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The role of alcohol in injuries presenting to St Vincent's Hospital Emergency Department and the associated short-term costs

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This bulletin presents the results from research investigating the role of alcohol in injury presentations to an inner-city emergency department and the associated short-term economic costs. In this study injured patients attending St Vincent's Hospital Emergency Department during September 2004 and February 2005 were interviewed about their alcohol consumption prior to the injury event and where possible, administered a breathalyser test. One-third of the injured patients interviewed reported consuming alcohol prior to the injury and almost two-thirds of these patients stated that they had been drinking at licensed premises. Alcohol consumption was found to be more prevalent amongst patients presenting with injuries resulting from interpersonal violence, with almost two-thirds of these patients reporting that they had been drinking prior to the injury. The estimated annual cost of alcohol to St Vincent's Emergency Department was as much as $1.38 million. While the overall economic cost of alcohol-related injuries is probably much greater than our estimate indicates, the research described here highlights the resources that could be devoted to other illness and disease if a proportion of alcohol-related injuries were reduced.

INTRODUCTION

The consumption of alcohol is a generally accepted part of Australian culture. However some drinking, particularly at high-risk levels, is associated with a considerable amount of harm to the community. Chikritzhs et al. (2003) estimate that, between 1993/94 and 2000/01, over half a million hospitalisations in Australia were caused by risky or high-risk alcohol consumption, and that 70 per cent of these episodes were for acute conditions, mostly injuries. These estimates include only alcohol-attributable conditions that require inpatient care. They do not include alcohol-related injuries that do not result in hospital admission. The main objective of the current study is to provide further data on the role of alcohol in injury events by examining recent alcohol use amongst injured patients attending an inner-city emergency department (ED). This study also aims to quantify the short-term economic cost of these injuries in terms of the ED resources that these cases consume.

ALCOHOL AND INJURY RISK

Numerous studies have demonstrated a significant association between alcohol intake and chronic diseases but many studies have also shown a significant relationship between alcohol consumption and acute harm, including intentional and unintentional injury. From a meta-analysis of this research, English and his colleagues (1995) estimated aetiological fractions reflecting the proportion of injuries that are caused by 'hazardous' or 'harmful' alcohol consumption.[1] These fractions are based on both (1) the strength of the causal

relationship (usually measured by relative risk) between risky drinking and the condition, and (2) the prevalence of risky drinking in the population (Chikritzhs et al. 2002). Reliable estimates of relative risk could not be found in the epidemiological literature for most acute alcohol-related conditions. Therefore English et al. (1995) calculated these fractions directly from case series studies (very few of which were conducted in Australia). These studies simply examine the proportion of cases of a particular type (e.g. assaults) coming to the attention of a medical practitioner in which some specified level of alcohol has been consumed. The estimated attributable fractions for several injury types (including assaults, road injuries, fire injuries and drownings) were 0.34 or above, indicating that over one-third of these injuries were related to risky/high-risk drinking. For assaults, the attributable fraction was 0.47, indicating that almost half of injuries incurred in assaults are caused by risky/high-risk drinking.

Ridolfo and Stevenson (2001) have since updated these alcohol population aetiological fractions for four major conditions (falls, road injuries, breast cancer and stroke), using evidence from more recent studies and Australian drinking prevalence estimates for 1995. However, Chikritzhs et al. (2003) have further improved on the methodologies used by English et al. (1995) and Ridolfo and Stevenson (2001) by developing alcohol population aetiological fractions based on State and year-specific levels of drinking prevalence. This enabled them to examine trends in alcohol-related harm over time and across different jurisdictions. Applying these revised fractions to Australian hospitalisation data, Chikritzhs et al. (2003) estimate that alcohol-related injuries resulted in the loss of over 12,000 lives in the 10 years to 2001 and the hospitalisation of over 250,000 people in the eight years between 1993/94 and 2000/01.

Most of the studies included in the meta-analyses on which these alcohol-attributable fractions are based, used hospitalisation data to examine the relationship between alcohol consumption and subsequent risk of injury. However, many alcohol-related injuries never require inpatient care. The extent to which these aetiological fractions are applicable to non-hospitalised injury cases is therefore unclear. For this reason, several recent studies have collected data from patients presenting to EDs to further examine the association between episodes of alcohol intoxication and injury events. These studies, which rely on several different data sources to determine alcohol involvement, have also demonstrated that alcohol is an important contributing factor to injuries and particularly to injuries resulting from interpersonal violence.

Cherpitel and her colleagues (Cherpitel et al. 2003a) undertook a meta-analysis of data collected in a large sample of ED studies in order to examine acute alcohol consumption in injury events compared to non-injury events. The studies included in this analysis spanned a 12-year period and covered 30 different sites across six countries. A similar methodology was employed by all studies in that (a) patients presenting to an ED during certain periods were administered a breath test as soon as possible after arrival (urine samples were taken at two sites) and (b) they were interviewed about their alcohol consumption in the six hours preceding the injury. The meta-analysis showed a consistent significant relationship, across all 30 ED sites, between Blood Alcohol Concentration (BAC) and injury, as well as between self-reported drinking and injury, even after controlling for relevant factors. The pooled effect size indicated that those who tested positive for alcohol, or who reported prior alcohol consumption, were 50 per cent more likely to present to the ED with an injury than to present with other medical problems.

A further analysis of these data (Cherpitel et al. 2003b) also found a significant relationship between usual drinking patterns and the likelihood of presenting for an alcohol-related injury. Among non-heavy drinkers (those who had not had five or more drinks on any one occasion in the previous year), people who drank weekly (frequent drinkers) were almost six times more likely to present with an alcohol-related injury than a non alcohol-related injury (or five times more likely, if self-reported consumption data were used to assess alcohol involvement). However, frequent, heavy drinkers who drank five or more drinks on a regular basis were twice as likely to present with an alcohol-related injury than those who drank similar quantities but with less frequency. These data suggest that both quantity and frequency of usual alcohol consumption are predictive of alcohol-related injury.

Other studies have quantified the relative risk of injury associated with different amounts of alcohol consumption by comparing the alcohol intake of injury patients presenting to EDs with the alcohol intake of matched controls in the community. Two such case-control studies have been undertaken in Australia, one in Western Australia in 1997 (McLeod et al. 2000) and the other in Queensland in 2000/01 (Watt et al. 2004). These two studies collected data on alcohol involvement in injuries on a quarterly basis over a 12-month period at EDs in large metropolitan hospitals. The Queensland study collected these data using interviewers located at the ED 24 hours a day on weekends. The Western Australian study collected the data through a similar arrangement but also had interviewers located at the ED from 6am to 1am on weekdays. In the Western Australian study, controls were matched on postcode of residence and time of injury, and in the Queensland study, controls were matched on residence, time of injury, age and gender. The results from both these case-control studies showed that the risk of injury increases significantly with the

amount of alcohol consumed and that, even at relatively low levels of alcohol consumption, injury risk is significantly higher for those who consume alcohol than for those who abstain from drinking.

The Western Australian study conducted by McLeod et al. (2000) for example, found that consumption of more than 60 grams of alcohol (or more than six standard drinks) in the six hours prior to the injury was associated with a 3.5-fold increase in injury risk, and that consumption of more than 90 grams of alcohol (or more than nine standard drinks) within the same period was associated with a five-fold increase, after controlling for relevant demographic variables. They also found that the risk of injury appeared to be modified by situational factors, including location at the time of the injury and the activity being undertaken when the injury occurred. The relative risk of injury was higher for industrial and recreation/sporting locations (though injury risk was also increased at several other locations including licensed premises) and for those participating in non-passive activities, such as sport and travel. Once these factors were taken into account, McLeod and colleagues found that, even at low BACs, the risk of injury was significantly higher compared with no alcohol consumption – with the risk of injury doubling as soon as any alcohol was consumed.

The case-control study conducted in Queensland, by Watt et al. (2004), confirmed the findings from McLeod et al. (2000) that acute alcohol intoxication significantly increases the risk of injury. Watt and colleagues (2004) found that consuming any alcohol in the six hours prior to the injury doubled the risk of injury compared with no alcohol consumption. Drinking above the Australian low-risk guidelines for acute harm (i.e. more than four standard drinks for females and more than six standard drinks for males; see National Health and Medical Research Council 2001) increased injury risk by a factor of 2.5. This relationship was apparent even after controlling for several demographic and situational risk factors, such as location of the person at the time of injury and the activity being undertaken when the injury was incurred. A later analysis of these data also showed that, controlling for other factors, the effects of acute alcohol consumption were not specific to the nature of the injury (e.g. fracture/dislocation, superficial, internal). This suggests that alcohol confers a generic risk for injury rather than a predisposition for a particular type of injury (Watt et al. 2005).

ALCOHOL AND VIOLENCE

The risk of injury associated with episodes of acute alcohol consumption may be even greater for injuries sustained from interpersonal violence. For example, in their study of 154 assault patients attending a Gold Coast Hospital ED, Campbell and Green (1997) found that 76 per cent of patients presenting to triage staff with an assault-related injury reported that they had been drinking alcohol prior to the injury event. In their larger survey of over one thousand assault patients at St Vincent's Hospital ED, Cuthbert, Lovejoy and Fulde (1991), found that 54 per cent of victims of street violence were under the influence of alcohol when the incident happened and further, that the majority of these incidents occurred in and around licensed premises.

ED studies also show that violent injuries are more likely than other injury groups to occur after drinking. Cherpitel (1993), for example, found that 50 per cent of patients presenting to a Californian ED with a violent injury had consumed alcohol in the six hours preceding the injury compared with only 17 per cent of patients presenting with other types of injuries. Patients with injuries related to interpersonal violence also recorded higher BACs, with 13 per cent recording a BAC over 0.10g/100ml, compared with just four per cent of those with non-violent injuries. Similarly, MacDonald et al. (1999) found, in their sample of 1,701 patients attending two Canadian Hospital EDs, that patients seeking treatment for violent injuries recorded significantly higher BACs than patients attending for other conditions. In this study, 42 per cent of those with a violent injury were found to have a BAC over 0.08g/100ml in comparison with only four per cent of cases with an accidental injury and two per cent of non-injury cases.

While these studies show strong evidence of an association between alcohol and violence, MacDonald et al. (2005) suggest that further data are needed to determine whether alcohol consumption is a cause of violence. They argue that two additional epidemiological criteria need to be met in order to strengthen causal interpretations; (1) that the statistical association between alcohol and violence be replicable across different locations and (2) that a dose-response relationship exist between BAC level and the likelihood of violence. To examine this issue, these authors compared alcohol involvement in violent injuries with alcohol involvement in accidental injuries, for a large sample of ED studies included in the meta-analysis described earlier in this bulletin (see Cherpitel et al. 2003a; Cherpitel et al. 2003b). They found (in all countries sampled) that the odds of incurring a violent injury were significantly higher for patients with BACs above 0.08g/100ml. They also found evidence for a significant dose-response relationship between alcohol consumption and violence, with the likelihood of incurring a violent injury increasing as BAC level increased.

ALCOHOL-RELATED COSTS

The studies described above confirm that alcohol intoxication is a significant risk factor in the occurrence of injuries, and particularly in injuries resulting from violence. Despite the large number of people being injured as a result of risky or high-risk alcohol consumption however, economic studies of alcohol

and injury in Australia are relatively scarce.

One exception to this is the work undertaken by Collins and Lapsley (2002). These authors used the Australian aetiological fractions for alcohol, updated by Ridolfo and Stevenson (2001), to estimate the social costs of drug abuse in Australia during the financial year 1998/1999. These estimated costs included both tangible costs, such as the costs associated with health care provision, and intangible costs, such as the costs arising from the loss of life or pain and suffering associated with drug abuse or misuse. From these data, the total cost of alcohol misuse in Australia in 1998/1999 was estimated to be approximately $7.6 billion. While Collins and Lapsley (2002) do not provide detailed estimates for alcohol-related injuries, they do disaggregate the social costs for several specific types of injury. For example, they estimate that the total social cost of alcohol-attributable road accidents in 1998/99 was $3.4 billion.

It should be noted here that the cost estimates developed by Collins and Lapsley (2002) were based on hospitalisation separation data and therefore do not reflect the cost of services provided by EDs. While the ED costs associated with alcohol misuse would be small in comparison to other economic and social costs, the epidemiological studies reviewed above would suggest that alcohol-related injuries do place a substantial burden on hospital EDs and consume resources that could be devoted to other illnesses or disease. Furthermore, Collins and Lapsley (2002) note that health care costs of this type may be on the rise, with a greater amount of acute care now being provided within hospitals as services to non-inpatients.

State-specific information on the costs of injuries related to alcohol misuse is also limited. Unwin, Codde, Swensen and Saunders (1997) provide some economic data for Western Australia on the cost of alcohol-related injuries that have resulted in a death. These authors estimated that approximately 40 per cent of all alcohol-related deaths in Western Australia between 1984 and 1995 were related to injury and that this translated into an approximate cost of $17.5 million per year. In New South Wales, Potter-Forbes and Aisbett (2003) undertook a comprehensive study of injury costs that included both direct costs to the New South Wales health care system and indirect costs associated with lost output and quality of life. They calculated an average lifetime cost per person injured in New South Wales for all injuries, and presented a breakdown of these lifetime cost estimates for injuries caused by different mechanisms (e.g. poisoning, road accidents, assault). While the estimated lifetime cost of injuries in New South Wales in 1998/99 reported in this study was considerable ($3.53 billion), these costs are yet to be applied to injuries identified as alcohol-related.

THE CURRENT STUDY

Data on the levels of alcohol consumed by patients attending EDs are not routinely collected in Australia. The case-control studies undertaken by McLeod et al. (2000) and Watt et al. (2004), in Western Australia and Queensland respectively, provide some indication of the scale of the problem, but similar estimates of the prevalence of alcohol use amongst injured patients attending EDs in New South Wales are not currently available. Accordingly, one of the major aims of the current study is to estimate the proportion of injuries presenting to the ED at St Vincent's Hospital that are alcohol-related.

A further aim of the present study is to assess the extent to which alcohol is a contributor to the occurrence of violent injuries. Much of what is known about alcohol-related violence in New South Wales comes from police-recorded crime or hospitalisation data. Police incident data is a limited data source for this purpose because not all victims report the incident to police and police do not always systematically record the involvement of alcohol in criminal incidents. Hospitalisation data is also limited in that it does not capture patients who are treated in an ED and subsequently discharged, or injured patients who attend an ED but do not wait for treatment. The current study aims to provide detailed information on alcohol involvement in violent injuries presenting to St Vincent's ED, both in terms of the alcohol consumption of patients and the alcohol consumption of other parties involved in the incident.

The final aim of the study is to examine the burden that alcohol-related injuries impose on the ED of a major hospital operating in a busy entertainment district. The current study aims to quantify this burden by estimating the cost of alcohol-related injuries in dollar terms. The costs included relate only to the ED resources consumed by alcohol-related injury cases (though relevant hospitalisation costs for admitted cases are also presented in the discussion section of this bulletin). Even so, they provide a valuable new perspective on the harm caused by alcohol misuse. They also provide useful baseline data for evaluating programs and policies designed to reduce alcohol-related harm.

METHOD

To estimate the proportion of injuries presenting to St Vincent's ED that are alcohol-related, four-week audits were conducted on two separate occasions, September 2004 and February 2005. The two separate audits were undertaken in an attempt to address the seasonal effects of certain incident types (e.g. more assaults in the summer months) and the varying levels of alcohol consumption at different times throughout the year.

The audits consisted of three parts. Firstly, all injury cases presenting to the ED, during the two data collection periods were identified and flagged on

the Emergency Department Information System (EDIS) by a research assistant. Secondly, information regarding the injured patient's alcohol consumption and the nature of their injury was collected via an interview and/or breath test soon after the patient had been assessed by a triage nurse. If the patient could not be approached for an interview and breath test, a medical record check was undertaken to see whether the attending medical officer had ordered a blood alcohol sample. Finally, further information pertaining to these flagged injury cases were extracted from EDIS and merged with the data collected from the interview or medical record check.

Prior to the commencement of the first audit, a brief pilot study was undertaken to trial the questionnaire, research methodology and breathalysers. During this pilot, twelve interviews and eleven breath tests were conducted and minor modifications were made to the data collection procedure and questionnaire.

IDENTIFYING AND INTERVIEWING INJURED PATIENTS

This study relied on the same injury definition employed by McLeod and colleagues (2000) in their case-control study of injury risk. As such, an injury was defined as "a disruption of the structure or function of the human organism, resulting from exposure to excessive or deficient energy" (McLeod et al. 2000; pp. 8-9). This can include exposure to chemical energy, heat energy, mechanical energy, electrical energy, radiant energy or lack of essentials for survival such as oxygen. Eight categories of injuries are defined by the National Data Standards for Injury Surveillance (NDSIS): vehicle accidents, poisoning, burns/smoke related, falls, animal caused, drowning or near drowning, being struck/cut/pierced and other.

Twenty research assistants were recruited to collect the data on alcohol-related injuries. Thirteen of these recruits were staff employed at St Vincent's ED and were thus already familiar with the ED environment, ED medical teams, and EDIS system. These research assistants also had previous nursing experience, so were well practiced in approaching patients to question them about their injuries as well as being knowledgeable about medical conditions and related terminology. Prior to their first shift, these staff members received a training manual that outlined the data collection procedure, defined the cases that were to be included in the study and explained specific parts of the questionnaire. The Project Officer also met with these staff members to clarify the aims and methods of the alcohol study, review the data collection procedure and answer any outstanding questions.

The remaining research assistants recruited for the study had interviewing experience either in a medical setting or in the drug and alcohol field. Before their first shift at the hospital, these interviewers were given an overview of the aims and objectives of the research. They were also trained in how to identify an injury case and administer the interview. The Project Officer or a senior ED staff member then gave each research assistant an orientation of the ED, introduced them to hospital staff and indicated appropriate locations to undertake the interviews. The Administration and Systems Manager from St Vincent's ED or the Project Officer instructed these interviewers on the workings of EDIS and how to flag injury cases on EDIS for inclusion in the study. Interviewers who were not involved in the pilot study also spent time during the audit observing one of the ED staff members recruited for this project, approaching patients and conducting the interviews and breath tests.

During the two data collection periods, a research assistant was situated at the ED, 24-hours a day. The research assistant was located in a room next to the nurses triage assessment area and monitored EDIS to keep track of each new patient entering the department.

An electronic tick-box had been placed on the EDIS triage screen which allowed any eligible case to be flagged for inclusion in the study. Based on the triage assessment, and any necessary consultations with medical staff, the research assistant ascertained whether the case was an injury and, if so, flagged the case on the EDIS system. The research assistant then entered the injured patient's details in a study logbook and approached the patient for an interview and a breath test.

Patients approached to participate in the study were firstly informed of the nature of the research and then asked to provide written consent to (1) participating in the interview, (2) providing a breath sample, (3) research staff accessing their medical records and/or (4) research staff interviewing someone who was present at the time the injury occurred. Those patients who consented to an interview were asked whether they had consumed any alcohol in the six hours preceding the injury and, if they had been drinking, how much they had consumed and where they had been mostly drinking. Additional information on the nature of the injury was also recorded for all patients interviewed. Since few criminological studies have utilised ED data to investigate violence, more detailed questions were asked of assault victims, including their subjective estimate of the perpetrator's intoxication levels and whether they intended to report the incident to police.

RESPONSE RATE ACHIEVED DURING DATA COLLECTION

The first 28-day audit commenced on September 2, 2004 and was completed on September 30, 2004. The second 28-day audit commenced on January 31, 2005 and finished on February 28, 2005. Figure 1 shows the number of injury presentations to St Vincent's Hospital ED during these two periods and the progression of these cases through the different stages of data collection for this study.

Figure 1: Flow of patients through St Vincent's ED study, Sep 2004 and Feb 2005

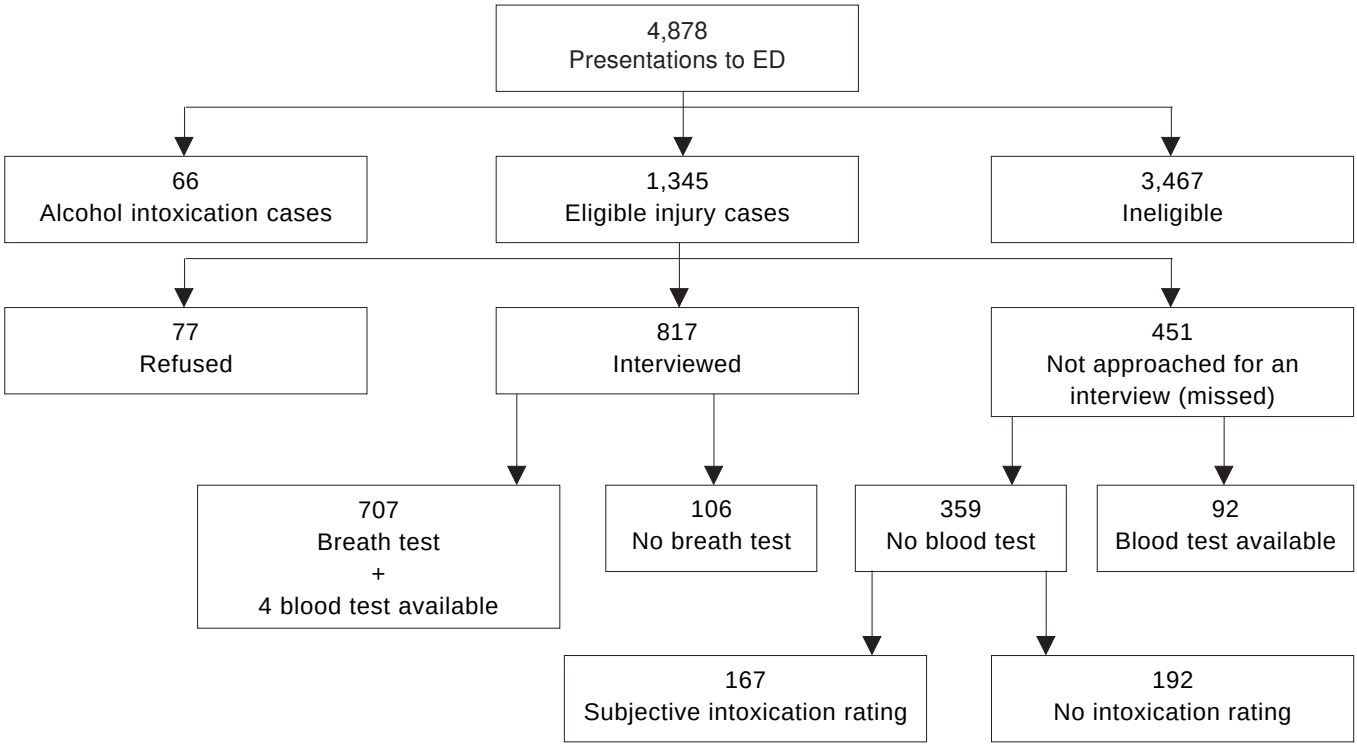

Table 1: Flagged cases presenting to St Vincent's ED by eligibility criteria, Sep 2004 and Feb 2005

Eligibility	*n*	*%*
Injury	1,345	90.8
Not an injury – alcohol intoxication	66	4.5
Not an injury	27	1.8
Under the age of 14	17	1.1
Non-English speaking	21	1.4
Other	5	0.3
Total	**1,481**	**100.0**

As seen in Figure 1, 4,878 cases presented to St Vincent's ED in the study period: 1,481 of these cases were flagged on the EDIS system for possible inclusion in the study (i.e. patients presenting with an injury) but only 1,345 (27.6% of all cases presenting to St Vincent's ED) were found to meet the study's eligibility criteria (i.e. injury, aged 14 years or over, English speaking).

Table 1 shows the number and percentage of flagged cases by the eligibility criteria. As seen here, 27 of the excluded flagged cases were not injuries and a further 66 were cases involving alcohol intoxication that did not receive an injury diagnosis (these latter cases are discussed in further detail below). Only a small number of cases involved injured patients who were excluded because they could not be interviewed (i.e. non-English speaking, under the age of 14).

Forty-three per cent of the eligible patients attended St Vincent's ED between 6pm on Friday and 6am on Monday and slightly more patients (53.8%) sought treatment for an injury during the second data collection period (i.e. January/February 2005) compared to the first data collection period (i.e. September 2004). Of the 1,345 eligible cases, 894 (66.5%) patients were approached for an interview: 817 (91.4%) injured patients agreed to the interview and 77 (8.6%) refused. Of these 817 patients, 707 (86.5%) were also administered a breath test. The majority of the interviewees who did not provide a breath test refused to do so for personal reasons or were presenting with an old injury. However, almost one-third (32.7%) of these patients were simply unable to undertake a breath analysis because their injury was too severe or they could not exhale long

enough to record a reading on the handheld breathalyser. Four of the patients interviewed who could not provide a breath test had information on BAC level from their medical records.

Given the nature of the ED environment and ED case-mix it was difficult to approach all patients for an interview. These 'missed cases' totalled 451 and consisted mostly of patients who left before they could be interviewed (29.3%) or patients who were unable to be interviewed because they were too severely injured, intoxicated/drugged, aggressive or distressed (45.9%). Although some of these 'missed' cases may not have been eligible for the study, the overall response rate was calculated on the basis of all potentially eligible patients presenting to the ED. Thus in total, 61 per cent of cases were interviewed, six per cent refused to be interviewed and 34 per cent were missed.

For injury cases where the patient was unable to be interviewed, a medical record check was undertaken to see whether the attending medical officer had ordered a blood alcohol test. Ninety-two of the 451 missed cases had information available on the patient's blood alcohol at the time of medical treatment. Thus, in addition to the information obtained from the interviews, data on alcohol consumption were available for 68 per cent of the eligible cases that presented during the audit periods. If a patient was unable to be interviewed and there was no blood alcohol information available, a subjective assessment of their intoxication level was made. These data were obtained either from the research assistant's own observation of the patient, from observations recorded by the triage nurse or from diagnostic information recorded by the attending medical officer. A further 167 cases, where no information on BAC or alcohol consumption was available, had a subjective rating of their intoxication level recorded by the research assistants. If these additional data are included, information on alcohol consumption was obtained from 80 per cent of eligible cases.

An additional 66 (4.5%) of the 1,481 cases flagged during the two audit periods involved patients who were seeking treatment for alcohol intoxication (1.4% of all cases presenting to the ED). None of these patients received an injury diagnosis but instead were mostly diagnosed as acutely intoxicated by alcohol or suffering from conditions related to alcohol addiction. Information obtained from either the breath test administered by the research assistant or the blood sample taken by the attending medical officer suggested that some of these cases might have been alcohol poisonings. At least 15 of these patients recorded a blood alcohol level of 0.20g/100ml or over, with one patient recording a blood alcohol level of 0.44g/100ml, however no cases in the dataset had 'alcohol poisoning' recorded as the primary diagnosis (ICD9 – 980). While some of these patients may have met the definition of an 'injury' they are analysed separately in this study from other injury cases but are included in the total estimated costs given that they represent an important contributor to ED costs related to alcohol.

COSTING ESTIMATE

Two methods were used to allocate costs to injury cases identified as alcohol-related during the audits. The first method relied on data collected in a previous study undertaken at Flinders Medical Centre (FMC) ED in Adelaide, South Australia in 1995/96, which directly measured a range of patient-specific costs and from these data calculated an average cost of treatment for different types of cases presenting to the ED (Erwich-Nijhout, Bond & Baggoley 1997). For the current study, patients presenting with injuries that were identified as alcohol-related were allocated to one of the case-mix classifications developed by Erwich-Nijhout, Bond and Baggoley (1997) and the appropriate average cost (adjusted upward to reflect 2004/05 costs) was then applied. The second method involved the use of estimated cost weights for different types of ED presentations and estimated average costs of ED care for New South Wales hospitals which have been developed by NSW Health (see NSW Health 2004). Again, cases identified as alcohol-related in the current study were assigned to the relevant case-mix classifications and the weighted average cost estimated for ED treatment at St Vincent's Hospital was applied. While this latter approach relies on less direct methods for estimating patient-specific costs, it utilises more recent costing data that are specific to New South Wales. Due to their complexity, the methodologies used in calculating these short-term costs are provided in a supplementary bulletin (see Poynton et al. 2005).

RESULTS FROM THE TWO AUDITS

ALL INJURIES

As discussed previously, 1,345 eligible injury cases presented to St Vincent's ED during the two audit periods (note that the 66 alcohol intoxication cases are excluded from this analysis). Sixty-three per cent (852) of these patients were male and 56 per cent (758) were under the age of 35 (23.9% were under 25 years). Most of the known injuries for which medical treatment was sought were caused by a fall (31.5%), being hit by or against something (20.6%), being cut or pierced (16.9%), or involved vehicle drivers/passengers, bike riders or pedestrians (6.3%). Fourteen per cent of the 1,345 injury attendances during the two audit periods resulted from interpersonal violence.

Sixty-one per cent (817) of the injured patients attending St Vincent's ED during the two 28-day periods were interviewed about the nature of their injury and their alcohol consumption in the six hours preceding the injury. Of these

interviewees, just over one-third (278) reported that they had been drinking alcohol in the six hours preceding their injury. Over half of these drinkers reported consuming this alcohol at a hotel or nightclub (65.5% on any licensed premises) and 41 per cent reported consuming more than six standard drinks during these six hours. Just over 60 per cent of the interviewees who reported consuming alcohol prior to their injury attended the ED between 6pm on Friday and 6am on Monday. There was no significant difference in the proportion of patients who reported having consumed alcohol prior to the injury in the first audit compared with patients interviewed during the second audit (35.3% v. 33.0%; $\chi^2 = 0.503$, $p = 0.478$).

Eighty-seven per cent of the injured patients who were interviewed for the study were also administered a breath test. Over three-quarters of these patients recorded a zero BAC but one in five recorded a BAC of over 0.05g/100ml and almost one in ten recorded a BAC over 0.15g/100ml. A moderate, positive correlation was found between the amount of alcohol the patient reported consuming in the six hours prior to the injury and the BAC recorded at the time of interview (r=0.46; p<0.001),[2] which increases our confidence in the self-reported data obtained in the interview. For most of the injured patients, these alcohol concentrations would underestimate the amount of alcohol consumed prior to the injury because of the inherent delay between the injury episode and subsequent attendance at the ED.

Several sources of data (including subjective evidence from self-report and observations, as well as objective evidence from breath tests and blood tests) were used to determine alcohol involvement in the injuries presenting to St Vincent's ED during the audit period. This gives a range of estimates on which to base alcohol-related injury costs. Table 2 shows the number and percentage of cases in the sample meeting six different alcohol-related criteria, listed by the least to the most restrictive criteria.

Table 2: Number and proportion of injuries meeting specified alcohol-related criteria, Sep 2004 and Feb 2005

Alcohol-related criteria	*n*	*% of known cases*	*% of all cases*
Drinking 6 hrs prior or positive blood test or showing at least 1 sign of intoxication	407	37.8 (n=1,076)	30.3 (n=1,345)
Drinking 6 hrs prior or positive blood test or showing 2 or more signs of intoxication (*Estimate 1*)	369	34.3 (n=1,076)	27.4 (n=1,345)
Drinking at risky/high-risk levels* or blood test >=0.05g/100ml (*Estimate 2*)	241	26.5 (n=909)	17.9 (n=1,345)
Breath test >=0.05g/100ml or blood test >=0.05g/100ml	182	22.7 (n=803)	13.5 (n=1,345)
Drinking at high-risk levels** or blood test >=0.10g/100ml	179	19.7 (n=909)	13.3 (n=1,345)

* *More than two standard drinks for females and four standard drinks for males (National Health and Medical Research Council 2001)*

** *More than four standard drinks for females and six standard drinks for males (National Health and Medical Research Council 2001)*

Table 3: Number and proportion of alcohol-related and non alcohol-related injuries by age and gender, Sep 2004 and Feb 2005

	Estimate 1 (n=1,076)				*Estimate 2 (n=909)*			
	Alcohol		*Non-Alcohol*		*Alcohol*		*Non-Alcohol*	
Patient characteristics	n	%	n	%	n	%	n	%
*Gender**								
Male	268	72.6	438	62.0	171	71.0	430	64.4
Female	101	27.4	268	38.0	70	29.0	238	35.6
Total	**369**	**100.0**	**707**	**100.0**	**241**	**100.0**	**668**	**100.0**
*Age***								
<25	105	28.5	154	21.8	74	30.7	148	22.2
25-29	74	20.1	126	17.8	49	20.3	118	17.7
30-34	63	17.1	96	13.6	44	18.3	93	13.9
35-39	44	11.9	47	6.6	30	12.4	45	6.7
40-49	26	7.0	91	12.9	18	7.5	86	12.9
50-59	30	8.1	56	7.9	18	7.5	50	7.5
60+	27	7.3	137	19.4	8	3.3	128	19.2
Total	**369**	**100.0**	**707**	**100.0**	**241**	**100.0**	**668**	**100.0**

* *Significant chi-square test at the 0.05 level*

** *The relationship between age and alcohol was significant at the 0.05 level for Estimate 1 but the p-value for Estimate 2 was 0.064*

As shown in Table 2, even where the most restrictive criteria are applied, a substantial proportion of injuries during the two audit periods involved alcohol.

One-fifth of injuries where alcohol involvement was assessed involved a person who had been drinking at high-risk or equivalent levels (i.e. more than four standard drinks for females or more than six standard drinks for males) or who had a BAC above 0.10g/100ml. If we include cases in the denominator where an alcohol assessment could not be undertaken, this represents about 13 per cent of all injuries presenting during the two data collection periods.

To examine other factors relating to the patient or the injury for which medical treatment was being sought, upper and lower bound estimates of alcohol involvement were used. For the upper bound estimate (Estimate 1), a case was classified as alcohol-related if the patient (1) drank alcohol in the six hours prior to the injury, or (2) recorded a positive blood alcohol test, or (3) displayed two or more visible signs of intoxication when they presented to triage. The lower bound estimate included any case where the patient was drinking at risky/high-risk levels[3] or the blood analysis was 0.05g/100ml or over.

As shown in Table 3, the contribution of alcohol to injuries varied by age and gender. A greater proportion of males incurred alcohol-related injuries while a greater proportion of females incurred non alcohol-related injuries. There was also a significant difference between alcohol and non alcohol-related injuries with regard to the age of the patient. Older people (i.e. 60+ years) were more likely to incur non alcohol-related injuries than alcohol-related injuries, while younger people (i.e. less than 25 years) were more likely to incur alcohol-related injuries compared to non alcohol-related injuries.

There was also a significant relationship between the location of the person at the time of the injury and whether the injury was alcohol-related. As shown in Table 4, injuries incurred at a licensed premises were more likely to be alcohol-related, while injuries incurred at home, on a construction site or at a recreation/

Table 4: Number and proportion of alcohol-related and non alcohol-related injuries by details of injury, Sep 2004 and Feb 2005

	Estimate 1 (n=1,076)				*Estimate 2 (n=909)*			
	Alcohol		*Non-Alcohol*		*Alcohol*		*Non-Alcohol*	
Injury details	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
*Location at time of injury**								
Licensed premises	102	27.6	68	9.6	79	32.8	78	11.7
Street area	73	19.8	118	16.7	52	21.6	119	17.8
House	91	24.7	192	27.2	59	24.5	192	28.7
School/office/trade	7	1.9	40	5.7	3	1.2	41	6.1
Industrial/construction site	1	0.3	33	4.7	0	0.0	32	4.8
Recreation/sport area	24	6.5	89	12.6	15	6.2	90	13.5
Other	30	8.1	94	13.3	15	6.2	95	14.2
Unknown	41	11.1	73	10.3	18	7.5	21	3.1
Total	**369**	**100.0**	**707**	**100.0**	**241**	**100.0**	**668**	**100.0**
*Medical result of injury**								
Superficial	60	16.3	106	15.0	34	14.1	97	14.5
Open Wound	71	19.2	145	20.5	51	21.2	138	20.7
Fracture	52	14.1	82	11.6	38	15.8	89	13.3
Dislocation	9	2.4	22	3.1	6	2.5	23	3.4
Sprain or strain	42	11.4	120	17.0	29	12.0	120	18.0
Poisoning	52	14.1	45	6.4	29	12.0	30	4.5
Intracranial injury	17	4.6	19	2.7	12	5.0	17	2.5
Multiple injuries	35	9.5	67	9.5	25	10.4	64	9.6
Other	29	7.9	100	14.1	16	6.6	90	13.5
Unknown	2	0.5	1	0.1	1	0.4	0	0.0
Total	**369**	**100.0**	**707**	**100.0**	**241**	**100.0**	**668**	**100.0**
*Intention of injury event**								
Unintentional	243	65.9	623	88.1	152	63.1	591	88.5
Intentional self-harm	25	6.8	26	3.7	17	7.1	17	2.5
Intentional harm by another	100	27.1	55	7.8	71	29.5	58	8.7
Unknown	1	0.3	3	0.4	1	0.4	2	0.3
Total	**369**	**100.0**	**707**	**100.0**	**241**	**100.0**	**668**	**100.0**
*Triage category***								
1	27	7.3	33	4.7	19	7.9	29	4.3
2	37	10.0	76	10.7	25	10.4	68	10.2
3	125	33.9	223	31.5	85	35.3	200	29.9
4	174	47.2	358	50.6	110	45.6	354	53.0
5	6	1.6	17	2.4	2	0.8	17	2.5
Total	**369**	**100.0**	**707**	**100.0**	**241**	**100.0**	**668**	**100.0**
Outcome								
Admitted to a ward	83	22.5	156	22.1	62	25.7	140	21.0
Non-admitted	262	71.0	515	72.8	170	70.5	505	75.6
Died in the ED	0	0.0	2	0.3	0	0.0	0	0.0
Did not wait	24	6.5	34	4.8	9	3.7	23	3.4
Total	**369**	**100.0**	**707**	**100.0**	**241**	**100.0**	**668**	**100.0**

* *Significant chi-square test at the 0.05 level*
** *A significant relationship was found between triage and alcohol for Estimate 2 with more alcohol-related cases triaged at 1 and fewer at 5 but not for Estimate 1*

sporting area were less likely to involve alcohol. There are further significant differences between alcohol and non alcohol-related injuries with regard to (1) the medical result of the injury; with more poisonings and fewer sprains or strains being alcohol-related and (2) intentionality; with more alcohol-related injuries caused by intentional self-harm or intentional harm by another being alcohol-related. There was a significant difference between alcohol-related and non alcohol-related injuries in terms of treatment urgency[4] using the Estimate 2 definition but not Estimate 1. There were no significant differences between alcohol-related and non alcohol-related injury cases in terms of outcome.[5]

INJURIES RESULTING FROM INTERPERSONAL VIOLENCE

Across the two audits, 14 per cent (191) of the eligible injury cases presenting to the ED involved injuries that had been incurred as a result of interpersonal violence. Eighty per cent of these assault patients were male and 69 per cent were under the age of 35 (28.3% were less than 25 years old). Slightly more patients sought treatment for an assault-related injury in the January/February audit (51.8%) than in the September audit (48.2%).

Table 5 presents further information about the nature of the assault injuries flagged during the two audit periods, and compares these data on assault injuries with information on other types of injuries presenting to the ED during the same periods. As seen here, males and young people were more likely to present to the ED with an assault-related injury in comparison to other types of injuries. Assault patients were also more likely to have been at or on the street outside a licensed premises when the injury occurred, compared to patients presenting with other types of injuries (24.6% v. 11.9%). Assault patients were more likely to present with multiple injuries (18.9% v. 7.2%) and less likely to

Table 5: Number and proportion of assault and other injuries by details of injury, Sep 2004 and Feb 2005

Patient characteristics/	*Assault (n=191)*		*Other injury (n=1,146)***	
injury details	*n*	*%*	*n*	*%*
*Gender**				
Male	152	79.6	693	60.5
Female	39	20.4	453	39.5
Total	**191**	**100.0**	**1,146**	**100.0**
*Age**				
<25	54	28.3	264	23.0
25-29	42	22.0	195	17.0
30-34	35	18.3	165	14.4
35-39	22	11.5	84	7.3
40-49	21	11.0	135	11.8
50-59	12	6.3	96	8.4
60+	5	2.6	207	18.1
Total	**191**	**100.0**	**1,146**	**100.0**
*Location at time of injury**				
Licensed premises	47	24.6	136	11.9
Street area	62	32.5	159	13.9
House	10	5.2	318	27.7
School/office/trade	5	2.6	48	4.2
Industrial/construction site	0	0.0	35	3.1
Recreation/sport area	7	3.7	117	10.2
Other	11	5.8	140	12.2
Unknown	49	25.7	193	16.8
Total	**191**	**100.0**	**1,146**	**100.0**
*Medical result of injury**				
Superficial	41	21.5	166	14.5
Open Wound	41	21.5	216	18.8
Fracture	21	11.0	147	12.8
Dislocation	1	0.5	34	3.0
Sprain or strain	15	7.9	188	16.4
Poisoning	0	0.0	117	10.2
Intracranial injury	11	5.8	33	2.9
Multiple injuries	36	18.9	82	7.2
Other	24	12.6	154	13.4
Unknown	1	0.5	9	0.8
Total	**191**	**100.0**	**1,146**	**100.0**
Triage Category				
1	8	4.2	66	5.8
2	10	5.2	126	11.0
3	74	38.7	355	31.0
4	95	49.7	565	49.3
5	4	2.1	34	3.0
Total	**191**	**100.0**	**1,146**	**100.0**
*Outcome**				
Admitted to a ward	38	19.9	254	22.2
Non-admitted	128	67.0	827	72.2
Died in the ED	0	0.0	2	0.2
Did not wait	25	13.1	63	5.5
Total	**191**	**100.0**	**1,146**	**100.0**

* *Significant chi-square test at the 0.05 level*

** *Note that for eight cases it could not be determined whether or not the injury resulted from interpersonal violence*

present with a sprain/strain (7.9% v. 16.4%) than other types of injuries. Despite this, a greater proportion of assault patients did not wait for treatment (13.1% v. 5.5%) in comparison to patients presenting with other types of injuries.

Fifty-eight per cent (111) of the assault patients were interviewed about the incident in which the injury occurred. Most of these patients reported that at least one other male had been involved in the altercation (94.6%) and in most cases, the patient did not know the other person(s) involved (65.8%). When asked about factors that had initiated the incident, 40 per cent of the assault patients reported that there had been no provocation, 27 per cent said that a verbal altercation had started the incident and nine per cent of patients reported that they had been injured as a result of a mugging or robbery. In just over one-quarter of all assaults a weapon had allegedly been used; 38 per cent (11) of these assaults involved a drinking vessel and 28 per cent (8) a knife. Less than one-third of the assault patients indicated, in the interview, that they would *not* report the incident to police.

Just under two-thirds (72) of the 111 assault patients interviewed reported that they had been drinking alcohol in the six hours preceding their injury. Seventy-one per cent of these drinkers reported consuming this alcohol at a hotel or nightclub (75.0% at any licensed premises) and 54 per cent reported consuming more than six standard drinks during these six hours. One-third (31) of the 92 assault patients who were breath tested recorded a BAC above 0.10g/100mls and nine per cent (8) recorded BACs above 0.20g/100mls. In the interview, assault patients were also asked whether the other party involved in the altercation had consumed alcohol. A large proportion of these patients were, however, unable to assess the extent to which the other person(s) had been drinking. This is consistent with the finding that most assault incidents involved a person(s) unknown to the patient. Still, around 40 per cent of the assault patients reported that they thought the other person(s) involved in the incident had been drinking alcohol, or were affected by alcohol, while 27 per cent reported that the other person(s) smelt of alcohol.

Table 6: Number and proportion of alcohol-related injuries by injury type, Sep 2004 and Feb 2005

	Assault		Other injury**	
Alcohol-related criteria	*n*	*% of known*	*n*	*% of known*
Drinking 6hrs prior or positive blood test or showing at least 1 sign of intoxication*	106	68.8 (n=154)	300	32.7 (n=918)
Drinking 6 hrs prior or positive blood test or showing 2 or more signs of intoxication (*Estimate 1*)*	99	64.3 (n=154)	269	29.3 (n=918)
Drinking at risky/high-risk levels or blood test >=0.05g/100ml (*Estimate 2*)*	70	54.7 (n=128)	170	21.9 (n=778)
Breath test >=0.05g/100ml or blood test >=0.05g/100ml*	58	53.2 (n=109)	123	17.8 (n=691)
Drinking at high-risk levels or blood test >=0.10g/100ml*	57	44.5 (n=128)	121	15.6 (n=778)

* *Significant chi-square test at the 0.05 level*

** *For four injury cases with information on alcohol involvement, it could not be determined whether the injury resulted from interpersonal violence*

Alcohol also appears to play a greater role in injuries resulting from interpersonal violence than it does for other types of injuries. Table 6 compares the number and proportion of assaults that meet each of the six alcohol-related criteria described earlier with the number and proportion of other types of injuries meeting these criteria. Across all six criteria, patients who had been involved in an assault were significantly more likely to have consumed alcohol, and to have consumed alcohol at high-risk levels than patients presenting to the ED with other injuries. Again using the most restrictive criteria for defining an injury as alcohol-related, the data revealed that 45 per cent of all assaults involved alcohol compared to only 16 per cent of other types of injuries.

ALCOHOL INTOXICATION

In total, 66 cases involving intoxicated patients (with a non-injury diagnosis) were flagged during the two audit periods. Because one-fifth (13) of these patients did not wait for treatment, the attending medical officer was unable to record a primary diagnosis. Most intoxication cases (65.2%) where a diagnostic code was recorded received a diagnosis of 'alcohol intoxication', 'alcohol intoxication in alcoholic', 'alcohol addiction' or 'alcoholic psychosis'. Eleven per cent (7) of intoxication cases involved patients who had allegedly had their drink spiked by another person(s). Information on blood alcohol levels was available for two of these patients and both recorded a BAC above 0.17g/100ml.

One-third of these intoxicated patients were aged less than 25 years and two-thirds were male. Slightly more intoxicated patients presented during the second data collection period than the first (56.19% v. 43.9%) and 65 per cent presented to the ED between 6pm on Friday and 6am on Monday during the two audit periods combined. Where objective data on intoxication levels were

available, over half of these patients recorded a BAC in excess of 0.20g/100ml and almost one-quarter (8) recorded a BAC in excess of 0.30g/100ml. Most of the patients identified as alcohol intoxicated were treated and subsequently discharged,[6] however 12 per cent (8) were admitted to a ward and a further 20 per cent (13) did not wait for treatment.

Table 7: Estimated annual cost of alcohol-related injuries and alcohol intoxication to St Vincent's ED by alcohol-related criteria and costing method, 2004/2005

Costing methodology	*Lower Bound (Estimate 2)*	*Upper Bound (Estimate 1)*
FMC Study	$693,030	$848,957
NSW Costs of Care Standards	$1,128,873	$1,383,924

ED COSTS FOR ALCOHOL-RELATED INJURIES AND INTOXICATION CASES

As discussed previously, two methodologies were used in the current study to estimate the cost of alcohol-related injuries and intoxication cases to St Vincent's ED. Firstly, cases involving injuries identified as alcohol-related or alcohol intoxication were allocated to one of the relevant case-mix classifications developed in the Flinders Medical Centre (FMC) study (Erwich-Nijhout, Bond & Baggoley 1997) and average adjusted costs for each classification were applied. These same cases were also assigned to relevant case-mix classifications utilised in the NSW Costs of Care Standards report and the weighted average cost for each classification was applied.

Two different definitions were once again used to obtain upper and lower bound estimates of the proportion of injuries that were alcohol-related. The upper bound estimate (Estimate 1) was based on the assumption that an injury was alcohol-related if the patient was drinking alcohol in the six hours prior to the injury, or recorded a positive BAC from the blood test[7] or was showing two or more visible signs of intoxication. The lower bound estimate (Estimate 2) was based on the assumption that an injury was alcohol-related if the patient reported drinking at risky/high-risk levels or recorded a BAC at 0.05g/100ml or over.[8]

It should be noted here that data on alcohol consumption were not available for a proportion of eligible injury patients (either because the patient could not be approached for an interview or the attending medical officer did not administer a blood alcohol test). Ignoring these cases would mean that we would significantly underestimate the actual cost of treating alcohol-related injury cases within the ED. For this reason, the estimated costs were adjusted for missing data on alcohol-involvement. This adjustment was based on the assumption that the rate of alcohol-related injuries amongst the cases with missing data was the same as the rate of alcohol-related injuries amongst cases where alcohol-involvement was directly confirmed (further information on these costing procedures are provided by Poynton et al. (2005)).

The estimated annual cost of alcohol-related injuries and alcohol intoxication to St Vincent's ED is presented in Table 7. This table shows the estimated costs by the type of costing methodology employed and the criteria used to identify an injury as alcohol-related. Costs associated with non-injury intoxication cases are also included in these estimates.

As seen from Table 7, regardless of which alcohol-related criteria or methodology is selected to calculate the cost of alcohol-related injuries and intoxication cases, the financial cost of these types of cases to St Vincent's ED is substantial. Using the most restrictive definition for classifying an injury as alcohol-related, we calculate that the annual cost of alcohol to St Vincent's ED is at least $700,000 and as much as $1.1 million if NSW-specific data are utilised. As will be discussed in later sections of this bulletin this is also likely to be a conservative estimate of costs arising from alcohol misuse given that our calculations rely on secondary data and it is possible that alcohol-related injuries generate higher ED costs than non alcohol-related injuries.

The ED resources consumed by alcohol-related injury and intoxication cases can also be expressed in terms of the amount of staff time spent dealing with patients. Using the procedures developed by Erwich-Nijhout, Bond and Baggoley (1997),[9] we calculate that ED staff at St Vincent's Hospital spent between 4,666 hours (using Estimate 2) and 5,638 hours (using Estimate 1) in 2004/05 dealing with alcohol-related injuries and alcohol intoxication cases (see Poynton et al. (2005) for further details regarding these calculations).

SUMMARY AND DISCUSSION

This study aimed to answer two specific research questions:

(1) What proportion of injuries presenting to St Vincent's ED are alcohol-related?

(2) What is the short-term financial cost associated with these alcohol-related injuries?

ALCOHOL-RELATED INJURIES AND INTOXICATION CASES

Overall, 4,878 cases presented to St Vincent's ED during the two 28-day audit periods and 1,345 of these (27.6%) were

identified as involving injuries relevant to the study. Most of these patients were male, under the age of 35 years and were seeking treatment for an injury caused either by a fall, being hit by or against something, or being cut/pierced. Fourteen per cent of injury attendances during the two audit periods were for injuries resulting from interpersonal violence.

Three data sources were used to determine alcohol-involvement in injury cases presenting during the two audit periods; (1) self-report data on the amount of alcohol consumed in the six hours preceding the injury (n=817), (2) BAC data from blood tests ordered by the attending medical officer (n=92) and (3) subjective ratings of intoxication (n=167). Each of these sources of data indicate that a substantial proportion of injuries presenting to St Vincent's ED can be classified as alcohol-related. One-third of all injured patients interviewed for this study reported consuming alcohol in the six hours preceding the injury. One-fifth of all injury cases, where alcohol involvement was known, involved a person who had been drinking at high-risk levels or who had a blood alcohol concentration above 0.10g/100ml.

Consistent with other research in this area (Humphrey, Casswell & Han 2003; McLeod et al. 2000; Watt et al. 2004; Young et al. 2004), males were more likely to present with alcohol-related injuries than females and young people were more likely to present with alcohol-related injuries than older people. Injuries sustained at licensed premises were more likely to be alcohol-related than injuries incurred at other locations, and injuries from intentional self-harm were more likely to involve alcohol than those resulting from accidental events. Almost two-thirds of the patients who reported consuming alcohol prior to the injury stated that they had been mostly drinking at licensed premises.

Alcohol was found to play an even greater role in injuries resulting from interpersonal violence. Regardless of which alcohol-related criterion was used, a higher proportion of violent injuries could be classified as alcohol-related compared with other types of injuries presenting to the ED during the study period. Almost two-thirds of the assault patients interviewed for this study reported drinking alcohol in the six hours preceding the assault incident, and the vast proportion of these drinkers (75%) reported that they had been drinking at licensed premises. Using a stricter definition of alcohol-related (drinking at at-risk levels or recording a blood alcohol above 0.10g/100ml), we found that 45 per cent of all assault cases, where alcohol information was available, could be classified as alcohol-related.

This latter estimate of alcohol involvement in violent injuries is reassuringly similar to English et al.'s (1995) pooled attributable fraction of 0.43 for assault. English and his colleagues based this estimate on the results of a small number of international studies that reported the proportions of assault patients with blood alcohol levels greater than 0.10g/100ml. In the current study, it was difficult to determine the level of alcohol consumption by other parties involved in the incident, given that many patients reported being assaulted by a stranger. Even so, 41 per cent of those interviewed reported that they thought the other person(s) involved in the incident had been drinking alcohol.

A further group of cases, which were not classified as injuries but which did involve the consumption of alcohol, also presented to St Vincent's ED during the audit periods. These cases typically involved patients who were seeking treatment for acute alcohol intoxication or for conditions associated with alcoholism. They represented about one per cent of all cases presenting to the ED during the study period. One-third of these patients were under the age of 25 years and most recorded BAC above 0.10g/100ml.

COSTS ASSOCIATED WITH ALCOHOL-RELATED INJURIES AND INTOXICATION CASES

The annual cost of alcohol to St Vincent's ED estimated from our calculations ranged between $693,000 and $1.38 million for 2004/05, depending on the criteria used to identify a case as alcohol-related and the methodology selected to allocate costs.

As seen from Table 7, the cost estimates obtained using the FMC study methodology differ quite substantially from those calculated using costing weights and average costs from the NSW Costs of Care Standards. There are two possible reasons for these differences. Firstly, there are probably significant differences between the two jurisdictions in the cost of health care provision, particularly in terms of medical staff salaries/wages and infrastructure costs. This is borne out by data from the National Hospital Cost Data Collection (NHCDC),[10] which shows that, overall, the average cost of an ED presentation in New South Wales ($261) is considerably higher than in other jurisdictions (e.g. South Australia = $201) and quite a bit higher than the national average ($211). Secondly, there are important differences between St Vincent's Hospital and the FMC in their ED case-mix (see Poynton et al. (2005) for further details). These differences could reflect changes in clinical practice within emergency departments since the FMC study was completed (NSW Health 2001), differences in the recording of disposition/outcome (see note 5), or a reduction in the accessibility of ward beds at St Vincent's Hospital. The cost weights and averages that have been developed for the NSW Costs of Care Standards attempt to deal with some of these issues and for this reason are probably more reliable.

The only way to assess the accuracy of the two costing methods described here would be through direct observation of staff time spent dealing with different cases and direct measurement of the

number of procedures, drugs and tests undertaken for patients presenting to this ED. This was, however, beyond the scope of the current study both because of its expense and the inconvenience it would cause to both staff and patients within this high-pressured work environment. As such, we consider it sufficient, for the present purposes, to view the costs derived from these two different methods as upper and lower bound estimates.

It should be noted, however, that regardless of which data is used to apportion average costs, the total cost of alcohol-related injuries and intoxication cases presented here is likely to be a conservative estimate of the actual cost of these cases to the ED for several reasons. Firstly, the two 28-day audits upon which annual cost estimates were based did not coincide with any holiday periods (e.g. Christmas and New Year) or major events (e.g. Sydney Gay and Lesbian Mardi Gras). With increased alcohol consumption during these periods we would anticipate a higher number of injuries presenting to this inner-city ED and, consequently, a greater amount of resources consumed over a 'typical' 12-month period. Secondly, there is some evidence that alcohol-related injuries, particularly major traumas, generate higher costs than other types of injuries. A trauma study (see Poynton et al. (2005) for further details) being conducted at St Vincent's at the same time as our study found that, on average, patients recording a positive BAC required more investigation, spent longer in ICU and more days on ventilation. These findings are consistent with other trauma research (e.g. Cherpitel 1993; Li, Keyl, Smith & Baker 1997; Pories, Gamelli, Vacek, Goodwin, Shinozaki & Harris 1992). Thirdly, alcohol-related injuries may generate higher costs because of the increased staffing levels that are required to treat these patients. ED staff for example, require security personnel to be in attendance if an intoxicated patient is behaving aggressively and are required to closely observe and monitor patients who are severely intoxicated.

It is also worth noting that the methods of cost-estimation used in the current study incorporate only the immediate cost of each injury case to the ED. Other costs associated with the injury, such as those which flow from hospitalisation and/or rehabilitation, or those associated with income loss and psychological distress are not included in these calculations. Some of these additional costs can be estimated by applying an average cost of acute inpatient care (as reported in the NSW Costs of Care Standards 2004/05) to those people in our sample who were admitted to a ward.[11] When this is done, the hospitalisation costs associated with the alcohol-related injury cases and alcohol intoxication cases identified during the audit periods total an additional $1.8 million for the 2004/05 financial year. Thus, the alcohol-related injury and alcohol intoxication cases presenting to the ED at St Vincent's Hospital cost a minimum of $3.2 million each year.

St Vincent's is a major trauma centre that services a fairly unique inner-city area where numerous entertainment venues and licensed premises are located and which, as a result, attracts large numbers of young people particularly on weekends and late at night. One might therefore expect to see a greater number of injuries and cases of alcohol intoxication presenting to this ED and possibly, with a higher density of alcohol outlets, a greater proportion of alcohol-related injuries requiring treatment (McLeod et al. 2000). It is worth noting, however, that the proportion of injured patients who reported consuming alcohol in the six hours prior to the injury in the current study is very similar to that found in a recent ED study undertaken in Queensland (Watt et al. 2004) and another undertaken in New Zealand (Humphrey, Casswell & Han 2003), though these estimates are somewhat higher than those reported in the Western Australian ED study conducted by McLeod and colleagues (2000).[12]

St Vincent's ED is just one of 143 EDs that service the NSW population and just one of the 13 major trauma centres operating in NSW metropolitan areas. Therefore our research would suggest that the total cost of alcohol-related injuries and intoxication cases to the NSW health care system would be considerable.

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NOTES

1 Hazardous and harmful drinking levels respectively relate to risky drinking (more than four standard drinks per day for men and more than two standard drinks for women) and high-risk drinking (more than six standard drinks per day for men and more than four standard drinks per day for women) under the 2001 NHMRC drinking guidelines (see National Health and Medical Research Council 2001).

2 A non-parametric measure of association (Spearman's rho) was used here because the self-reported measure of alcohol consumption was an ordinal variable.

3 Note that the National Health and Medical Research Council guidelines (2001) being used here are those for risk of harm in the long-term rather than the guidelines for risk of harm in the short-term. Even at these lower levels of episodic consumption (i.e. more than two drinks for females and more than four drinks for males), however, the risk of injury is twice that of no consumption, controlling for other factors (McLeod et al. 2000).

4 Triage Category is a standardised national scale which indicates the urgency of patient treatment in an ED. Category 1 = Resuscitation: Immediate (within seconds); Category 2 = Emergency: Within 10 minutes; Category 3 = Urgent: Within 30 minutes; Category 4 = Semi-urgent: Within 60 minutes; Category 5 = Non-urgent: Within 120 minutes.

5 The outcome categories used by St Vincent's include (1) Dead on arrival, (2) Admitted died in ED, (3) Admitted to critical care ward, (4) Admitted via operating suite, (5) Admitted transferred to another hospital, (6) Admitted to a ward not critical care, (7) Admitted and discharged as an inpatient within the ED, (8) Departed treatment completed, (9) Departed transfer to another hospital, (10) Departed left at own risk, (11) Departed for another facility, (12) Departed did not wait. For our purposes categories 1 to 6 are classified as 'admitted to ward/died/DOA', categories 7 to 11 as 'non-admitted' and category 12 as 'did not wait'. This is consistent with the classifications used in the FMC study (Personal communication with Professor Chris Baggoley 14/04/2005). However, we were advised by St Vincent's ED staff that patients classified as Category 7 can sometimes spend several days in the ED and are therefore potentially as costly as an 'admitted to ward' patient. Moreover, in some cases these patients may have been admitted to a ward had a bed been available. These issues are relevant to the costing estimates and, as such, are discussed in further detail in later sections of the bulletin.

6 Note that 21 of these intoxicated cases fell under the category of 'admitted and discharged as inpatient within the ED'.

7 The blood analysis results did not report the actual BAC reading if less than 0.03g/100ml. A BAC of 0.03g/100ml was therefore considered to be equivalent to a zero BAC.

8 Note that four patients reported they consumed alcohol but data on number of standard drinks were missing. Three of these patients recorded breath tests greater than 0.05 so were included in the risky/high-risk group.

9 See pp. 15 of the Appendices to the Erwich-Nijhout, Bond and Baggoley (1997) report.

10 The NHCDC is a voluntary annual collection of hospital costs and activity data that is co-ordinated by the Department of Health and Aging and reported for each financial year. About 200 public hospitals across Australia collect these data, and since 1998/1999 (NHCDC Round 3) the NHCDC has gathered additional data on the number and cost of ED presentations.

11 Note that we could not use appropriate cost weights because many of the injury cases were not assigned a relevant ICD9 code and therefore could not be assigned to an Australian Refined Diagnostic Related Group (AR-DRG) on which these weights are based. Thus, average costs (excl. the ED cost group) are applied. Rehabilitation costs also are not included in this estimate.

12 In the current study the proportion who drank in the six hours prior was 34.7%; in the Queensland study 35.2%; in the New Zealand study 35%; in the West Australian study 21.6%.

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