

The measurement of harmful outcomes following drinking on licensed premises

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Abstract

The relationships between five potential indicators of alcohol-related harm following drinking on licensed premises in Perth were explored. These were annual purchases made by individual licensees of 'high' ($\geq 3.8\%$) and 'low' ($< 3.8\%$) alcohol content drinks, the number of times a particular licensed establishment is cited by drivers as the last place of drinking prior to failing a roadside breath-test (including after accidents) and the annual number of assaults occurring either on or in the vicinity of particular licensed premises. The study area selected was a central part of the Perth metropolitan area with 367 licensed premises serving a residential population of 400 000. Highly significant correlations were found between each of the five variables. The correlations involving purchases of low alcohol drinks, however, were small. When purchases of alcohol were controlled, significant, though lower, correlations, were still evident between the other three variables. This suggests that there are risk factors other than extent of alcohol sales which further research will need to identify, and that these indicators of harm can be of value in monitoring the impact of future intervention strategies. [Stockwell T, Somerford P, Lang E. The measurement of harmful outcomes following drinking on licensed premises. *Drug Alcohol Rev* 1991; 10: 99-106]

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Introduction

A traditional response to the prevention of alcohol-related crime has been to educate the general public about the dangers of alcohol use. For many years relevant agencies have variously warned the general public through mass media campaigns, educated young people through school programmes, and, more recently, provided education programmes for offenders as a condition of probation. Unfortunately, the results of formal evaluations for each of these types of intervention have not been encouraging: at best, the behaviour

changes have been slight and of a temporary nature [1,2].

International expert opinion is almost unanimous in recommending that alcohol-related harm of all kinds is best prevented through macro-economic means [3,4]. Thus, it has been suggested that *per capita* consumption of alcohol should be reduced by limiting the availability of alcohol, e.g. by increasing its price in real terms. To date, these measures have been successfully resisted by the alcohol industry and even less

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controversial measures, such as levying tax on drinks directly in proportion to alcoholic content, have been dropped from the new Australian National Health Policy on Alcohol [5]. As might be expected, the control of alcohol-related problems through increasing tax on alcohol may not be a measure popular with the general public [6].

Meanwhile, as governments continue to heed the interests of the alcohol industry rather than the recommendations of health experts, millions of dollars of public money have been channelled into ineffective education initiatives at the expense of the more controversial, but effective macro-economic measures [7].

Fortunately, these possible interventions do not exhaust the full range of possibilities; it is being recommended increasingly that the prevention of alcohol-related problems can occur simply by the enforcement of existing legislation [8]. In all states of Australia the opportunity exists for reducing alcohol-related harm by enforcing liquor licensing laws more vigorously. However, the universal adoption of such laws is only matched by the equally universal reluctance by the police to enforce them. By way of illustration, the law prohibiting the sale of intoxicating liquor to a drunken person is so rarely prosecuted that statistics on these are not published by police departments in Australia. Furthermore, there have been no recorded instances of the serving of alcohol to minors having resulted in the prosecution of a licensee in New South Wales in recent years. Recent legislation in Western Australia even allows for the possibility that a licensee may be held responsible for the behaviour and conduct of his or her customers upon leaving their premises [9]. By contrast, successful cases of litigation have been brought in North America against the proprietors of licensed establishments whose customers were subsequently involved in an accident resulting in injury or death to a third party [10]. It is thought that the success of these cases has been largely responsible for the wide uptake of training schemes for bar staff in North America to help them reduce the probability of customers drinking to intoxication, driving when drunk, or being served when under-age [11].

It is likely that the take-up of server intervention training programmes by licensees in Australia and the stricter enforcement of liquor licensing legislation will go hand-in-hand. At present early

progress on server training has been made in Queensland through the Patron Care Programme, although the take-up of this programme has been limited to date. There is clear potential for research in this area which attempts to examine the links between alcohol-related crime and prior drinking setting. The extent to which alcohol-related crime and accidents occur following drinking in licensed drinking settings as opposed to others, and of which kinds of licensed drinking settings, needs to be determined in order to make the case for the introduction of such interventions in Australia.

Research on drinking settings

A great deal of research has examined the characteristics of individuals who have developed, or who are at risk of developing, alcohol-related problems. Until recently there has been a dearth of studies which have the drinking environment or setting as the main focus of their enquiry. Studies of individual risk factors for alcohol problems have found, for example, that young men are a particularly high risk group for problems related to intoxication from alcohol, such as assaults and road traffic accidents [11,12]. Similarly, drinker characteristics have been linked to preferred drinking settings; many problem drinkers have been shown to disassociate themselves from previous social networks and to patronize taverns which tolerate heavy drinking [13]. Other predictors of preferred type of tavern have been found to be socio-economic status and age of potential customers [14].

The limited data available concerning the social ecology of drinking situations and alcohol-related harm point strongly to the licensed drinking environment as a major cause for concern and an important focus for prevention efforts. In Western Australia in 1985 it was shown that 32% of male drinkers and 28% of female drinkers drank at licensed premises on their heaviest day of drinking, and this figure increases to 46% of drinkers under 25 years of age [15]. A recent New South Wales study of serious assaults (excluding homicides) coming to the notice of the police found that about 40% involved alcohol [11]. Moreover, more than half of these assaults occurred around club and hotel closing times, and nearly half occurred in drinking establishments or in the

streets nearby. Research in Western Australia has shown that approximately 48% of drivers convicted for a drink-driving offence had been drinking on licensed premises prior to their offence [16]. A very similar figure was arrived at by a review of US studies [17].

An emerging trend in alcohol and crime research is for observational studies of the behaviour of customers to be carried out in taverns and bars. It has been shown that a large drinking group, particular kinds of entertainment and fast-drinking companions each contribute to heavy drinking in social groups [18-20]. It also appears that certain physical features of a bar environment, such as decor and cleanliness, predict aggressive behaviour [9]. In the most impressive study of this genre, detailed observations were made of some 200 bars in Vancouver [21]. It was found that both intoxication and aggression were related to large seating capacity, and lower standards of furnishings and upkeep. It was also found that some social characteristics of the drinking environment were important, such as the kind of entertainment offered, whether food was available, the degree of noise and extent of crowding. The role of bar workers was particularly highlighted showing, for example, that bar workers vary greatly in their ability to defuse aggressive incidents.

Rationale for the present study

The above discussion outlines some of the evidence for the view that the licensed drinking environment is a priority for prevention research in Australia. A substantial proportion of alcohol-related harm is associated with drinking on licensed premises; there is the possibility of influencing drinking in this setting via legislation and there already exists evidence that this can be achieved.

At the outset of a programme of research designed to explore the prevention possibilities for this setting, it was decided that there existed a need to measure the extent to which the customers of particular licensed establishments were at risk of experiencing alcohol-related harm. Existing official records held by police, and liquor licensing and health authorities pertaining to the Perth metropolitan area were examined for information which identified individual licensed premises by name. In addition, the Perth Traffic Branch

agreed to co-operate with the study by instigating the collection of data not previously recorded, namely, the last drinking location used by individuals before attending for a confirmatory breath test. The present paper describes the methodology for the collection of these various data sets and an analysis of the inter-relationships between five possible indicators of harm for licensed premises. Of central interest was whether positive and significant correlations would be obtained between the various indicators since this would suggest they are valid and can be used to assist with the evaluation of future prevention programmes.

Methods

The data were collected from several sources and amalgamated to produce a database containing descriptive variables relating to all licensed premises in the central Perth metropolitan area. The indicators used to measure the prevalence of alcohol-related problems were the number of traffic accidents, drink driving charges and assaults that could be attributed to these licensed premises. These three measures will be referred to as indicators of alcohol-related problems throughout this paper.

The Breath Analysis Section of the WA Police Department's Perth Traffic Branch began to collect data at our request on all drivers ($n = 2166$) who, after failing a roadside test, were given a confirmatory breath-test at the Perth Traffic Police HQ during the period January 6th 1989 to June 30th 1989. The bulk of this group ($n = 1909$, 88.2%) comprised individuals tested by routine traffic patrols (including random breath test units) and of drivers involved in traffic accidents to which the police were called ($n = 257$, 11.8%), all of whom are routinely breath-tested. Data supplied by the WA Police Department indicate that they were called to 18.3% of all road traffic accidents in the study area during the study period, including 100% of fatal accidents and 82.4% of those causing injuries requiring hospital treatment. For the purposes of this study, individuals tested were routinely asked to state the location in which they last consumed alcohol and also the name of the establishment, if it was licensed. Such information was provided by 93% of persons tested. The name of the *last* premises was sought even if an individual had done most of their drinking

elsewhere prior to this: their intoxication level would have been highest at the last establishment and, arguably, the bar staff were most culpable in permitting them to drink there.

Information on the name, type of licence, location and total annual purchases made by all licensed premises in the Perth metropolitan area for the period July 1st 1988 to June 30th 1989 were made available by the Liquor Licensing Division of the Office of Racing and Gaming. These data are normally used for calculating annual licence fees in Western Australia.

A search was performed on the Police Department of Western Australia database for assault offences in which the details of the location of the offences specified licensed premises. Details of each assault ($n=132$) that occurred on licensed premises and which were reported to the police during the period July 1st 1988 and June 30th 1989 were obtained. This period corresponded to the financial year for which the above licensing data were available. The sample size was too small to conduct analyses restricted to just the period for which data were available from breath-tested drivers.

There were 70 hotels and taverns out of a total of 114 that had a 'bottle shop' for off-sales on the premises. This means that the total alcohol purchases for such premises must be adjusted by the amount of alcohol sold for consumption off the premises. Since the Liquor Licensing Division's records do not distinguish between purchases of alcohol for on- and off-sales, all hotel and tavern managers were surveyed by telephone to determine their best estimates of the proportions of these two

types of sales in their particular outlet. Due to the subjective nature of these estimates, an empirical test of validity was employed.

Those premises studied were confined to the inner Perth metropolitan area as determined by police operational subdivisions. The population of this area is very close to 400 000.

Because of the large number of premises that had neither traffic offences nor assaults attributed to them the frequency distribution for these indicators is very skewed. Because of the many 'tied' pairs of observations, Kendall correlation coefficients were calculated in order to examine the inter-relationships between the putative indicators of alcohol-related harm.

Results

Descriptive statistics

Descriptive statistics for the various putative indices of alcohol-related harm are provided in Tables 1 and 2.

Managers' estimates of the proportions of on- and off-sales for hotels and taverns

Of the 114 hotels and taverns in the study area, 112 licensees or managers consented to provide all the information requested by the telephone survey. It emerged that 70 of these establishments had combined on- and off-sales making up their total establishment's purchases of alcohol. Estimates of the proportions of on- to off-sales varied from 20:1 to 1:10 with a modal value of 2:3. As shown in

Table 1. *The number of premises, the total annual purchases of alcohol and the number of alcohol-related problems for each licence type*

Licence type	Number	Annual purchases (\$1m)	Traffic accidents	Drink driving	Assaults
Hotel	77	26.0	14	277	66
Tavern	37	9.2	12	103	18
Club	81	7.9	3	18	0
Restaurant	149	7.5	1	9	5
Nightclub	23	4.0	7	135	43
Total	367	54.6	37	442	132

N.B. Annual Purchases and Assaults are for the full 1988/89 financial year; traffic accidents and drink-driving offences are for the second 6 months only.

Table 3 when annual purchases of alcohol were adjusted so as only to include estimated purchases for sale on premises, substantially higher correlations emerged with two out of the three indicators of harm (assaults and drink-driving offences involving a traffic accident) than for the unadjusted annual purchase data. It is to be expected that if a genuinely positive association exists between two variables, then a more accurate method of measuring one of these will result in there being a higher correlation between them. Hence, this finding was interpreted as support for the validity of the managers' estimates and so the adjusted data were employed in the foregoing analyses.

Correlations between harm indicators and annual purchases of alcohol

Positive and highly significant Kendall correlation coefficients were found between annual purchases of alcohol by the 367 licensed establishments in the study area and their score on each of the three indicators of harm. As shown in Table 4, there were also significant correlations between the scores obtained on each of the three indicators.

Correlations between harm indicators controlling for annual purchases of alcohol

When annual purchases of alcohol were controlled

Table 2. Descriptive statistics for annual purchases of alcohol, traffic accidents, drink-driving offences and assaults for the study sample of 367 licensed premises

Indicator or harm	Mean	Standard deviation	Maximum	Median
Annual purchases	\$145 388	\$186 465	\$1 706 565	\$73 763
Traffic accidents	0.10	0.35	2	0
Drink-drive offences	1.45	3.77	37	0
Assaults	0.36	1.27	17	0

Table 3. Correlations between annual purchases of alcohol with indicators of harm for hotels and taverns ($n=70$, Kendall's tau) with and without an adjustment for estimated proportion of bar to bottleshop sales

Harm indicator	Unadjusted annual purchases	Adjusted annual purchases
Assaults	0.15	0.30**
DDO's not from accidents	0.45***	0.43***
DDO's from accidents	0.13	0.25*

* $p < 0.01$ ** $p < 0.001$ *** $p < 0.0001$.
N.B. DDO refers to drink-driving offences.

Table 4. Kendall coefficients* for correlations between annual purchases, assaults and drink-driving offences for all licensed establishment ($n=367$)

	Annual purchases	Assaults	DDO's from accidents
Assaults	0.37		
DDO's from accidents	0.30	0.25	
DDO's not from accidents	0.48	0.45	0.35

*All correlations significant at $p < 0.0001$ level.

for by dividing indicator scores by total purchases for each establishment, significant positive correlations were still obtained between the three harm indicators (see Table 5).

Table 5. Kendal coefficients* for correlations between assaults and drink-driving offences with annual purchases of alcohol controlled for ($n=367$)

	Assaults	DDO's from accidents
DDO's from accidents	0.21	
DDO's not from accidents	0.36	0.30

* $p < 0.0001$ in each case.

N.B. DDO = drink-driving offence.

Correlations between harm indicators for purchases of 'low' and 'high' alcohol content drinks

Data on purchases of alcohol differentiating between 'low' (<3.8%) and 'high' (>3.8%) alcohol content drinks were available for 364 licensed premises. On average \$16 225 worth of 'low' content drinks (sd = \$26 067, range \$25 to \$246 620) and \$141 879 worth of 'high' content drinks (sd = \$228 806, range \$780 to \$2 411 531) were purchased. Purchases of both high and low alcohol content drinks were significantly correlated with each of the three harm indicators. As shown in Table 6 the correlations were consistently stronger for the high alcohol content drinks; however, the ratio of low:high purchases failed to correlate significantly with any of the indicators of harm.

Discussion

The results reported above are a graphic illustration of the conflicting interests of the alcohol industry on the one hand and the public health lobby on the other. Licensed outlets will endeavour to sell as much alcohol as they can in order to sustain the viability of their businesses. Unfortunately, it would appear that higher alcohol sales are associated with an increased risk that an establishment's customers will commit an alcohol-related offence.

To the authors' knowledge this study is the first to have had the opportunity to link not only alcohol-related offences to particular licensed establishments, but also to be able to link these to a measure of volume of sales for each establishment. Previous studies have linked changes in alcohol consumption of various countries to corresponding changes in the incidence of alcohol-related problems. Such a relationship has even been demonstrated between total monthly sales of alcohol in the state of Michigan in the United States to traffic accidents one month later [22]. The present study is the first to demonstrate a relationship between alcohol-related harm and individual drinking settings. The findings of significant and positive correlation between an indication of the volume of sales for a particular outlet (annual purchases of alcohol), and the involvement of customers in assaults and drink driving offences adds weight to the case for the introduction of alcohol control policies which will impact upon the licensed drinking environment.

The second finding of interest is that even when annual purchases of alcohol are controlled for, there are still positive and highly significant

Table 6. Kendal coefficients for correlations between annual purchases of high (>3.8%) and low (<3.8%) alcohol content drinks, assaults and drink-driving offences ($n=364$ premises)

	Annual purchases of 'high' content alcohol	Annual purchases of 'low' content alcohol	Ratio 'low' to 'high'
Assaults	0.39*	0.24*	-0.06
DDO's from accidents	0.31*	0.24*	-0.02
DDO's not from accidents	0.48*	0.35*	0.04

* $p < 0.0001$.

N.B. DDO = drink-driving offence.

correlations between the extent to which customers of the licensed premises are involved in different types of alcohol-related offences. Thus, a pub that appears several times as the location of an assault reported to the police is also more likely to have its customers convicted for a drink-driving offence whether this is following a traffic accident, a random breath test or a roadside breath test instigated for other reasons. There may be several reasons for this finding.

- (1) Customers of 'high-risk' licensed establishments typically attain higher blood alcohol levels by the time they leave such an establishment.
- (2) 'High-risk' establishments attract a clientele who, regardless of the blood alcohol levels they typically attain, are more prone to committing criminal acts (e.g. young males).
- (3) 'High-risk' establishments provide a drinking environment which, regardless of patron type or typical levels of intoxication, encourages—or fails to discourage—both violence and drink driving.

Further research is planned to disentangle the separate and interactive effects of patron type, intoxication levels and environmental variables in determining the levels of harm associated with particular establishments. The consistency of scores on the different indices of harm over time will also be examined in order to examine the possible influence of changing fashions in drinkers' choice of venues, seasonal factors and variations in the style of entertainment and service provided.

The finding of significant correlations between indicators of harm derived from three different data sources is also encouraging support for the validity of such indicators. Whatever bias effects each of the indicators—for example, due to the police only targeting establishments where it is convenient to set up a random breath testing unit or bias introduced by the use of different time periods—these results suggest that to some degree these data genuinely reflect the extent to which different licensed premises are likely to have their customers involved in an alcohol-related offence. As a consequence these data can be employed in the evaluation of the effectiveness of new strategies for the prevention of alcohol-related harm. For example, a controlled evaluation of the introduc-

tion of community policing [23] of pubs and clubs has been proposed for an entertainment area of Perth. The above indicators of harm will be examined both across time and location in order to assess the impact of this initiative.

Another possible use of this methodology for identifying high-risk licensed premises is to incorporate harm indicators into the process of reviewing applications for renewing liquor licenses. For example, the training of bar staff in the responsible serving of alcohol could be required as a condition for renewing a licence, while persistently offending establishments might have their licence withdrawn. The harm indicators might also be used to direct efforts to enforce liquor licensing laws such as those pertaining to the serving of customers to the point of intoxication.

The finding that purchases of higher strength (>3.8%) alcoholic drinks were more closely correlated with the indicators of harm than were purchases of lower strength (<3.8%) drinks also suggests possible prevention strategies. For example, incentives could be created for licensees to only sell lower strength drinks on some evenings (e.g. at discos for young people) or even, following the example of the Finnish low-alcohol bar, to only ever sell such drinks.

In summary, the results of this study show that:

- (1) valid data can be collected by the police on a community-wide basis which indicate the extent to which the customers of licensed drinking establishments are involved in alcohol-related offences;
- (2) the extent of such offences emanating from particular establishments is significantly correlated with the volume of sales for that establishment;
- (3) these data can be used to both target and evaluate the impact of interventions designed to prevent alcohol-related harm in the community.

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