500. Accordingly the probability level for rejection of the null hypothesis (not an outlier) was adjusted using the Bonferroni inequality (see, for example, Howell 1992).

7. Cliff and Ord (1981) note that their correction procedure for spatial autocorrelation generally involves taking account of only the effect of adjacent cells. One way therefore of detecting any deleterious effects of spatial autocorrelation is to only use in the analysis, postcodes that are all non-adjacent. This procedure was followed and 188 postcodes, none with adjacent boundaries, were selected. The regression analysis examining the relationship between beer and assault, when controlling for the percentage of males aged 15-24 and SEIFA, was repeated on the 188 non-adjacent postcodes and on the full set of 569 postcodes. Following removal of outliers, the non-adjacent postcode analysis was reduced to 175 postcodes and the full set to 532. The variance accounted for by beer (S_r^2) was 8.9 per cent in the non-adjacent postcode model and 11.2 per cent in the full model. The similarity between these two estimates is reassuring.

8. Two factors make this likely. First, the CDHFS-NDS (1996) found that cafes/restaurants are the least common venue (fifth out of five) for consumption of alcohol for males and females under 35. For those 35 and over, this ranking for cafes/restaurants as places where alcohol is commonly consumed rises to second out of five. A second point concerns money. If the principal purpose is to drink until a point of moderate or severe intoxication is reached, not only will it be counter-productive to eat at the same time, it is also likely to be beyond the means of many teenagers/ young adults. Furthermore, licensed restaurants may often charge more for alcohol than if it were purchased from other licensed premises.

9. For each offence type, the 50 postcodes with the highest alcohol sales volume were selected. These varied somewhat between offence types as the sample sizes were different due to the removal of outlying observations during the regression procedure (see Method section). The values entered into each regression model were the mean values for the 50 selected postcodes for the percentage of males aged 15-24 (Males), the SEIFA (Seifa) and the mean total alcohol sales volume per capita (Alcohol). These provided the values used in predicting the offence rate. The calculations were then repeated by substituting the mean per capita total alcohol sales volume for the 50 postcodes, with the Statewide mean. The percentage change in predicted crime rates is reported in the text. The regression equations utilised for these calculations and their associated values are listed below:

   (1) Offensive behaviour (Cube root, per capita, per postcode)
   = 0.199043 (intercept) + 0.053098 x Log Males - 0.000244 x Seifa + 0.013767 x Cube root Alcohol
   with means of Males = 15.616, Seifa = 971.933 and Alcohol = 213.752

   (2) Malicious damage (Cube root, per capita, per postcode)
   = 0.089214 (intercept) + 0.195211 x Log Males - 0.000177 x Seifa + 0.017655 x Cube root Alcohol
   with means of Males = 15.797, Seifa = 975.781 and Alcohol = 190.077

   (3) Assault (Cube root, per capita, per postcode)
   = 0.384556 (intercept) + 0.090738 x Log Males - 0.000358 x Seifa + 0.010535 x Cube root Alcohol
   with means of Males = 15.639, Seifa = 977.074 and Alcohol = 190.656

   The value of the Statewide Alcohol mean was 152.869. Thus this would involve alcohol reductions in the order of 20-30 per cent, per capita, to return the 50 high alcohol sales volume postcodes to the Statewide mean.

REFERENCES

Arnold, M.J. & Laidler, T.J., 1994, Situational and Environmental Factors Impacting on Alcohol Related Violence in Public, National Symposium on Alcohol Misuse and Violence Report Number 7, Commonwealth Department of Health, Housing, Local Government and Community Services, Canberra.

Australian Bureau of Statistics 1993, Information paper - 1991 Census Socio-economic Indexes for Areas, Australian Bureau of Statistics, Canberra.

Australian Bureau of Statistics 1996, New South Wales Year Book, Number 76, 1996, Australian Bureau of Statistics, Sydney.

Bonney, R. 1989, N.S.W. Summary Offences Act, NSW Bureau of Crime Statistics and Research, Sydney.

Bonney, R. 1992, Aspects of Malicious Damage, NSW Bureau of Crime Statistics and Research, Sydney.

Brown, D., Neal, D., Farrier, D. & Weisbrot, D., 1990, Criminal Laws, The Federation Press, Sydney.

Bushman, B.J. & Cooper, H.M. 1990, 'Effects of alcohol on human aggression: An integrative research review', Psychological Bulletin, vol. 107, pp. 341-354.

Burns, L. 1992, 'Dry zones' and Crime in Walgett: An Evaluation of the Local Government (Street Drinking) Amendment Act 1990, NSW Bureau of Crime Statistics and Research, Sydney.

Clarke, R.V.G. 1978, Tackling Vandalism, Home Office Research Study Number 47, HMSO, London.

Cliff, A.D. & Ord, J.K. 1981, Spatial Processes: Models and Applications, Pion, London.

Collins, J.J. & Schlenger, W.E. 1987, 'Acute and chronic effects of alcohol use on violence', Journal of Studies on Alcohol, vol. 18, pp. 516-521.

Commonwealth Department of Human Services and Health 1994, Secondary School Students' Drug Use: Comparisons of Patterns in Victoria and New South Wales 1992, Commonwealth Department of Human Services and Health, Canberra.

Commonwealth Department of Health and Family Services 1996, National Drug Strategy Household Survey, Survey Report, 1995, Commonwealth Department of Health and Family Services, Canberra.

Conover, W.J. 1980, Practical Nonparametric Statistics, John Wiley and Sons, New York.

Cook, D. 1994, 'Police may get power to tackle street drinking', Sydney Morning Herald, 5 Dec., p. 13.

Cook, P.J. & Moore, M.J. 1993, 'Violence reduction through restrictions on alcohol availability', Alcohol, Health and Research World, vol. 17, pp. 151-156.

Cookson, H.M. 1992, 'Alcohol use and offence type in young offenders', British Journal of Criminology, vol. 32, pp. 352-360.

Devery, C. 1992, Mapping Crime in Local Government Areas: Assault and Break and Enter in Waverley, NSW Bureau of Crime Statistics and Research, Sydney.

Egger, G. & Champion, R. 1978, Adolescent Drug and Alcohol Use in NSW 1971 to 1977, Health Commission of New South Wales, Sydney.

Field, S. 1990, Trends in Crime and their Interpretation, Home Office Research Study Number 119, HMSO, London.

Gallagher, P., Da Huong, M.T.N, & Bonney, R. 1994, Trends in Homicide 1968 to 1992, NSW Bureau of Crime Statistics and Research, Sydney.

Greenberg, S.W. 1982, 'Alcohol and crime: A methodological critique of the literature,' in Drinking and Crime: Perspectives on the Relationships between Alcohol Consumption and Criminal Behavior, ed. J.J. Collins, Tavistock Publications, New York.

Homel, R. & Tomsen, S. 1991, 'Violence, public drinking and public policy', Current Affairs Bulletin, Dec., pp. 20-27.

Homel, R., Tomsen, S. & Thommeny, J. 1992, 'Public drinking and violence: Not just an alcohol problem', The Journal of Drug Issues, vol. 22, pp. 679-697.

Hope, T. 1985, Implementing Crime Prevention Measures, Home Office Research Study Number 86, HMSO, London.

Howell, D.C. 1992, Statistical Methods for Psychology, PWS-Kent, Boston.

Indermaur, D. 1990, 'Prisoners' experience with alcohol', in Alcohol and Crime , ed. J. Vernon, Australian Institute of Criminology, Canberra.

Ireland, C.S. 1990, 'Juvenile alcohol consumption, a cause for concern', in Alcohol and Crime, ed. J. Vernon, Australian Institute of Criminology, Canberra.

Ireland, C.S. & Thommeny, J.L. 1993, 'The crime cocktail: licensed premises, alcohol and street offences', Drug and Alcohol Review, vol. 12, pp. 143-150.

Jeffs, R.W. & Saunders, W.M. 1983, 'Minimizing alcohol related offences by enforcement of the existing licensing legislation', British Journal of Addiction, vol. 78, pp. 67-77.

Jochelson, R. (in preparation), The Use of Offensive Language and Offensive Behaviour Charges Against Aborigines in NSW, NSW Bureau of Crime Statistics and Research.

Justice Under Scrutiny 1994, Report of the Inquiry into the Implementation by Governments of the Recommendations of the Royal Commission into Aboriginal Deaths in Custody, House of Representatives Standing Committee on Aboriginal and Torres Strait Islander Affairs, Canberra.

Kevin, M. 1992, Drug and Alcohol Exit Survey, Publication Number 26, NSW Department of Corrective Services, Sydney.

Klatsky, A.L., Armstrong, M.A. & Kipp, H. 1990, 'Correlates of alcoholic beverage preference: Traits of persons who choose wine, liquor or beer', British Journal of Addiction, vol. 85, pp. 1279-1289.

Lang, E. 1990, 'Server intervention: what chance in Australia?', Drug and Alcohol Review, vol. 10, pp. 381-393.

McMurran, M. & Hollin, C.R. 1989, 'Drinking and delinquency: Another look at young offenders and alcohol', British Journal of Criminology, vol. 29, pp. 386-394.

Montgomery, D.C. & Peck, E.A. 1992, Introduction to Linear Regression Analysis, John Wiley and Sons, NY.

National Symposium on Alcohol Misuse and Violence 1993, Violence Against Women and Children in the Home, Report Number 4, Canberra.

NSW Bureau of Crime Statistics and Research 1995, New South Wales Criminal Court Statistics 1994, NSW Bureau of Crime Statistics and Research, Sydney.

NSW Bureau of Crime Statistics and Research 1996, New South Wales Recorded Crime Statistics 1995, NSW Bureau of Crime Statistics and Research, Sydney

NSW Department of Gaming and Racing 1995, Noise Complaints - Summary of Statistics for October to December 1995, NSW Department of Gaming and Racing, Sydney.

NSW Department of Health 1990, 1989 Survey of Drug Use by NSW Secondary School Students, NSW Department of Health, Sydney.

NSW Drug and Alcohol Directorate 1995, Premiers Forum, Alcohol and the Community: Misuse, Effects and Solutions, NSW Drug and Alcohol Directorate, Sydney.

Pirie, K. & Cornack, S. 1993, 'What is obscene - The language or the arrest that follows?', in Aboriginal Justice Issues, ed. S. McKillop, Australian Institute of Criminology, Canberra.

Raffaele, G. 1995, Alcohol and violence looking for a link, Interview with Ross Homel in Criminology Australia, vol. 7, pp. 3-9.

Ramsay, M. 1989, Downtown Drinkers: The Perceptions and Fears of the Public in a City Centre, Crime Prevention Unit Paper 19, Home Office Crime Prevention Unit, London.

Ramsay, M. 1990, Lagerland Lost? An Experiment in Keeping Drinkers off the Streets in Central Coventry and Elsewhere, Crime Prevention Unit Paper 22, Home Office Crime Prevention Unit, London.

Ramsay, M., 1996, 'The relationship between alcohol and crime', Research Bulletin, vol. 38, pp. 37-43.

Robb, T. 1988, Police Reports of Serious Assault in NSW, NSW Bureau of Crime Statistics and Research, Sydney.

Rosenthal, R. 1966, Experimenter Effects in Behavioral Research, Meredith Publishing Company, New York.

Scribner, R.A., MacKinnon, D.P. & Dwyer, J.H. 1995, 'The risk of assaultive violence and alcohol availability in Los Angeles County', American Journal of Public Health, vol. 85, pp. 335-340.

Shepherd, J., Irish, M., Scully, C. & Leslie, I. 1989, 'Alcohol consumption among victims of violence and among comparable U.K. populations', British Journal of Addiction, vol. 84, pp. 1045-1051.

Smith, D.I. & Burvill, P.W. 1986, 'Effect on juvenile crime of lowering the drinking age in three Australian States', British Journal of Addiction, vol. 82, pp. 181-188.

Stockwell, T. 1995, The Measurement of Alcohol Problems for Policy: A First Report of Research in Progress, National Centre for Research into the Prevention of Drug Abuse, Curtin University, Perth.

Stockwell, T., Masters, L., Philips, M., Daly, A., Gahegan, M., Midford, R. & Philp, A. 1996, Consumption of different alcoholic beverages as predictors of local rates of assault, road crash and hospital admissions, presented at the 22nd Meeting of the Kettilbrun Epidemiological Studies on Alcohol, Edinburgh, U.K.

Strang, H. 1993, 'Characteristics of homicide in Australia 1990-91', in Homicide: Patterns, Prevention and Control, eds H. Strang, & S. Gerull, Australian Institute of Criminology, Canberra.

Tabachnick, B.G. & Fidell, L.S. 1989, Using Multivariate Statistics, Harper Collins, New York.

Tuck, M. 1989, Drinking and Disorder: A Study of Non-metropolitan Violence, Home Office Research Study Number 108, HMSO, London.

Victorian State Committee on Vandalism 1981, Vandalism Report, Publications and Information Branch, Education Department of Victoria.

Walker, J. and Henderson, M. 1991, Understanding Crime Trends in Australia, Trends and Issues in Crime and Criminal Justice, Number 28, Australian Institute of Criminology, Canberra.

Weatherburn, D. 1990 'Sources of confusion in the alcohol and crime debate', in Alcohol and Crime, ed. J. Vernon, Australian Institute of Criminology, Canberra.

Weatherburn, D. 1992, Economic Adversity and Crime, Trends and Issues in Crime and Criminal Justice, Number 40, Australian Institute of Criminology, Canberra.

APPENDIX A

Transformations conducted to normalise each variable:

(1) Total alcohol - cube root;

(2) Crime type (all) - cube root;

(3) Per cent males aged 15-24 - log;

(4) Alcohol type, beer - cube root; L.A. beer, wine, spirits - log;

(5) Licence type, restaurant - log; hotel, club, off-licence - cube root;

(6) Hotel by alcohol type, beer - log log; L.A. beer, wine, spirits - log;

(7) Club by alcohol type, L.A. beer - log; beer - square root; wine, spirits - cube root;

(8) Off-licence by alcohol type, spirits - log; wine - cube root; beer, L.A. beer - square root;

(9) Restaurant by alcohol type, beer, wine - log log; L.A. beer, spirits - cube root.

APPENDIX B

Presented below are tables of variance accounted for, for variables used in the regression analyses reported in the Results section. Only significant (5 per cent level) squared Pearson correlations are shown. To retrieve the correlations from which these values have been derived, the sign of the correlation is indicated in each table. All variables increase in magnitude with increase in number (e.g. per cent males can vary from zero upwards). SEIFA scores are similar: a low score indicates social disadvantage, a high score social advantage.

Table B1: Squared Pearson correlations, r^2 (%), for key variables in the total alcohol by offensive behaviour analysis

Variables (n=566)	*% Males 15-24*	*SEIFA*	*Total alcohol*
Offensive behaviour	NS[a]	14.0[a]	13.6
Total alcohol	2.8[a]	11.5[a]	-
SEIFA	2.2	-	-

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B2: Squared Pearson correlations, r^2 (%), for key variables in the total alcohol by assault analysis

Variables (n=528)	*% Males 15-24*	*SEIFA*	*Total alcohol*
Assault	NS	41.1[a]	17.6
Total alcohol	5.5[a]	13.0[a]	-
SEIFA	3.2	-	-

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B3: Squared Pearson correlations, r^2 (%), for key variables in the total alcohol by malicious damage analysis

Variables (n=544)	*% Males 15-24*	*SEIFA*	*Total alcohol*
Malicious damage	5.3	12.1[a]	17.2
Total alcohol	4.1[a]	12.9[a]	-
SEIFA	2.5	-	-

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B4: Squared Pearson correlations, r^2 (%), for key variables in the alcohol type by assault analysis

Variables (n=525)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. Beer*	*Spirits*	*Wine*
% Males 15-24	3.2	-	-	-	-	-
Beer	19.8[a]	8.8[a]	-	-	-	-
L.A. Beer	9.0[a]	7.1[a]	64.7	-	-	-
Spirits	1.2[a]	NS	26.8	26.4	-	-
Wine	NS	2.1	6.8	12.6	56.9	-
Assault	41.9[a]	NS	19.4	7.5	5.5	NS

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B5: Squared Pearson correlations, r^2 (%), for key variables in the alcohol type by offensive behaviour analysis

Variables (n=564)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	2.2	-	-	-	-	-
Beer	16.5[a]	4.8[a]	-	-	-	-
L.A. beer	8.7[a]	4.4[a]	66.3	-	-	-
Spirits	1.2[a]	NS	32.4	29.6	-	-
Wine	NS	3.2	11.3	16.0	59.8	-
Offensive behaviour	13.2[a]	NS	11.4	11.6	8.1	5.6

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B6: Squared Pearson correlations, r^2 (%), for key variables in the alcohol type by malicious damage analysis

Variables (n=538)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	2.8	-	-	-	-	-
Beer	21.5[a]	5.5[a]	-	-	-	-
L.A. beer	9.5[a]	5.0[a]	64.5	-	-	-
Spirits	1.5[a]	NS	25.1	25.9	-	-
Wine	NS	3.5	7.5	13.0	62.1	-
Malicious damage	13.9[a]	6.8	8.1	4.8	11.2	10.2

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B7: Squared Pearson correlations, r^2 (%), for key variables in the outlet type by assault analysis

Variables (n=526)	*SEIFA*	*% Males 15-24*	*Hotels*	*Clubs*	*Off-licences*	*Restaurants*
% Males 15-24	2.9	-	-	-	-	-
Hotels	11.8[a]	6.0[a]	-	-	-	-
Clubs	7.9[a]	8.0[a]	11.0	-	-	-
Off-licences	NS[a]	3.4	5.8[a]	1.8	-	-
Restaurants	1.7	2.2	0.8	NS	11.9	-
Assault	42.9[a]	NS	12.8	2.3	1.7	1.9

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B8: Squared Pearson correlations, r^2 (%), for key variables in the outlet type by offensive behaviour analysis

Variables (n=563)	*SEIFA*	*% Males 15-24*	*Hotels*	*Clubs*	*Off-licences*	*Restaurants*
% Males 15-24	2.1	-	-	-	-	-
Hotels	12.0[a]	6.0[a]	-	-	-	-
Clubs	7.2[a]	6.0[a]	8.0	-	-	-
Off-licences	NS[a]	4.8	5.4[a]	3.1	-	-
Restaurants	0.9	3.0	NS	NS	12.7	-
Offensive behaviour	13.8[a]	NS	8.3	13.4	10.0	3.7

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B9: Squared Pearson correlations, r^2 (%), for key variables in the outlet type by malicious damage analysis

Variables (n=539)	*SEIFA*	*% Males 15-24*	*Hotels*	*Clubs*	*Off-licences*	*Restaurants*
% Males 15-24	2.9	-	-	-	-	-
Hotels	12.8[a]	5.2[a]	-	-	-	-
Clubs	7.7[a]	6.9[a]	9.8	-	-	-
Off-licences	NS[a]	4.6	5.5[a]	1.3	-	-
Restaurants	1.4	3.0	1.6	NS[a]	11.4	-
Malicious damage	14.0[a]	6.2	3.6	NS	9.7	7.5

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B10: Squared Pearson correlations, r^2 (%), for key variables in the hotel by alcohol type analysis for malicious damage

Variables (n=538)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	3.0	-	-	-	-	-
Beer	13.0[a]	7.3[a]	-	-	-	-
L.A. beer	8.0[a]	7.6[a]	76.4	-	-	-
Spirits	5.4[a]	2.4[a]	56.6	51.1	-	-
Wine	3.1[a]	NS[a]	41.9	35.1	66.9	-
Malicious damage	14.0[a]	6.2	3.1	1.8	5.7	6.9

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B11: Squared Pearson correlations, r^2 (%), for key variables in the hotel by alcohol type analysis for offensive behaviour

Variables (n=564)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	2.2	-	-	-	-	-
Beer	11.8[a]	7.2[a]	-	-	-	-
L.A. beer	7.5[a]	8.0[a]	77.9	-	-	-
Spirits	5.1[a]	3.2[a]	59.5	54.0	-	-
Wine	3.2[a]	NS[a]	43.7	37.1	66.2	-
Offensive behaviour	13.2[a]	NS[a]	7.6	6.3	7.7	6.1

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B12: Squared Pearson correlations, r^2 (%), for key variables in the hotel by alcohol type analysis for assault

Variables (n=528)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	3.0	-	-	-	-	-
Beer	12.3[a]	8.1[a]	-	-	-	-
L.A. beer	7.8[a]	8.8[a]	77.2	-	-	-
Spirits	5.7[a]	3.9[a]	60.6	56.8	-	-
Wine	3.3[a]	0.8[a]	44.5	38.9	65.8	-
Assault	41.8[a]	NS	12.2	7.3	8.9	6.2

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B13: Squared Pearson correlations, r^2 (%), for key variables in the club by alcohol type analysis for malicious damage

Variables (n=540)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	2.9	-	-	-	-	-
Beer	8.4[a]	7.0[a]	-	-	-	-
L.A. beer	7.7[a]	9.0[a]	81.3	-	-	-
Spirits	3.5[a]	1.6[a]	69.2	53.7	-	-
Wine	1.5[a]	3.5[a]	71.0	61.5	77.6	-
Malicious damage	13.8[a]	6.0	NS	NS	1.1	NS

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B14: Squared Pearson correlations, r^2 (%), for key variables in the club by alcohol type analysis for offensive behaviour

Variables (n=564)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	2.2	-	-	-	-	-
Beer	7.4[a]	5.7[a]	-	-	-	-
L.A. beer	7.4[a]	7.1[a]	82.6	-	-	-
Spirits	3.2[a]	1.5[a]	72.4	56.8	-	-
Wine	1.6[a]	3.2[a]	74.2	64.4	79.5	-
Offensive behaviour	13.2[a]	NS[a]	12.8	12.7	10.9	8.5

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B15: Squared Pearson correlations, r^2 (%), for key variables in the club by alcohol type analysis for assault

Variables (n=526)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	3.0	-	-	-	-	-
Beer	8.4[a]	7.7[a]	-	-	-	-
L.A. beer	8.3[a]	9.5[a]	83.4	-	-	-
Spirits	3.3[a]	2.5[a]	69.9	55.5	-	-
Wine	1.4[a]	4.9[a]	71.9	63.3	76.8	-
Assault	41.9[a]	NS	3.2	2.8	2.5	NS

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B16: Squared Pearson correlations, r^2 (%), for key variables in the off-licence by alcohol type analysis for malicious damage

Variables (n=539)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	3.0	-	-	-	-	-
Beer	1.0[a]	3.2	-	-	-	-
L.A. beer	NS[a]	1.1	75.2	-	-	-
Spirits	NS	6.6	64.4	57.8	-	-
Wine	0.9	7.1	67.1	58.4	79.9	-
Malicious damage	13.6[a]	6.0	10.0	7.9	7.4	7.4

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B17: Squared Pearson correlations, r^2 (%), for key variables in the off-licence by alcohol type analysis for offensive behaviour

Variables (n=563)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	2.2	-	-	-	-	-
Beer	0.9[a]	3.9	-	-	-	-
L.A. beer	NS[a]	1.9	77.4	-	-	-
Spirits	NS	6.5	66.1	59.3	-	-
Wine	NS	7.4	69.7	60.7	80.0	-
Offensive behaviour	13.1[a]	NS[a]	10.6	10.8	3.4	5.3

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B18: Squared Pearson correlations, r^2 (%), for key variables in the off-licence by alcohol type analysis for assault

Variables (n=527)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	3.0	-	-	-	-	-
Beer	1.2[a]	2.7	-	-	-	-
L.A. beer	NS[a]	1.0	74.7	-	-	-
Spirits	NS	5.5	63.4	55.7	-	-
Wine	0.8	6.7	66.5	56.9	79.4	-
Assault	41.9[a]	NS	2.5	2.0	NS	NS

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B19: Squared Pearson correlations, r^2 (%), for key variables in the restaurant by alcohol type analysis for malicious damage

Variables (n=536)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	2.9	-	-	-	-	-
Beer	0.7	2.6	-	-	-	-
L.A. beer	1.3	2.7	75.3	-	-	-
Spirits	NS	3.7	83.6	67.6	-	-
Wine	2.8	3.6	79.7	66.4	77.6	-
Malicious damage	13.8[a]	6.3	9.2	7.4	9.0	7.1

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B20: Squared Pearson correlations, r^2 (%), for key variables in the restaurant by alcohol type analysis for offensive behaviour

Variables (n=562)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	2.2	-	-	-	-	-
Beer	NS	3.0	-	-	-	-
L.A. beer	1.0	3.1	77.1	-	-	-
Spirits	NS	3.8	84.3	69.5	-	-
Wine	2.4	3.1	79.9	67.8	78.4	-
Offensive behaviour	13.3[a]	NS	5.4	4.2	6.6	2.1

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).

Table B21: Squared Pearson correlations, r^2 (%), for variables in the restaurant by alcohol type analysis for assault

Variables (n=527)	*SEIFA*	*% Males 15-24*	*Beer*	*L.A. beer*	*Spirits*	*Wine*
% Males 15-24	3.0	-	-	-	-	-
Beer	1.0	2.3	-	-	-	-
L.A. beer	1.5	2.7	74.5	-	-	-
Spirits	0.9	2.8	83.1	67.0	-	-
Wine	3.2	2.3	78.4	65.5	76.4	-
Assault	41.7[a]	NS	2.5	1.1	2.1	1.0

[a] Indicates value derived from negative correlation (unmarked values all derived from positive correlations).