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# An intercept study to measure the extent to which New Zealand university students pre-game

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**P**re-gaming (also known as front-loading, pre-loading, pre-drinking, or pre-partying) is defined as the consumption of alcohol *before* a night out or event.<sup>1-3</sup> It is often typified by the swift consumption of alcohol over a short period of time<sup>4</sup> and is practised in part due to the price point of alcohol being much higher at on-licences (e.g. night clubs, sporting events) relative to off-licence outlets (e.g. liquor stores).<sup>2,3,5</sup> (For an overview of pre-gaming motives see: Bachrach et al., 2012; Labhart et al., 2016).<sup>6,7</sup> For example, in New Zealand, a drink bought at an on-licence premise costs about 2.6 times more than a drink bought at an off-licence premise.<sup>8</sup>

Pre-gaming is considered a high risk behaviour because it often results in individuals consuming more alcohol relative to nights on which they do not pre-game.<sup>1,4,9-11</sup> For example, Labhart et al. (2013) found that when individuals pre-gamed, they consumed nearly twice as much alcohol relative to nights on which they did not report pre-gaming.<sup>10</sup> Higher levels of alcohol consumption as a result of pre-gaming have also been reported using measures that do not rely on self-reported alcohol use (e.g. breathalysers that measure Breath Alcohol Concentration [BrAC]).<sup>12-14</sup> Given that more alcohol is consumed on nights when individuals pre-game, it is unsurprising that pre-gaming has been linked to higher levels of alcohol-related harm.<sup>1,9,10,15-17</sup> For example, on nights that individuals pre-game, they are more likely to experience a blackout<sup>18</sup> and get into a fight.<sup>19</sup>

## Abstract

**Objective:** We aimed to quantify the degree to which students pre-gamed in New Zealand, using self-report and breathalysers.

**Methods:** A total of 569 New Zealand undergraduate students were interviewed (men = 45.2%; first year = 81.4%) entering three university-run concerts. We asked participants to report how many drinks they had consumed, their self-reported intoxication and the duration of their pre-gaming session. We then recorded participants' Breath Alcohol Concentration (BrAC; µg/L) and the time they arrived at the event.

**Results:** The number of participants who reported consuming alcohol before the event was 504 (88.6%) and the number of standard drinks consumed was high ( $M=6.9$ ; median=6.0). A total of 237 (41.7%) participants could not have their BrAC recorded due to having consumed alcohol  $\leq 10$  minutes before the interview. The remaining 332 participants (57.3%) recorded a mean BrAC of 288.8µg/L (median=280.0 µg/L). Gender, off-campus accommodation, length of pre-gaming drinking session, and time of arrival at the event were all associated with increased pre-gaming.

**Conclusion and implications for public health:** Pre-gaming was the norm for students. Universities must take pre-gaming into account; policy implications include earlier start times of events and limiting students' access to alcohol prior to events.

**Key words:** alcohol, university, pre-gaming, high-intensity drinking, heavy drinking

Relative to the large number of studies conducted on pre-gaming in the US and UK, there is little research on pre-gaming in Australia or New Zealand. The limited research that has been conducted in Australia is consistent with international research suggesting that pre-gaming is commonplace,<sup>20</sup> that price is a key motivation for pre-gaming<sup>20-22</sup> and that pre-gaming is associated with greater odds of experiencing alcohol-related harms.<sup>20,21,23,24</sup> Research in New Zealand is even more limited, with (to our knowledge) only a single study investigating pre-gaming.<sup>25</sup> Specifically, McCreanor et al. (2016) conducted a qualitative study with

groups of young adults. Consistent with the literature reviewed above, one of the key drivers for pre-gaming was price. Although not focusing on university students, a narrative provided by one male participant suggests pre-gaming may have a particularly strong social element among university students:

*Like there was this whole sort of ritual like I was at a hall last year where people would start drinking like as much alcohol as they could between eight o'clock and eleven o'clock. At eleven o'clock they got kicked out of the hall so if you wanted to go to town you had to leave by eleven. So people would get really*

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*drunk then go to town and like there'd be a big convoy of about 150 people walking all the way down the hill into town.*<sup>25(p41)</sup>

Indeed, research from the US suggests that attending university is marked by a significant increase in the prevalence of pre-gaming (pre-university = 62% vs. during university = 80%),<sup>26</sup> with pre-gaming behaviour being established early in a student's academic career and persisting throughout it.<sup>9</sup>

The aim of the current study was to: a) provide the first quantitative study on pre-gaming in a university population in New Zealand; and b) determine which factors contribute to increased pre-gaming (gender, year at university, accommodation type, time spent pre-gaming). To test this, we intercepted students entering university-run orientation week events. Orientation week (also known as freshers' week, introductory week, welcome week, etc.) generally consists of a number of social events that precede the start of the academic year. Students were interviewed regarding their current pre-gaming session and, given that self-reported alcohol use has been described as potentially unreliable,<sup>27</sup> we obtained an objective measure of pre-gaming by recording participants' Breath Alcohol Concentration (BrAC).

## Methods

### Sample and procedure

The study was conducted on nights when social events were run (i.e. a toga party and two music concerts) for the 2016 orientation week held at the University of Otago, Dunedin, New Zealand (a small city of 120,000 residents, including ~20,000 university students). Alcohol was available at the three events for students to purchase. Interviews were conducted directly outside the events between 7:30 pm and 10:30 pm by a group of 10 trained researchers working in groups of 2–3. Each group operated a Lifeloc® FC10 breathalyser, which provided a measure of BrAC (micrograms of alcohol per litre of breath; µg/L). The Lifeloc® FC10 is an Australian standard certified police-grade breathalyser. It uses fuel cell technology and reports an accuracy range of ±0.005 BAC with scores up to 0.100 BAC, with a ±5% above 0.100 BAC.<sup>28</sup>

The research groups approached students, explained the purpose of the study (which included assurance that there would be no punitive outcomes for taking part), and

invited them to take part in a three-to five-minute interview. At the completion of each interview, research groups approached the next student or group who walked past. Those who agreed to take part provided verbal consent. Self-reported alcohol consumption was recorded first, followed by the breathalyser reading. At the conclusion of the interview, participants were told their BrAC and were provided with a card containing information about BrAC and the contact details of community support groups and taxi companies. All study procedures were approved by the University of Otago ethics committee, reference number 16/007.

### Measures

**Demographics:** Demographic data collected included gender, age, year at university, ethnicity and type of university accommodation (e.g. residential college, flat, home or other). For ethnicity, we asked participants to identify which groups they identified with, which were later simplified to Caucasian, Māori/Pacific Island, Asian or another ethnicity (percentages add to more than 100 due to multiple affiliations).

**Current session alcohol use:** Participants were asked to report the length of their current drinking session (i.e. the time of their first drink and their last drink, which was converted to minutes) and the number of New Zealand standard drinks they had consumed during the current drinking session (one New Zealand standard drink contains 10 grams of alcohol). Participants were also asked to rate their current intoxication from 0 (not intoxicated) to 10 (very intoxicated) and had their BrAC recorded; similar measures have been used by Lubman et al. 2014.<sup>29</sup>

### Data analysis strategy

To test our first aim, which was to determine the extent to which students pre-gamed, we calculated descriptive statistics (mean, median, standard deviation, range) for all drinking variables (standard drinks, intoxication, pre-gaming length, and BrAC).

To test our second aim, which was to determine which factors (gender, year at university, accommodation type) contributed to increased pre-gaming, we used independent samples *t*-tests and chi-square tests to test for differences between groups (men vs. women, first vs. other year, residential college vs. other accommodation)

on the drinking variables (number of standard drinks, intoxication, pre-gaming length and BrAC). To explore the impact of the length of pre-drinking session on alcohol use, we ran Pearson's *r* correlations between time and the other drinking variables (standard drinks, intoxication, BrAC). Finally, to investigate the impact of the time participants arrived at the event (7:30–8:29 pm; 8:30–9:29 pm; 9:30–10:30 pm) on pre-gaming, we ran an Analysis of Variance (ANOVA) with time period as the between-subjects independent variable and the drinking variables (standard drinks, intoxication, drinking session length and BrAC) as the dependent variables.

## Results

### Data preparation and demographics

The flow of attrition can be seen in Figure 1. Of the 902 participants approached, 757 (83.9%) agreed to take part. After removing participants who were leaving the events ( $n=124$ ; 13.8%) and non-students ( $n=57$ ; 6.5%), 575 students remained (63.8% of people approached). An additional six participants were removed for incomplete drinking survey data, which yielded a sample of 569 students with complete data available for analysis.

As seen in Supplementary Table 1, the 569 who provided complete data were predominantly first-year students (81.4%; second year 3.3%, third or above 15.3%) living in residential colleges (72.6%; student flat 21.1%; other 5.8%), about half of whom were men (45.2%; 1.9% did not specify gender). Participants ranged in age from 17 to 32 years old ( $M=18.5$ ,  $SD=1.5$ ) and the majority identified as Caucasian (75.9%) with others identifying as Māori/Pacific Island (14.1%), Asian (6.3%), or another ethnicity (2.8%); 0.9% did not specify their ethnicity.

Unfortunately, of the 569 participants who provided complete data, 237 participants (41.7%) had consumed alcohol ≤10 minutes prior to the interview and, therefore, could not provide a reliable BrAC result. BrAC results presented in Table 1 are for those 332 participants who could provide reliable breath tests. It is important to note that, compared to the 332 participants who could be breathalysed, those who had consumed alcohol ≤10 minutes prior to the interview reported consuming significantly more standard drinks of alcohol before the events ( $M=8.6$ , median=7.5 [ $SD=5.0$ ] vs.  $M=5.7$ , median=5.0 [ $SD=5.0$ ];  $t[567]=6.892$ ,  $p<0.001$ ;

$d=0.58$ ) and greater intoxication ( $M=5.2$ , median=6.0 [ $SD=2.2$ ] vs.  $M=3.6$ , median=4.0 [ $SD=2.8$ ];  $t[567]=7.498$ ,  $p<0.001$ ;  $d=0.64$ ).

### Descriptive Statistics

The mean number of standard drinks consumed, intoxication levels, drinking session length, and BrAC are presented in Table 1. Of the 569 participants who agreed to take part and completed the interview, 88.6% reported having consumed alcohol before the events and, on average, had consumed 6.9 standard drinks. Table 1 also shows the difference in drinks for gender, year at university and accommodation.

### Risk factors and pre-gaming

**Gender:** Significantly more men than women reported drinking before events (women=85.0%, men=92.2%;  $\chi^2[1]=6.921$ ,  $p=0.009$ ) and men consumed significantly more alcohol before the events, reported greater levels of intoxication, reported longer pre-gaming sessions, and reached a higher BrAC than women.

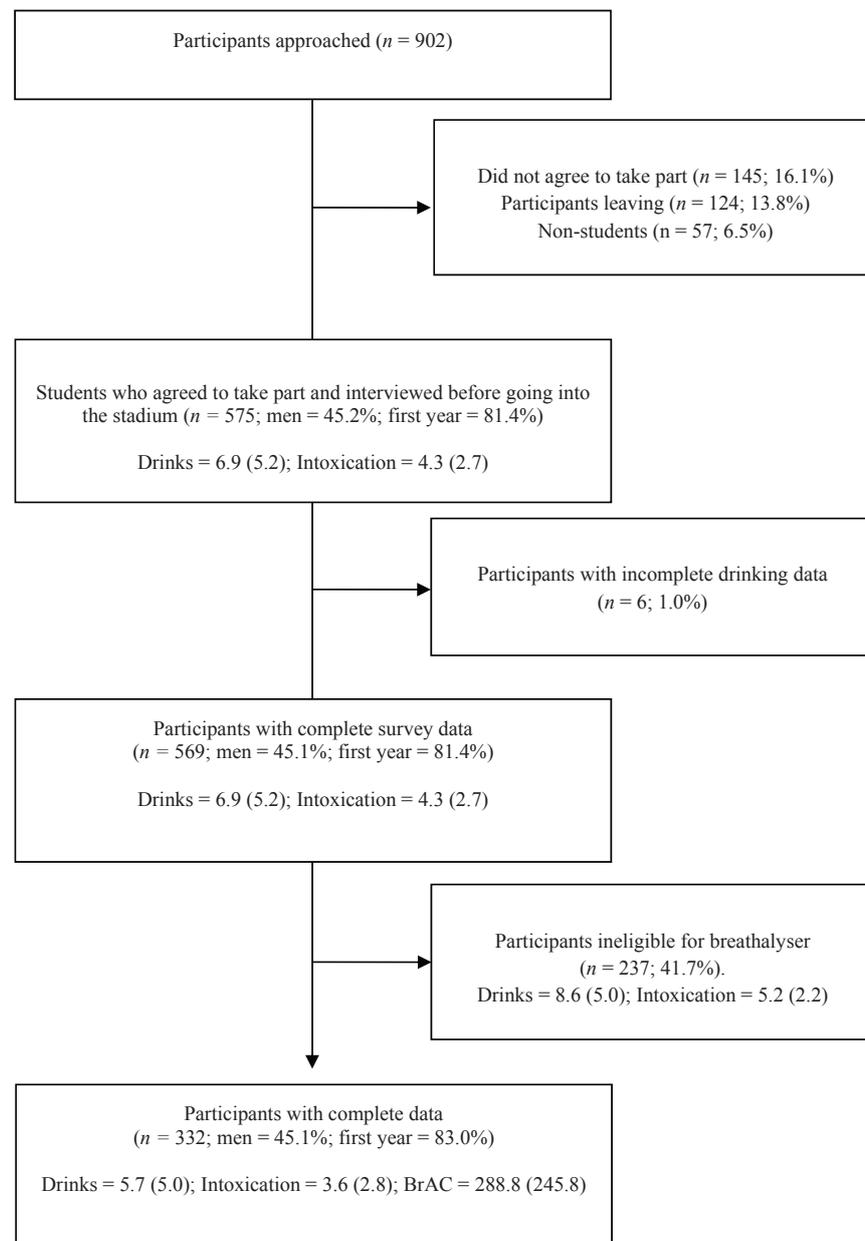
**Year at university (first year vs. other years):** Because our sample was predominantly first-year students, we opted to compare first-year students to those who were above first year. Chi-square tests revealed that there was no difference in the ratio of drinkers to non-drinkers when comparing first-year vs. other-year students (first year=88.1%, second year and above = 90.6%;  $\chi^2[1]=0.510$ ,  $p=0.475$ ). There was also no difference in the amount of alcohol consumed before the events or reported levels of intoxication. However, first-year students reported shorter pre-gaming sessions and registered a lower BrAC than returning students.

**Accommodation (residential college vs. other):** Chi-square tests revealed that there was no difference in the ratio of drinkers to non-drinkers when comparing those who lived in residential colleges vs. other accommodation (college=87.4%, other=91.5%;  $\chi^2[1]=1.841$ ,  $p=0.475$ ). However, those who lived in other accommodation were more likely to drink more alcohol and report longer drinking sessions (but not greater intoxication or BrAC).

### Pre-gaming session length and time arrived at the event

The correlation matrix for all drinking variables can be seen in Table 2. For those who reported drinking ( $n=504$ ), Pearson's  $r$  correlations revealed a strong relationship

**Figure 1: Flow of attrition with number and percentage of individuals who did not meet requirements at each step. The mean (and standard deviation) of the standard drinks consumed and self-reported intoxication are presented for each attrition group.**



between the length of the pre-gaming session and each of the variables: drinks consumed, self-reported intoxication and BrAC.

Following a similar protocol to Lubman et al. (2014), we investigated the impact of the time participants arrived at the event (7:30–8:29 pm; 8:30–9:29 pm; 9:30–10:30 pm) on the measured variables.<sup>29</sup> Analysis of Variance (ANOVA) with time period as the between-subjects factor revealed a significant difference in the number of drinks consumed ( $F[2,568]=38.753$ ,  $p<0.001$ ); drinking session

length ( $F[2,568]=33.204$ ,  $p<0.001$ ); perceived intoxication ( $F[2,568]=41.157$ ,  $p<0.001$ ); and BrAC ( $F[2, 329]=38.671$ ,  $p<0.001$ ). Those who arrived later at the orientation week events consumed more alcohol, and reported longer pre-gaming sessions than those who arrived earlier (see Table 1).

### Discussion

The primary aim of the current study was to quantify the extent to which New Zealand university students pre-game before large events. Pre-gaming was the norm for New

**Table 1: Mean (median; standard deviation), minimum – maximum, 95% Confidence Interval, effect size for standard drinks consumed, intoxication, length of drinking session, and breath alcohol concentration (µg/L) before the Orientation Week events.**

	By Gender						By Time		
	Overall (569)	Women (301)	Men (257)	t	95% CI	Effect size	7:30 (204)	8:30 (243)	9:30 (122)
Pregame alcohol use NZ standard drinks	6.9 (6; 5.2) 0 - 32	4.8 (5; 3.5) 0 - 16	9.1 (9; 5.5) 0 - 32	10.629**	3.5, 5.0	0.93	4.7 (4; 5.0) 0 - 30	7.5 (7; 4.9) 0 - 32	9.5 (9; 4.6) 0 - 30
Self-reported intoxication	4.3 (5; 2.7) 0 - 10	3.8 (4; 2.7) 0 - 10	4.7 (5; 2.5) 0 - 10	4.006**	0.45, 1.3	0.35	3.3 (3; 2.8) 0 - 10	4.3 (5; 2.5) 0 - 10	5.9 (6; 2.1) 0 - 10
Pregame session length in minutes	113.9 (101;100.6) 0 - 634	84.2 (71; 73.3) 0 - 322	145.7 (135; 115.4) 0 - 146	7.363**	45.0, 77.9	0.64	76.0 (45; 103.1) 0 - 613	120.9 (105;96.7) 0 - 634	163.4 (159; 77.3) 0 - 340
	Overall (332)	Women (175)	Men (150)	t	95%CI	Effect size	7:30 (127)	8:30 (127)	9:30(62)
BrAC µg/La	288.8 (280; 245.8) 0 - 980	234.3 (180; 229.1) 0 - 970	342.1 (365; 250.5) 0 - 980	4.053**	55.5, 160.2	0.45	188.2 (110; 214.7) 0 - 980	307.8 (310; 227.9) 0 - 910	481.9 (495; 225.4) 0 - 970

Note: effect size = Cohen's d; BrAC = Breath Alcohol Concentration as measured by breathalyser; µg/L = microgram per litre; \*\*p<.001.

	Accommodation						Year				
	Hall (413)	Other (153)	t	95% CI	Effect	First(463)	Above(106)	t	95% CI	Effect	
Pregame alcohol use NZ standard drinks	6.7 (6; 5.0) 0 - 30	7.7(7;5.5) 0 - 32	2.017*	0.03, 1.95	0.19	6.8 (6;5.2) 0 - 32	7.6 (7; 4.9) 0 - 20	1.492	-1.93, 0.26	0.16	
Self-reported intoxication	4.2 (5; 2.7) 0 - 10	4.6 (5; 2.6) 0 - 10	1.440	-0.86, 0.13	0.19	4.2 (5; 2.7) 0 - 10	4.7 (5; 2.5) 0 - 10	1.806	-1.10, 0.03	0.08	
Pregame session length in minutes	107.3 (90; 98.4) 0 - 634	133.0 (125; 104.6) 0 - 604	2.710*	7.01, 44.3	0.28	106.7 (90; 100.3) 0 - 634	145.4 (141; 96.0) 0 - 405	3.606**	17.59, 59.69	0.39	
	Hall(252)	Other(78)	t	95%CI	Effect	First(276)	Above(56)	t	95%CI	Effect	
BrAC µg/L	274.7 (270;233.2) 0 - 980	336.0 (340;281.0) 0 - 910	1.750	-130.8, 8.1	0.24	272.0 (270;232.2) 0 - 980	371.6 (375;292.3) 0 - 910	2.793*	29.5, 169.7	0.38	

\*p<0.05; \*\*p<0.001.

Zealand students with nearly 90% of students reporting some level of pre-gaming. On average, students consumed close to the equivalent of one bottle of wine before the event. While pre-gaming was common for all students, we found that certain factors were associated with an increase in pre-gaming outcome measures, namely: being a male; living off-campus (drinks and session length); reporting a longer pre-gaming session; and arriving later at the event. The current study is the first New Zealand study to accurately measure pre-gaming using breathalysers, and also the first in Australia and New Zealand to do so with a sample of university students.

To this end, our study has several policy implications. Considering that students consumed more alcohol during longer pre-gaming sessions, alcohol policies could focus on ways to reduce the length of pre-gaming sessions such as setting earlier starting times for events. However, it should be noted that policies are only effective if they do not drive students away from university-run events and towards off-campus parties.<sup>5</sup> Given that the university-run events (or events run on campus) provide a significant amount of support for intoxicated students (i.e. rides home, free food and water, security,

etc.) and that limiting pre-gaming session length may be unpopular, policy changes must find a balance between reducing drinking sessions and ensuring the events are attractive to students.<sup>30</sup> To help find this balance, universities could consult students in policy discussions.<sup>31</sup> This recommendation is offered while acknowledging that the price differential between on- and off-licence liquor sales is considered a core motive for pre-gaming behaviour, particularly among university students where income can be limited.<sup>20,32</sup> As such, measures to address the price gap between on- and off-licence liquor are also likely to influence pre-gaming behaviour, especially for this cohort.<sup>5,25</sup> Wells et al. suggest that events could set affordable prices earlier in the evening (without promoting intoxication) or balance on- and off-premise alcohol.<sup>5,19</sup> Finally, universities

could consider having a zero-tolerance policy for alcohol use or intoxication before the event to deter heavy pre-gaming.<sup>5</sup>

**Limitations**

A potential limitation of the current study is that we only obtained BrAC readings from 332 (57.3%) participants. Rather than detracting from our findings, the fact that 237 (41.7%) participants could not have their BrAC recorded due to recently consuming alcohol clearly demonstrates that, in many cases, pre-gaming continues right up until entry into the event. While other groups have circumvented this issue by implementing mandatory waiting periods before recording BrAC,<sup>33</sup> this practice was viewed as impractical when conducting interviews directly outside the event due to: a) having large groups of

**Table 2: Correlations among the drinking variables for those who reported consuming alcohol (n=504; BrAC results n=268).**

Drinking Variables	Number of drinks	Self-reported intoxication	Length of session
Number of drinks			
Self-reported intoxication	0.492**		
Length of session	0.625**	0.409**	
BrAC (n = 268)	0.658**	0.657**	0.505**

Note: \*\*p < .001 level

students congregate outside the event; and b) the fact the majority of participants would have likely refused to wait the required period of time.

A second limitation is that the current study was conducted during orientation week, potentially providing an inflated picture of the degree to which students pre-game. Indeed, in both New Zealand and the US, orientation week is associated with higher levels of alcohol consumption relative to a typical week during the academic year.<sup>34-39</sup> Despite this, the overall proportion of students pre-gaming in the current study is not markedly different to that reported for US students during the academic year (Haas et al. 79.9% vs. 88.6% in the current study).<sup>26</sup> To determine whether the incidence of pre-gaming differs between orientation week and the academic year, future studies should track students' pre-gaming levels across the semester.

A final limitation is that participants may have been interviewed on multiple nights because data were collected across three consecutive nights and no identifying information was recorded.<sup>40</sup>

## Summary

The current study demonstrates that pre-gaming is the norm for New Zealand students and highlights the need for intervention approaches that specifically target pre-gaming.

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## Supporting Information

Additional supporting information may be found in the online version of this article:

**Supplementary Table 1:** Descriptive statistics for the demographic variables for those who met inclusion criteria (n=569).