Patterns and sources of alcohol consumption preceding alcohol-affected attendances to a New Zealand hospital emergency department

Manidipa Das, Rebecca Stewart, Michael Ardagh, Joanne M Deely, Stuart Dodd, Nadia V Bartholomew, Scott Pearson, Ruth Spearing, Tracey Williams, Martin Than

Abstract

**Aim** To perform a descriptive study of the drinking behaviour (amounts, types, sources of alcohol consumed) preceding alcohol-affected presentations to Christchurch Hospital Emergency Department (ED).

**Methods** Over 336 hours in the ED, patients with recent alcohol consumption or alcohol-related attendances were identified, classified as alcohol-affected or alcohol-unaffected, and invited to consent to answering questions on types, amounts and sources of alcohol consumed in the drinking session preceding or implicated in their ED attendance. Demographic information and level of intoxication were also recorded. Data were summarised descriptively.

**Results** Alcohol-affected patients were more frequently young (16–25 years) and male. Median alcohol consumption was 14 (range 1 to 71) standard drinks. Beer was the most popular beverage (34%), but spirits (23%), ready-to-drink mixes (21%) and wine (20%) were also popular. Liquor stores (45%) were the most popular source of alcohol, followed by on-licence premises (25%), and supermarkets (21%). The popularity of different types of beverages and their source varied according to patient age and gender.

**Conclusions** Consumption of large amounts, as well as allegedly ‘safe’ amounts, of a range of alcoholic beverages, most commonly from an off-licence source, contributed to alcohol-affected presentations to the ED. Beverage and source popularity varied by age and gender.

Alcohol is an important part of social life for many New Zealanders, but it also causes a great deal of harm. Alcohol is responsible for over 1,000 deaths and 12,000 years of life lost each year in New Zealand, has known contribution to around 60 medical conditions, and is implicated in violent offending and other social ills.

The harms that arise from alcohol relate to the pattern (amount and frequency) of consumption, which are partially shaped by the nation’s sociopolitical environment. Deregulation since 1989 has resulted in cheap, readily-available alcohol, allowing a culture of excessive use, with over 25% of NZ adults drinking hazardedly. The Sale and Supply of Alcohol Act 2012 was passed to moderate the nation’s drinking behaviours and limit the harm caused by alcohol. Among other measures, it gave Territorial Authorities the power to develop Local Alcohol Policies (LAPs) to control licensing and restrict access to and the availability of alcohol.
The Christchurch City Council’s proposed LAP includes restrictions to trading hours, and is due to be implemented in 2014 or later. To assess the impact of the LAP on drinking behaviours, it was considered necessary to characterise drinking behaviours before, and at some time after, its introduction. This study is part of the ‘before’ component of such an assessment.

The setting of Christchurch Hospital Emergency Department (ED) allowed us to assess drinking behaviours that resulted in health-related harms and intoxication. We are aware of the existence of overseas studies looking at how alcohol-related ED admissions change with alcohol-related law changes,6–9 and New Zealand studies on the drinking behaviour of the general population.10–12

However, international and national evidence on the types, amounts and sources of alcohol consumed preceding ED admissions is sparse. We aimed to find the age and gender of alcohol-affected patients, their pattern of consumption (amount and type of alcohol consumed in their last/implicated drinking session), and their source of alcohol.

**Methods**

Data were collected by two investigators (MD and RS) over a sample time equivalent to two full weeks (24 hours/day, seven days/week) in the ED. All triaged patients were asked whether they had consumed alcohol in the 4 hours prior to their time of triage, and whether they thought alcohol contributed to their ED attendance.

Clinical judgement of staff (doctors and nurses involved in the patient’s care) also helped inform the latter question. Patients were eligible for the study if they had positive answers to either or both of these questions. Eligible patients had demographic data (age and gender) and their observed level of intoxication – outwardly sober (sober) or outwardly not sober (not sober) – noted (using an ‘intoxication assessment tool’)13 on a ‘pre-consent form’. They were invited to answer questions about their most recent or implicated drinking session to allow completion of a ‘post-consent form’. Eligible patients under 16 years of age could only participate if consent was obtained from an accompanying parent/guardian.

Consenting patients were asked about the type, amount and purchase place of all alcoholic beverages they had consumed in their last or implicated drinking session. Recall of volumes and strengths of the alcohol consumed was encouraged to allow conversion to standard drink units by use of a conversion formula, or a ‘standard drinks guide’14 (where one standard drink equates to 10g of ethanol).

If the drinking session that contributed to the ED presentation was not the patient’s most recent drinking session (for example, if they had injured themselves the previous day during a prior drinking session), then alcohol consumption in the former (implicated) session was recorded.

Patients who could not be interviewed and who had no family or friends available to assist with the interview were tracked retrospectively using notes and by consulting clinical staff involved in their care. They were recorded as ‘missed patients’.

Cases included retrospectively with suspicion of alcohol involvement were noted as ‘unknown’. Any sober patients for whom it was unclear if alcohol contributed to their presentation were also classified as ‘unknown.’ By recording these patients as ‘unknown’ the number of patients recorded as ‘alcohol affected’ would be underestimated, but the possible extent of the underestimation would be defined.

Consenting patients were divided into two groups: those who were ‘alcohol-affected’ (were presenting to ED because of an alcohol-contributed problem and/or were not outwardly sober at ED), and those who were ‘alcohol-unaffected’ (consumed alcohol in 4 hours prior to triage, but appeared outwardly sober at ED and not presenting for an alcohol-contributed problem).

Data were summarised descriptively within Microsoft Excel software, version 2007 (Microsoft, Redmond, WA) using counts and percentages for categorical variables, and medians, interquartile ranges and ranges for continuous variables.

Ethical approval was granted by the local Health Research Council Regional Ethics Committee.
## Results

**Patient participation**—Figure 1 shows the process of patient inclusion and exclusion. Over the study period, all 3,619 patients who presented to the ED were screened; 297 were eligible for the study and had pre-consent forms completed. Of these, 29 were excluded as they fell into the ‘unknown’ category; one more was a repeat presentation. Of the remaining 267 patients, 169 (63%) gave informed consent to be questioned about their drinking session. Reasons for non-consent are shown in Table 1.

Of the 98 non-consenters, 20 (20%) were sober, 66 (67%) were not sober. An additional five patients (5%) were not sober, but it was unclear what proportion of this was due to alcohol and what proportion due to other factors (such as drug use, psychosis, or delirium). The level of intoxication of 23 patients (23%) was unknown (in most cases because they were retrospectively tracked).

A further six presentations were excluded due to consumption of large amounts of methylated spirits, which could otherwise result in over-estimation of binge-drinking behaviours. Of the remaining 163 presentations, 113 (69.3% or 3.1% of all presentations) were ‘alcohol-affected’ (alcohol contributed to presenting complaint and/or patient was not sober), and 50 (30.7%) were ‘alcohol-unaffected’ (had consumed alcohol but were sober and presenting with a complaint to which alcohol did not contribute).

### Figure 1. Inclusion and exclusion of patients
Table 1. Consent and primary reason for non-consent/exclusion (n=267)

<table>
<thead>
<tr>
<th>Consent/primary reason for non-consent</th>
<th>Number of eligible patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consented</td>
<td>169 (63%)</td>
</tr>
<tr>
<td>Consented but excluded due to methylated spirit consumption</td>
<td>6 (2%)</td>
</tr>
<tr>
<td>Not approached for consent</td>
<td>85 (32%)</td>
</tr>
<tr>
<td>Inappropriate to interview</td>
<td>38 (14%)</td>
</tr>
<tr>
<td>Missed patient</td>
<td>27 (10%)</td>
</tr>
<tr>
<td>Aggressive/uncooperative/unsafe to approach</td>
<td>14 (5%)</td>
</tr>
<tr>
<td>No recent alcohol consumption, chronic-use associated</td>
<td>4 (2%)</td>
</tr>
<tr>
<td>Presenting due to someone else’s alcohol consumption</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Approached but did not give consent</td>
<td>13 (5%)</td>
</tr>
</tbody>
</table>

Age and gender profile—The age and gender profile of alcohol-affected patients is shown in Figure 2. It shows a bimodal distribution; 45 of the 113 (40%) patients were 16–25 year olds, and there is a smaller peak in 41–55 year olds.

The youngest patient was 14 years old, and the oldest was 87 years old. Males accounted for 72 (64%) of alcohol-affected patients, compared to 41 (36%) females, making the male to female ratio 1.8:1.

Figure 2. Alcohol-affected patients by age and gender (n=113)

Amount consumed by alcohol-affected vs. alcohol-unaffected patients—The median number of standard drinks consumed in the last/implicated drinking session by alcohol-affected patients was 14.0, the minimum 1.0, the maximum 70.6, and the interquartile range 7.5–20.7.
In comparison, the median number of standard drinks consumed by alcohol-unaffected patients was 2.5, the minimum 0.5, the maximum 15.2, and the interquartile range 1.8–4.0 (Figure 3).

Figure 3. Number of standard drinks consumed by alcohol-unaffected vs alcohol-affected patients (n=163)

Binge drinking by type of presentation—The number of patients whose last/implicated drinking session was a binge, as defined by the Health Promotion Agency (seven or more standard drinks), was 91 of 113 (81%) for alcohol-affected presentations, and 5 of 50 (10%) for alcohol-unaffected presentations.

Type of alcohol consumed by alcohol-affected patients—Beer was the most common of the beverage types consumed (34%), followed by spirits (23%), ready-to-drinks (RTDs; 21%), and wine (20%; Table 2).
Table 2. Number of standard drinks consumed collectively by the alcohol-affected patient group by type, amount and source of alcohol (n=113)

<table>
<thead>
<tr>
<th>Alcoholic beverage</th>
<th>NUMBER OF STANDARD DRINKS CONSUMED</th>
<th>Total on-licence</th>
<th>Total off-licence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Liquor store</td>
<td>Off-licence source</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7%)</td>
<td>(7%)</td>
</tr>
<tr>
<td>Beer</td>
<td>253 (14%)</td>
<td>131</td>
<td>125 (7%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7%)</td>
<td>(7%)</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spirits</td>
<td>50 (3%)</td>
<td>319 (18%)</td>
<td>N/A**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(18%)</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTDs†</td>
<td>77 (4%)</td>
<td>295 (17%)</td>
<td>N/A**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(17%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wine</td>
<td>48 (3%)</td>
<td>32 (2%)</td>
<td>245 (14%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2%)</td>
<td>(14%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy mixers††</td>
<td>9 (1%)</td>
<td>26 (2%)</td>
<td>N/A**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2%)</td>
<td></td>
</tr>
<tr>
<td>All types of alcohol</td>
<td>437 (25%)</td>
<td>803 (45%)</td>
<td>370 (21%)</td>
</tr>
</tbody>
</table>

* “Untaxed” alcohol consists of duty-free and home-brewed alcohol.
** Spirits and RTDs are not available for purchase at supermarkets.
†“RTDs” are ready-to-drinks (pre-mixed spirits and mixers).
††“Energy mixers” consist of spirits and an “energy drink” mixer.

**Beer consumed by alcohol-affected patients**—Beer was popular among males of a range of ages, and had noteworthy consumption among 31–55 year-old females (Figure 4). Off-licence consumption of beer (58% of total beer) was slightly greater than on-licence (42% of total beer). Comparable amounts of beer were sourced from supermarkets and liquor stores (21% and 22% of total beer, respectively; Table 2).

Figure 4. Beer consumed by alcohol-affected patients (n=113)
Spirits consumed by alcohol-affected patients—Spirits were most popular among young males (21–25 years) and very young females (16–20 years; Figure 5). Like RTDs, the majority of spirits (77%) came from off-licence sources (namely liquor stores; Table 2). Untaxed (duty-free or home-brewed) spirits comprised 11% of the total spirits consumed (Table 2).

Figure 5. Spirits consumed by alcohol-affected patients (n=113)

[Graph showing age distribution of spirits consumption]

RTDs consumed by alcohol-affected patients—Ready-to-drinks (RTDs) are pre-mixed spirit-based beverages. RTDs were particularly popular among young people (<30 years; Figure 6). The majority (79%) came from liquor stores (Table 2).
Wine consumed by alcohol-affected patients—Wine was notably more popular among females than males (Figure 7). The majority of wine was sourced off-licence (87%). Supermarkets were the most popular source of wine, accounting for 80% of off-licence and 69% of on- and off-licence wine. In comparison, liquor stores accounted for 10% of off-licence and 9% of on- and off-licence wine consumed by alcohol-affected patients (Table 2).

On-licence sources of alcohol consumed by alcohol-affected patients—78 alcohol-affected patients (69%) had consumed alcohol exclusively from off-licence sources, 21 patients (19%) from both on- and off-licence sources, and 14 patients (12%) exclusively from licensed premises. Hence, 88% of patients had consumed off-licence alcohol. Overall, 436 standard drinks (25%) came from on-licence premises, while 1336 standard drinks (75%) came from off-licence premises (Table 2).

Alcohol consumption at on-licence venues had greatest popularity among young males (21–25 years; Figure 8). Bars and pubs were the most frequented on-licence venues. Beer was the most popular on-licence beverage, comprising 58% of all on-licence standard drinks (Table 2).
Figure 7. Wine consumed by alcohol-affected patients (n=113)

Figure 8: On-licence alcohol consumed by alcohol-affected patients (n=113)
Liquor store-sourced alcohol consumed by alcohol-affected patients—Liquor stores were a popular source across most age groups, with greatest use from young males (16–30 years) and young females (16–20 years; Figure 9). Almost half the standard drinks consumed by alcohol-affected patients were purchased from liquor stores, and most of this was comprised of spirits (40% of alcohol from liquor store) and RTDs (37% of alcohol from liquor store; Table 2).

Figure 9. Liquor store-sourced alcohol consumed by alcohol-affected patients (n=113)

Supermarket-sourced alcohol consumed by alcohol-affected patients—31 to 35 year-old females were the greatest consumers of supermarket-sourced alcohol (Figure 10). Beer and wine are the only major alcoholic beverages that supermarkets are permitted to sell.

Supermarkets accounted for 21% of the standard drinks of alcohol consumed by alcohol-affected patients. Of this, two-thirds was wine (69% of all wine) and one-third beer (21% of all beer; Table 2).
Figure 10. Supermarket-sourced alcohol consumed by alcohol-affected patients (n=113)

Discussion

Many alcohol-affected patients drank hazardously—People with alcohol-affected presentations had relatively high levels of alcohol consumption; for the most part it was well into the range of binge drinking.

Consumption of more than four standard drinks in one session doubles the risk of injury within the following 6 hours and the risk increases with further consumption.\textsuperscript{15}

To reduce the risk of immediate injury, the Health Promotion Agency recommends that women consume no more than four standard drinks and men no more than five in any single drinking session.\textsuperscript{16}

Notably, a small proportion of alcohol-affected patients had consumed four or fewer standard drinks prior to presentation, suggesting that alcohol may have intoxicating or harmful short-term effects for some individuals even when consumed within recommended “safe” levels.

Youth were over-represented and drank a lot (of a range of beverages, most commonly liquor store-sourced) as a group—People aged 16–25 were over-represented in the study. They comprised 40% of the alcohol-affected group, compared to the general population of Christchurch, in which 15–24 year-olds make up approximately 15% of the population.\textsuperscript{17}

Large amounts of a range of alcoholic beverages were consumed by the young alcohol-affected patient group (most often from a liquor store)—this might be due to
the large number of alcohol-affected patients in that age category, and/or due to consumption of large amounts of alcohol by the individuals in these groups.

Other studies have found that young adults aged 18 to 24 are twice as likely as the general drinking population to drink large amounts of alcohol at least once a week (34% vs. 15%),\textsuperscript{18} tend to have greater per occasion alcohol consumption, and also experience more harm per standard drink compared with older drinkers.\textsuperscript{19} Their over-representation in this study is therefore unsurprising.

There is also a second, smaller peak in middle-aged drinkers (41–55 years; Figure 2), which we are not aware of in other NZ literature.

**Males were over-represented**—There were considerably more males with alcohol-affected presentations compared with females. This is consistent with previous evidence showing males are more likely to be drinkers than females, drink more frequently, and tend to drink more heavily when they do drink.\textsuperscript{18} It also reflects a global pattern, and Rehm and Room (2009) noted that globally 21.6% of injuries to males were alcohol-related, compared with 7.7% to females.\textsuperscript{20}

**Females aged 16 to 20 outnumbered their male counterparts and had high consumption of spirits and wine**—There was, however, a female predominance in two age brackets: 16–20 year-olds and 41–45 year-olds. The 16–20 year age bracket is of interest, as it was the second-highest 5-year age bracket represented (after 21 to 25 year-olds; Figure 2).

According to Rankine et al (2013), the proportion of 16–17 year old females consuming eight or more standard drinks in a session has tripled between 1995 and 2011.\textsuperscript{21} The 2011/2012 NZ Health Survey found that among past-year drinkers, the proportion of men who had consumed hazardous levels of alcohol in the last year significantly outnumbered women in all age categories except for the 15–17 year old age category.\textsuperscript{22} In this age group, the difference between males and females was not found to be statistically significant.

The large numbers of 16–20 year old females in our study could perhaps be a result of a similar phenomenon, coupled with the possibility that young female drinkers were more likely to come to harm and require ED attendance compared to their male counterparts because of a lower alcohol tolerance.

Alcohol-affected females aged 16–20 were amongst the highest consumers of spirits and wine; liquor stores were the most common source of alcohol consumed by this group, with smaller contributions from supermarkets and on-licence premises.

**A minority of alcohol was consumed at on-licences premises, predominantly by young males drinking beer**—Young males were the biggest consumers of on-licence alcohol in our study. The Alcohol Use in New Zealand 2004 report states that people aged 18–24 were significantly more likely than most other age groups to have consumed large amounts of alcohol at pubs, hotels, taverns and/or nightclubs, and that males were significantly more likely to have consumed large amounts of alcohol at pubs, hotels and/or taverns compared with females (by age-standardised analysis).\textsuperscript{18}

Beer was the most popular on-licence alcoholic beverage, and is the most popular alcoholic beverage in New Zealand.\textsuperscript{3}
The majority of alcohol was consumed off-licence—Off-licence alcohol consumption was more popular than on-licence among our alcohol-affected study participants, with 75% of the alcohol being from off-licence sources.

A common and worrying phenomenon is that of “pre-loading”, where there is significant consumption of off-licence alcohol prior to patronising on-licence settings. A major reason pre-loading occurs is because of the significant price difference between on- and (cheaper) off-licence alcohol.

In our study, 19% of alcohol-affected patients had consumed both on- and off-licence alcohol, while 69% had only off-licence alcohol. The Alcohol Use in New Zealand 2004 report states that in the previous 12 months, 47% of drinkers had consumed large amounts of alcohol in their own home, compared with 16% having consumed large amounts of alcohol at a pub, hotel and/or tavern.18

The popularity of off-licence alcohol has increased over time—it was estimated that 59% of all alcohol was consumed off-licence prior to deregulation (which occurred from 1989),23 compared to 68% in 2007–8.24

Property damage from earthquakes in Christchurch in 2010 and 2011, reduced access to on-licence premises and forced closure of parts of the central business district, may partially account for the dominance of off-licence drinking observed in our study.

The majority of wine was sourced from supermarkets—It is interesting to note that for the beverages which could be sold at either supermarkets or liquor stores (namely, wine and beer), comparable amounts of beer came from the two sources. In contrast, the vast majority of wine came from supermarkets, with very little contribution from liquor stores.

The justification for the introduction of wine into supermarkets was to foster a “wet” drinking culture in NZ, where regular consumption of small amounts of wine (for example, with meals) was the norm.3 This was intended to replace our traditional “dry” culture of less frequent but greater per occasion consumption, which is associated with greater harm.10

Since its introduction to supermarkets in 1989, wine consumption has increased from 25 bottles, to 37 bottles per capita (15 years plus) in 2008.3 Wall and Casswell (2012) commented that the step-change increase in wine consumption following its introduction to supermarkets might have been further amplified by increasing affordability of wine as a result of supermarkets’ more aggressive pricing policies.25

The Law Commission (2009) noted that the introduction of wine to supermarkets failed to dissipate our heavy drinking culture,3 and our study suggests that supermarket-sourced alcohol makes a noteworthy contribution to harm.

Additionally, the purchasing power of the New Zealand’s two primary supermarket chains and their growing market share has been identified as a key factor in the development of the highly competitive off-premise liquor retail market.3

Study limitations—This study had a number of limitations. Firstly, the timing of the study might not represent drinking behaviours throughout the year (for example, alcohol consumption would be expected to rise over the lead-up to the Christmas/New Year period).
A number of events traditionally involving heavy alcohol consumption (such as the New Zealand Trotting Cup, Christchurch Show Day and the Christchurch Wine and Food Festival) fell within the sampling period, so recorded drinking behaviour might not be typical. However, these accounted for only a small portion of the two week sample time.

Secondly, 66% of those not consenting were not sober. The people with the highest levels of intoxication were unable to consent (due to, for example; critical state, safety concerns etc.), and a high level of intoxication is associated with memory-loss, which limits patients’ ability to answer questions about their drinking accurately. The sampling bias due to the most intoxicated being unable to contribute and the recall bias of those with impaired memory from intoxication, have most likely led to underestimation of the true level of drinking.

Thirdly, while most patients seemed happy to answer questions about their drinking, there might have been a response bias relating to stigma, or conversely pride, associated with alcohol consumption, leading to an under- or over-estimation of alcohol consumption. Fourthly, the time of observation of patients’ level of intoxication varied according to waiting room times and the workload within the ED. Some patients might have sobered up in this time and subsequently been categorised inappropriately.

Finally, 29 patients who were missed and retrospectively tracked through notes might or might not have been eligible to consent. These patients were not included in the study. Therefore, there has probably been an underestimation of the number of alcohol-affected patients.

Even with these limitations, this study establishes a baseline with which the effects of any policy changes can be compared in the future.

**Competing interests:** Nil.

**Author information:** Manidipa Das, Medical Student, University of Otago Christchurch; Rebecca Stewart, Medical Student, University of Otago Christchurch; Michael Ardagh, Professor of Emergency Medicine, University of Otago Christchurch; Stuart Dodd, Alcohol Harm Minimisation Co-ordinator, Community and Public Health, Canterbury District Health Board (CDHB), Christchurch; Nadia V Bartholomew, Public Health Registrar, CDHB at the time of the study, now Child and Youth Programme Manager, Pegasus Health, Christchurch; Scott Pearson, Clinical Director, Emergency Department, Christchurch Public Hospital; Ruth Spearing, Chair of Alcohol Harm Minimisation Advisory Group and Deputy Chair of Clinical Board, CDHB, Christchurch; Tracey Williams, Associate Clinical Nurse Manager, Emergency Department, Christchurch Public Hospital, Christchurch; Martin Than, Emergency Physician, Emergency Department, Christchurch Public Hospital, Christchurch

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Correspondence: Professor Michael Ardagh, University of Otago Christchurch, Emergency Department, Christchurch Hospital, Private Bag 4710, Christchurch, New Zealand. Michael.Ardagh@cdhb.health.nz

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http://www.who.int/substance_abuse/msbalcinuries.pdf


