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# Correlates and motives of pre-drinking with intoxication and

# harm around licensed venues in two cities

Running Head: Pre-drinking, harm, motives and trading hours

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### **Conflict of Interest**

The authors declare no conflict of interest.

# Abstract

Introduction and Aims: The study investigates the prevalence of pre-drinking culture in the night-time economy (NTE) and its impact upon intoxication and alcohol-related harm and violence experienced by patrons. Design and Methods: Cross-sectional surveys were conducted in and around licensed venues in Newcastle (NSW) and Geelong (Victoria) during peak trading hours (typically 9pm-1am). Participants completed a five minute structured interview which targeted: demographics, past and planned movements on the survey night, safety/experience of harm, and patron intoxication. 3949 people agreed to be interviewed, a response rate of 90.7%. Around half (54.9%) of interviewees were male and mean age was 24.4 years (SD=5.8). Results: 66.8% of participants reported pre-drinking prior to attending licensed venues. On a 1-10 scale measuring self-rated intoxication, pre-drinkers scored significantly higher compared to non pre-drinkers (p<.001). Compared to non-pre-drinkers, patrons who had consumed 6-10 standard pre-drinks were 1.5 times more likely to be involved in a violent incident in the past 12 months (OR=1.50, 95%CI 1.03-2.19, p=.037) increasing to 1.8 times more likely for patrons who had 11-15 drinks (OR=1.80, 95%CI 1.04-3.11 *p*=.036). Pre-drinking was also associated with both self-rated and observer-rated intoxication, as well as increased probability of illicit drug use. Amongst pre-drinkers,

price was the most commonly reported motive for pre-drinking (51.8%). **Discussion and Conclusions:** 'Pre-drinking' was normal behaviour in the current sample and contributes significantly to the burden of harm and intoxication in the NTE. Price disparity between packaged vs. venue liquor is a key motivator for pre-drinking.

# **Keywords (MeSH)**

Alcoholic Beverages, Alcoholic Intoxication, Alcohol Drinking, Violence, Aggression

# Introduction

Alcohol-related harm in and around licensed venues constitutes a substantial drain on police, community and health resources, and remains a significant concern to community members. This includes crime, violence, treatment costs, loss of productivity and premature death, and has been shown to contribute significantly to levels of assaults, offensive behaviour in the street, fatal road accidents, and road injuries requiring hospitalization (1-3). Recently, a number of studies in the US and UK have addressed pre-loading (or 'pre-gaming', 'front-loading'; planned heavy drinking prior to going to a social event) and its association with greater alcohol-related risks, and higher intoxication and alcohol consumption (4). This paper builds upon international research by investigating the associations between pre-drinking, levels of alcohol consumption, and experience of harm in a large Australian nightlife sample from two cities; Newcastle (NSW) and Geelong (Victoria). These cities were chosen because of their very similar demographics, but very different licensing regimes (5). Newcastle had strict measures in place, primarily including licensed venues being shut at 3:30am and a one-way door (or lockout) at 1:30am (6, 7). On the other hand, Geelong venues were able to trade until 7am while a range of measures aimed at reducing harm such as an industry funded education campaign, ID scanners, CCTV and radio networks were in place (8, 9). The occurrence of different approaches in similar cities was seen as an opportunity to study the different characteristics of drinking cultures in these cities as well as assessing any impacts the interventions may have had on patron behaviour and levels of harm in the community (10). This paper aims to document the trends in these cities in relation to pre-drinking as well as explore any potential influences the licensing or other differences may have, within the framework of an opportunistic observation of a naturally occurring experiment.

### **Pre-drinking**

Pre-drinking has been identified as a risk factor for alcohol-related harm (11). Heavy drinking prior to going out has emerged as a common and celebrated practice among young adults around the world, and it has been proposed that pre-drinking is becoming increasingly intense and ritualized (12). In the US, pre-drinking studies have predominantly focussed upon college student samples where the behaviour has been linked to greater alcohol consumption and higher blood alcohol content (4). In the UK where student and nightlife cultures are a closer match to the Australian context (4), over half (57.6%) of patrons entering nightlife areas had consumed alcohol prior to entering licensed venues (13). Pre-drinkers were more likely to consume high (>20 units) amounts of alcohol in a session, and were at 2.5 times greater risk of being involved in a violent incident.

Wells et al. (11) suggest that apparent motivations for pre-drinking include: avoiding high priced drinks at commercial drinking establishments; to achieve drunkenness and enhance and extend the night out; and socializing with friends before going out. However, they also point to a small body of research across the globe and the need for greater insight into the motivators for pre-drinking, as well as the harms associated with pre-drinking and the reasons why pre-drinking is problematic. On an individual level, pre-drinking can be motivated by issues of cost disparities between packaged and on-premises liquor, seeking to increase intoxication before entering nightlife areas, or simply socializing before entering nightlife areas (1, 4, 11, 14). It has been contended that licensed venues may not be providing a space conducive to conversation, dining and socialising which some patrons are seeking, leading predrinking off-premises where such activities are possible (4). Others have concluded that consumer attraction to pre-drinking may stem from the possibility of rapid consumption of alcohol in home environments, free from constraints of responsible service practices or waiting in bar lines (13). This type of consumption then interacts with situational variables, such as street or transport safety as people who are

intoxicated migrate to and from licensed venues. Impaired judgement and higher levels of impulsiveness now permeate the entire time they are away from private environments (15). On top of this, another key environmental factor is the use of illicit drugs which is been found to increase intoxication levels (16-18) and the likelihood of patrons experiencing harm (17), however as yet it is unclear the extent to which illicit drug use co-occurs with pre-drinking behaviour and subsequent intoxication and experience of harms. Given this international body of research, examination of predrinking behaviour in unique Australian policy environments is warranted, and allows for comparison of differences between mandatory and voluntary policy implementation in two otherwise comparable regional Australian cities. Finally, and most importantly, there is no research to date documenting interventions which can successfully address pre-drinking behaviour without encouraging higher levels of drinking overall (11).

The aims of this study are to document levels of pre-drinking in a sample of Australian licensed-venue patrons across the 2 sites, and its association and interaction with intoxication, illicit drug use, alcohol-related harms and violence experienced.

# Methodology

### **Design and setting**

A cross-sectional study was conducted over an 18 month period, surveying patrons attending licensed venues in entertainment districts in two regional Australian cities: Geelong (Victoria) and Newcastle (New South Wales) (5).

### Geelong

Geelong is a city of approximately 220,000 people located 70 kilometres from Melbourne, it is both a regional centre and a suburb of Melbourne. The central Geelong suburb has around 150 liquor licenses (156 in March 2009), with 29 general (hotel). At the time of writing this report, 12 venues had licenses to trade after 1am and two venues continued to trade normally until 7am.

#### Newcastle

The Greater Newcastle Metropolitan area is located approximately 160km north of Sydney, in New South Wales, and is the second most populated area in the state. The area has an estimated population of 550,000 people (2006). The Newcastle Metropolitan area has over 1,000 liquor licenses, with 170 of these being hotel licenses. Since 2008, all premises in the Newcastle entertainment precinct are prohibited from trading later than 3.30am, and no patrons are allowed to enter venues after 1.30am (6, 19). Six hotels in the Hamilton entertainment precinct were subjected to similar conditions in 2010, with the exception of the reduced trading hours.

## Premises

Venues in both cities were approached with the support of the local association representatives to participate in the study. All venues trading beyond midnight in the Geelong, Newcastle and Hamilton main entertainment precincts were approached. The majority of venues in the entertainment precincts of Geelong (11/13 venues) and Newcastle/Hamilton (11/17) agreed to patrons being interviewed.

All surveys were completed on busy nights of the week (typically Friday and Saturday nights) during peak trading hours (typically 9pm to 1am). Surveys were conducted fortnightly depending on weather. Interviews were also conducted at later times (until 3.30am) in Geelong on at least 2 occasions to reflect the later trading hours.

### Data collection procedure

A team of 4 or more trained researchers attended up to 6 venues on allocated evenings. Venues were selected based on ensuring all venues were covered equally during the study period. An identifiable interview location was recorded for 3427

respondents (97.4%). Surveys were conducted between 20 March 2010 and 13-Jun-2011. All data was collected using Personal Digital Assistants (PDAs) or iPhones/iPods (see (5) for further details).

The research team approached every third patron in a queue or seating area, briefly explained the survey and invited them to participate in a 5 minute survey. A businesssized information card was provided to each respondent, containing a study web address and contact details for further information or withdrawal of consent. Survey data were directly entered into PDA Palm Pilots or iPhones.

#### Measures

The Patron survey consisted of 7 domains. Demographics: First name, year of birth, postcode of residence and occupation. Past and planned movements on the survey night: venue types attended that night, amount of money spent, main motivation for going out, how they are planning to get home. Normal entertainment patterns in the prior 12 months: Frequency of attendance at licensed venues anywhere, frequency of intoxication, frequency of service refusal. *Safety*: Perceptions of: safety of current venue; measures they use to keep safe; frequency of police presence and security/ID checks. Experience of harm: Witnessed/involved in aggressive or violent incident in the past 12 months and intoxication levels and incident setting. Policy attitudes: attitudes regarding the effectiveness of interventions being implemented at licensed venues located at the research sites. Patron intoxication: self-rated intoxication (0-10, 10 highest), amount of alcohol consumed, types of alcohol consumed, amount of alcohol consumed before visiting a licensed venue that night (pre-drinking), motivation for predrinking amongst respondents who reported predrinking, refusal of service, other substance use including illicit substances. Patron intoxication was also independently rated by the interviewer based upon visible symptoms of intoxication. Intoxication signs noted were: a) Loss of coordination, b) Slurred speech, c) Spilling drinks, d) Staggering or falling over, or e)

Glassy/red eyes. It is worth noting that even a single sign of intoxication could be associated with higher levels of intoxication (20).

Other survey details that were also recorded included: location of the survey, time, date and the interviewer's name. If the interview was ended early, the reason for this was recorded.

Participant responses for main reason for going out, frequency of going out in past 12 months, venue types visited, type of alcohol consumed, level of predrinking, motivation for predrinking, illicit drug use, and involvement or witnessing aggression in the past 12 months were recorded and coded categorically. Illicit substance use was dichotomously coded for analysis, and was recorded as positive if participants reported any illicit substance use at the time of interview. Harm was operationalised as involvement in violence in the previous 12 months. Categorical response options are shown in Tables 1 and 2.

### Analysis

Initially, univariate analyses (chi-square tests and Mann-Whitney tests, as appropriate) were conducted to compare demographic and alcohol consumption behaviours of night-time economy patrons interviewed in Geelong and Newcastle. A second set of univariate analyses examined the associations between patron characteristics and involvement in violence. Subsequently, the predictors of involvement in violence in the past 12 months were examined with a random intercept multilevel hierarchical logistic regression analysis, with observations clustered within interview locations. Variables were entered into the model in a sequence of pre-defined steps (see supplementary table). Statistical significance of each sets was assessed with likelihood ratio tests. Potential indirect effects of pre-drinking on involvement in violence through increased intoxication and illicit drug use was further tested using multilevel path analysis (21). A multilevel approach was employed as observations were clustered within interview locations with different alcohol-related policies and contexts. The path model specified violence involvement, self-rated intoxication, observer rated intoxication, and illicit drug use as the dependent variables and level of pre-drinking as main predictor. Remaining variables were included in the model as covariates. To facilitate interpretation of indirect effects, all dependent variables in path analysis were modelled as ordered categorical variables (22), with probit coefficients for model paths derived using Bayes estimator. Probit coefficients represent z-scores for the effects of predictors on the probabilities that the response variable equals one and were subsequently converted intro probabilities (23). Statistical significance of indirect effects was assessed with 95% bootstrap confidence intervals.

Prior to multivariate analysis, the associations between predictors were tested for potential collinearity, with variance inflation factor (VIF) values <3.0 considered acceptable. Socialising and special occasion as main reasons for going out showed co-dependency, with VIF values 3.2 and 3.1, respectively. Following the removal of socialising, VIF values for the remaining variables were 2.9 or lower.

Data were analysed using SAS version 9.3 (Copyright © 2013, SAS Institute Inc., Cary, NC, USA). In all analyses, *p*-values <.05 were interpreted as statistically significant. Path modelling was undertaken with Mplus version 7.11 (23). Missing data ranged from 0.1% for pre-drinking amount to 30.3% for time of interview. Missing data were assumed to be missing at random and were imputed using expectation-maximisation algorithm.

# Results

### **Sample Characteristics**

The interviewers approached a total of 4374 individuals (Geelong: 2051; Newcastle: 2323), of whom 3949 agreed to be interviewed, a response rate of 90.7% (Geelong: 92.5%; Newcastle: 89.1%). Of these, 3518 (89.1%) responded to pre-drinking items (see Table 1).

#### INSERT TABLE 1 APPROX HERE.

Approximately half (54.9%) of the participants were male and median age was 23 years. Two thirds (66.8%) reported consuming alcohol before attending licensed venues on that night. The majority (73.0%) of participants reported a self-rated intoxication level of 5 out of 10 or lower. Over a third of the sample (38.5%) were noted by interviewers as showing physical signs of intoxication, with 22.7% recorded as showing more than one visible indicator. Fifteen percent (15.3%) had been personally involved in a physical fight in the entertainment precinct in the previous 12 months (Table 1).

The Newcastle sample was one year older, on average (p<.001), had 2% more males (p<.001), and were between 1 and 6% more likely to report going out more than once a week over the past 12 months (p<.001). While there were no significant differences in frequency of involvement in violence (p=.728) or self-rated intoxication (p=.221) between Newcastle and Geelong, both the number of observed intoxication symptoms (Geelong: M=0.98, SD=3.85; Newcastle: M=0.65, SD=2.55, p<.001) and self-report of witnessing an episode of violence in the past 12 months (Geelong: 62.9%; Newcastle: 58.7%, p=.012) were significantly higher in Geelong than Newcastle. Frequency and level of pre-drinking (p<.001) and illicit drug use (p=.011) were also significantly higher in Geelong than in Newcastle.

#### Motivation for pre drinking

Amongst participants who reported pre-drinking during the current session and who also responded to pre-drinking motive items (*n*=2151), price was the most commonly reported motivator for pre-drinking with 51.8% of pre-drinkers reporting price motivations as their primary reason for pre-drinking. Further, 19.4% of pre-drinkers reported pre-drinking as a chance to catch up with friends, while 9.1% cited convenience motives and 1.3% sated that they didn't want to go out to licensed venues too early. The remaining 18.3% of pre-drinkers cited "other" motives.

#### Association of pre drinking with Reported Prior Experience of violence

Univariate associations between involvement in violence and patrons' demographic and alcohol-related behaviours are summarised in Table 2. Results of building the multivariate model can be found in supplementary on-line materials. The results of the final logistic regression model explaining violence involvement are summarised in Table 3. In the final model, higher odds of involvement in violence were associated with younger age (p<.001), male sex (p<.001), higher frequency of going out over the past 12 months (p=.001), going out with an intention of getting drunk (p=.004) or finding a partner (p=.008), and illicit drug use (p=.004). Those who consumed between 6 and 15 pre-drinks had higher odds of violence involvement than those who did not pre-drink, controlling for other variables in the model (6-10 pre-drinks: OR=1.50, 95% CI 1.03-2.19; 11-15 pre-drinks: OR=1.80, 95% CI 1.04-3.11).

**Indirect effects**. Results of the path analysis are summarised in Table 4. Pre drinking was associated with higher levels of self-rated (z=0.40, 95% CI 0.32-0.47) and observer-rated (z=0.36, 95% CI 0.27-0.44) intoxication and higher probability of illicit drug (z=0.15, 95% CI 0.01-0.29). The estimated probability of being involved in violence in the past 12 months for a person who did not pre-drink was 0.69% controlling for other predictors in the model. Exploratory mediated path analyses revealed an indirect effect of pre-drinking on being involved in violence through observed intoxication and

illicit drug use was significant (z=0.01, 95% CI 0.01-0.03). The indirect effect of predrinking on violence increased the baseline probability of violence involvement from 0.69% to 0.71% for those who consumed 1-5 pre-drinks, and to 0.8% for 15+ predrinks, over and above the effects of other predictors in the model. A 15.9% increase overall.

**INSERT TABLE 2, 3 and 4 APPROX HERE.** 

# Discussion

The findings of this study demonstrate that pre-drinking was common across the two sites, in line with previous international research findings. Two thirds (66.8%) of the sample reported pre-drinking prior to attending NTE's, slightly higher than previous reports of 55-60% from the UK (13) and 64% from the US (24).

### Pre drinking and violence

Pre-drinking was strongly associated with having a recent prior experience of violence. Patrons who consumed alcohol before attending licensed venues were up to 1.8 times as likely to report being involved in a violent incident in the past 12 months. This is consistent with previous UK research (13) showing that risk of harm increases with number of pre-drinks consumed. Pre-drinking has been identified as one of the major impediments to responsible service of alcohol and has also been identified as major predictors of subsequent intoxication and an increased likelihood of experiencing violence (13, 24). Our modelling extends prior research by using path analysis to show that individuals who consumed more pre-drinks are more intoxicated at the time of interview and that higher levels of intoxication were associated with increased probability of illicit drug use, both of which increased individual's chances of being involved in violence.

The association between pre-drinking and prior experience of violence draws a link between drinking behaviour on one night and previous experience of violence. These findings do not provide a direct link between pre-drinking and violence on a specific night, but rather show that people who pre-drink are more likely to have experienced violence in the past. The question of whether a person had been pre-drinking on the night they experienced violence was not asked in this study, because the prevalence of violence is so low in the population and would require much larger numbers of participants (25). It is possible that people who report pre-drinking on the night they were interviewed do so regularly. Indeed, past behaviour is the best predictor of future behaviour. This relationship requires substantial further research. The association may be related to the way in which people consume their drinks, the characteristics of people who pre-drink, and/or the extension of the drinking period by drinking before going out. For example, people who consume for rapid intoxication may be more predisposed to being victims or perpetrators of violence. It is also possible that the association between pre-drinking and violence reflects a third common variable (such as socioeconomic status, concern for social honour or anxiety) (26).

#### Pre drinking and intoxication

Pre-drinking was robustly associated with greater levels of self-rated intoxication and observed symptoms of intoxication. The patron interviews showed substantial levels of intoxication, both self and interviewer rated in both sites. Patrons who had consumed more pre-drinks exhibited higher levels of self-reported intoxication and more visible symptoms of intoxication. This indicates that patrons who pre-drink greater quantities are consuming larger volumes of alcohol over the course of a night, rather than only replacing units of alcohol that would otherwise be purchased onpremises, supporting the findings of previous studies (4, 27). The apparent implications of pre-drinking are amplified by the finding that participants who had pre-drunk more were significantly more likely to have also consumed illicit substances, compounding intoxication symptoms(11). As a result, patrons are entering and leaving NED's in increasingly intoxicated states. This behaviour has repercussions for safe transport and navigation of impaired patrons to and from licensed premises (15, 24).

#### Pre-drinking patterns in the context of restricted trading hours

An interesting finding was the association of restricted trading hours with earlier cessation of heavy pre-drinking. While city of interview was not found to contribute to overall levels of violence, patrons in Newcastle reported similar or higher levels of predrinking earlier in the night, but heavy pre-drinking (11 or more drinks) had completely ceased by 1am because people were required to have entered a venue or be 'locked out'. Although further specific research is required, this association suggests that earlier trading hours may encourage people to start their night earlier, rather than staying at home for longer and drinking more before going out – as appears to be the case in Geelong. Reasons for pre-loading in Geelong suggest a more social culture around pre-loading where more people catch up with friends before going out. This finding may go some way to explaining the reductions in harm observed when trading hours are restricted (28).

#### **Reasons for pre-drinking**

While the findings show that social and convenience factors played a role in patron motivations for pre-drinking, it is clear that the price differential between packaged liquor and alcohol purchased in venues was by far the most common reason for preloading. This supports previous qualitative findings from research around the world (4, 11, 12, 14). Of the two thirds of the sample who indicated pre-drinking, most reported that they did this primarily because of price concerns. In this context, it is worth

considering that supermarkets and bottle shops currently sell heavy beer (i.e., full strength beer with alcohol content >3.5%) on special at around \$1 per standard drink and cheap vodka at around \$1.25 per standard drink

(http://www.danmurphys.com.au). By comparison, the median price for a heavy beer in the nightclubs studied was \$4.50.

However, a substantial minority also mentioned social reasons for pre-drinking, rather than price alone. This may reflect a number of separate trends and the combination of some factors. Price considerations may have initially been the prime motivator for people to drink at home with friends, but this may subsequently create a culture of greater bonding, the chance to 'loosen up' or less restricted drinking (including drinking games), although drinking games and pre-drinking have been found to be somewhat separate in prior research (12, 29). Other reasons, as also contended by previous authors, may include the structural realities of nightclubs and large, noisy and less intimate licensed venues meaning people prefer to catch up on talking to each other before entering environments where loud music limits the chance to talk (4, 12).

## Limitations

Although patron interviews have substantial benefits in terms of investigating people who visit NTE districts, certain limitations should be noted. As potential participants are in the middle of a night out, and are approached in public areas, interviews are necessarily kept short and are not suitable for in-depth questions or questions which probe private information. As a result, the interviews were not designed to collect detailed demographic information on education level, social class, employment status, or income which would allow reliable generalisation of the current findings beyond nightlife patrons in Newcastle and Geelong. Further, most people were intoxicated. It is difficult to ascertain what effect this may have on the veracity of their

responses. Interviewers ended obviously spurious interviews quickly, yet, it is worth noting that there is no evidence to suggest how intoxication influences people's truthfulness in this context, and there is no guarantee that a person who is sober is more truthful than someone who is intoxicated, indeed, the reverse may be true. Future qualitative research should address complex patron motivations and predictors for predrinking behaviour (e.g. 12).

# Conclusions

'Pre-drinking' was very normal behaviour in both cities of Geelong and Newcastle, although people reported less heavy pre-drinking in Newcastle. Patrons who pre-drank 6-15 pre-drinks were significantly more likely to have experienced violence in the past 12 months. Intoxication from pre-loading is extremely difficult for venues to manage and substantially harms their businesses, making it a barrier to effective harm reduction in the NTE. The consistent identification of price as a key motivator for pre-drinking indicates that policy initiatives are needed to address the price disparity between packaged liquor and licensed venue purchases.

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# Tables

Table 1 Characteristics (Median, IQR) and n (%) of Study Participants, Overall and by City where

#### Interview was Conducted

|  | Overall |         |     | eelong  | Nev  | Newcastle |                    |  |
|--|---------|---------|-----|---------|------|-----------|--------------------|--|
|  | N       | %       | Ν   | %       | N    | %         | value <sup>1</sup> |  |
| Age, Median (IQR)                            | 23      | (20-26) | 22  | (20-26) | 23   | (20-27)   | <.001              |  |
| Male sex                                     | 1927    | (54.9)  | 842 | (52.5)  | 1085 | (56.9)    | .009               |  |
| Frequency of going out in the past 12 months |         |         |     |         |      |           | <.001              |  |
| Never  | 48      | (2.8)   | 27  | (1.7)   | 21   | (1.1)     |                    |  |
| Once   | 69      | (4.0)   | 33  | (2.1)   | 36   | (1.9)     |                    |  |
| Twice  | 135     | (7.7)   | 64  | (4.0)   | 71   | (3.7)     |                    |  |
| Every 2-3 months                             | 420     | (23.8)  | 176 | (11.0)  | 244  | (12.8)    |                    |  |
| Monthly                                      | 732     | (42.3)  | 374 | (23.5)  | 358  | (18.8)    |                    |  |
| More than monthly                            | 619     | (35.5)  | 292 | (18.3)  | 327  | (17.2)    |                    |  |
| Weekly                                       | 1147    | (65.6)  | 531 | (33.3)  | 616  | (32.3)    |                    |  |

| More than weekly                              | 329  | (18.3) | 97   | (6.1)  | 232  | (12.2) |       |
|---|------|--------|------|--------|------|--------|-------|
| Interview after midnight                      | 961  | (81.5) | 533  | (51.2) | 428  | (30.3) | <.001 |
| Venues visited tonight                        |      |        |      |        |      |        |       |
| Hotel/Pub/Bar                                 | 1529 | (43.5) | 676  | (42.1) | 853  | (44.6) | .129  |
| Private house                                 | 2339 | (66.5) | 1012 | (63.0) | 1327 | (69.4) | <.001 |
| Nightclub                                     | 114  | (3.2)  | 69   | (4.3)  | 45   | (2.4)  | <.001 |
| Restaurant                                    | 288  | (8.2)  | 103  | (6.4)  | 185  | (9.7)  | <.001 |
| Sporting club                                 | 91   | (2.6)  | 35   | (2.2)  | 56   | (2.9)  | .162  |
| Sports event                                  | 48   | (1.4)  | 23   | (1.4)  | 25   | (1.3)  | .752  |
| Main reason for going out                     |      |        |      |        |      |        |       |
| Special event                                 | 1097 | (31.2) | 574  | (35.7) | 523  | (27.4) | <.001 |
| Pick up or find partner                       | 144  | (4.1)  | 58   | (3.6)  | 86   | (4.5)  | .185  |
| Get drunk                                     | 264  | (7.5)  | 112  | (7.0)  | 152  | (8.0)  | .272  |
| Normal night out                              | 247  | (7.0)  | 124  | (7.7)  | 123  | (6.4)  | .138  |
| Socialise                                     | 1324 | (37.6) | 563  | (35.1) | 761  | (39.8) | .004  |
| Type of alcohol consumed                      |      |        |      |        |      |        |       |
| Beer  | 1383 | (39.3) | 608  | (37.9) | 775  | (40.6) | .103  |
| Spirits                                       | 1124 | (32.0) | 503  | (31.3) | 621  | (32.5) | .456  |
| Wine  | 526  | (15.0) | 253  | (15.8) | 273  | (14.3) | .224  |
| Motivation for pre-drinking                   |      |        |      |        |      |        |       |
| Chance to catch up with friends               | 440  | (12.5) | 255  | (15.9) | 185  | (9.7)  | <.001 |
| Convenience                                   | 205  | (5.8)  | 65   | (4.0)  | 140  | (7.3)  | <.001 |
| Price   | 1190 | (33.8) | 511  | (31.8) | 679  | (35.5) | .020  |
| Did not want to go out too early              | 18   | (1.1)  | 15   | (0.8)  | 33   | (0.9)  | .303  |
| Level of pre-drinking                         |      |        |      |        |      |        | <.001 |
| No pre-drinking                               | 1166 | (33.2) | 459  | (28.6) | 707  | (37.0) |       |
| 1-5 drinks                                    | 1328 | (37.8) | 613  | (38.2) | 715  | (37.5) |       |
| 6-10 drinks                                   | 760  | (21.6) | 387  | (24.1) | 373  | (19.5) |       |
| 11-15 drinks                                  | 162  | (4.6)  | 92   | (5.7)  | 70   | (3.7)  |       |
| >15 drinks                                    | 99   | (2.8)  | 55   | (3.4)  | 44   | (2.3)  |       |
| Observed intoxication, Median (IQR)           | 0    | (0-1)  | 0    | (0-2)  | 0    | (0-1)  | <.001 |
| Self-rated intoxication, Median (IQR)         | 4    | (2-6)  | 4    | (2-6)  | 4    | (2-6)  | .221  |
| Illicit drug use                              | 196  | (11.4) | 107  | (6.7)  | 89   | (4.7)  | .011  |
| Involvement in violence in the last 12 months | 540  | (15.9) | 247  | (16.2) | 293  | (15.7) | .728  |
| Witnessing violence in the last 12 months     | 2126 | (60.6) | 1008 | (62.9) | 1118 | (58.7) | .012  |

<sup>1</sup>From Pearson's Chi-Square or Mann-Whitney tests, as appropriate; IQR=interquartile range; significant associations (p<.05) are bolded.

#### Table 2 Univariate associations between involvement in violence in the past 12 months and

#### demographic and alcohol related behaviours (Median, IQR) and n (%)

|  | Involvement in violence in the last 12 months |         |          |                 |               |
|--|---|---------|----------|-----------------|---------------|
|  |   | No      |          | Yes             | p-            |
|  | N   | %       | N        | %               | value1        |
| Age in years, Median (IQR)                   | 23  | (20-27) | 22       | (20-24)         | <.001         |
| Percentage of sample who were male           | 1464  | (51.4)  | 403      | (74.6)          | <.001         |
| Frequency of going out in the past 12 months |   |         |          |                 | <.001         |
| Never  | 38  | (1.3)   | 4        | (0.7)           |               |
| Once   | 61  | (2.2)   | 3        | (0.6)           |               |
| Twice  | 118   | (4.2)   | 10       | (1.9)           |               |
| Every 2-3 months                             | 355   | (12.5)  | 50       | (9.3)           |               |
| Monthly                                      | 624   | (22.0)  | 88       | (16.4)          |               |
| More than monthly                            | 515   | (18.2)  | 83       | (15.4)          |               |
| Weekly                                       | 877   | (31.0)  | 227      | (42.2)          |               |
| More than weekly                             | 245   | (8.6)   | 73       | (13.6)          |               |
| Interview after midnight                     | 781   | (38.6)  | 161      | (43.4)          | .080          |
| Venues visited tonight                       | 101   | (00.0)  | 101      | (1011)          |               |
| Hotel/Pub/Bar                                | 1225  | (43.0)  | 250      | (46.3)          | .154          |
| Private house                                | 1901  | (667)   | 356      | (65.9)          | 726           |
| Nightclub                                    | 85  | (30)    | 28       | (52)            | .009          |
| Restaurant                                   | 246   | (8.6)   | 30       | (5.2)           | .017          |
| Sporting club                                | 71  | (2.5)   | 17       | (3.1)           | 379           |
| Sports event                                 | 39  | (14)    | 8        | (15)            | 837           |
| Main reason for going out                    | 57  | (1.1)   | 0        | (1.5)           | .007          |
| Pick up or find partner                      | 93  | (33)    | 43       | (8.0)           | < 001         |
| Get drunk                                    | 183   | (6.4)   | 71       | (13.0)          | < 001         |
| Normal night out                             | 188   | (6.1)   | 47       | (87)            | 077           |
| Special event                                | 932   | (327)   | 139      | (25.7)          | .077          |
| Socialise                                    | 1096  | (385)   | 169      | (23.7)          | 002           |
| Type of drink consumed on the night          | 1070  | (30.5)  | 107      | (31.5)          | .002          |
| Roor   | 1069  | (375)   | 268      | (49.6)          | < 001         |
| Spirits                                      | 887   | (31.1)  | 196      | (363)           | 018           |
| Wine   | 455   | (160)   | 52       | (9.6)           | < 001         |
| Motivation for pre-drinking                  | 155   | (10.0)  | 52       | (9.0)           | 5.001         |
| Chance to catch up with friends              | 251   | (123)   | 70       | (13.0)          | 676           |
| Convenience                                  | 163   | (12.5)  | 30       | (15.0)          | .070          |
| Don't want to go out too early               | 27  | (0.9)   | 5        | (0.0)           | 962           |
| Drice  | 927   | (0.7)   | 214      | (0.7)           | .702          |
| I evel of pre-drinking                       | )21   | (32.3)  | 214      | (37.0)          | .001<br>< 001 |
|  | 096   | (24.6)  | 120      | (24.1)          | <.001         |
| 1 5  | 1111  | (34.0)  | 172      | (24.1)          |               |
| 1-5<br>6 10                                  | 1111<br>E72                                   | (39.0)  | 173      | (32.1)          |               |
|  | 575<br>111                                    | (20.1)  | 139      | (29.5)          |               |
| 11-13<br>\1E                                 | 111<br>60                                     | (3.9)   | 47<br>20 | (6.7)           |               |
| >15<br>Observed intervisation Madian (IOD)   | 00  | (2.4)   | 30<br>1  | (3.0)           | < 0.01        |
| Colf rated interviention, Median (IQR)       | 0   | (0-1)   | 1        | (0-2)           | <.001         |
| Sen-rated intoxication, Median (IQK)         | 4<br>101                                      | (2-0J   | 5        | (2-0J<br>(10.0) | <.UU1         |
| lilleli ul ug use                            | 134   | (4.7J   | 20       | [10.9]          | 5.001         |
| City where interview was conducted           | 4004  | (44.0)  | 0.45     |                 | ./34          |
| Geelong                                      | 1281  | (44.9)  | 247      | (45.7)          |               |
| Newcastle                                    | 1569  | 155 11  | 293      | 154 31          |               |

<sup>1</sup>From Pearson's Chi-Square or Mann-Whitney tests, as appropriate; IQR=interquartile range; significant associations (p<.05) are bolded.

| Fixed effects                           | OR        | (95%CI)     | p-value |
|---|-----------|-------------|---------|
| Intercept                               | 0.01      | (0.01-0.02) | <.001   |
| Age (mean centred)                      | 0.93      | (0.91-0.95) | <.001   |
| Male sex                                | 2.39      | (1.86-3.08) | <.001   |
| Frequency of going out <sup>1</sup>     | 1.13      | (1.05-1.21) | .001    |
| Main reason for going out               |           |             |         |
| Find partner                            | 1.86      | (1.23-2.83) | .004    |
| Get drunk                               | 1.58      | (1.13-2.22) | .008    |
| Night out                               | 1.34      | (0.93-1.93) | .117    |
| Special event                           | 0.96      | (0.75-1.22) | .730    |
| Type of alcohol consumed                |           |             |         |
| Beer                                    | 1.07      | (0.84-1.37) | .581    |
| Spirits                                 | 1.12      | (0.88-1.42) | .353    |
| Wine                                    | 0.88      | (0.61-1.25) | .463    |
| Level of pre-drinking                   |           |             |         |
| >15                                     | 1.72      | (0.88-3.36) | .116    |
| 11-15                                   | 1.80      | (1.04-3.11) | .036    |
| 6-10                                    | 1.50      | (1.03-2.19) | .037    |
| 1-5                                     | 1.22      | (0.90-1.66) | .194    |
| None                                    | Reference |             |         |
| Interviewed in Newcastle                | 1.03      | (0.81-1.31) | .815    |
| City by pre-drinking level <sup>2</sup> | 1.04      | (0.86-1.25) | .705    |
| Observed intoxication                   | 1.08      | (0.99-1.18) | .078    |
| Self-rated intoxication                 | 1.01      | (0.96-1.06) | .649    |
| Illicit drug use                        | 1.72      | (1.19-2.47) | .004    |
| Random effects                          | Estimate  | Standard I  | Error   |
| Random intercept                        | 0.14      | 0.17        |         |

Table 3 Results of Logistic Regression Analysis Modelling Predictors of Involvement in Violence

<sup>1</sup>Modelled as a semi-continuous variable to facilitate model parsimony; modelling frequency of going out as a categorical predictor produced virtually no change in coefficients of other variables in the model. <sup>2</sup>Computed such that higher values correspond with higher level of pre-drinking in Newcastle relative to Geelong; computing interaction term with Newcastle as a reference produced virtually identical results.

| Table 4 Results of | nath analysis m  | odelling direct ar | nd indirect effects of | pre-drinking o | n involvement in violence |
|--------------------|------------------|--------------------|------------------------|----------------|---------------------------|
|                    | path analy 010 m |                    |                        | pro mining o   |                           |

|  | Violence |               |                  | Observed intoxication |               |                  | Self-rated intoxication |               |                  | Illicit drug use |               |                  |
|--|----------|---------------|------------------|-----------------------|---------------|------------------|-------------------------|---------------|------------------|------------------|---------------|------------------|
|  | $z^1$    | 95%CI         | %<br>probability | $z^1$                 | 95%CI         | %<br>probability | $z^1$                   | 95%CI         | %<br>probability | z <sup>1</sup>   | 95%CI         | %<br>probability |
| Intercept <sup>2</sup>                                       | 2.47     | (2.09,2.83)   | 0.69             | 1.02                  | (0.70,1.27)   | 15.48            | -0.54                   | (-0.94,-0.27) | 70.54            | 3.15             | (2.44,3.72)   | 0.08             |
| Direct effects   |          |               |                  |                       |               |                  |                         |               |                  |                  |               |                  |
| Age (mean centred)   | -0.04    | (-0.06,-0.02) | 0.61             | 0.00                  | (-0.01,0.01)  | 15.48            | 0.00                    | (-0.01,0.01)  | 70.57            | 0.03             | (0.01,0.04)   | 0.09             |
| Male sex   | 0.44     | (0.24,0.63)   | 2.13             | 0.33                  | (0.19,0.47)   | 24.73            | 0.03                    | (-0.11,0.17)  | 71.67            | 0.27             | (-0.02, 0.51) | 0.20             |
| Frequency of going out                                       | 0.03     | (-0.03,0.09)  | 0.74             | -0.03                 | (-0.07,0.01)  | 14.80            | -0.03                   | (-0.07,0.01)  | 69.67            | 0.12             | (0.04,0.20)   | 0.12             |
| Main reason for going out                                    |          |               |                  |                       |               |                  |                         |               |                  |                  |               |                  |
| Find partner   | 0.46     | (0.13,0.79)   | 2.26             | 0.29                  | (0.03,0.55)   | 23.51            | 0.43                    | (0.19,0.66)   | 83.32            | 0.38             | (-0.04, 0.77) | 0.28             |
| Get drunk  | 0.40     | (0.12,0.69)   | 1.96             | 0.42                  | (0.21,0.63)   | 27.46            | 0.45                    | (0.26,0.65)   | 83.87            | 0.37             | (0.01,0.71)   | 0.27             |
| Night out  | 0.22     | (-0.11,0.52)  | 1.23             | -0.13                 | (-0.37,0.12)  | 12.53            | 0.03                    | (-0.18,0.23)  | 71.40            | -0.02            | (-0.51, 0.43) | 0.08             |
| Special event  | -0.02    | (-0.21,0.19)  | 0.65             | 0.11                  | (-0.02,0.25)  | 18.22            | 0.28                    | (0.16,0.40)   | 79.36            | 0.30             | (0.07,0.56)   | 0.22             |
| Type of alcohol consumed                                     |          |               |                  |                       |               |                  |                         |               |                  |                  |               |                  |
| Beer   | 0.06     | (-0.14,0.26)  | 0.80             | -0.03                 | (-0.18,0.11)  | 14.73            | 0.19                    | (0.06,0.31)   | 76.61            | -0.06            | (-0.31,0.19)  | 0.07             |
| Spirits  | 0.12     | (-0.07,0.30)  | 0.95             | 0.07                  | (-0.07,0.2)   | 17.21            | 0.23                    | (0.11,0.35)   | 78.05            | 0.17             | (-0.07, 0.40) | 0.14             |
| Wine   | -0.18    | (-0.47, 0.11) | 0.41             | 0.06                  | (-0.13, 0.25) | 17.00            | 0.19                    | (0.02,0.35)   | 76.67            | -0.01            | (-0.36, 0.34) | 0.08             |
| Level of pre-drinking  | 0.06     | (-0.06,0.19)  | 0.82             | 0.36                  | (0.27, 0.44)  | 25.43            | 0.40                    | (0.32,0.47)   | 82.51            | 0.15             | (0.01, 0.29)  | 0.13             |
| Interviewed in Newcastle                                     | 0.04     | (-0.24, 0.32) | 0.75             | -0.31                 | (-0.46,-0.17) | 9.24             | 0.04                    | (-0.10, 0.17) | 71.74            | -0.19            | (-0.43, 0.06) | 0.04             |
| City by pre-drinking level (2)                               | -0.06    | (-0.21, 0.1)  | 0.58             | -0.03                 | (-0.14,0.08)  | 14.78            | -0.04                   | (-0.14,0.06)  | 69.15            | 0.12             | (-0.06, 0.31) | 0.12             |
| Observed intoxication  | -0.01    | (-0.12, 0.09) | 0.66             |                       |               |                  |                         |               |                  | 0.19             | (0.06, 0.31)  | 0.15             |
| Self-rated intoxication                                      | 0.00     | (-0.10, 0.08) | 0.68             |                       |               |                  |                         |               |                  | 0.06             | (-0.06, 0.17) | 0.10             |
| Illicit drug use   | 0.23     | (0.06,0.39)   | 1.26             |                       |               |                  |                         |               |                  |                  |               |                  |
| Indirect effects   |          |               |                  |                       |               |                  |                         |               |                  |                  |               |                  |
| Pre-drinking level==>Observed<br>intoxication==>Violence     | 0.00     | (-0.04,0.03)  | 0.68             |                       |               |                  |                         |               |                  |                  |               |                  |
| Pre-drinking level==>Self-rated<br>intoxication==>Violence   | 0.00     | (-0.04,0.03)  | 0.68             |                       |               |                  |                         |               |                  |                  |               |                  |
| Pre-drinking level==>Illicit drug<br>use==>Violence          | 0.03     | (0.00,0.08)   | 0.75             |                       |               |                  |                         |               |                  |                  |               |                  |
| Pre-drinking level==>Observed<br>intoxication==>Illicit drug | 0.01     | (0.01,0.03)   | 0.71             |                       |               |                  |                         |               |                  |                  |               |                  |

use==>Violence Pre-drinking level==>Self-rated intoxication==>Illicit drug 0.01 (-0.01,0.02) 0.69 use==>Violence <sup>1</sup>probit coefficient; <sup>2</sup>represents score=1 when all other predictors are equal to 0.