Psychological distress in New Zealand university students and its association with alcohol consumption

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Abstract

Background

There is debate on the nature of the association between alcohol use and psychological distress in young people. This study investigates this association among New Zealand university students aged 17-24 years at the time of sampling.

Aims

1. To review published research relevant to the topic. 2. To characterise alcohol consumption and how it varies demographically; 3. To describe psychological distress and how it varies demographically; 4. To quantify the association between alcohol consumption and psychological distress.

Methods

A systematic review of the literature was undertaken, using inclusion criteria of: young people aged 15-30 years, a measure of psychological distress, and a measure of alcohol consumption. For the quantitative study, data were drawn from a 2009 web-based survey of university students across six New Zealand universities (n=2921, response fraction = 54% for women and 46% for men). Measures included modified Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) questions and the Kessler-10 scale for psychological distress. Multiple regression analysis was used to estimate the association between alcohol consumption and psychological distress. Analyses were carried out with alcohol consumption as the outcome and repeated with psychological distress as the outcome, adjusting for a range of demographic characteristics. When analysing psychological distress as an outcome, two sets of potential moderators (alcohol-related problems and second-hand effects of alcohol) were also adjusted for.

Results

1. In the published literature, interpretation of findings was limited by the poor quality of the research in most cases. Among the strongest studies there was inconsistency in the associations found. Over half (7/13) of the studies found psychological distress to be lowest at moderate levels of consumption and highest in heavy drinkers and at low levels

of consumption (including non-drinkers and ex-drinkers). Four studies found no association, and four studies found a positive association between alcohol consumption and psychological distress. 2. Student alcohol consumption was heavy and characterised by infrequent heavy drinking occasions. 3. Psychological distress was common and higher in women than men. 4. In the unadjusted analyses, no association between alcohol consumption and psychological distress was observed. 5. In the adjusted analysis, the level of psychological distress was not associated with alcohol consumption. In the reverse direction, there was a small negative association between level of alcohol consumption and psychological distress, after adjustment for demographic variables and moderating factors, indicating the possibility of a direct effect. There was a larger positive association between alcohol-related problems and non-assaultive second-hand effects, and psychological distress, indicating the possibility of an indirect effect.

Conclusions

Previously published research did not provide good evidence about the nature of this association. The results of the quantitative study suggest the possibility of an indirect positive effect of alcohol consumption on psychological distress through alcohol-related problems.

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Chapter 1.

Introduction

Alcohol consumption is among the leading causes of death and disability through acute and chronic health conditions worldwide. The WHO (2011) attributes 2.25 million deaths globally to alcohol consumption. It is estimated that in New Zealand 5.4% of all deaths are attributable to alcohol. (Connor, Kydd, Rehm, & Shield, 2013). Young people aged 15-29 years accounted for a third of these deaths in 2007 (Connor et al, 2013). Even higher is the number of people who live with ill health as a result of alcohol use (Connor, Kydd, et al., 2013; Rehm et al., 2003). The effects have a monetary cost for society too. During the week, it is estimated that between 18-35% of all injuries arriving at emergency hospital wards are alcohol related. This figure inflates to around 70% at the weekend (Humphrey, Casswell, & Han, 2003; Jones, McElnay, & Robinson, 2009). For a given day, the New Zealand Police (2009) report that 18% of their budget is put towards targeting alcohol related incidents. Other studies have attempted to quantify the cost of harmful drinking on New Zealand as a whole with estimates ranging from $16 million to $735 million (BERL, 2009; Law Commission, 2009). However, although alcohol use is a health issue for all of society, young people experience a disproportionately high level of harm from alcohol use.

Alcohol consumption, in particular intoxication, substantially contributes to acute effects on health. Mostly acute effects are unintentional injuries such as road traffic crashes, poisoning, falls, drowning, fires, or intentional injuries such as self-harm or assault (Babor, 2010). In 2013, a major report: “Alcohol-attributable burden of disease and injury in New Zealand: 2004 and 2007” was published, summarising the findings of national studies on alcohol use and harms (Connor et al, 2013). It found that in New Zealand over half of alcohol attributable deaths in men, and a quarter of alcohol attributable deaths in women are due to injury (Connor et al., 2013). In young people aged 15-30 years, this figure rises to 90%. Young people, especially young men, experience the highest proportion of deaths due to alcohol attributable injury of any age group. In 2007, 25% of all deaths in men and 15% of deaths in women aged 15-30 years were due to an alcohol related injury (Connor et al., 2013).

Sexual health is also impacted by the impaired decision making induced by alcohol consumption. In New Zealand, sexual health is on the public health agenda due to the high prevalence of sexually transmitted infections (STIs) (ESR, 2013). The Annual Surveillance Report (2013) found that in line with previous years, chlamydia was the most common STI with 633 cases per 100,000 of the population. Sixty-eight per cent of cases were from the 15-24 years age group. The second most common STI was gonorrhoea with 78 cases per 100,000. Young people aged 15-24 years accounted for 50% of cases. The only STI that was less common in young people than in other age groups was syphilis which was most common in people aged 40 years and over (ESR, 2013). The association between alcohol consumption and sexual risk-taking has been reported across countries and populations (Halpern-Felsher, Millstein, & Ellen, 1996; Vagenas et al., 2013). In a study of New Zealand university students, it was found that the association between current alcohol use and risky sex was mediated by whether there was alcohol use when they last had sex (Connor, Psutka, Cousins, Gray, & Kypri, 2013).

A key factor in the increased prevalence of acute harms of alcohol consumption in young people is heavy alcohol use leading to intoxication. The New Zealand Health Survey 2012/2013 reported that the age group that drank to intoxication with the highest frequency was 20-24 year-olds, followed by 15-19 year-olds and then 25-34 year-olds (Ministry of Health, 2013). Research on New Zealand university students suggests that alcohol consumption is higher and more hazardous in students than their non-student peers (Kypri, Cronin, & Wright, 2005). Kypri et al. (2005) compared scores on the Alcohol Use Disorders Identification Test (AUDIT) for the 2002/2003 New Zealand Health Survey with scores from Otago University students (Kypri, Gallagher, & Cashell-Smith, 2004). Scores in students were 50-60% higher than in the wider population of young people while twice as many students scored in the hazardous drinking range than non-students (Kypri et al., 2004).

An aspect of health unexplored in relation to the effect of alcohol consumption in New Zealand is psychological distress. Psychological distress is defined as a negative emotional state with symptoms on the anxiety-depression spectrum (Mirowsky & Ross, 2003). High levels of psychological distress are indicative of being at risk of mental disorder (Ministry of Health, 2008). Experiencing a mental disorder is common in New Zealand and the onset is often early (Wells et al., 2006).The New Zealand Mental Health Survey (2006) reported that in the New Zealand population, 20.7% of the population met the criteria for a mental disorder in the past year and the authors predicted that 46.6% of the population would experience a mental disorder in their lifetime. The prevalence of mental disorder in the past year was 28.6% for the 16-24 years age group which was the highest of all age groups (Wells et al., 2006).

The New Zealand Health Survey (2006/07) measured psychological distress in the New Zealand population in the past four weeks, finding that 79% of people experienced low levels of psychological distress. Twelve percent of women and 7% of men aged 15-24 years experienced high or very high levels of psychological distress. Levels of psychological distress were highest in young women but there was no difference between different age groups of men (Ministry of Health, 2008). The prevalence of psychological distress in New Zealand university students has not been evaluated, however, Australian estimates suggest that university students experience higher levels of psychological distress than the general population. Stallman (2010) reported that the proportion of very high levels of psychological distress was four times higher in 18-24 year old university students compared to their peers in the 2004 National Health Survey.

There is substantial research reporting the comorbidity between alcohol use disorders and mental disorders (Kessler et al., 1997; Regier et al., 1990). However, the association between alcohol use in the general population and psychological distress is inconsistent. Some research has reported a positive association between alcohol consumption and psychological distress, depression or anxiety (Aseltine & Gore, 2000; Balogun, Koyanagi, Stickley, Gilmour, & Shibuya, 2014; Fröjd, Ranta, Kaltiala-Heino, & Marttunen, 2011). Conversely, other research has found that alcohol is associated with stress reduction (Sayette, 1999). Associations could be bi-directional: alcohol could be changing the risk of poor psychological health, or poor psychological health could be changing the level of risk of alcohol consumption, or both could occur within individuals. Another issue faced in researching risks and benefits of alcohol consumption for stress and mental wellbeing, is confounding. In countries where alcohol consumption is normative, drinkers may experience improved social functioning compared with non-drinkers (Molnar, Busseri, Perrier, & Sadava, 2009). It is possible that in these situations, alcohol's role as a social facilitator is responsible for observations of improved mental wellbeing and decreased stress rather than alcohol's chemical properties (Borsari, Borsari, & Carey, 2006; Nezlek, Pilkington, & Bilbro, 1994). A further research challenge, is the variety and lack of clarity of terms used. Psychological distress, distress, stress, anxiety, depression, wellbeing, mental illness and many more are used at times interchangeably (Pohorecky, 1991; Sayette, 1999).

Further research is needed on the association between alcohol consumption and psychological distress, particularly among young people who are most at risk. This research uses data from the 2009 Tertiary Student Health Study to describe the patterns of alcohol consumption, prevalence of psychological distress, and the association between these factors, in a large sample of university students. Analysis of the data is informed by a

systematic review of the literature on the topic. As there is no current information on the prevalence of psychological distress or the association between psychological distress and alcohol consumption in New Zealand university students, this study will contribute to reducing alcohol-related harm and improving students' mental health.

Chapter 2.

Background

2.1. Psychological distress

Psychological distress is rarely defined as a distinct concept and is often embedded in the context of stress and distress. This lack of clear terminology causes confusion in clinical practice and research. In order to review research relevant to the relationship between alcohol consumption and psychological distress, and to clearly articulate how psychological distress is defined and measured in this study, the origins of psychological distress as a concept are explored.

Most confusion about psychological distress springs from the term *stress*. Before the 1950s, stress was a word used in relation to mechanics and physics but by the 1980s it was part of popular social discourse (Ogden, 2012). It remains widely used and carries various connotations, making it an ambiguous term. Definitions of stress within psychology fall broadly into three categories: stimulus-based, response-based or interactional/ transactional (Gross, 2012).

Stimulus-based definitions were grounded in military research of the mid-twentieth century and applied the theory of stress as it is used in physics and engineering to describe substances 'under stress' when a load is applied (Lazarus, 1993). It was theorized that soldiers who went to war experienced stressful stimuli, and just as in physics, if this load was too heavy, there was a breakdown of health (Lazarus, 1993). The engineering concept of an elastic-limit, or the maximum amount of stress that could be applied to a substance before it breaks down, was used as an analogy to explain that people can endure a limited amount of applied stress (Gross, 2012; Ogden, 2012). The stimulus-based definition is the simplest but does not explain the more complex aspects of stress and never gained popularity outside of workplace and military contexts.

Response-based definitions were popularised by endocrinologist Hans Selye (Wheaton & Montazer, 2010). Based on his experiments, Selye defined stress as the non-specific physiological response of an organism to any demand or 'stressor' (Ogden, 2012). According to this theory, stress is always present, can be good or bad, and is necessary for life. He later defined good stress as 'eustress' and bad stress as 'distress' (Selye, 1976). When a person is exposed to a stressor and is able to meet the challenge the result is eustress.

When exposed to a stressor and the challenge is overwhelming, distress occurs. In this formulation, distress is a cause of ill-health (Selye, 1976). However, this theory is criticised for not accounting for personality differences in the stress response.

Interactional and transactional theories of stress built upon response-based and stimulus-based definitions to incorporate the person-environment interaction (Gross, 2012). They posit that it is a person's perception of being unable to cope that results in stress (Lazarus, 1985). There is a distinct cognitive component of these theories compared to stimulus and response-based theories. Where stimulus-based explanations focussed on stress as a cause outside the body and response-based explanations described stress as the physiological response, interactional and transactional theories define stress as the entire process from a stimulus, to the person's appraisal of the stimulus, to the person's response, which may be physiological, psychological or both (Ogden, 2012).

There is no consensus within the field on which of these definitions of stress best fits observational and experimental data (Gross, 2012; Ogden, 2012). The interactional and transactional definitions are credited for accounting for the most aspects of stress, however research findings are inconclusive. Lazarus (1985), a key proponent of transactional theory, suggests that stress should be seen as a general concept used to organise complex phenomena (Lazarus & Folkman, 1984). Others have gone further to argue that stress has been rendered a useless concept by the glut of meanings attributed to the term (Cohen, Kessler, & Gordon, 1995; Elliott & Eisdorfer, 1982).

A commonality of all theories of stress, is the understanding that stress can affect health (Ogden, 2012). In stimulus-based theory, extreme stress on the body could cause a breakdown in either psychological or physical health (Lazarus, 1985). In response-based definitions, distress caused by a stressor, would cause a physiological response and repeated exposure could affect physical and psychological health (Ogden, 2012). Interactional and transactional theories describe the effect of stress on dimensions of health too but also suggest that psychological changes (e.g. anxiety or depression) in response to a stimulus can in turn influence subsequent experiences of stress (Lazarus, 1971). Symptoms of poor psychological health feature in the different definitions as a result of stress and as a predisposing factor for stress (Gross, 2012; Ogden, 2012).

In comparison, distress is more easily defined than stress. The Oxford English Dictionary (2014) gives the most common definition of the noun as 'the sore pressure or strain of adversity, trouble, sickness, pain, or sorrow; anguish or affliction affecting the body, spirit,

mind, or community'. Distinct from Selye's (1976) use of the term distress, distress is not by definition related to stress although it could occur in response to stress.

In the context of health, distress can be either physical or psychological (The Oxford English Dictionary, 2014). Psychological distress is distress specifically relating to the mind or spirit. It is a subjective negative emotional state with symptoms on the anxiety-depression spectrum (Mirowsky & Ross, 2002). Stress research often describes psychological distress as an outcome of stress or a form of stress (Mirowsky & Ross, 2003). Although stress has been found to cause psychological distress, psychological distress can occur in the absence of stress or a stressor.

Symptoms of psychological distress have been reported as being both transient (Horwitz, 2007) and stable over time (Wheaton, 2007). This likely reflects the fact that experiencing some psychological distress is normal but experiencing several symptoms of psychological distress often may be indicative of a mental disorder such as anxiety or depression. The measurement of psychological distress can be used as an indicator of the psychological health of a population without specifically assessing the presence or absence of mental disorder (Mirowsky & Ross, 2003).

Psychological distress is often not directly measured in research but discussed in studies measuring related concepts (Lazarus, 1993; Pohorecky, 1991; Sayette, 1999; Selye, 1976). Symptoms of psychological distress overlap with symptoms of stress, distress, anxiety or depression and frequently feature in scales designed to measure these concepts. Due to the sprawling nature of the stress concept, tools used to measure stress can be similar to tools used to measure distress and psychological distress. An example of this is the Daily Hassles and Uplifts Scales (Kanner, Coyne, Schaefer, & Lazarus, 1981) designed to measure stress and the Symptom Distress Scale (McCorkle & Young, 1978), a tool used to measure distress, which employ terms with similar meanings, e.g. 'having enough personal energy' vs 'fatigue'.

In order to accurately measure psychological distress, the tool used must be developed on the basis of the comprehensive definition of psychological distress. The General Health Questionnaire (Goldberg & Williams, 2000), Kessler-10 (Kessler et al., 2002), Brief Symptom Inventory (Derogatis & Melisaratos, 1983) and more recent variants of these scales are all designed to measure psychological distress as a negative emotional state with symptoms of anxiety and depression. The Kessler-10 scale was used in the current study to measure psychological distress.

2.2. Measuring psychological distress: the Kessler-10

The Kessler-10 (K-10) is a 10-item validated scale designed to measure psychological distress (Kessler et al., 2002). The questions assess how often symptoms on the anxiety-depression spectrum are experienced in the past four weeks with five options ranging from none of the time to all of the time. The items can then be scored to give a psychological distress score classifiable into four levels: low, moderate, high, and very high. The K-10 was specifically developed for use in population surveys (Harvard, 2014). For increased precision and sensitivity across ages and gender, and in the range of psychological distress indicative of mental disorder, the scale was developed using item response theory models (Kessler et al., 2003). Research has supported that K-10 scores are not biased by age (O'Connor & Parslow, 2010), education, or gender (Baillie, 2005). Compared to the General Health Questionnaire (12-item), the K-10 is more effective at identifying those at risk of mental disorder (Furukawa & Goldberg, 1999). The K-10 is used to measure psychological distress in many large population studies such as the U.S. National Health Interview Survey, the World Health Organisation's World Mental Health Initiative, and the New Zealand Health Survey as well as in clinical settings (Harvard, 2014).

Chapter 3. Systematic review of the literature

3.1. Introduction

As discussed in the previous chapter, the definition of psychological distress is not clear cut. There is often an overlap between psychological distress and generalised stress, with symptoms of psychological distress considered symptoms of generalised stress. A great deal of research has been carried out to understand the relationship between generalised stress and alcohol consumption but findings are mixed. Some studies suggest that alcohol consumption reduces stress while others find the opposite (Pohorecky, 1991, Sayette, 1993). It is clear that the nature of the relationship between alcohol consumption and generalised stress, if any, is complex, and may vary by age. In this study, psychological distress is defined as *a measure of negative emotional state with symptoms on the anxiety-depression spectrum*. There are fewer studies that have focussed specifically on the potential effect of psychological distress on alcohol but the conclusions of these studies are similarly incongruent (Hansell et al., 1999; Geisner et al., 2004). Given the lack of coherence in the published literature, a systematic review of studies most relevant to the research question was undertaken, which concerns the association of psychological distress and alcohol consumption in the young adult population.

Systematic reviews have major advantages over narrative or selective reviews. They facilitate the reduction of large quantities of research material, allow discussion of generalisability, and assessment of consistency in relationships (Mulrow, 1994). In many cases systematic reviews can incorporate meta-analysis, however, due to the variety in measurement that was not possible in this review. There are currently no published systematic reviews of psychological distress and alcohol use in young people or the general population.

3.2. Aim

The aim was to identify all published studies that investigated the association between alcohol consumption and psychological distress in a young adult population, to evaluate the reports of those studies that met the inclusion criteria, and to use the findings to refine the research questions considered in this thesis.

3.3. Relationship model

In examining the relationship between psychological distress and alcohol consumption, neither factor is being solely considered the exposure (independent variable) or the outcome (dependent variable). Instead, we are investigating the possibility that the relationship could take a variety of forms. In the figure below, the potential relationships between psychological distress and alcohol consumption are outlined.

Psychological distress	→	Alcohol consumption	Causal association
Psychological distress	←	Alcohol consumption	Causal association
Psychological distress	↔	Alcohol consumption	Causal association
Psychological distress	—/—	Alcohol consumption	No association
Psychological distress	—	Alcohol consumption	Confounded association
	↖ other factors ↗		

Figure 3.1. Potential relationships between psychological distress and alcohol consumption.

3.4. Methods

3.4.1. Literature search strategy

A primary systematic literature search on the topic was carried out in 2012 and updated in March 2014. Online databases Embase and PsycINFO were searched using the OVID portal. The search strategies for the databases differed slightly as a result of differences in the mapping of subject headings in each one. However, attempts were made to keep the searches as similar as possible.

Embase all-years (1947-present) was searched using the following strategy:

- 'Distress syndrome' (focused) or 'stress' (exploded and focused) or 'anxiety' (exploded and focused) were searched with 'drinking behaviour' (exploded) and 'alcohol consumption' (exploded) or 'alcohol drinking patterns' (multi-purpose).
- The results were limited to human adolescents aged 13-17 years and adults aged 18-64 years.

PsycINFO (1967- present) was similarly searched.

- ‘Distress’ (exploded and focused) or ‘stress’ (exploded and focused) or ‘anxiety’ (exploded and focused) were searched with ‘alcohol drinking patterns’ (exploded and focused).
- The results were limited to human adolescents aged 13-17years and young adults 18-29 years.
- Search terms were exploded to include related terms within the subject heading tree in order to increase sensitivity of the search.
- Certain terms were focused to insure the authors considered the term a main topic and to reduce the number of irrelevant results. This was especially true of distress symptoms which are often taken into consideration in research, while not being a prime interest.

Google Scholar was also searched for applicable literature using the condition:

- ((anxiety or stress or distress) and (alcohol or drinking)).
- The first ten pages of results were reviewed.

Reference lists of those studies found, were also searched for potentially applicable studies.

3.4.2. Inclusion criteria

In order to be considered applicable, a study had to contain:

- a measure of alcohol consumption,
- a measure of psychological distress, and
- some investigation of the association between these factors.

It was decided to include studies with a measure of anxiety or depression because psychological distress is defined as distress on the anxiety-depression spectrum. Studies with a measure of stress were also included due to the broad definition of stress in the literature that tends to include symptoms of psychological distress (Pohorecky,1991). The population of interest was young adults. Accordingly:

- The mean age of participants at time of measuring alcohol consumption and psychological distress had to be 15- 30 years.

Furthermore, as clinical populations were not of interest, and due to the potential confounders associated with conditions requiring treatment, studies with a focus on alcohol or drug dependence and mental health disorders were excluded from this review. Lastly, studies for which there was not an online holding were excluded for practical reasons.

3.5. Results

The literature search returned 496 articles matching the search terms. Initially the abstracts of all studies were read to determine whether they warranted further consideration. Based on the content of the abstract, the majority of the articles retrieved were eliminated, either because the study population was described as clinical, the exposure/outcome measurement was not alcohol consumption, or a distinctively inappropriate age group was being studied (e.g. pensioners). Following this, 123 papers were read in their entirety to establish eligibility for inclusion. Articles were rejected when it was deduced that the population was clinical, the association between alcohol consumption and psychological distress was not investigated and, most commonly, because the mean age was either too young or too old. The remaining 31 studies were deemed eligible for inclusion.

3.5.1. Description of the studies

The studies that met the inclusion criteria are listed in Table 3.1, and described in detail below. Many were not primarily investigating the relationship between psychological distress and alcohol consumption. In these cases, only the results relevant to the research question are reported. The studies are grouped by the variables being analysed, as shown in Table 3.1.

Table 3.1 *List of included research papers by author and psychological distress variable studied*

	Author(s)	*Year*	*Psychological distress variable*	*Star rating*
1.	Hansell et al.	1999	Psychological distress	***
2.	Geisner et al.	2004	Psychological distress	**
3.	Pereira et al.	2011	Psychological distress	*
4.	Cable & Sacker	2007	Psychological distress	***
5.	Power et al.	1998	Psychological distress	***
6.	Balogun et al.	2014	Psychological distress	***
7.	Park et al.	2004	Stress	**

8.	Butler et al.	2010	Stress	**
9.	Aseltine & Gore	2000	Stress	***
10.	Crutzen et al.	2010	Stress	**
11.	Hiro et al.	2007	Stress	***
12.	O'Hare & Sherrer	2006	Stress	**
13.	McCreary & Sadava	1998	Stress	***
14.	Dick et al.	1993	Stress & Depression	*
15.	Hutchinson et al.	1998	Stress & Depression	*
16.	Adewuya et al.	2006	Anxiety	*
17.	Fröjd et al.	2011	Anxiety	***
18.	Kushner et al.	1994	Anxiety	*
19.	Alati et al.	2005	Anxiety & Depression	***
20.	Caldwell et al.	2002	Anxiety & Depression	***
21.	Said et al.	2013	Anxiety & Depression	***
22.	Oetting et al.	1997	Anxiety & Depression	*
23.	Paschall et al.	2005	Depression	***
24.	O'Donnell et al.	2006	Depression	***
25.	Battista & Kocovski	2010	Depression & Social Anxiety	*
26.	Buckner et al.	2006	Social Anxiety	*
27.	Booth & Hasking	2009	Social Anxiety	**
28.	Ham et al.	2011	Social Anxiety	*
29.	Ham et al.	2007	Social Anxiety	*
30.	Strahan et al.	2011	Social Anxiety	**
31.	Ham & Hope	2005	Social Anxiety	*

The studies have been given a star reliability rating from 1-3 based on the study type, sampling methods and consideration of confounding. The ratings reflect the reliability of the reported association between psychological distress and alcohol use, and not the study as a whole which in many cases had other primary aims. Three-star studies were more reliable studies where the study design was longitudinal or a larger cross-sectional study, random sampling or equivalent was used, and confounders were well-considered. Two-star studies were less reliable studies that were cross-sectional, considered some confounding, and used convenience sampling. One-star studies were the least reliable studies that were cross-sectional, did not consider confounding and used convenience sampling.

3.5.2. Studies of psychological distress and alcohol consumption

Six studies were identified, and are described below.

1. Hansell, S., Raskin White, H., & Molaparast Vali, F. (1999). Specific alcoholic beverages and physical and mental health among adolescents. *J Stud Alcohol, 60*(2), 209-218.

About the study	*Variables analysed*	*Results*	*Comments*
Psychological distress ***1999*** ***USA*** ***Young adults*** ***Cross-sectional and longitudinal*** ***n=1380 (38% response)*** ***n=1270 at 6 year follow up*** *Study rating:******	1.*Psychological distress* via global severity index of the Johns Hopkins Symptom Checklist 2*. Alcohol use* as a combination of 3 variables: 1.Freq. of use of –beer – wine and – spirits in year (Never to 1+ times a day) 2. Quantity of beverage type per occasion 3.Number of times the participant got 'high' from a beverage type in the year (0-50+)	*Cross-sectional correlations:* Alcohol-psychological distres0073 Wave 1: Beer = 0.06 Wine= 0.05 Spirits = 0.05 Wave 2: Beer = 0.04 Wine =0.02 Spirits= 0.04 Wave 3 Beer= 0.02 Wine=0.00 Spirits=0.06 *Longitudinal correlations* Wave 1 alcohol use as a predictor of wave 2 psych. distress. Beer= 0.14 Wine=0.01 Spirits=0.10 Wave 2 alcohol use as a predictor of wave 3 psych. distress. Beer=-0.06 Wine=0.01 Spirits=-0.08 Wave 1 psych distress as a predictor of wave 2 alcohol use Beer= -0.01 Wine=-0.02 Spirits=-0.01 Wave 2 psych distress as a predictor of wave 3 alcohol use Beer= 0.02 Wine=0.00 Spirits=0.03 In all cases p>0.05 Overview: Results suggest no association	Sampling: Random sampling of New Jersey (US) households via telephone Generalisability: limited to white middle class adolescents due to over selection Potential confounders: didn't take information on any clinical mental health issues or physical health conditions but controlled for other possible confounders Measurement error: as participants rated drinking multiple types of beverages there is no way to be sure the associations between one drink measured and outcome factors were not due to another beverage. Overall: addressed the need to look at the variables longitudinally and as such offers sound evidence

2. Geisner, I.M., Larimer, M. E., & Neighbors, C. (2004). The relationship among alcohol use, related problems, and symptoms of psychological distress: gender as a moderator in a college sample. *Addict Behav, 29*(5), 843-848.

About the study	*Variables analysed*	*Results*	*Comments*
Psychological distress ***2004*** ***USA*** ***University students*** ***Cross-sectional*** ***n=1705*** ***(response rate unknown).*** *Study rating:***	1. *Psychological distress* via the Brief Symptom Inventory 2. Freq./quantity of *alcohol consumed* via Daily Drinking Questionnaire	A table of results was not provided and so the results are based on the author's description. Participants with higher levels of psychological distress reported greater alcohol consumption than those with low psychological distress ($p<0.0001$)	Sampling: No information provided on sampling except that participants came from an existing cohort. Generalisability: West Coast of US university students Potential confounders: Only confounders considered were age and ethnicity. Overall: Not enough information provided regarding results, selection or analysis.

3. Perera, B., Torabi, M., & Kay, N. S. (2011). Alcohol use, related problems and psychological health in college students. *Int J Adolesc Med Health, 23*(1), 33-37.

About the study	*Variables analysed*	*Results*	*Comments*
Psychological distress ***2011*** ***USA*** ***University students*** ***Cross-sectional*** ***N=554*** ***(response rate unknown)*** *Study rating:**	1. *Psychological distress* via General Wellbeing Schedule of 18 items such as anxiety, depression, wellbeing. 2. Level *of alcohol use* - participants answered whether they had had a drink in the past 30 days, if they had they were considered an alcohol user and if not they were a non-user -If they consumed 1-2 drinks at a time, used alcohol at least once a month but less than once a week, they were a moderate user and all others were heavy users.	Psychological distress (incorporating all items of GWBS) score in males: Current user: 72.11 Occasional/non-user: 69.16 In females: Current user: 69.77 Occasional/non-user: 72.82 Psychological distress (incorporating only the anxiety and depression items on GWBS) Moderate consumption: Anxiety : 17.75 (Male), 16.08 (female) Depression: 16.42 (M), 16.26 (F) Heavy consumption: Anxiety: 17.58 (M), 16.89 (F) Depression: 16.12 (M), 16.68(F) No other statistics were provided. Overview: There was no significant difference between psychological distress scores for occasional/non-users and users of alcohol for males or females. (no p values provided)	Sampling: No information on how participants were recruited, participation rate or even the name of the university they came from in the US. Generalisability: potentially representative of American university students but not enough detail provided. Potential Confounders: No information provided Measurement: The definition of the categories of alcohol use are questionable. A moderate user is someone who has 1-2 drinks on any one occasion, at least once a month but less than once a week. Heavy users are all those who exceed this. This seems like a very low level of drinking to be considered 'heavy' in a university sample. Overall: Not enough information provided about participants or results.

4. Cable, N., & Sacker, A. (2007). The role of adolescent social disinhibition expectancies in moderating the relationship between psychological distress and alcohol use and misuse. *Addict Behav, 32*(2), 282-295.

About the study	*Variables analysed*	*Results*	*Comments*
Psychological distress 2007 UK General population Cross-sectional and longitudinal n=11621 at age 16 n= 11261 at age 30 (loss to follow up = 30%) *Study rating:***	1.*Psychological distress* via 12-item General Health Questionnaire 2. *Alcohol use* via reported quantity and types of alcohol consumed the previous week 3. *Alcohol misuse* via CAGE questionnaire	Regression analysis of association between psych distress and alcohol use. In men for each unit increase in psychological distress the odds of being: Infrequent drinker: 1.01 (1-1.03) Light/Moderate: 1.00 Moderate/Heavy:1.00 (0.98-1.01) Very heavy: 1.03 (1.003-1.05) In women for each unit increase in psychological distress the odds of being: Infrequent drinker: 1.01 (1-1.02) Light/Moderate: 1.00 Moderate/Heavy:1.02 (1-1.04) Very heavy: 1.01 (0.98-1.04) For each unit increase in psych distress the odds of alcohol misuse for: Men: 1.07 (1.05-1.08) Women: 1.08 (1.06-1.1) Overview: For a given level of distress men and women were more likely to be infrequent drinkers than light/moderate drinkers. Men were more likely to be a heavy drinker than a light/mod drinker. Women were more likely to be a mod/heavy drinker than a light/mod drinker. Women and men were almost just as likely to misuse alcohol for a given level of psych distress. Suggests a U-shaped relationship for men but less pronounced for women.	Sampling: A large cohort of British participants born in 1970 with only 30% of those invited to participate at birth missing at age 16. Generalisability: Likely reflective of British young people Confounders: Important confounders were considered and regression analysis carried out Overall: Sound methodology and reliable study

5. Power, C., Rodgers, B., & Hope, S. (1998). U-shaped relation for alcohol consumption and health in early adulthood and implications for mortality. *The Lancet, 352*(9131), 877.

About the study	*Variables analysed*	*Results*	*Comments*
Psychological distress 1998 UK General population Cross-sectional and longitudinal n=16,482 at age 23 n=16290 at age 33 (loss to follow up=8%) *Study rating:***	1. *Alcohol consumption:* reported their consumption of beer, wine, spirits and other alcohols in previous week. Units of alcohol consumed were estimated from this. 2. *Psychological distress* via the malaise inventory which was a 24 item symptom list.	Experience of psychological distress for each level of alc. consumption at age 33. Abstainers: 10% (Males), 14.8% (Females) Light: 4.6% (M), 10.1% (F) Moderate: 5.3% (M), 9.5% (F) Heavy: 9.1% (M), 20% (F) All levels: 6.2% (M), 11.6% (F) Experience of psych distress at each level of alc consumption at age 33 when heavy drinkers at age 23 were excluded. Abstainers: 9.8% (M), 14.8% (F) Light: 4%(M), 9.8%(F) Moderate: 5.3% (M), 9.3% (F) Heavy: 11% (M), 22.8%(F) All levels: 5.9% (M), 11.5% (F) P<0.001 for all above Overview:A U-shaped relationship between alcohol consumption and psychological distress was found whereby abstainers and heavy drinkers experienced the most psychological distress. This relationship persisted even when previous heavy drinkers at 23 were excluded from the analysis.	Sampling: large birth cohort sample but unfortunately, as this study was not presented in a research paper but instead in a research letter of a single page in length, there is very little detail about why information was only available for 9605 participants. Also no demographic information was provided. As men and women were analysed separately, this is not too problematic. Generalisability: Likely representative of British population born in late 1950s. Potential confounders: Little information given, however, past heavy drinking, poor health and illness were considered. Overall: One of the few studies examining alcohol consumption as a predictor of psychological distress over time but weakened by the lack of information provided in the results of the study as to what wave of the study the data was being drawn from.

6. Balogun, O., Koyanagi, A., Stickley, A., Gilmour, S., & Shibuya, K.(2014). Alcohol Consumption and Psychological Distress in Adolescents: A Multi-Country Study. *Journal of Adolescent Health, 54*(2), 228-234.

About the study	*Variables analysed*	*Results*	*Comments*
Psychological distress 2014 12 countries Adolescents Cross-sectional n=32,001 (68.4-95.6% response) *Global School-Based Student Health Survey from a pool of 12 countries: Botswana, Grenada, Indonesia, Kenya, Myanmar, the Philippines, Trinidad, Seychelles, Thailand, Uganda, Saint Lucia, Saint Vincent and the Grenadines.* *Study rating:***	1. *Alcohol use* via past 30 day alcohol use – how many drinking days 2. *Alcohol misuse* characterized by having at least one episode of drunkenness is lifetime – how many times in your life have you been really drunk? 3. *Psychological distress* via 2 questions about depression and anxiety- During the past 12 months, did you ever feel so sad of hopeless almost every day for 2 weeks or more in a row that you stopped doing your usual activities? (Yes/No) During the past 12 months, how often have you been so worried about something that you could not sleep at night? (never/rarely/sometimes/most of the time/always)	Association between 30 day alcohol consumption and psychological distress with OR following regression analysis Botswana: **Q1 (depression)- 1.72 (1.19-2.48),** **Q2 (anxiety)- 1.73 (1.22-2.47)** Grenada: Q1: 1.15 (0.75-1.76) Q2: 2.07 (1.51-2.81) Indonesia: Q1: 1.80 (0.95-3.44) Q2: 1.46 (0.62-3.42) Kenya: Q1: 1.44 (0.98-2.12) Q2: 1.59 (1.17-2.15) Myanmar: Q1: 1.58 (0.59-4.27) Q2: 1.29 (0.36-4.62) Philippines: **Q1: 1.45 (1.04-2.01)** **Q2: 1.60 (1.34-1.91)** Saint Lucia: Q1: 1.39 (1.02-1.90) Q2: 1.27 (0.93-1.73) Saint Vincent & the Grenadines Q1: 1.15 (0.76-1.75) Q2: 1.20 (0.9-1.58) Seychelles: **Q1: 1.66 (1.54-1.78)** **Q2: 1.15 (1.07-1.23)** Thailand: **Q1: 1.78 (1.08-2.99)** **Q2: 2.00 (1.56-2.56)** Trinidad: **Q1: 1.68 (1.26-2.22)** **Q2: 1.49 (1.17-1.89)** Uganda: **Q1: 1.45 (1.06-1.98)** **Q2: 2.10 (1.68-2.62)** Overview: In half the countries, psychological distress was significantly associated with alcohol consumption (bold). In three countries there was a partial association and in a further 3, there was no association at all. In looking at the associations between lifetime drunkenness and psychological distress, a similar pattern emerged. 5/6 countries with significant association for 30 day use also had significant associations for drunkenness (Philippines did not). Of the remaining countries, Kenya showed a significant association but no others.	Sampling: Participants drawn from a sample of schools and randomly selected classes and had a high response rate. However, the use of schools as PSU despite being a logical choice, makes the sample less representative in developing countries where not all attend school. Generalisability: The results are not homogenous and therefore are less likely to be representative of all developing countries than of the individual countries. Would be generalizable to school going adolescents in each of the countries at an individual level. Possible confounders: Regression analysis was carried out to address a wide range of confounders. Hunger was used as a proxy for SES but SES should still be considered as a potential confounder. Measurement: The 2 questions used to measure psychological distress are not a validated measure. Overall: This study offers an insight into the potential cultural differences in associations between alcohol use and psychological distress around the world. Would be stronger with validated measures.

Summary

All six studies focussed on whether there was an association between alcohol consumption and psychological distress, and the results varied. Hansell et al. (1999) and Perera et al. (2011), did not find evidence of an association between the two variables. The remaining four studies suggest there is an association but are not in agreement on the nature

of the relationship. Geisner et al. (2004) found that participants with higher levels of psychological distress consumed more alcohol than those with low psychological distress. Balogun et al. (2013) analysed data from 12 developing countries finding that in half of countries, alcohol consumption was significantly associated with psychological distress, and in the other half of countries there was no association. Cable and Sacker (2007) described the relationship between alcohol use and psychological distress as being gender specific. In men, they observed a U-shaped relationship between the variables where psychological distress increased the likelihood of being an infrequent or very heavy drinker compared with light drinkers. In women, psychological distress also increased the likelihood of being an infrequent drinker versus a light drinker, however, psychological distress was not associated with very heavy drinking. Instead, psychological distress increased the likelihood of a woman being a moderate drinker compared to a light drinker. In this way, the relationship was not a clear U shape as in men. Power et al. (1998) also observed a U-shaped relationship, where alcohol consumption predicted psychological distress. The relationship was observed for both men and women. Based on the results of all six studies, it appears that the relationship between psychological distress and alcohol consumption is inconsistent.

A note on descriptions of shape: Studies describing the shape of a relationship as U-shape or J-shape, describe a pattern in the outcome of interest (alcohol use or psychological distress) where it is at its lowest in the mid-ranges of the exposure and highest at the low end and high end of the exposure. U-shape and J-shape describe the same pattern, and researchers use the terms interchangeably but the descriptions here use whichever term is used in the study being summarised.

3.5.3. Studies of stress and alcohol use

Seven studies were identified as investigating an association between stress and alcohol consumption. Detailed descriptions are provided in the tables below.

1. Park, C. L., Armeli, S., & Tennen, H. (2004). The daily stress and coping process and alcohol use among college students. *J Stud Alcohol, 65*(1), 126-135.

About the study	*Variables analysed*	*Results*	*Comments*
Stress 2004 US University students Cross-sectional n=137 (response rate unknown) *Study rating:***	1. *Daily reported stress* - described most negative experience of the day and rated how stressful it was on a 7 point scale. 2. *Alcohol consumption* - Participants recorded how many drinks they had the *previous* day	Correlation between stress and alcohol consumption= -0.23 (p<0.01) Results from regression analysis: 1. For daily stress' within person effect on alcohol consumption – b=-0.057 (p<0.024) 2. Average daily stress' effect on average alcohol consumption- gamma = -0.215 (p<0.006) Overview: At the day to day level, participants who experienced more stress on a day, drank less that day. Over the study period, participants who experienced more stress, drank less on the whole.	Sampling: Drawn from a participant pool at university and participation for course credit. Possible selection bias as 38% of responders did not consume alcohol (they were subsequently not included) - perhaps those who drink less were more likely to respond for course credit. Generalisability: Not likely to be representative of all students. More generalizable to the females in the university participant pool. Confounders: In the regression analysis, mood, coping style and effect of day of the week were the main confounders considered. Mental health and SES were not considered. Measurement: The issue with the daily diary is that a lot of participants failed to comply (20% of participants were excluded for this reason). It is then possible that on drinking days/or high stress days, participants didn't fill out the diary and were excluded. Overall: the exclusion of 38% of the sample as non-drinkers and a further 20% of the sample due to lack of compliance, weakens this study.

2. Butler, A. B., Dodge, K. D., & Faurote, E. J. (2010). College student employment and drinking: a daily study of work stressors, alcohol expectancies, and alcohol consumption. *J Occup Health Psychol, 15*(3), 291-303.

About the study	*Variables analysed*	*Results*	*Comments*
Stress 2010 US University students Longitudinal n=106 (response rate unknown) *Study of the within-person relationship between work stressors and alcohol consumption over 14 days using an internet diary study.* *Study rating:***	1. *Job stress* via - Hours worked each day - Workload (I didn't have to work very hard… to.. my job was very demanding) -Work-school conflict using a 4 item scale 2. *Alcohol consumption* measure via count of standard drinks consumed that day	Results of linear regression modelling on the association between job stresses and alcohol consumption 1. Hours worked b=0.13 (p<.05) 2. Work-school conflict b=-.55 (p<0.01) 3. Workload b= -0.12 (p>.05) Overview: The elements of job stress as measured in this study were differentially associated with alcohol consumption. Working more hours was positively associated with alcohol consumption. Conflict between work and studies was negatively associated with consumption. Job workload showed no association with alcohol consumption.	Sampling: Convenience sample introduces potential selection bias via self-selection, where participants who volunteered for credit may different from the average student (e.g. drink less). Generalisability: Due to the over representation of women and lack of diversity, the study is most generalisable to white, female students in the US. Confounders: Main confounders were considered, including day of the week effect and daily earnings as potential 'drinking money' Measurement: There is little evidence that the three measures of job stress do actually measure that. Instead it may be better to consider the variables for what they do measure e.g. Hours worked, conflict and workload. Overall: This study provides information on the association between working and alcohol consumption but may not be a good source of information on the relationship between stress and alcohol consumption.

3. Aseltine, R. H., Jr., & Gore, S. L. (2000). The variable effects of stress on alcohol use from adolescence to early adulthood. *Subst Use Misuse, 35*(5), 643-668.

About the Study	*Variables analysed*	*Results*	*Comments*
Stress 1988-1996 US High school students Longitudinal n=1208 (77% response, 90% reinterview) *Sample drawn from systematic probability sample of grade 9, 10 and 11 in 3 Boston schools. Interviewed in 5 waves between 1988 to 1996.* *Study rating:***	*Stress via* 1.Negative life events 2.Parent conflict 3.Parent support 4.Peer conflict 5.Peer support *Alcohol use via* 1. Frequency of consumption in past year (never – everyday) 2. Frequency of binge drinking (5+ drinks) in past 5 weeks	Multilevel model results for the effect of stress on frequency of consumption Parent support: -0.104 (p<.05) Parent conflict: 0.076 (p<.05) Life events: 0.128 (p<.05) Peer support: 0.095 (p<.05) Peer conflict: 0.033 (p>.05) Effect of stress on binge drinking Parent support: -0.048 (p<.05) Parent conflict: 0.056 (p<.05) Life events : 0.081 (p<.05) Peer support: 0.052 (p<.05) Peer conflict: -0.003 (p>.05) Effect of stress variables on the age-alcohol consumption relationship Although stress was a significant predictor of alcohol consumption in the model, the trend for increasing consumption with age until the mid-twenties when there was a decrease, remained strong and significant. Effect of age on the stress-alcohol consumption relationship In younger adolescents the effect of parent conflict and life events has a stronger positive association with frequency of drinking and parental support has a stronger negative association with frequency of drinking. As participants age, the slope of the relationship between each of these factors and frequency of consumption becomes less steep. Overview: Stress was positively associated with alcohol consumption but did not explain the age-consumption trend. Stress also had a stronger association with the frequency of consumption in the younger ages than older ages.	Sampling: Participants drawn from a longitudinal study from Boston in the US. A high participation rate (77%) and a high reinterview rate (90%). Middle class is over represented in sample. Generalisability: Likely representative of Boston young people and generalizable to US young people that do not live in disadvantaged circumstances. Confounders: Confounders were considered in the model, however, investigators suggest that data on life events in childhood should have been acquired. Overall: This is a well-considered study but those of low SES are not represented.

4. Crutzen, R., Knibbe, R. A., & Mysyuk, Y. (2010). Unravelling the role of drinking motives in the relationship between stress and alcohol use and its related problems. *Mental Health and Substance Use, 3*(1), 38-46.

About the study	*Variables analysed*	*Results*	*Comments*
Stress 2010 Netherlands University students Cross-sectional n=179 (response rate unknown) *Volunteers from a convenience sample from 2 university restaurants.* *Study rating:**	1.*Stress* via - Life Event Stress Scale -Survey of Recent Life Experiences (daily hassles) 2.. *Alcohol use* via - quantity and - frequency - binge drinking (how often 6+ drinks consumed)	Regression analysis of alcohol consumption and stress: 1. Stress via life events: b=0.015 (p=.832) 2. Stress via daily hassles: b=0.044 (p=0.573) *Binge drinking and stress:* 1. Stress via life events: Odds ratio = 1.002 (p=0.415) 2. Stress via daily hassles: Odds ratio: 0.984 (p=0.268) Overview: No association between alcohol use and stress was found	Sampling: This study's weakness is its convenience sampling. No information is given on the response rate of participants at the restaurant either. Generalisability: As drawn from a restaurant, not likely to be a representative sample of all students but instead generalizable to Dutch students who can afford to eat out and who eat the particular cuisine served at the restaurant. Confounders: Study did consider confounders and carry out regression analysis Overall: The study offers a European perspective on the alcohol-stress relationship, however, its reliability comes under question due to the sampling choice.

5. Hiro, H., Kawakami, N., Tanaka, K., & Nakamura, K. (2007). Association between job stressors and heavy drinking: age differences in male Japanese workers. *Ind Health, 45*(3), 415-425.

About the study	*Variables analysed*	*Results*	*Comments*
Stress 2007 Japan Male workers Cross-sectional n=25104 (~85% response) *Participants drawn from Japan Work Stress and Health Cohort.* *Study rating:****	1*. Job stress* evaluated using Generic Job Stress Questionnaire which examines 13 job stressors 2*. Heavy drinking* (275g + of alcohol per week) was measured using: 1.Quantity consumed on drinking day 2. No. drinking days per month 3. Types of beverages consumed	Participants were divided into one of three stress levels for each job stressor (Low, intermediate and high score). The low score group was the comparison group. The odds of heavy drinking for different levels of stress compared with low stress levels were then calculated. None of the 13 job stressors were significantly associated with heavy alcohol use in the 18-29 year old men. All odds ratios were wide (eg.0.6-4.07)	Sampling: Drawn from a cohort study with a high response rate. Non-drinkers were excluded from the sample. Generalisability: Japanese drinking culture and work culture is different from the West. With this in mind, the study is generalizable to young Japanese working men. Confounders: Study considered a wide range of confounders. Measurement: Study was only interested in measuring heavy drinking. By looking at drinking as a continuous variable, other insights may have been provided. The 13 job stressors assessed realistically stressful aspects of work. Overall: The study offers a non-Western insight into the stress-alcohol consumption relationship. The Japanese drinking trends are different to many other cultures, with alcohol use being lowest in the 18-29 year old group.

6. O'Hare, T., & Sherrer, M. V. (2006). Stress, Recent Changes in Alcohol Consumption Level, and Problem Drinking in Freshman First Offenders. *Journal of Human Behavior in the Social Environment, 13*(3), 33-50.

About the study	*Variables analysed*	*Results*	*Comments*
Stress ***~1995-2000*** ***US*** ***University students*** ***Cross-sectional*** ***n=389*** ***(response rate unknown)*** *Participants took the questionnaire in the mid to late 90s as part of the process involved in paying their fine for their first offence of underage drinking* *Study rating:***	1. *Stress* via South Shore Problem Inventory Revised which had 9 items (depression, anxiety, anger, trouble sleeping, trouble concentrating, conflicts with others, loneliness, impulsiveness and shyness). 2. *Alcohol use* via AUDIT questionnaire (problem drinking score is >= 8) 3. *Changes in alcohol use* via the question, 'In the past months how would you describe your alcohol consumption?' (reduced a lot to increased a lot)	Correlation between stress and alcohol use (audit score) = 0.307 ($p<0.01$) Multivariate analysis: gender x stress on problem drinking For the interaction term gender x stress rsquared= 0.156 ($p<0.001$) Post-hoc correlation of stress and problematic alcohol use by gender In males r=0.36 ($p<0.01$) In females r=0.22 ($p<0.01$) Linear regression examining the 9 items of the SSPIR and problematic alcohol use by gender *In males*: 2 out of 9 factors predicted alcohol use at a significant level. -conflict -> rsquared=0.122, $p<0.001$ -impulsivity -> rsquared=0.179, $p<0.001$ *In females*: 1 out of 9 factors predicted alcohol use at a significant level. -problems concentrating -> rsquared=0.05, $p<0.01$ Overview: Overall stress was positively correlated with alcohol use and problem drinking however, not all stress factors were significant predictors of problem drinking.	Sampling: Convenience sample of students referred for underage drinking. Generalisability: The sample is unlikely to be representative of the general population of young people. Due to the convenience sampling, only a subset of the university population who were caught drinking underage (under 21) were sampled. Males were over representative. Confounders: Main confounders considered were drug use and change in alcohol consumption. Measurement: The tool used to measure stress could be argued to measure psychological distress. The authors at times call it psychosocial stress. Overall: The study is not representative of the wider young population, a fact the authors are aware of. Also the research predominantly focusses on the effect of stress on problem levels of drinking as opposed to alcohol consumption levels in general and is limited by it.

7. McCreary, D. R., & Sadava, S. W. (1998). Stress, drinking, and the adverse consequences of drinking in two samples of young adults. *Psychology of Addictive Behaviors, 12*(4), 247-261.

About the study	*Variables analysed*	*Results*	*Comments*
Stress ***1991*** ***Canada*** ***Young people*** ***Cross-sectional*** ***n=843 (82% response)*** ***Participants were drawn from the 1991 phase of Niagara Young Adult Health Survey.*** *Study rating:****	1.*Stress* measured using 3 variables: 1. Perceived stress (frequency of feeling 'stressed' & how stressful they would describe their life) 2. Chronic stress via The Hassles Scale 3.Acute stress via the Life Events Survey 2. *Alcohol use* via quantity-frequency index	Regression analysis of stress variables as predictors of alcohol use. 1. Perceived stress b= -.00 $p>0.05$ 2. Chronic stress b= -.07 $p>0.05$ 3. Acute stress (negative life events) b= 0.13 $p<0.001$ Overview: Acute stress in the form of negative life events was the only stress factor that was significantly positively associated with quantity and frequency of alcohol consumption.	Sampling: Random sampling with high response rate in a time period when landline phones were widespread Generalisability: Likely to be representative of the young Candian population Confounders: important confounders were considered Overall: Study suggests different forms of stress are differently associated with alcohol use.

8. Dick, R. W., Manson, S. M., & Beals, J. (1993). Alcohol use among male and female Native American adolescents: patterns and correlates of student drinking in a boarding school. *J Stud Alcohol, 54*(2), 172-177.

About the study	*Variables analysed*	*Results*	*Comments*
Stress ***1988*** ***US (Native American)*** ***High schoolers*** ***Cross-sectional*** ***n=188*** ***(response rate unknown)*** *Data was collected as part of a larger longitudinal study of Native American high schools.* *(Also depression)* *Study rating:**	1. *Stress* via Life Events Schedule 2. *Depression* via the Center for Epidemiological Studies- Depression Scale	Regression analysis of alcohol use by stressful life events *Quantity/frequency* -Beta=0.13 (p=.356) *Freq. of intoxication* -Beta= 0.003 (p=.581) Overview: Stressful events were slightly positively associated with alcohol use however, this was not significant. No association between stress and freq. of intoxication was observed.	Sampling: no details provided on participation rate. No mention is given to those absent from class who couldn't have taken the class test but may score more highly on the variables analysed. Generalisability: With little information on sampling, and given the niche sample (boarding school, Native American), it is not likely generalisable to young people outside of the Native American communities. Confounding: Although regression analysis was carried out, confounders considered are not explicitly named. General: Small study of a minority group. Lack of information in the report hinders confidence.

9. Hutchinson, G., Patock-Peckham, J., Cheong, J., & Nagoshi, C. (1998). Irrational Beliefs and Behavioral Misregulation in the Role of Alcohol Abuse Among College Students. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 16*(1), 61-74.

About the study	*Variables analysed*	*Results*	*Comments*
Stress ***1998*** ***US*** ***University students*** ***Cross-sectional*** ***n=203*** ***(response rate unknown)*** *(Also depression)* *Study rating:**	1. *Alcohol use* via - frequency of use - quantity - frequency of drunkenness 2. *Stress* via Hassles and Uplifts Scale	Correlation between alcohol use and stress = 0.03 (p>0.05) Overview: no association between alcohol use and stress was observed	Sampling: small convenience sample with reward motivation. Only participants who reported consuming alcohol were included in the sample. Generalisability: not generalisable to wider group due to sampling method. Confounders: In the results described here, no confounders were considered as the association between alcohol use and stress was not a main focus of the study. General: This study's focus was not on stress primarily and does not provide strong evidence as a result.

Summary

As in the case of psychological distress and alcohol consumption, there was little consensus between the studies focussing on stress and alcohol use. The types of stress measured varied, with stress reported daily, job stress, life events, daily hassles, and problems from stress all featuring. The results varied from finding no association, to a positive association, to a negative association, and to a mix of different associations. All of the studies considered stress as the independent variable and alcohol use as the dependent variable although many acknowledged the potentially dynamic nature of the relationship. Park et al. (2004) conducted a diary study, finding a negative relationship between stress and alcohol

consumption, with participants drinking less on high stress days. Butler et al. (2010) also noted a negative relationship between stress and alcohol use, however only in the case of job stress resulting from conflict with university study. Another job stress variable 'hours worked' had the opposite effect, with increased alcohol use associated with more hours worked. In Aseltine et al.'s (2000) longitudinal study, a positive relationship between stress and alcohol consumption emerged. This effect of stress on alcohol use was greater in the teenage years than in the twenties. O'Hare and Sherrer (2006) too found a positive relationship between stress and alcohol use in university students. McCreary and Sadava (1998) found that in Canadian young people, acute stress in the form of negative life events, was positively associated with alcohol use. However, perceived stress and chronic stress were not significantly associated with alcohol use. Four other studies found no significant association between the variables. In a Dutch sample of university students, Crutzen et al. (2010), found no significant association between stress and alcohol use. In a Japanese context, there was also no significant association between job stresses and alcohol use in young people (Hiro et al., 2006). In a sample of Native American high school students, Dick et al. (1993) found no significant association between the variables either. Hutchinson et al. (1998) examined university students in the USA, finding no significant association between stress and alcohol use. It is hard to draw firm conclusions from such a variety of results but perhaps the results are indicative of the complicated nature of the stress-alcohol relationship.

3.5.4. Studies of anxiety and alcohol use

Seven studies were identified as investigating an association between anxiety and alcohol use. These studies are detailed below.

1. Adewuya, A. O., Ola, B. A., & Aloba, O. O. (2006). Gender differences in the relationship between alcohol use and anxiety symptoms among Nigerian college students. *Drug Alcohol Depend, 85*(3), 255-257.

About the study	*Variables analysed*	*Results*	*Comments*
Anxiety 2006 Nigeria University students Cross-sectional n=86 (100% response) *Recruited from the sample of another alcohol study.* *Study rating:**	1.*Alcohol drinking status* (Abstaining, moderate, hazardous, abusive, dependent drinkers) via Composite International Diagnostic Interview 2. *Anxiety* via Zung's Self Rating Anxiety Scale (Data taken up to a week after alcohol drinking status data)	Anxiety score for different levels of alcohol consumption by gender Abstainers: 41.1 (f) 37.9 (m) Moderate: 48 (f) 30.3 (m) Hazardous: 56.3 (f) 43.6 (m) Abusive: 62.6 (f) 49.9 (m) Dependent: 67 (f) 57 (m) Overview: The relationship between alcohol use and anxiety was different in men and women. In women the relationship was linear and in men it was j-shaped.	Sampling: No details provided on how participants were recruited into primary study Generalisability: Very small sample of Nigerian university students. Not enough information provided to suggest the results are generalisable. Confounders: If confounders were considered, no information on this was provided in the report. Measurement: No details provided about why the two measurements were not carried out at the same time. Overall: There was very little information provided in the brief study report. Study did not conduct analysis for measures of association.

2. Fröjd, S., Ranta, K., Kaltiala-Heino, R., & Marttunen, M. (2011). Associations of Social Phobia and General Anxiety with Alcohol and Drug Use in A Community Sample of Adolescents. *Alcohol and Alcoholism*.

About the study	*Variables analysed*	*Results*	*Comments*
Anxiety 2011 Finland Young people Longitudinal n=2070 (94% response, 28% drop in females, 46% drop out in males) *Study sample is part of larger Adolescent Mental Health Cohort Study.* *Study rating:****	1. *Anxiety* via 1 general anxiety question, 'Which of the following best describes you? I don't easily lose my nerve or get anxious (0)/ I don't feel anxious or nervous (0)/ I get anxious and nervous rather easily (1)/ I get very easily distressed, anxious or nervous (2)/ I am constantly anxious and distressed, my nerves are always on edge (3).(score of 2-3 = general anxiety) 2. *Alcohol* use via frequency of use and frequency of drunkenness	1. Odds of frequent alcohol use when general anxiety is present compared to absense of anxiety at baseline. - Model 1 (When controlling for gender, family structure and parental education levels) OR=2.9 (1.6-5.3) - Model 2 (When additionally controlling for depression) OR=1.8 (0.9-3.6) 2. Odds of frequent drunkeness when general anxiety is present compared to absense of anxiety at baseline. - Model 1- OR=3.3 (1.3-8.3) - Model 2- OR=1.7 (.6-4.9) 3. Odds of new cases of frequent alcohol use at 2 year follow up according to general anxiety at baseline. - Model 1- OR=2.5 (1.3-4.6) - Model 2- OR=2.4 (1.2-4.8) 4. Odds of new cases of frequent drunkeness at 2 year follow up according to general anxiety at baseline. - Model 1- OR=1.8 (0.7-4.3) - Model 2- OR=1.5 (0.6-3.9) 5. Odds of new cases of general anxiety at 2 year follow up according to frequent alcohol use at baseline. - Model 1- OR=1.6 (.78-3.4) - Model 2- OR= 1.3 (.6-2.8) 6. Odds of new cases of general anxiety at 2 year follow up according to frequent drunkeness at baseline. - Model 1- OR=1.2 (0.3-5) - Model 2- OR=0.8 (0.2-3.6) Overview: At baseline, those experiencing anxiety were more likely to be frequent drinkers and getting frequently drunk than those not experiencing anxiety. Experiencing anxiety at baseline was associated with increased odds of becoming a frequent alcohol user at the 2 year follow up. However, there was no evidence that general anxiety at baseline increased the odds of becoming frequently drunk at follow up. There is also no evidence that frequent alcohol use or frequent drunkeness at baseline increased the risk of new cases of anxiety at follow up. When controlling for depression all ORs became insignificant except for the increased odds of becoming a frequent alcohol user at the 2 year follow up if anxious at baseline.	Sampling: All secondary schools in two Finnish towns were sampled with 94% response at baseline. Drop out rate was 37%. Drop out was related to being male, of lower SES and positive scores on the variables analysed. Generalisability: Likely representative of Finnish students. Confounding: Carefully considered the important confounders Measurement: May have been better to use continuous scales Overall: Study that investigates the temporal relationship between factors.The confounding effect of depression in the analysis supports the use of more comprehensive measures such as psychological distress.

3. Kushner, M. G., Sher, K. J., Wood, M. D., & Wood, P. K. (1994). Anxiety and drinking behavior: moderating effects of tension-reduction alcohol outcome expectancies. *Alcohol Clin Exp Res, 18*(4), 852-860.

About the study	*Variables analysed*	*Results*	*Comments*
Anxiety 1994 US University students Cross-sectional N=421 (response rate unknown) *Study rating:**	1. *Alcohol consumption* measured using: - Consumption quantity/freq. composite of past year and past 30 days - Heavy drinking composite for past 30 days 2. *Anxiety* measured using select scales of the Brief Symptom Inventory	Correlations between alcohol use and anxiety by gender. 1. Quantity/frequency of alcohol use and anxiety Females= 0.13 (p<.05) Males = 0.12 (p<.10) 2. Heavy drinking and anxiety Females=0.24 (p<.0001) Males= 0.14 (p<.10) Overview: A small positive correlation between alcohol use and anxiety was observed. The correlation was larger and significant in women.	Sampling: Details on how the participants were identified to take the questionnaire are not provided nor are participation rates. Generalisability: Likely reflective of American university students Confounders: Participants with major confounders were eliminated from the study. Information on other confounders was collected, however, as the research question was not primarily alc/anxiety, they were not considered in the results provided here. Overall: The study's primary interest was not alcohol use and psychological distress. More information on the sampling methods would be beneficial.

4. Alati, R., Lawlor, D. A., Najman, J. M., Williams, G. M., Bor, W., & O'Callaghan, M. (2005). Is there really a 'J-shaped' curve in the association between alcohol consumption and symptoms of depression and anxiety? Findings from the Mater-University Study of Pregnancy and its outcomes. *Addiction, 100*(5), 643-651.

About the study	*Variables analysed*	*Results*	*Comments*
Anxiety 1981-1989 Australia Mothers Longitudinal and cross-sectional N=7223 (response rate unknown) *The women were recruited after giving birth in the South Brisbane hospital between 1981 and 1984. Data was collected during antenatal clinic appointments for their children, firstly at 2-3 days after birth (but questions to relating to pre-pregnancy), then 5 years.* *(Also depression)* *Study rating:****	1. *Alcohol use* via - Frequency of consumption (never-daily) - Quantity consumed per drinking occasion (none to 7+ standard drinks) 2. *Anxiety* via the anxiety subscale of Delusions-Symptoms-States Inventory (DSSI)	Percentage of women with anxiety at different levels of alcohol use at baseline and 5 year follow up. -Abstainers: 20% / 27.8% -Light: 21% / 25% -Moderate: 25% /31% -Heavy: 40% / 44% p-value for linear trend baseline: <0.005 5 year: <0.67 p-value for non-linear trend baseline: <0.17 5 year: <0.002 Adjusted odds of experiencing anxiety at different levels of drinking at baseline. Abstainers: 0.94 (0.78-1.13) Light: 1.00 Moderate: 1.01 (0.75-1.36) Heavy: 1.59 (0.92-2.76) Adjusted odds of experiencing anxiety at different levels of drinking at 5 year follow up. Abstainers: 1.24 (1.04-1.46) Light: 1.00 Moderate: 1.34 (0.98 -1.85) Heavy: 1.85 (0.92-3.71) Overview: At baseline, a linear association between alcohol consumption and anxiety is observed. 5 years later the relationship took on a j-shape where abstainers experienced more anxiety than light drinkers. When the adjusted odds-ratios are calculated, a similar J-shape relationship emerges, however, it is not significant.	Sampling: Large cohort study. Participants excluded due to missing data were heavier drinkers, more anxious, more likely to be having relationship problems and less wealthy than other participants. Generalisability: Representative of urban Australian mothers. Confounders: In analysis, they adjusted for age, family income, smoking, marital status and relationship quality. They also went to great lengths to eliminate the effect of 'sick quitters'. Overall: Large study that provides an insight into the longitudinal association between alcohol use and anxiety. However, the difference observed between the baseline data and the 5 year follow up data could in part be due to women abstaining prior to pregnancy for different reasons than they might at a 5 year follow up.

5. Caldwell, T. M., Rodgers, B., Jorm, A. F., Christensen, H., Jacomb, P. A., Korten, A. E., & Lynskey, M. T. (2002). Patterns of association between alcohol consumption and symptoms of depression and anxiety in young adults. *Addiction, 97*(5), 583-594.

About the study	*Variables analysed*	*Results*	*Comments*
Anxiety ***2002*** ***Australia*** ***General population*** ***Cross-sectional*** ***N=2276 (59% response)*** *Participants were drawn from the 20-24 age group of the first wave of the PATH Through Life study.* *(Also depression)* *Study rating:****	1. *Alcohol use* via -AUDIT questionnaire - Drinking history via quantity and freq. of alcohol consumption when it was at its highest 2. *Anxiety* via Goldberg's Anxiety Scales	Adjusted mean anxiety scores by alcohol use for men Non/occasional: **3.58** (sig different than light drinkers) Light: 2.98 Moderate: 2.91 Hazardous**: 3.70** (sig different than light drinkers) Pvalue for trend: <0.001 Unadjusted mean anxiety scores by alcohol use for women Non/occasional: 4.35 Light: 4.36 Moderate:4.53 Hazardous**:** 4.88 Pvalue for trend: >0.05 No difference between alcohol use categories Overview: In men, a j-shaped relationship in alcohol use and anxiety levels emerged. In women a non-significant, slight linear association between alcohol use and anxiety was observed.	Sampling: Random sampling of large population but response rate not high. No information available on non-responders. Generalisability: Likely representative of most Australian young people. Confounding: Considered tobacco, marijuana, life events, work status in the analysis of male data but in the female analysis no adjustments were made as there was no significant trend. Overall: A large cross-sectional study that highlights male/female differences in the nature of the alcohol/anxiety relationship.

6. Said, D., Kypri, K., & Bowman, J. (2013). Risk factors for mental disorder among university students in Australia: findings from a web-based cross-sectional survey. *Soc Psychiatry Psychiatr Epidemiol, 48*(6), 935-944.

About the study	*Variables analysed*	*Results*	*Comments*
Anxiety ***2013*** ***Australia*** ***University students*** ***Cross-sectional*** ***n=24209 (25% response)*** *Research part of a large mental health online survey in an Australian university.* *(Also depression)* *Study rating:****	1. *Anxiety* via Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PHQ) 2. *Alcohol* use via AUDIT questionnaire	Adjusted odds of anxiety by drinking status Non-drinker: 1 (ref) Moderate: 0.68 (0.56-0.84) Hazardous: 0.72 (0.56-0.91) Harmful: 0.96 (0.66-1.4) Possibly dependent: 2.41 (1.61-3.60) Overview: Moderate and hazardous drinkers were significantly less likely than non-drinkers to experience anxiety. Possibly dependent drinkers were more than twice as likely as non-drinkers to experience anxiety. Suggests a J-shape relationship.	Sampling: There were many non-responders. Under the presumption that non-responders are most like late responders, researchers did estimate non-response bias but found no significant differences between early and late responders. Generalisability: May be representative of older Australian university students but is limited by response rate. Confounding: The study focussed on many other risk factors for anxiety as well as alcohol use, which were included in the analysis. Overall: Provides an Australian perspective but held back by low response rates.

7. Oetting, E. R., Swaim, R. C., Edwards, R. W., & Beauvais, F. (1989). Indian and Anglo adolescent alcohol use and emotional distress: path models. *Am J Drug Alcohol Abuse, 15*(2), 153-172.

About the study	*Variables analysed*	*Results*	*Comments*
Anxiety 1989 US (Native American & Anglo) High school students Cross-sectional n=524 (NA)(89% response) n= 327 (Anglo (80% response) *Those who were not surveyed were either out of class or the whole class wasn't available to take the study or in the case of a few students, they declined to participate.* *(Also depression)* *Study rating:**	1. *Anxiety* via 3 item anxiety scale (3 questions about being tense, nervous or worrying) 2. *Alcohol use* via Alcohol Involvement Scale (6 questions about frequency of use, drunkenness and when and how it's used)	Correlation between anxiety and alcohol involvement for: -Anglo youth= 0.09 p<0.05 -Indian youth=-0.10 p>0.05 Overview: A small significant positive correlation between anxiety and alcohol involvement was observed in Anglo youth. In Indian youth, an insignificant negative correlation between anxiety and alcohol use emerged.	Sampling: All available school children were sampled and the response rate was high. Generalisability: Representative of Native American youths living on reservations and Anglo youth in the wider area. Confounding: As this study was not primarily examining anxiety alone, the analysis involving confounding variables was not reported here. The correlation data did not take confounding into consideration. Measurement: Researchers did note that the reliability alpha for anxiety scale was much lower for Indian youth than Anglo youth presumably due to cultural difference in meaning. Overall: Interesting study in a younger sample that suggests cultural differences in association between anxiety and alcohol use but also cultural differences in measurement of anxiety.

Summary

The studies investigating the relationship between anxiety and alcohol use had varying results. The relationship between alcohol use and anxiety was described in some studies as J-shaped and in other studies a significant linear association or a non-significant association was reported. Said et al. (2013) reported a J-shaped relationship between alcohol use and anxiety where moderate drinkers were the least likely to experience anxiety while non-drinkers and possibly dependent drinkers had the second highest and highest odds of experiencing anxiety, respectively. Adewuya et al. (2006) also described the association between the variables, however, they noted gender differences in the relationship. In males, the relationship between alcohol use and anxiety was J-shaped but in women it was linear. Caldwell et al. (2002) also noted gender differences in the shape of the relationship. They too found a J-shaped trend in men but in women there was a slight non-significant linear relationship instead. In Alati et al.'s (2005) longitudinal study of women, a linear relationship between alcohol use and anxiety at baseline was observed but at the 5-year follow up the relationship was J-shaped. This could represent age related differences in the relationship or possibly indicate that non-drinkers prior to pregnancy (time point referred to in baseline) were different to non-drinkers at follow up. Kushner et al. (1994) also noted gender differences, finding a significant small positive association between alcohol use and anxiety in women but no significant association in men. Oetting et al. (1989) studied both Native American and Anglo high school students and found a significant association between anxiety and alcohol use in

Anglo students but in Native American students there was a non-significant negative correlation. In the only study assessing the temporal nature of the anxiety-alcohol relationship, Fröjd et al. (2011) found that participants experiencing anxiety at baseline were more likely to become a frequent alcohol user at the 2 year follow up. Alcohol use at baseline did not increase the likelihood of anxiety at follow up. In the majority of studies, the highest level of alcohol use was associated with the highest level of anxiety. However, the effect of abstaining from alcohol is less consistent. In some studies, a linear relationship was described. In others with a J-shaped relationship, non-drinkers were more likely than moderate drinkers to experience anxiety. Furthermore, in almost half of studies there was a gender difference in the nature of the relationship.

3.5.5. Studies of depression and alcohol use

Nine studies were identified as investigating a relationship between depression and alcohol use. The studies are described in the tables below.

1. Paschall, M. J., Freisthler, B., & Lipton, R. I. (2005). Moderate alcohol use and depression in young adults: findings from a national longitudinal study. *Am J Public Health, 95*(3), 453-457.

About the study	*Variables analysed*	*Results*	*Comments*
Depression ***2002*** ***US*** ***Young people*** ***Cross-sectional*** ***n=13892 (response rate unknown)*** *20745 participants were randomly sampled for a larger study but only those with complete data were included in this study.* *Study rating:****	1. *Depression* via The Center for Epidemiological Studies Depression Scale 2. *Alcohol use* via (1995) – any lifetime alcohol use (yes/no) (2002)- any alcohol use since 1995 (yes/no) - how often alcohol was consumed in the past 12 months (none-almost every day) -drinks per occasion (1-18) -intoxication in past year (y/n) -5+ drinks on one occasion in past 2 weeks (y/n)	Linear regression analysis of depression by different levels of alcohol use Lifetime abstainers:0.11 Ex-drinkers:0.5 (p<.01) Heavier moderate:0.33 Infrequent heavy:0.55 (p<.01) Occasional heavy: 0.55 (p<.001) Frequent heavy: 1.27 (p<.001) Overview: Prior to considering all possible confounders, it appeared that moderate drinking was associated with a lower level of depression than other levels of consumption. In the regression analysis above, lifetime abstainers and heavier moderate drinkers have a smaller association with depression, however, neither is significant. Heavy drinkers and ex-drinkers have larger associations with depression at a significant level. Frequent heavy drinkers are the highest.	Sampling: We are given little information on the 7000 participants who were a part of the larger study but did not participate in this one. It is stated that 'complete' data was only available for 13892 participants. It is not clear if incomplete data is the reason for all non-responders. Generalisability: Likely representative of young people across the US Confounding: In the regression analysis discussed here, an extensive number of confounders were considered. Overall: Large sample and reliable study, however, the report made it difficult to extract the facts. It's worth noting that until SES and health were added to the model, there was still a significant relationship suggesting these factors are important but they have not been much considered in other studies.

2. Dick, R. W., Manson, S. M., & Beals, J. (1993). Alcohol use among male and female Native American adolescents: patterns and correlates of student drinking in a boarding school. *J Stud Alcohol, 54*(2), 172-177.

About the study	*Variables analysed*	*Results*	*Comments*
Depression ***1988*** ***US (Native American)*** ***High school students*** ***Cross-sectional*** ***n=188 (response rate unknown)*** *Data was collected as part of a larger longitudinal study of Native American high schools* *(also in stress category)* *Study rating:**	1. *Alcohol use* via - quantity/frequency index - frequency of intoxication 2. *Depression* via the Center for Epidemiological Studies- Depression Scale	Regression analysis of alcohol use by depression *Quantity/frequency* -Beta = 0.067 (p=.456) *Freq. of intoxication* -Beta= 0.13 (p=.181) Overview: Depression was slightly positively associated with alcohol use however, this was not significant.	Sampling: no details provided on participation rate. No mention is given to those absent from class who couldn't have taken the class test but may score more highly on the variables analysed. Generalisability: With little information on sampling, and given the niche sample (boarding school, Native American), it is not likely generalisable to young people outside of the Native American communities. Confounding: Although regression analysis was carried out, confounders considered are not explicitly named. Overall: Small study of a minority group. Lack of information in the report hinders confidence.

3. Hutchinson, G., Patock-Peckham, J., Cheong, J., & Nagoshi, C. (1998). Irrational Beliefs and Behavioral Misregulation in the Role of Alcohol Abuse Among College Students. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 16*(1), 61-74.

About the study	*Variables analysed*	*Results*	*Comments*
Depression ***1998*** ***US*** ***University students*** ***Cross-sectional*** ***n=203 (response rate unknown)*** *(also in stress category)*	1. *Alcohol use* via - frequency of use - quantity - frequency of drunkenness 2. *Depression* via Zung Depression Scale	Correlation between alcohol use and depression = 0.05 (p>0.05) Overview: no association between alcohol use and depression was observed	Sampling: small convenience sample with reward motivation. Only participants who reported consuming alcohol were included in the sample. Generalisability: not generalisable to wider group due to sampling method. Confounders: In the results described here, no confounders were considered as the association between alcohol use and depression was not a main focus of the study. Overall: This study's focus was not on depression primarily and does not provide strong evidence as a result. Exclusion of non-drinkers did not allow for investigation into the shape of the relationship.

4. O'Donnell, K., Wardle, J., Dantzer, C., & Steptoe, A. (2006). Alcohol consumption and symptoms of depression in young adults from 20 countries. *J Stud Alcohol, 67*(6), 837-840.

About the study	*Variables analysed*	*Results*	*Comments*
Depression 2006 20 Countries University students Cross-sectional n=15748 (~90% response) *From the International Health and Behaviour Study in Belgium, Bulgaria, Columbia, England, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, Slovakia, South Africa, Spain, the US and Venezuela* *Study rating:****	1. *Alcohol use* via - Are you a drinker or non-drinker? -How many days in the last 2 weeks have you consumed a drink? -How many drinks did you have on average on the drinking days? 2. *Depression* via Beck Depression Inventory	Regression analysis of alcohol consumption on depression with odds ratios. *Alcohol classification* Non-drinker: 1.22 (1.06-1.42) Moderate: 1 (ref) Heavy: 1.32 (1.12-1.57) *Drinks in past 2 weeks* None:1.25 (1.02-1.53) 1-4: 1.11 (0.89-1.38) 5-13: 1 (ref) ≥14: 1.50 (1.26-1.78) Overview: Non-drinkers, and to a greater extent, heavy drinkers, were more likely than moderate drinkers to have depressive symptoms. A similar pattern emerged in the number of drinks consumed in the previous fortnight. Those who said no drinks and more than 13 drinks were more likely than those drinking 5-13 drinks to experience depressive symptoms. Those drinking 1-4 drinks were no more likely to experience depressive symptoms than those drinking 5-13. Suggests a u-shaped relationship.	Sampling: drawn from university classes around the world. No details given on how the universities were selected. In most countries, only 1 university was sampled. High response rate from the convenience sample. Generalisability: likely most representative of university students in the Americas and Europe but potentially has a wider reach. Confounders: Considered wide range. Influenced by Paschall et al (2005). Age, sex, living situation, parental education (as a proxy for SES) and health all in model. Overall: Reliable study with an international perspective. Did have a large proportion of non-drinkers compared to NZ which likely reflects lower drinking rates in other cultures.

5. Alati, R., Lawlor, D. A., Najman, J. M., Williams, G. M., Bor, W., & O'Callaghan, M. (2005). Is there really a 'J-shaped' curve in the association between alcohol consumption and symptoms of depression and anxiety? Findings from the Mater-University Study of Pregnancy and its outcomes. *Addiction, 100*(5), 643-651.

About the study	*Variables analysed*	*Results*	*Comments*
Depression 1981-1989 Australia Mothers Longitudinal and cross-sectional N=7223 (response rate unknown) *The women were recruited after giving birth in the South Brisbane hospital between 1981 and 1984. Data was collected during antenatal clinic appointments for their children, firstly at 2-3 days after birth (but questions to relating to pre-pregnancy), then 5 years.* *(Also anxiety)* *Study rating:****	1. *Alcohol use* via - Frequency of consumption (never-daily) - Quantity consumed per drinking occasion (none to 7+ standard drinks) 2.*Depression* via the depression subscale of Delusions-Symptoms-States Inventory (DSSI)	Percentage of women with depression at different levels of alcohol use at baseline and 5 year follow up (age adjusted). -Abstainers: 8.1% / 11.2% -Light: 9.4% / 9.6% -Moderate: 11.6% /14.1% -Heavy: 15.4% / 19.1% p-value for linear trend baseline: <0.02 5 year: <0.62 p-value for non-linear trend baseline: <0.93 5 year: <0.01 Adjusted odds of experiencing depression at different levels of drinking at baseline. Abstainers: 0.85 (0.67-1.15) Light: 1.00 Moderate: 0.91 (0.62-1.37) Heavy: 0.92 (0.42-2) Adjusted odds of experiencing depression at different levels of drinking at 5 year follow up. Abstainers: 1.35 (1.06-1.72) Light: 1.00 Moderate: 1.42 (0.92 -2.2) Heavy: 2.07 (0.89-4.87) Overview: At baseline, a linear trend between alcohol consumption and depression is observed. 5 years later the trend took on a j-shape where abstainers experienced more depression than light drinkers. When the adjusted odds-ratios are calculated for baseline, all levels of drinking are less likely to experience depression relative to light drinking, but these odds are insignificant. At follow up, a j-shape trend emerges again with abstainers and heavy drinkers being more likely to experience depression than light drinkers, this is only significant for abstainers.	Sampling: Large cohort sample. Participants excluded due to missing data were heavier drinkers, more anxious, more likely to be having relationship problems and less wealthy than other participants. Generalisability: Representative of urban Australian mothers. Confounders: In analysis, they adjusted for age, family income, smoking, marital status and relationship quality. They also went to great lengths to eliminate the effect of 'sick quitters'. Overall: Large study that provides an insight into the trend between alcohol use and depression. However, the difference observed between the baseline data and the 5 year follow up data could in part be due to women abstaining prior to pregnancy for different reasons than they might at a 5 year follow up.

6. Said, D., Kypri, K., & Bowman, J. (2013). Risk factors for mental disorder among university students in Australia: findings from a web-based cross-sectional survey. *Soc Psychiatry Psychiatr Epidemiol, 48*(6), 935-944.

About the study	*Variables analysed*	*Results*	*Comments*
Depression ***2013*** ***Australia*** ***University students*** ***Cross-sectional*** ***n=24209 (25% response)*** *Research part of a large mental health online survey in an Australian university. (Also anxiety)* *Study rating:***	1. *Depression* via Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PHQ) 2. *Alcohol* use via AUDIT questionnaire	Adjusted odds of anxiety by drinking status Non-drinker: 1 (ref) Moderate: 0.49 (0.39-0.63) Hazardous: 0.50 (0.38-0.67) Harmful: 0.64 (0.41-1.02) Possibly dependent: 2.14 (1.59-3.55) Overview: Moderate and hazardous drinkers were significantly less likely than non-drinkers to experience depression. Possibly dependent drinkers were more than twice as likely as non-drinkers to experience depression. Suggests a jshape relationship.	Sampling: There were many non-responders. Under the presumption that non-responders are most like late responders, researchers did estimate non-response bias but found no significant differences between early and late responders. Generalisability: May be representative of older Australian university students but is limited by response rate. Confounding: The study focussed on many other risk factors for depression as well as alcohol use, which were included in the analysis. Overall: Provides and Australian perspective but held back by low response rates.

7. Caldwell, T. M., Rodgers, B., Jorm, A. F., Christensen, H., Jacomb, P. A., Korten, A. E., & Lynskey, M. T. (2002). Patterns of association between alcohol consumption and symptoms of depression and anxiety in young adults. *Addiction, 97*(5), 583-594.

About the study	*Variables analysed*	*Results*	*Comments*
Depression ***2002*** ***Australia*** ***General population*** ***Cross-sectional*** ***N=2276 (59% response)*** *Participants were drawn from the 20-24 age group of the first wave of the PATH Through Life study.* *(Also anxiety)* *Study rating:***	1. *Alcohol use* via -AUDIT questionnaire - Drinking history via quantity and freq. of alcohol consumption when it was at its highest 2. *Depression* via Goldberg's Depression Scales	Adjusted mean depression scores by alcohol use for men Non/occasional: **3.02** (sig different than light drinkers) Light: 2.32 Moderate: 2.28 Hazardous**: 3.20**(sig different than light drinkers) Pvalue for trend: <0.001 Adjusted mean depression scores by alcohol use for women Non/occasional: 3.19 Light: 3.01 Moderate:2.96 Hazardous**:** 3.16 Pvalue for trend: >0.05 No difference between alcohol use categories Overview: In men, a j-shaped (almost u-shaped) trend in alcohol use and depression emerged. In women there was no significant trend and no differences in depression levels between alcohol use categories.	Sampling: Random sampling of large population but response rate not high. No information available on non-responders. Generalisability: Likely representative of most Australian young people. Confounding: Considered tobacco, marijuana, life events, education, work status in the analysis of data. Overall: A large cross-sectional study that highlights male/female differences in the nature of the alcohol/anxiety relationship.

8. Oetting, E. R., Swaim, R. C., Edwards, R. W., & Beauvais, F. (1989). Indian and Anglo adolescent alcohol use and emotional distress: path models. *Am J Drug Alcohol Abuse, 15*(2), 153-172.

About the study	*Variables analysed*	*Results*	*Comments*
Depression ***1989*** ***US (Native American & Anglo)*** ***High school students*** ***Cross-sectional*** ***n=524 (NA)(89% response)*** ***n= 327 (Anglo (80% response)*** *Those who were not surveyed were either out of class or the whole class wasn't available to take the study or in the case of a few students, they declined to participate.* *(Also anxiety)* *Study rating:**	1. *Depression* via 5 item depression scale (5 questions about being low, sad or lonely) 2. *Alcohol use* via Alcohol Involvement Scale (6 questions about frequency of use, drunkenness and when and how it's used)	Correlation between depression and alcohol involvement for: -Anglo youth= 0.04 p>0.05 -Indian youth=-0.08 p>0.05 Overview: A small insignificant positive correlation between depression and alcohol involvement was observed in Anglo youth. In Indian youth, an insignificant negative correlation between depression and alcohol use emerged.	Sampling: All available school children were sampled and the response rate was high. Generalisability: Representative of Native American youths living on reservations and Anglo youth in the wider area. Confounding: As this study was not primarily examining depression alone, the analysis involving confounding variables was not reported here. The correlation data did not take confounding into consideration. Overall: Interesting small study in a younger sample that suggests cultural/environmental differences in association between depression and alcohol use.

9. Battista, S. R., & Kocovski, N. L. (2010). Exploring the effect of alcohol on post-event processing specific to a social event. *Cogn Behav Ther, 39*(1), 1-10.

About the study	*Variables analysed*	*Results*	*Comments*
Depression ***2010*** ***Canada*** ***University students*** ***Cross-sectional*** ***N=208 (response rate unknown)*** *Examined as part of a broader topic through online questionnaires.* *(Also social anxiety)* *Study rating:**	1. *Depression* via Beck Depression Inventory 2. *Alcohol use* via Daily Drinking Questionnaire (quantity consumed on typical week and heavy week as well as number of drinks consumed per hour)	Correlation between depression and alcohol use Heavy week= 0.05 Typical week= -0.01 Drinks per hour= 0.06 p>0.05 for all Overview: No association between depression and alcohol use was observed	Sampling: No information on how the participants were recruited or response rates. Received course credit. Had to have attended a social event the prior weekend. Generalisability: Low generalisability due to sampling but most representative of Canadian university students. Confounding: No confounding considered in relationship between depression and alcohol use as it was of prime interest in the study. Overall: Weak evidence due to sample size and no consideration of confounding.

Summary

The studies focussing on depression and alcohol use had similar results to the previous studies of anxiety. The main reason for this is that four of the studies included above were also included in the anxiety section of the report and were studying anxiety and depression as two factors that go hand-in-hand. In fact, in only two studies described above was depression the sole factor considered from the psychological distress spectrum. Two studies examined stress and depression and another examined social anxiety and depression.

Paschall et al. (2005) conducted one of the two studies solely examining the association depression and alcohol use. They found that frequent heavy drinkers were more often depressed while infrequent and occasional heavy drinkers and ex-drinkers had similar levels of depression. Lifetime abstainers and heavier moderate drinkers had the lowest levels of depression. J-shaped associations were present when lifetime abstainers were omitted and a linear association was observed if ex-drinkers were omitted. O'Donnell et al. (2006) also studied depression alone. Examining depression and alcohol use in 20 countries, they found heavy drinkers were the most likely to experience depression, non-drinkers were second most likely and moderate drinkers were the least likely. The researchers suggest the existence of a U-shaped relationship between the variables. Alati et al. (2005) found a similar association in the depression-alcohol relationship as in the anxiety-alcohol relationship in their longitudinal study of Australian women. There was a significant linear association at baseline and a significant J-shaped association at the 5-year follow up. When adjusted for confounders, the association at baseline was no longer significant. At follow up the only risk estimate that remained significantly different to that for light drinkers was that for abstainers, who were more likely than light drinkers to experience depression. Said et al.'s (2013) results also echoed the anxiety-alcohol findings. Drinkers who were possibly dependent were twice as likely as non-drinkers to experience depression but moderate and hazardous drinkers were less likely than non-drinkers to experience depression, suggesting a J-shape association. Caldwell et al. (2002) found the depression-alcohol relationship was gender specific. In men there was a significant J-shape association while in women there was no significant association. Oetting et al. (1989) studied Anglo and Native American students finding a small positive association between depression and alcohol use in Anglo youth and a small negative association in Native American youth, however, neither association was significant. Dick et al. (1993) studied Native American youth finding a slight positive association but this was not significant. Battista and Kocovski (2010), and Hutchinson et al. (1998) found no significant association between depression and alcohol use in US university students. Of those studies that found a significant association between depression and alcohol use, all found that the highest level of alcohol use was the most strongly associated with depression. Many of the studies also agreed that non-drinkers were more likely than moderate drinkers to experience depression.

3.5.6. Studies of social anxiety and alcohol use

Seven articles describing alcohol use and social anxiety were identified as applicable. The studies are described in the tables below.

1. Battista, S. R., & Kocovski, N. L. (2010). Exploring the effect of alcohol on post-event processing specific to a social event. *Cogn Behav Ther, 39*(1), 1-10.

About the study	*Variables analysed*	*Results*	*Comments*
Social anxiety ***2010*** ***Canada*** ***University students*** ***Cross-sectional*** ***N=208 (response rate unknown)*** *Examined as part of a broader topic through online questionnaires. (Also depression)* *Study rating:**	1. *Social anxiety* via Social Phobia Scale 2. *Alcohol use* via Daily Drinking Questionnaire (quantity consumed on typical week and heavy week as well as number of drinks consumed per hour)	Correlation between social anxiety and alcohol use Heavy week= -0.13 (p>.05) Typical week= -0.15 (p<.05) Drinks per hour= -0.04 (p>.05) Overview: social anxiety was negatively correlated with all alcohol use variable, however, only significantly with 'typical week'.	Sampling: No information on how the participants were recruited or response rates. Received course credit. Had to have attended a social event the prior weekend. Generalisability: Low generalisability due to sampling but most representative of Canadian university students. Confounding: No confounding considered in relationship between social anxiety and alcohol use as it was of prime interest in the study. Overall: Weak evidence due to sample size and no consideration of confounding.

2. Buckner, J. D., Eggleston, A. M., & Schmidt, N. B. (2006). Social anxiety and problematic alcohol consumption: the mediating role of drinking motives and situations. *Behav Ther, 37*(4), 381-391

About the study	*Variables analysed*	*Results*	*Comments*
Social anxiety ***2006*** ***US*** ***University students*** ***Cross-sectional*** ***n=293 (response rate unknown)*** *Study rating:**	1. Alcohol use via Alcohol Consumption Form (no. drinks consumed on each day of the week on an average week in the past month) 2.Social anxiety via Social Interaction Anxiety Scale (SIAS)	Correlation between social anxiety and alcohol use -Quantity: r= -.08, -Frequency: r= -.06 Neither was significant at p<0.05 Overview: No evidence of correlation between alcohol use and social anxiety	Sampling: Psychology students who volunteered for course credit. Response bias possible. Absainters not included. Generalisability: Not widely generalisable. Most representative of American psychology students. Confounding: No confounding considered in analysis as social anxiety-alcohol relationship was not of main interest. Overall: Limited by sampling. Also, the elimination of the non-drinkers doesn't allow for any comment on the u-shaped relationship observed in other studies.

3. Booth, C., & Hasking, P. (2009). Social anxiety and alcohol consumption: the role of alcohol expectancies and reward sensitivity. *Addict Behav, 34*(9), 730-736.

About the study	*Variables analysed*	*Results*	*Comments*
Social anxiety 2009 Australia Young people Cross-sectional n=454 (response rate unknown) *Study rating:***	1. Social anxiety via Liebowitz Social Anxiety Scale (fear and avoidance) 2. Alcohol use via Khavari Alcohol Test	Correlation between social anxiety fear and avoidance, and alcohol use. Social anxiety (fear) = -.07 (p>0.05) Social anxiety (avoidance) = -.13 (p<0.05) Effect of social anxiety on alcohol use after adjusting for age and gender SA fear: beta = .02 SA avoidance: beta= -.10 p>0.05 for both Overview: Initially a small negative correlation between social anxiety avoidance and alochol use was observed. This ceased to be significant when gender and age were accounted for.	Sampling: Minimal information is provided on recruiting. Majority of participants were university students who gained course credit. No information about the non-uni participants was provided except that they didn't differ from the uni participants. No information on why the sample was mostly women. Generalisability: Without more information on sampling, it is presumed that the study sample is unlikely to be generalisable but is likely to be most relevant to Australian young women. Confounding: Only gender and age considered in regard to the variables of interest to this review. Overall: Study is weakened by sampling methods

4. Ham, L. S., Zamboanga, B. L., & Bacon, A. K. (2011). Putting thoughts into context: Alcohol expectancies, social anxiety, and hazardous drinking. *Journal of Cognitive Psychotherapy, 25*(1), 47-60.

About the study	*Variables analysed*	*Results*	*Comments*
Social anxiety 2011 US University students Cross-sectional n=377 (response rate unknown) *Study rating:**	1. Social anxiety via Social Interaction Anxiety Scale 2. Hazardous alcohol use via AUDIT questionnaire	Correlation between social anxiety and hazardous alcohol use = 0.08 (p>.05) Overview: No evidence for a relationship between social anxiety and hazardous alcohol use.	Sampling: Little information provided. Participants volunteered and received course credit. Females over represented. Response bias likely. Generalisability: Not widely generalisable due to sampling. Most similar to female American university students. Confounding: Not considered in the alcohol/social anixety relationship Overall: This study is limited by its sampling. It also only considered the relationship between social anxiety and hazardous drinking as opposed to drinking on a continuous scale.

5. Ham, L. S., Bonin, M., & Hope, D. A. (2007). The role of drinking motives in social anxiety and alcohol use. *Journal of Anxiety Disorders, 21*(8), 991-1003.

About the study	*Variables analysed*	*Results*	*Comments*
Social anxiety 2007 US University students Cross-sectional n=239 (response rate unknown) *Study rating:**	1. Social anxiety measured using the Social Phobia Anxiety Inventory. 2. Alcohol use via Alcohol Use Questionnaire (quantity x frequency derived)	Correlation between social anxiety and quantity x frequeny of alcohol use = -0.15 ($p<0.05$) Overview: A significant small negative correlation between alcohol quantity x frequency was observed.	Sampling: Participants were psychology students who volunteered for course credit. Likely response bias. Generalisability: Not widely generalisable but most similar to American psychology students. Confounding: Not considered in relationship between social anxiety and alcohol use. (Were considered in other unrelated analysis) Overall: It is weakened by its sampling method.

6. Strahan, E. Y., Panayiotou, G., Clements, R., & Scott, J. (2011). Beer, wine, and social anxiety: Testing the "self-medication hypothesis" in the US and Cyprus. *Addiction Research & Theory, 19*(4), 302-311.

About the study	*Variables analysed*	*Results*	*Comments*
Social anxiety 2011 US & Cyprus University students Cross-sectional N=824 (response rate unknown) *Study rating:***	1. Social anxiety via Social Interaction Anxiety Scale 2. Alcohol use via AUDIT questionnaire	Correlations between alcohol use and social anxiety AUDIT frequency:-.1 ($p<.01$) AUDIT quantity:-.07 ($p<.05$) AUDIT binge: -.06 ($p>.05$) AUDIT total: .01 ($p>.05$) Mean freq. of alcohol use per social anxiety quartile 1st quartile: 1.8 2nd quartile: 1.86 3rd quartile: 1.69 4th quartile: 1.50 - When graphed for females a linear trend for decreasing consumption frequency with increasing anxiety was observed. In males, the trend was an upside down U shape with low and high anxiety having the lowest frequency of consumption. Multiple regression analysis of social anxiety predicting alcohol use In total sample: Beta =0.093 $p<0.001$ In cyprus students: $p>.05$ (beta not provided) In US students: Beta =0.072 $p<0.05$ Overview: Frequency and quantity of alcohol use were significantly negatively correlated with social anxiety. Further evidence suggests a more complicated relationship with gender differences in the nature of the relationship as well as possible cultural differences.	Sampling: In both samples, participants were volunteers for course credit. Response bias is possible as a result. Generalisability: Hampered by sampling but most representative of US students and Cypriot students. Confounding: Gender, year of study and GPA were considered. Overall: Large study that would have been stronger if different sampling methods were used. Does provide insight into possible effect of gender on the relationship.

7. Ham, L. S., & Hope, D. A. (2005). Incorporating social anxiety into a model of college student problematic drinking. *Addictive Behaviors, 30*(1), 127-150.

About the study	*Variables analysed*	*Results*	*Comments*
Social anxiety 2005 US University students Cross-sectional n=316 (response rate unknown) *Study rating:**	1. Social anxiety via The Interaction Anxiousness Scale 2. Alcohol use via the Alcohol Use Questionnaire	<u>Correlation between social anxiety and typical weekly drinking</u> = -.019 p<0.01 Overview: Social anxiety was significanlty negatively correlated with typical weekly drinking.	Sampling: convenience sampling of students who were taking an alcohol skills training program following campus alcohol violation but 100% of group agreed to participate. More males than females as a result. Generalisability: Not widely generalisable but most representative of American university students. Confounding: Not considered for the relationship discussed here. Were considered as part of a broader study. Overall: Strength of the study was reduced by convenience sampling but interesting use of a high risk sample.

Summary

Of all the study categories, studies on social anxiety and alcohol use had the most consistent results. Of the seven studies, five found a negative association between social anxiety and alcohol use, however, many of these associations were non-significant. Buckner et al. (2006) and Booth et al. (2009) both found non-significant negative associations between social anxiety and alcohol use. Battista and Kocovski (2010) also found a negative association between social anxiety and alcohol use, however, it was non-significant for heavy drinking weeks and drinks per hour and only significant for quantity per typical week. Ham et al. (2011) found a very small positive association between social anxiety and alcohol use but it too was non-significant. In two other studies, Ham et al. (2007) and Ham et al. (2005) found a significant negative association between the variables. Strahan et al. (2011) reported a mix of results. Quantity and frequency of alcohol use were significantly negatively associated with social anxiety. Frequency of alcohol use was also analysed by social anxiety quartile, revealing a decreasing linear association in frequency with increasing social anxiety for women and in men an inverted U-shape association between increased frequency of use at low and high social anxiety. However, multivariate adjustment left only a small positive association between social anxiety and alcohol use. When looking at the two different samples, there was no significant association between social anxiety and alcohol use in the Cypriot sample while there was a small positive association between social anxiety and alcohol use in the US sample. Although it would appear that there is some consensus between the studies that social anxiety and alcohol use are negatively associated, the overall quality of the studies was poor. In part this was due to the investigation of social anxiety and alcohol use not being the primary purpose of the studies. Confounders were rarely considered and

only unadjusted associations were reported. Sampling methods were weak across the board. The reliability of the evidence provided is therefore doubtful.

3.5.7. Overview of all results

As seen in the results for each group of studies, there were incongruent findings, and studies were generally weak. To reduce some of the noise, 13 more reliable studies were identified and analysed. More reliable studies were 3-star studies that addressed a wide range of confounders, used random sampling or equivalent and were typically longitudinal, listed in Table 3.2 below. The results are divided into different categories and presented in Tables 3.3 to 3.8.

Table 3.2. *More reliable studies drawn from the original studies*

Author(s)	*Year*	*Psychological distress variable*
Hansell et al.	1999	Psychological distress
Cable & Sacker	2007	Psychological distress
Power et al.	1998	Psychological distress
Balogun et al.	2014	Psychological distress
Aseltine & Gore	2000	Stress
Hiro et al.	2007	Stress
McCreary & Sadava	1998	Stress
Fröjd et al.	2011	Anxiety
Alati et al.	2005	Anxiety & Depression
Said et al.	2013	Anxiety & Depression
Caldwell et al.	2002	Anxiety & Depression
Paschall et al.	2005	Depression
O'Donnell et al.	2006	Depression

Table 3.3. *Studies describing a J-shape or U-shaped relationship between factors*

Author(s)	*Year*	*Psychological distress variable*	*Nature of relationship*
Cable & Sacker	2007	Psychological distress	U shape (stronger in men)
Power et al.	1998	Psychological distress	U shape (stronger in men)
Alati et al.	2005	Anxiety & Depression	Linear then Jshape
Said et al.	2013	Anxiety & Depression	J shape
Caldwell et al.	2002	Anxiety & Depression	J shape (men only)

Table 3.4. *Studies drawing comparisons between heavy drinkers and non-drinkers compared to moderate drinkers*

Author(s)	*Year*	*Psychological distress variable*	*Nature of relationship*
Paschall et al.	2005	Depression	Heavy and ex-drinkers highest association
O'Donnell et al.	2006	Depression	Heavy and non-drinkers highest association

Table 3.5. *Studies describing no association between alcohol use and psychological distress variables*

Author(s)	*Year*	*Psychological distress variable*	*Nature of relationship*
Hansell et al.	1999	Psychological distress	No association
Balogun et al.	2014	Psychological distress	No association (in ¼ of countries)
Hiro et al.	2007	Stress (job)	No association
McCreary & Sadava.	1998	Stress (chronic & perceived)	No association

Table 3.6. *Studies describing a positive association between alcohol use and psychological distress variables*

Author(s)	*Year*	*Psychological distress variable*	*Nature of relationship*
Aseltine & Gore	2000	Stress	Positive association
Balogun et al.	2014	Psychological distress	Positive association (in ½ of countries)
Fröjd et al.	2011	Anxiety	Positive association
McCreary & Sadava.	1998	Stress (acute)	Positive association

Table 3.7. *Studies in non-English speaking countries*

Author(s)	*Year*	*Psychological distress variable*	*Nature of relationship*
Balogun et al.	2014	Psychological distress	½ countries positive association, ¼ countries no association, ¼ countries some positive associations, some no associations
Hiro et al.	2007	Stress (job)	No association
Fröjd et al.	2011	Anxiety	Positive association

Table 3.8. *Studies identifying gender differences in the relationship*

Author(s)	*Year*	*Psychological distress variable*	*Nature of relationship*
Caldwell et al.	2002	Depression & Anxiety	In men a J-shape trend for both depression and anxiety, for women there was an insignificant linear trend for anxiety and no trend at all for depression
Cable & Sacker	2007	Psychological distress	U shape in men, less pronounced in women
Power et al.	1998	Psychological distress	U shape in men, less pronounced in women

Overall, the literature permits no conclusive statement regarding the association between alcohol use and psychological distress among young people. The findings are inconsistent and it is unclear why. On the one hand, there are studies showing a positive linear relationship between alcohol use and psychological distress. On the other hand, other findings suggest a non-linear relationship with the association between alcohol use and psychological distress being stronger in abstainers and the heaviest drinkers than moderate drinkers (Tables 3.3 and 3.4). The element that is widely agreed upon is that heavy alcohol use was more strongly associated with psychological distress than were other levels of consumption.

Chapter 4. Aims and Methods

4.1. Aims

1. Characterise alcohol use in the New Zealand student population and how it varies demographically.
2. Quantify psychological distress in the student population and how it varies demographically.
3. Investigate the association between psychological distress and alcohol use in this population.

4.2. Methods

4.2.1. Design of the study

Cross-sectional data were collected in the 2009 web-based Tertiary Student Health Survey. All eight universities in New Zealand were invited to participate in the study and six agreed, including eight campuses across the country. The participating universities were Lincoln University, University of Canterbury, Massey University (Albany, Wellington and Palmerston North campuses), University of Otago, University of Waikato and Victoria University of Wellington. Independent simple random samples of full-time intramural students aged 17 to 24 were drawn separately for Māori and non- Māori. Up to 430 Māori students (if there were fewer than 430 Māori students enrolled, all were invited) and 430 non-Māori students were sampled from each campus. Māori students were oversampled in order to increase the power to separately study this population who experience a greater level of alcohol related harm (Connor et al., 2013).

4.2.2. Questionnaire

The 2009 questionnaire was based on the 2005 and 2007 Tertiary Student Health Surveys to ensure comparability. It contained consistent measures of demographic characteristics, alcohol use, and alcohol-related consequences. The 2009 questionnaire contained a psychological distress measure for the first time (Kessler-10). The questionnaire was web-based and a demonstration version can be viewed at: https://ipru3.otago.ac.nz/limesurvey/index.php while a hard copy is included in Appendix B.

Completion of the questionnaire took 10-15 minutes and was confidential. There was an option to complete the survey in Māori or English.

4.2.3. Recruitment

Dillman et al. (2011) systematically reviewed the effectiveness of strategies to increase participation in postal and electronic surveys. This study incorporated the following of their recommendations:

- Provision of a non-monetary incentive
- Inclusion of the incentive in the first post contact
- Contacting sample members before sending the questionnaire
- Personalising letters to potential participants
- Emphasising the role of the university in first contact
- Providing assurances of confidentiality
- Keeping the questionnaire short (10-15 minutes)
- Follow-up contact with initial non-responders

An online survey that could be completed at home was preferred as the online medium has been shown to increase the feeling of anonymity and increase the honesty of answers proffered (Huang, 2006).

Each sampled student received a letter in the post inviting them to participate in the study and providing them with a web address where they could access the online questionnaire (Appendix A). They were also provided with an Alcohol Advisory Council of New Zealand pen. Two days after receiving the postal invitation, sampled students received an email invitation with a link to the online survey. Sampled students who did not respond initially received another letter by post and up to three reminder emails. This method was based on previous Tertiary Student Health Surveys and allowed researchers to make comparisons between early, intermediate and late responders, and non-responders (Kypri, Stephenson, & Langley, 2004).

4.2.4. Ethical approval

The study received ethical approval from the Multi-Region Ethics Committee (MEC/05/01/013) and from the directors of student services at each of the six universities.

4.2.5. Survey measures

Demographics

Information was collected on participants' gender, age, living situation, and ethnicity. The options for living situation during term time were a shared house/flat, a hall of residence, living with parents, own home, boarding, and elsewhere.

Ethnicity information was classified and prioritised according to Statistics New Zealand guidelines (SNZ, 2012). Participants had the option to select multiple ethnicities and to specify an ethnicity if the option that best described them was not provided. When multiple ethnicities were selected, ethnicity was prioritised in the order of Māori, Pacific, Asian, Middle Eastern/Latin American/African (MELAA), Other, and European. All free text responses were coded into one of these groups.

Alcohol consumption measures

Participants were asked whether they had a drink containing alcohol in the last 12 months. An answer to this question was required to continue. Those who responded with 'no', were considered abstainers. Those who answered 'yes' were asked how many days in a typical 4-week period they would drink alcohol, on average how many drinks they would have per drinking day, and on how many days in a typical 4-week period they would have 6 or more standard drinks on one occasion (heavy drinking occasions). These questions are derived from the Alcohol Use Disorders Identification Test – Consumption (AUDIT-C) which can be scored and used as a brief screening test for hazardous drinkers and alcohol use disorders. In the current study, the modified AUDIT-C questions did not use five categorical response options but instead participants selected a number between 0-28 or 0-30+. All three questions had a 'prefer not to answer' option. On the web page, participants were provided with the definition of a standard drink (10g ethanol), pictorial descriptions of a standard drink (e.g. glass containing 100ml wine) and examples of the average number of standard drinks in typical bottles (e.g. a bottle of wine=7.5 standard drinks).

The responses about the number of days in a typical 4-week period when alcohol was consumed and the number of drinks per typical drinking day were used to create a typical 4-week alcohol consumption measure. The frequency of drinking was multiplied by the quantity to estimate the total number of standard drinks consumed in a typical 4-week period.

Alcohol-related problems

Participants who had responded affirmatively to alcohol consumption in the past 12 months were asked 17 questions on adverse effects of their own drinking. The response options were yes/no/prefer not to answer. Fourteen of these questions were drawn from the Alcohol Problems Scale (APS), previously used for measuring alcohol-related problems in the Tertiary Heath Research Project (McGee & Kypri, 2004). The current study used 12 of the 14 items and based on previous research split them into three groups in order to identify the differences in nature of the problems experienced (Maclennan, 2005).

The first derived group was APS Personal. The questions relating to personal adverse effects were: 'As a result of drinking alcohol, have you experienced the following over the past 4 weeks?: a hangover/ an emotional outburst/ a period of time that you could not remember (blackouts)/ an inability to pay your bills as a result of spending too much money on alcohol'. The responses were dichotomised so that if a participant experienced two or more adverse personal consequences in the previous 4 weeks due to their own drinking, they were coded as a 'yes' for APS personal.

The second derived group was APS sexual. The question relating to adverse sexual effects was: As a result of drinking alcohol, have you experienced the following over the last 4 weeks?: unsafe sex/ a sexual situation you were unhappy with at the time/ a sexual situation you later regretted. Again the responses were used to create a dichotomous variable, where one or more adverse sexual effects was coded as a 'yes'.

The third group was APS social. The questions relating to social problems were: As a result of drinking alcohol, have you experienced the following over the last 4 weeks?: you stole public or private property/ you committed an act of vandalism/ you were removed or banned from a pub or club/ you were physically aggressive towards someone/ had a heated argument. This was coded as 'yes' if participants had experienced one or more adverse social consequence of their drinking.

Second-hand effects

All participants were asked 11 questions about adverse effects they had experienced in the past 4 weeks as a result of other students' drinking (Langley et al., 2003). The participants could respond yes/ no/ prefer not to answer. Following the work of Maclennan (2005), nine questions on second-hand effects (SHE) were divided into two categories.

The first category, SHE assaultive, incorporated physical aggression and was coded as 'yes' if one or more incident was experienced. The contributing questions asked: In the last 4 weeks, which of the following have you experienced because of other students' drinking?: been pushed, hit or otherwise assaulted/ been a victim of sexual assault or date rape.

The second category, SHE non-assaultive, was a count of the number of less serious adverse effects experienced. The questions were:

> 'In the last 4 weeks, which of the following have you experienced because of other students' drinking?'

- Been insulted or humiliated
- Had a serious argument or quarrel
- Had your property damaged
- Had to "baby-sit" or take care of another student who drank too much
- Found vomit in the halls or bathroom of your residence
- Had your studying or sleep interrupted
- Experienced an unwanted sexual advance.

Psychological distress

Psychological distress was measured using the Kessler-10 (K-10) questionnaire (Kessler, Barker et al., 2003). The K-10 is a 10-item scale with questions about generalised anxiety and depression. It is used to identify levels of psychological distress and to screen for mental illness. There were six response options for each question: none of the time/ a little of the time/ some of the time/ most of the time/ all of the time/ prefer not to answer. The responses were scored from 1-5. The lowest scoring response was 'none of the time', and the highest was 'all of the time'. As such, the lowest possible total score for the questionnaire was 10 and the highest was 50. If a participant chose 'prefer not to answer' for one question, their scores for the remaining questions were disregarded and they were marked as prefer not to answer for all. The questions asked:

> 'In the past four weeks, about how often did you feel…'

- Tired out for no good reason
- Nervous
- So nervous that nothing could calm you down
- Hopeless

- Restless or fidgety
- So restless you could not sit still
- Depressed
- Everything was an effort
- So sad that nothing could cheer you up
- Worthless.

The psychological distress scores were categorised for some analyses as follows, low (10-15), moderate (16-21), high (22-29) and very high (30-50). The category cut-offs were in line with those used in the New Zealand Health Survey (2011). When the K-10 is used as screening tool, a score of 22 or more is indicative of mental illness (New Zealand Health Survey, 2011).

4.2.6. Data analysis

For all prevalence and parameter estimates and statistical tests for differences in means or proportions, 95% confidence intervals or P-values were calculated.

Demographics

In order to create a demographic profile of the study sample, descriptive statistics were used to identify the proportion of participants by gender, in different age groups, ethnic groups and living situations. Sample weights were constructed for the campuses to adjust for the previously described oversampling of Māori students. These sampling weights were used in calculation of all statistics.

Alcohol use

The prevalence of abstaining from alcohol consumption in the past 12 months was calculated for the total sample and by gender and ethnicity.

The mean and median number of drinking days for a typical 4-week period, average number of drinks per drinking day and number of heavy drinking occasions in a typical 4-week period were calculated, as well as the mean and median of the total typical 4-week consumption (created from number of drinking days x average number of drinks per day). All alcohol use measures were calculated separately for men and women by ethnic group and living situation.

The prevalence of experiencing alcohol-related problems and adverse effects of other students' drinking was estimated for men and women. The average total typical 4-week alcohol consumption for men and women who did and did not experience alcohol-problems was computed.

Psychological distress.

The mean K-10 psychological distress score was reported for men and women, with 95% confidence intervals. P-values for the difference in mean K-10 scores for men and women were calculated. The proportion of men and women in each psychological distress category was also presented.

The distribution of mean K-10 psychological distress scores by ethnicity and living situation was computed.

Association between alcohol consumption and psychological distress

The mean typical total 4-week alcohol consumption was calculated for each psychological distress category for men and women with 95% confidence intervals. The results were examined for evidence of a non-linear relationship by examining the differences in mean typical total 4-week alcohol consumption between levels of psychological distress. Following this, histograms first with alcohol consumption and then psychological distress as the dependent variable were created and the distribution of K-10 psychological distress scores and typical total 4-week alcohol consumption were scrutinised for evidence of a non-linear trend.

Based on these findings, linear regression analysis was carried out. As alcohol consumption was of prime interest, only current drinkers, those with a typical total 4-week consumption of 1 standard drink or more were included in the analysis. First, typical total 4-week alcohol consumption was analysed as the outcome and psychological distress as the exposure. Unadjusted linear regression was carried out, and then the model was adjusted for the demographic variables: gender, age, ethnicity, and living situation, as they are all potential confounders. These steps were repeated with psychological distress as the outcome and typical total 4-week consumption as the exposure. Alcohol-related problems and second-hand effects of other students' drinking were added to this second model, as they could be either confounders or mediators of this association.

Sensitivity analysis

As the linear regression analysis only included current drinkers, a sensitivity analysis was undertaken to compare it with the association between alcohol use and psychological distress when non-current drinkers were included. The process of linear regression analysis described previously was repeated, this time including non-current drinkers with a typical total 4-week alcohol consumption of zero but who were not 12 month abstainers. The results of these linear regression analyses were compared to the previous analysis of current drinkers.

To estimate whether the likelihood of consuming no alcohol in the past 12 months (abstaining) was different for different levels of psychological distress, logistic regression analysis was carried out. The odds of being an abstainer at different levels of psychological distress were adjusted for gender, age, ethnicity, living situation, and second-hand effects of alcohol. Based on these results, no further investigation was warranted.

Chapter 5. Results

5.1. Study numbers and response fractions

A total of 5770 students were invited to participate in the study and 2921 took part, giving an overall response fraction of 50.6%. Across the eight campuses, the response fraction varied from 30.6% to 58.6%. The response fraction for women was 54% and for men was 46%. As a result of the gender difference in response, and the greater representation of women in the eligible population (57% vs 43%), the respondents were 61% women and 39% men. As stated previously, Māori students were oversampled to increase the power to study this population separately. Thirty-six per cent of the respondents were enrolled as Māori at university. The analyses in this thesis are weighted to account for oversampling.

5.2. Demographic characteristics of the study sample

The key demographic characteristics of the study sample are presented in Table 5.1.

Table 5.1. *Demographic characteristics of the sample by gender with study numbers and weighted proportions*

	Total sample (n=2921)		Women (n=1856)		Men (n=1065)	
	n	*%*	*n*	*%*	*n*	*%*
Age (years)						
<18	51	1.0	35	7.3	16	0.3
18-20	1371	44.6	879	27.2	879	17.4
20-22	998	37.4	647	23.9	647	13.5
22-24	378	13.6	223	7.6	223	5.9
24-25	123	3.4	72	1.7	72	1.7
Ethnicity						
European	1627	74.2	1030	45.9	597	28.2
Maori	860	7.3	571	4.6	289	2.7
Pacific	58	2.5	35	1.5	23	1.0
Asian	286	13.6	169	7.6	117	0.6
MELAA*	31	1.3	16	0.7	15	0.6
Other	15	1.0	10	0.7	5	0.03
Living situation						
Flat	1405	50.9	895	31.0	510	19.9
Hall	573	19.6	360	12.3	213	7.3
With parents	741	23.3	457	13.7	284	9.6
Own home	111	3.2	84	2.1	27	1.1
Boarding	67	2.0	47	1.4	20	0.6
Elsewhere	24	0.9	13	0.5	11	0.3

*MELAA=Middle Eastern, Latin American or African

5.3. Alcohol use in the sample

There were five measures of alcohol use in this study: any drinking in the past 12 months, frequency of consumption over a typical four weeks, average quantity consumed per drinking occasion, frequency of heavy drinking occasions (consumption of six or more drinks) over a typical four week period, and a derived typical 4-week total consumption (typical frequency of consumption x typical quantity per occasion). Study numbers and weighted summary statistics for these measures are presented in Table 5.2. Almost all participants had consumed a drink containing alcohol in the past 12 months (93.1%). Men (8%) and women (6%) were similarly likely to be an abstainer ($p=0.12$). On average, participants had 4.4 drinking days over 4 weeks. On a drinking day, the mean number of standard drinks was 5.2. Heavy consumption (six or more drinks) occurred on average 2.4 times over 4 weeks. Men consumed alcohol more often and in greater quantities than women for all measures ($p<0.0001$).

Table 5.2. *Alcohol consumption by gender: Prevalence of abstention, mean and median number of drinking days per typical 4 week period, number of drinks per drinking day, number of heavy drinking occasions per typical 4 week period and total alcohol consumption per typical 4 week period, by gender, with 95% confidence intervals*

	Total		Women		Men		Gender comparison
	*n**	%	*n*	%	*n*	%	P-value
Abstainers							
Yes (95% C.I.)	183	6.9 (5.7-8.2)	97	6.1 (4.8-7.7)	86	8.1 (6.2-10.6)	0.12
No (95% C.I.)	2738	93.1 (91.8-94.3)	1759	93.9 (92.3-95.2)	979	92.1 (89.3-93.8)	
	n	*no. days*	*n*	*no. days*	*n*	*no. days*	
Drinking days per typical 4 weeks	2916		1854		1062		
-mean (95% C.I.)		4.4 (4.2-4.6)		4.0 (3.9-4.2)		5.0 (4.7-5.3)	
-median (25th, 75th percentitles		3.0 (1.0-6.0)		3.0 (1.0-6.0)		4.0 (1.0-8.0)	<0.0001
	n	*no. standard drinks*	*n*	*no. standard drinks*	*n*	*no. standard drinks*	
Drinks per drinking day	2904		1850		1054		
-mean (95% C.I.)		5.2 (5.0-5.3)		4.5 (4.4-4.7)		6.2 (5.9-6.5)	
-median (25th, 75th percentitles)		4.0 (2.0-8.0)		4.0 (2.0-6.0)		5.0 (2.0-10.0)	<0.0001
	n	*no. days*	*n*	*no. days*	*n*	*no. days*	
Heavy drinking occasions in typical 4 weeks	2911		1853		1058		
-mean (95% C.I.)		2.4 (2.3-2.5)		2.0 (1.9-2.1)		3.0 (2.8-3.2)	
-median (25th, 75th percentitles)		1.0 (0.0-4.0)		1.0 (0.0-3.0)		2.0 (0.0-8.0)	<0.0001
	n	*no. standard drinks*	*n*	*no. standard drinks*	*n*	*no. standard drinks*	
Typical 4-week consumption	2901		1848		1053		
-mean (95% C.I.)		29.3 (27.9-30.8)		23.3 (21.9-24.6)		38.8 (35.9-41.8)	
-median (25th, 75th percentitles)		15.0 (3.0-40.0)		12.0 (3.0-35.0)		20.0 (3.0-56.0)	<0.0001

*Total sample numbers vary as participants had the option not to answer

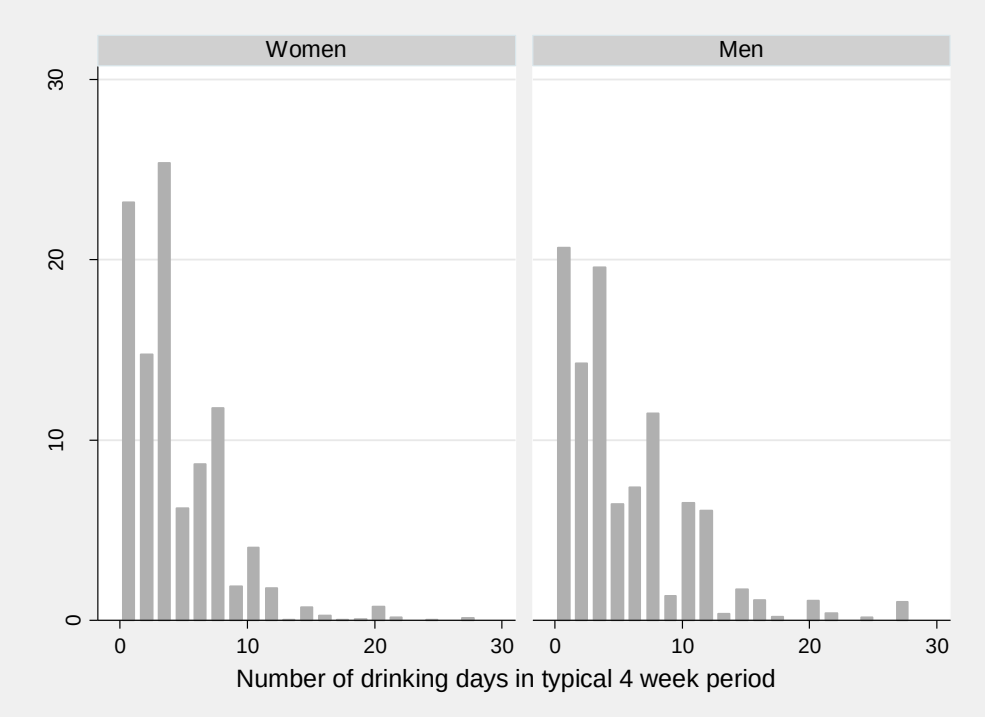

Figure 5.1. Number of drinking days in typical 4-week period in current drinkers by gender

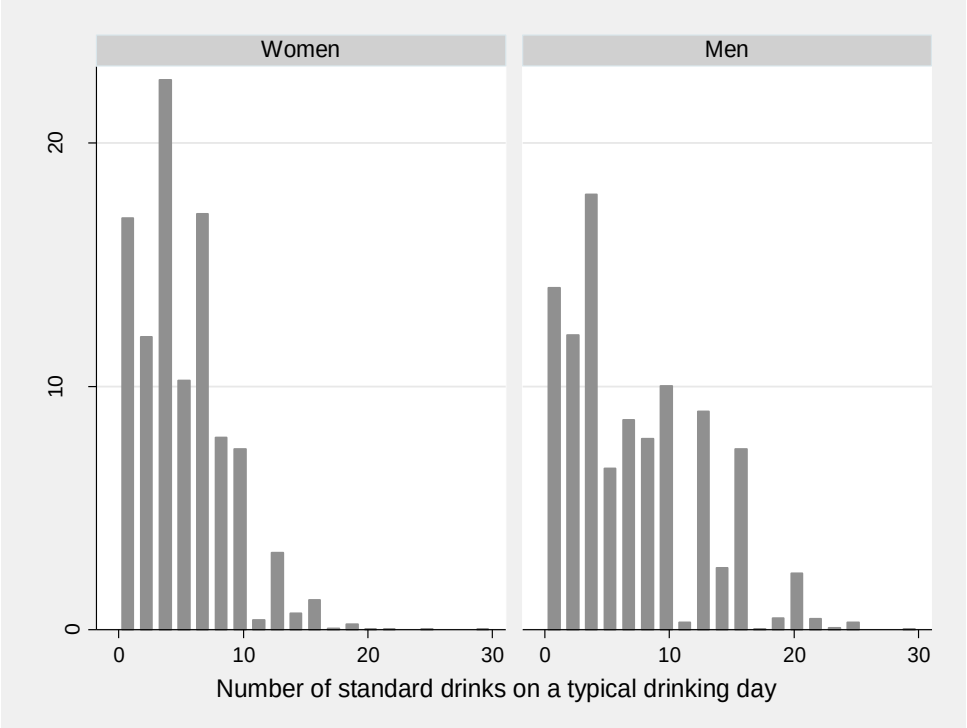

Figure 5.2. Number of drinks on a typical drinking day in current drinkers by gender

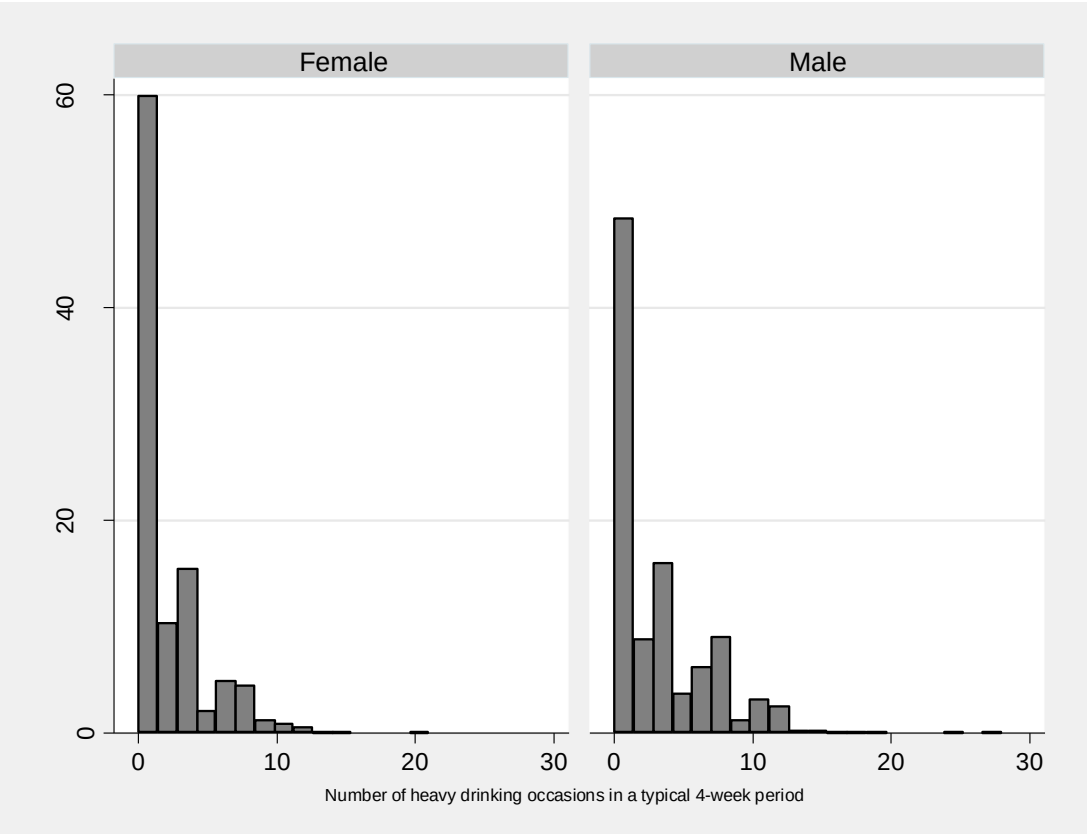

Figure 5.3. Number of heavy drinking occasions in a typical 4-week period in current drinkers, by gender

These distributions are typical of alcohol consumption variables which in general populations exhibit positive skew and kurtosis. In light of this, the median statistic, and values at the 25th and 75th percentiles are also provided in Table 2 for comparison. In all cases, the median is less than the mean, indicating positive skew. The distributions of number of drinking days, number of drinks and number of heavy drinking occasions over a typical 4-week period are portrayed visually in Figures 5.1, 5.2 and 5.3. Frequency of drinking days across four weeks varied in both men and women from once to almost every day. Similarly, the number of drinks consumed on a drinking occasion varied from 1-30 for both genders. The frequency of drinking six or more drinks at a time across four weeks was most commonly once in both men and women. At the other end of the spectrum, some women drank six or more drinks up to 15 times, and some men did so 20 or more times. These results suggest that while the median frequency of heavy drinking is once per four weeks and the median number of drinking days is three, there are students who are drinking heavily much more frequently.

Table 5.3. *Alcohol consumption in a typical 4-week period by ethnicity and gender, with 95% confidence intervals*

	Mean drinking days		Mean drinks per drinking day		Mean. heavy drinking occasions	
	Women	Men	Women	Men	Women	Men
European 95% C.I.	4.5 (4.3-4.7)	5.6 (5.2-5.9)	5.0 (4.8-5.2)	7.1 (6.6-7.3)	2.3 (2.1-2.4)	3.6 (3.3-3.8)
Maori 95% C.I.	4.0 (3.4-4.6)	5.2 (4.3-6.2)	5.7 (5.0-6.4)	8.3 (7.0-9.6)	2.4 (1.9-2.8)	3.6 (2.9-4.3)
Pacific 95% C.I.	3.3 (2.3-4.2)	2.7 (1.9-3.3)	5.5 (4.2-6.9)	5.9 (4.1-7.5)	1.7 (1.1-2.2)	2.1 (1.2-2.8)
Asian 95% C.I.	1.8 (1.4-2.1)	2.9 (1.9-3.3)	1.8 (1.4-2.4)	2.6 (2.2-3.0)	0.6 (0.4-0.9)	0.7 (0.5-0.9)
MELAA 95% C.I.	0.4 (0.3-1.1)	1.0 (0.6-2.95)	1.4 (0.4-2.4)	2.9 (0.4-5.3)	0.4 (-0.03-0.6)	1.0 (-0.03-2.0)
Other 95% C.I.	1.9 (0.8-3.1)	4.9 (1.8-7.9)	1.3 (0.7-1.9)	3.1 (0.8-5.4)	0.2 (0.04-0.4)	2.7 (0.8-4.5)

*MELAA= Middle-Eastern, Latin American and African

Table 5.3 illustrates that differences in mean drinking quantity and frequency among drinkers are also seen across ethnic groups. European and Māori students drank the most frequently and at greatest quantities, with Māori males and females drinking the most per occasion of any ethnic group. Māori and European males also drank six or more drinks the most frequently compared with other ethnicities. Pacific students drank less frequently than Māori and Europeans, but consumed high typical volumes. Asian and MELAA students, especially females, drank the least of the ethnic groups. The 'other' category participants show the most variability in their drinking in these groups which may be due to the heterogeneity of the grouping.

Table 5.4. *Prevalence of abstention, by ethnicity and gender. Weighted proportions with 95% confidence intervals*

	n	Total %	95% C.I.	Women %	95% C.I.	Men%	95% C.I.
European	1627	2.7	(1.9-3.8)	1.7	(0.01-0.03)	4.2	(2.6-2.9)
Maori	860	3.0	(1.8-4.8)	2.2	(1.0-4.6)	4.3	(1.0-4.6)
Pacific	58	17.3	(8.9-31.0)	18.7	(7.6-39.2)	15.3	(5.9-34.4)
Asian	286	22.3	(17.1-28.4)	25.2	(18.3-33.7)	18.5	(11.6-28.1)
MELAA	31	47.9	(28.1-68.4)	44.8	(20.2-73.2)	51.3	(22.7-79.0)
Other	15	43.2	(19.6-70.2)	43.0	(16.4-74.3)	43.5	(8.6-86.3)

*MELAA= Middle-Eastern, Latin American and African

Table 5.5. *Unadjusted odds ratios for abstention, by ethnicity (n=2877)*

	Unadjusted odds ratio	P-value
European	1.00	- reference
Maori	1.04	0.89
Pacific	10.90	<0.001
Asian	13.41	<0.001
MELAA	40.25	<0.001
Other	25.16	<0.001

The prevalence of abstention in different ethnic groups is shown in Table 5.4. The highest prevalence was in the small sample of MELAA students and 'other' ethnicities. Over a fifth of Asian students and one in six Pacific students were abstainers. The prevalence of abstention among Māori and European students was very low, approximately 2% in women and 4% in men.

The odds of being an abstainer in different ethnic groups compared to European is shown in Table 5.5. There was no significant difference between Māori and European students. All other ethnicities were significantly more likely to abstain compared to European students ($p<0.0001$).

There are also different patterns of alcohol use in men and women in different living situations. Figure 5.4, illustrates the mean typical total 4-week alcohol consumption for men and women who lived in different forms of accommodation.

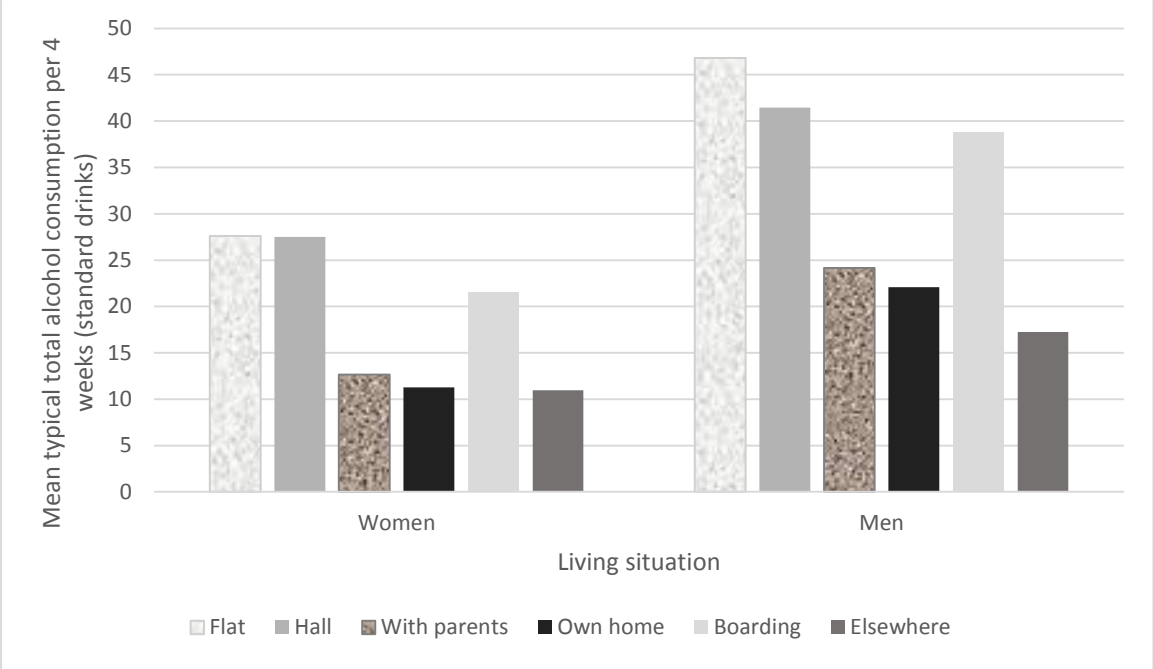

Figure 5.4. Mean typical alcohol consumption per 4-week period in different living situations, by gender

The figure shows women in flats and halls had the highest level of consumption. There was no difference in consumption between those in a flat or a hall ($p=0.11$). Those living with their parents ($p<0.0001$) or in their own home ($p=0.0008$) drank less than those in a flat. There was no significant difference in consumption of women boarding or living elsewhere compared to flatting ($p>0.09$). Men drank more than women in all living situations ($p<0.05$), and as in women, the highest consumption was in flats and halls, with no difference between them ($p=0.36$). Men living at home drank significantly less than their flatting counterparts ($p<0.0001$). There was no significant difference in consumption for those in their own home, boarding or living elsewhere compared to flatting ($p>0.09$).

5.4. Alcohol related consequences

Consequences of alcohol consumption were measured using the Alcohol Problems Scale (APS) (McGee & Kypri, 2004) and a second-hand effects scale (SHE) (Langley, Kypri, & Stephenson, 2003).

The APS asks about problems resulting from the participant's own drinking. The prevalence of personal, sexual and social problems due to drinking alcohol is presented in Table 5.6 and is similar in men and women. Over a third of women and men reported personal problems while drinking. Sexual problems were reported by 13.3% of men and 10.5% of

women. Social problems were experienced by more than a quarter of men and more than a fifth of women. Few participants preferred not to answer the questions, and this was not significantly different in men and women (p=0.56).

Table 5.6. *Prevalence of personal, sexual and social problems due to own drinking in the past 4 weeks, by gender, with 95% confidence intervals*

Problems	Total % *n=2444*	95% C.I.	Women % *n=1569*	95% C.I.	Men % *n=875*	95% C.I.	P-value
*Personal**							
Yes	38.1	(35.4-40.9)	39.3	(35.9-42.8)	36.2	(32.0-40.7)	0.28
No	61.5	(58.7-64.2)	60.4	(56.8-63.8)	63.2	(58.7-67.6)	0.33
Prefer not to answer	0.04	(0.1-1.0)	0.03	(0.01-2.0)	0.05	(0.1-1.9)	0.56
*Sexual***							
Yes	11.6	(9.9-13.5)	10.5	(8.5-12.9)	13.3	(10.6-16.6)	0.13
No	87.8	(85.8-89.5)	89.0	(86.6-91.1)	85.7	(82.2-88.5)	0.07
Prefer not to answer	0.06	(0.3-1.3)	0.04	(0.2-1.1)	1.0	(0.3-2.5)	0.21
*Social****							
Yes	24.3	(21.9-26.8)	22.4	(19.5-25.5)	27.4	(23.5-31.7)	0.05
No	75.0	(72.4-77.4)	77.1	(74.0-80.0)	71.5	(67.1-75.5)	0.03
Prefer not to answer	0.07	(0.4-1.5)	0.05	(0.2-1.5)	0.05	(0.05-2.7)	0.26

*Including: a hangover, emotional outburst, blackout, or inability to pay bills

** Including: unsafe sex, sexual situation they were unhappy with at the time, or sexual encounter later regretted

***Including: a heated argument, being physically aggressive towards someone, stealing, vandalism, or removed/banned from a pub

The SHE measured the impact of other people's drinking on the participant. The measure of assault (including sexual assault and rape) was dichotomised (yes/no) while less serious second-hand effects are presented as counts. The prevalence of these experiences is shown in Table 5.7. Experiencing assault due to another's drinking was more common in men (12.7%) than women (8.1%, p=0.004). Men also more commonly preferred not to answer questions about assault (1.4% vs 0.4%, p=0.014). The reporting of non-assaultive effects was similar in both men and women. Eighty percent of men reported 0-2 non-assaultive effects as did 76% of women. The prevalence of experiencing no second-hand effects was 36.9% in men and 34.8% in women. Ten percent of the sample experienced more than 4 effects.

Table 5.7. *Prevalence of adverse effects of other people's drinking in the past 4 weeks, by gender with 95% confidence intervals*

Second-hand effects	Total %	95% C.I.	Women %	95% C.I.	Men %	95% C.I.	P-value
*Assaultive**	*n=2921*		*n=1856*		*n=1065*		
Yes	9.8	(8.5-11.5)	8.1	(6.5-10.0)	12.7	(10.2-15.8)	0.004
No	89.3	(87.7-90.8)	91.6	(89.6-93.1)	85.9	(82.7-88.5)	0.0005
Prefer not to answer	0.8	(0.4-1.4)	0.4	(0.1-1.1)	1.4	(0.7-2.7)	0.014
*Non-Assaultive***	*n=2870*		*n=1837*		*n=1033*		
0	35.6	(33.3-38.0)	34.8	(31.9-37.9)	36.9	(33.0-41.0)	0.4
1	23.3	(21.2-25.6)	21.9	(19.4-24.7)	25.5	(21.9-29.4)	0.12
2	18.9	(16.9-21.0)	19.3	(16.7-21.9)	18.5	(15.4-22.0)	0.76
3	12.2	(10.5-14.0)	14.0	(11.8-16.5)	9.3	(7.1-12.0)	0.009
4	6.1	(4.9-7.4)	6.5	(5.0-8.3)	5.4	(3.8-7.7)	0.4
5	2.3	(1.6-3.2)	2.0	(1.3-3.1)	2.7	(1.6-4.5)	0.346
6	1.4	(0.9-2.2)	1.4	(0.8-2.5)	1.4	(0.7-3.0)	0.998
7	0.3	(0.1-0.8)	0.2	(0.004-1.0)	0.4	(0.1-1.4)	0.614

*Including: been pushed/hit/assaulted, and been a victim of sexual assault/date rape

**Including: been insulted/humiliated, had an argument/quarrel, had property damaged, had to care for another drunk student, found vomit in residence, has sleep/study interrupted, and, experienced unwanted sexual advance

Table 5.8. *Mean typical 4-week alcohol consumption, by reporting of personal, sexual and social alcohol related problems in the past 4 weeks, by gender, with 95% confidence intervals*

		Mean total 4 week consumption (standard drinks)					
Alcohol Problems	*n*	Total	95% C.I.	Women	95% C.I.	Men	95% C.I.
Personal							
Yes	1507	55.0	(51.0-59.5)	42.5	(38.9-46.0)	77.6	(68.5-86.6)
No	928	22.4	(20.5-24.4)	17.7	(15.6-19.7)	29.9	(26.0-33.7)
P-value	9	*<0.0001*		*<0.0001*		*<0.0001*	
-Prefer not to answer		44.8	(-16.3-104.3)	86.1	(25.2-146.9)	5.0	(-6.3-16.4)
Sexual							
Yes	330	67.2	(57.9-76.4)	50.2	(42.2-58.2)	89.1	(71.8-106.5)
No	2093	30.9	(28.7-33.0)	24.8	(22.8-26.9)	40.9	(36.5-45.3)
P-value		*<0.0001*		*<0.0001*		*<0.0001*	
Prefer not to answer	21	24.5	(10.5-38.5)	40.6	(24.2-57.1)	13.5	(1.0-26.1)
Social							
Yes	592	59.9	(54.0-65.7)	45.2	(39.6-50.8)	79.3	(68.7-89.9)
No	1835	26.8	(24.7-28.8)	22.3	(20.4-24.1)	34.6	(30.2-39.0)
P-value		*<0.0001*		*<0.0001*		*<0.0001*	
Prefer not to answer	17	52.3	(14.2-90.4)	61.7	(1.3-122.0)	45.4	(-2.0-92.9)

Table 5.8 presents mean typical 4-week consumption in those who did or did not experience problems resulting from their own drinking. The typical 4-week consumption of alcohol in those who experienced personal problems was more than double that of those who did not (55.0 vs 22.4 drinks, p<0.0001). Women experiencing personal problems reported

drinking more than twice as much as those not experiencing problems (42.3 vs. 17.6 drinks, p<0.0001). Typical 4-week consumption was higher in men than women. Among men reporting personal problems, the mean typical 4-week consumption was 77.6 drinks while it was 29.9 drinks in those not reporting problems (p<0.0001). This pattern continued for the social and sexual problems. When sexual problems due to alcohol were reported, average typical 4-week consumption was 67.2 versus 30.9 drinks when no problem was reported (p<0.0001). Similarly, when an alcohol-related social problem was reported, average typical 4-week consumption was 59.9 drinks and when there was no problem it was 26.8 drinks (p<0.0001). Men and women who experienced either a personal, sexual or social alcohol related problem, drank more alcohol in total over a typical 4-week period (p<0.0001).

5.5. Psychological distress

Psychological distress was measured using the Kessler-10 (K-10) questionnaire. The minimum score possible was 10 and the maximum was 50. Table 5.9 summarises the distribution of psychological distress scores, by gender. The sample mean was 19. Overall, women scored higher (19.5) compared to men (18.2, p=0.0004). When K-10 scores were categorised as low, moderate, high and very high (as per the New Zealand Health Survey), it can be seen that there was a lower proportion of women in the low and a higher proportion in high categories compared to men (p<0.05).

Table 5.9. *Mean psychological distress scores, by gender, with 95% confidence intervals*

Psychological distress	Total			Women			Men			P-value
	n	mean	95% C.I.	*n*	mean	95% C.I.	*n*	mean	95% C.I.	
K-10 score	2891	19.0	(18.9-19.1)	1841	19.5	(19.4-19.6)	1050	18.2	(18.1-18.3)	0.0004
K-10 category		%	95% C.I.	*n*	%	95% C.I.	*n*	%	95% C.I.	
Low	1032	34.6	(32.2-37.0)	602	30.5	(27.6-33.5)	430	40.9	(36.9-45.1)	<0.0001
Moderate	1061	37.4	(35.0-40.0)	686	38.5	(35.4-41.7)	375	35.8	(31.9-39.8)	0.296
High	561	19.9	(17.9-22.0)	387	22.1	(19.5-24.9)	174	16.4	(13.5-19.7)	0.0134
Very high	237	8.2	(6.9-9.7)	166	9.0	(7.3-11.0)	71	6.9	(5.1-9.3)	0.1985

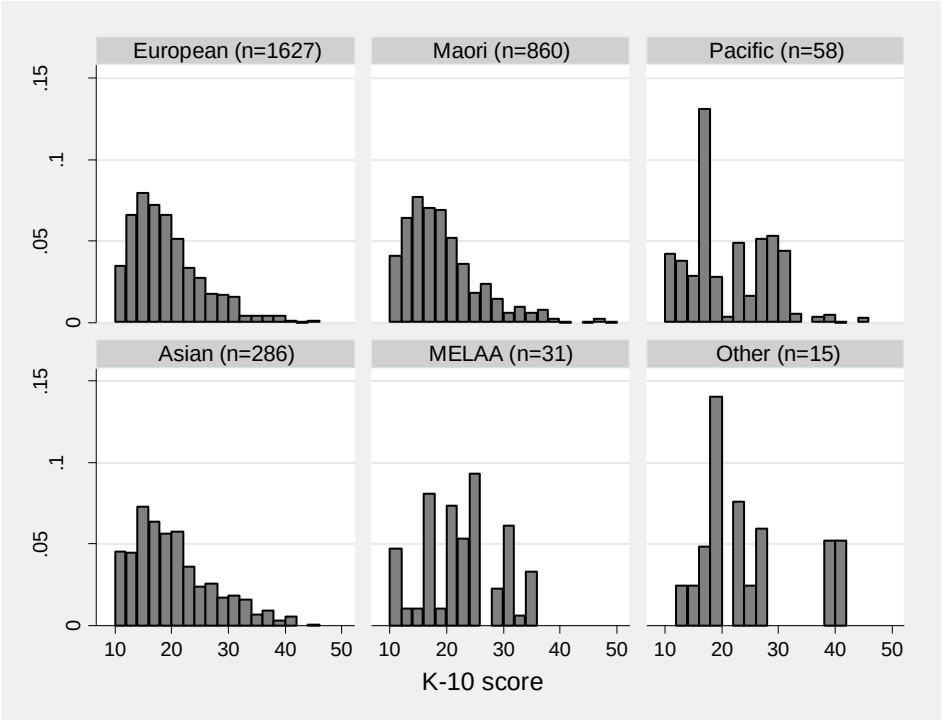

Figure 5.5. Kessler-10 psychological distress scores, by ethnicity

The distribution of psychological distress scores is similar across European, Māori and Asian groups, as seen in Figure 5.5. The data are positively skewed so that the majority of K-10 scores in these groups are between 10 and 20. The distribution of scores in the other groupings is less clear due to small numbers. Overall there was no significant difference in K-10 scores for different ethnicities compared to Europeans ($p>0.05$).

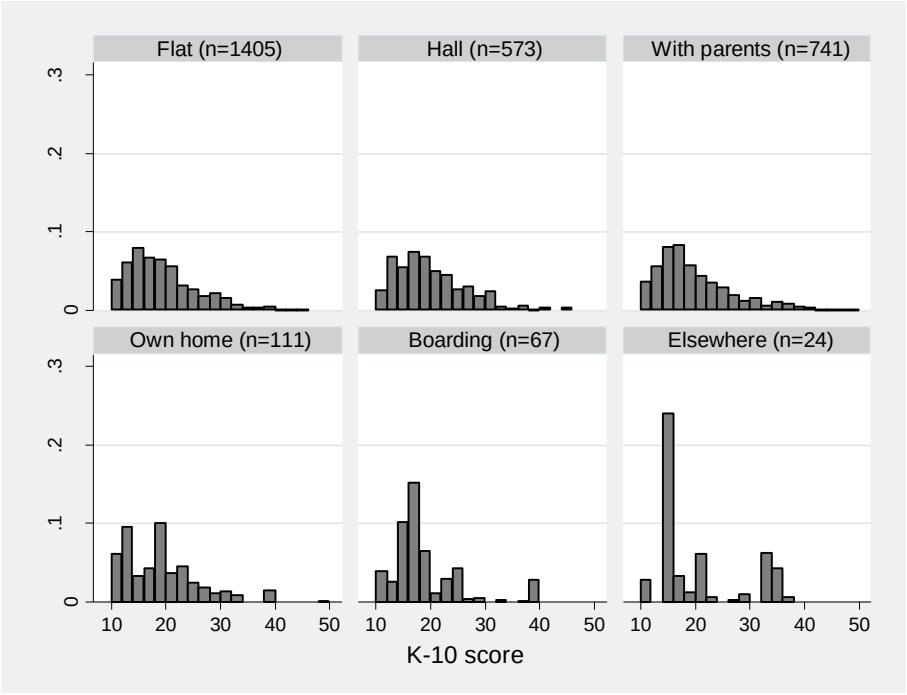

Figure 5.6. Kessler-10 psychological distress scores, by living situations

A similar pattern in psychological distress scores emerges across the different living situations in Figure 5.6. The data are skewed so that most scores fall between 10 and 20. The small numbers of participants in their own home, boarding and 'elsewhere' categories mean the distribution is less clear. Overall, there was no difference in psychological distress for those living in different living situations compared to flatting ($p>0.05$).

5.6. The effect of psychological distress on level of alcohol consumption

Table 5.10 describes typical 4-week consumption at different levels of psychological distress. At a glance, it appears that in men and women, the lowest average consumption of alcohol use was in students with low and very high levels of psychological distress but there is much overlap between the confidence intervals for alcohol consumption in the low, medium and high levels of psychological distress. There was no significant difference in typical 4-week consumption for any level of psychological distress in men. In women the only significant difference in typical 4-week alcohol consumption for different levels of psychological distress was between the high (24.7) and very high (15.9) categories ($p<0.05$). At low, medium and high levels of psychological distress, men drank significantly more in total than women. At very high levels of psychological distress, the difference was non-significant ($p=0.07$)

Table 5.10. *Mean total typical 4-week alcohol consumption at different levels of psychological distress, by gender, with 95% confidence intervals*

Psychological distress (K-10)	Typical 4 week alcohol consumption (mean standard drinks)			
	Total (95% C.I.) *n=2871*	Women (95% C.I.) *n=1841*	Men (95% C.I.) *n=1050*	P-value for gender difference
Low	30.1 (28.8-31.5)	23.6 (22.2-24.9)	37.7 (35.0-40.3)	<0.0001
Medium	31.2 (29.7-32.6)	24.2 (22.8-25.6)	43.2 (40.0-46.3)	<0.0001
High	29.6 (28.1-31.1)	24.7 (23.3-26.1)	39.9 (36.4-43.4)	0.0041
Very high	18.7 (17.6-19.7)	*15.9 (14.9-16.9)	24.4 (22.1-26.7)	0.0700

*p<0.05 for difference in means between high and very high

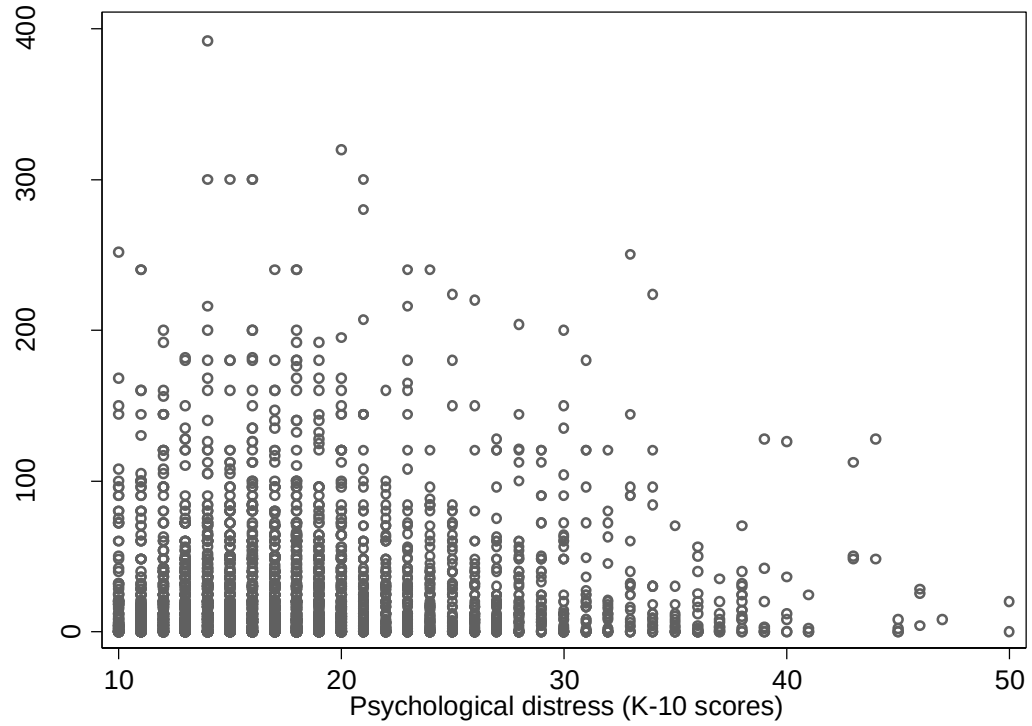

Figure 5.7. Scatterplot of typical 4-week alcohol consumption, by Kessler-10 psychological distress scores

The scatterplot in Figure 5.7 is in accordance with Table 5.10. The distribution of typical 4-week alcohol consumption by psychological distress scores shows that as the psychological distress scores increase, typical 4-week alcohol consumption decreases. Taken together, Table 5.10 and Figure 5.7 suggest a negative linear association between psychological distress scores and typical 4-week alcohol consumption. Based on these results, non-linear associations were not further considered.

The association of psychological distress with alcohol use, as modelled using linear regression analysis, is presented in Table 5.11. With each unit increase of psychological

distress, typical 4-week alcohol consumption was 0.22 standard drinks lower but the association was non-significant (p=0.172).

Table 5.11. *The association of psychological distress with typical 4 week alcohol consumption in current drinkers*. Unadjusted linear regression model (n=2431)*

Typical 4 week alcohol consumption	Coefficient	Standard Error	t	p value	Confidence interval (95%)
Psychological distress score (K-10)	-0.22	0.16	-1.37	0.172	(-0.55, -0.10)

* Current drinkers were those who had a typical total 4-week alcohol consumption of at least 1 standard drink

Table 5.12. *Association of psychological distress with typical 4-week alcohol consumption in current drinkers*. Linear regression model adjusted for demographic factors (n=2406)*

Typical 4 week alcohol consumption	Coefficient	Standard Error	t	P-value	Confidence interval (95%)
Psychological distress score (K-10)	- 0.029	0.17	-0.18	0.86	(-0.36, 0.30)
Age	- 1.42	0.83	-1.70	0.089	(-3.06, 0.22)
Gender					
Women	reference				
Men	20.88	2.34	8.02	0.001	(15.77, 25.98)
Ethnicity					
European	reference				
Maori	4.14	2.34	1.76	0.078	(-0.46, 8.74)
Pacific	- 6.04	5.58	-1.08	0.278	(-17.02, 4.89)
Asian	-18.85	3.67	-5.14	0.001	(-26.05, -11.65)
MELAA	-15.46	8.26	-1.87	0.061	(-31.66, 0.74)
Other	-13.84	4.46	-3.10	0.002	(-22.60, -5.09)
Living situation					
Flat	reference				
Hall	- 0.02	3.58	-0.00	0.996	(-7.06, 7.02)
With parents	-16.74	2.44	-6.86	0.001	(-21.53, -11.95)
Own home	-16.55	3.77	-4.39	0.001	(-23.94, -9.15)
Boarding	1.32	7.96	0.17	0.869	(-14.28, 16.92)
Elsewhere	- 0.01	9.44	-0.00	0.999	(-18.53, 18.52)

F (13, 2392)=14.91, p<0.0000

*Current drinkers were those who had a typical 4-week alcohol consumption of at least 1 standard drink

Demographic characteristics that were considered to be potential confounders (i.e. common causes of the exposure and the outcome) were added to the model. The association of psychological distress and alcohol use when controlling for age, gender, ethnicity and living situation is presented in Table 5.12. With these demographic factors held constant, an increase in psychological distress of one point on the K-10 score was associated with 0.029 of a standard drink less consumption per 4-week period. This association is small in magnitude and statistically non-significant (p=0.86). The expected association of gender with typical 4-

week alcohol consumption is seen. Men drank on average 20.88 standard drinks more in the typical 4-week period than women (p=0.001).

5.7. The effect of level of alcohol consumption on psychological distress

As a causal relationship between psychological distress and alcohol consumption could theoretically go in either direction, or both directions by different mechanisms, the analyses were repeated with typical 4-week alcohol consumption as the exposure.

As previously depicted in Figure 5.7, the scatterplot in Figure 5.8 displays an alternative orientation of the distribution of K10 scores with varying typical 4-week alcohol consumption. At low levels of typical 4-week alcohol consumption, psychological distress scores are the highest, with a linear decrease in psychological distress with increased typical 4-week alcohol consumption.

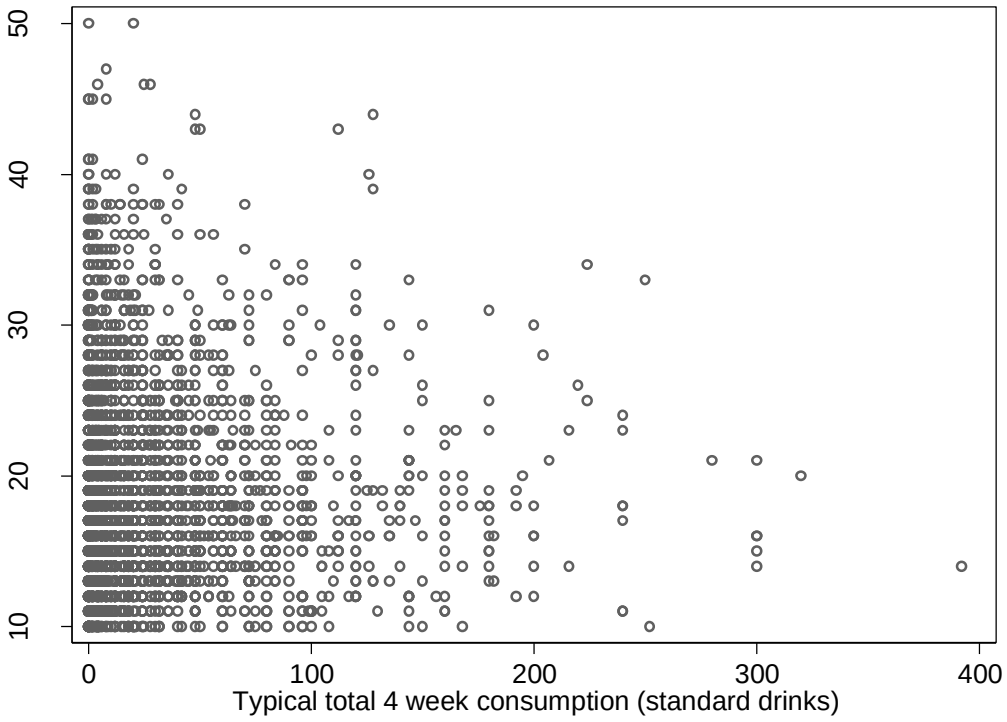

Figure 5.8. Scatterplot of Kessler-10 psychological distress scores with typical 4-week alcohol consumption

Table 5.13. *The association of typical 4-week alcohol consumption with psychological distress in current drinkers*. Unadjusted linear regression model (n=2341).*

Psychological distress score (K-10)	Coefficient	Standard Error	t	P-value	Confidence interval (95%)
Typical 4-week alcohol consumption	-0.005	0.004	-1.34	0.180	(-0.02, -0.002)

* Current drinkers were those who had a typical total 4-week alcohol consumption of at least 1 standard drink

The association of typical 4-week alcohol consumption with psychological distress is presented in Table 5.13. As before (Table 5.11) a weak negative association is seen that is not statistically significant (p=0.18).

Table 5.14. *Association of typical 4-week alcohol consumption with psychological distress in current drinkers*. Linear regression model adjusted for demographic factors (n=2406)*

Psychological distress score (K-10)	Coefficient	Standard Error	t	P-value	Confidence interval (95%)
Typical 4-week alcohol consumption	-0.0008	0.004	-0.18	0.858	(-0.01, 0.007)
Age	-0.19	0.12	-1.60	0.110	(-0.42, 0.43)
Gender					
Women	reference				
Men	-1.39	0.36	-3.77	0.001	(-2.12, -0.67)
Ethnicity					
European	reference				
Maori	-0.04	0.35	-0.11	0.911	(-0.71, 0.64)
Pacific	1.20	1.33	0.91	0.364	(-1.40, 3.81)
Asian	1.20	0.65	1.83	0.068	(-0.09, 2.48)
MELAA	0.91	1.95	0.46	0.643	(-2.91, 4.73)
Other	5.03	3.31	1.52	0.129	(-1.47, 11.54)
Living situation					
Flat	reference				
Hall	0.51	0.52	0.98	0.326	(-0.52, 1.55)
With parents	-0.26	0.45	-0.57	0.566	(-1.17, 0.64)
Own home	-0.37	1.15	-0.32	0.746	(-2.63, 1.89)
Boarding	-0.78	1.05	-0.74	0.457	(-2.85, 1.28)
Elsewhere	-2.57	1.43	-1.79	0.074	(-5.38, 0.24)

F (13, 2814)=3.21, p<0.0001

* Current drinkers were those who had a typical total 4-week alcohol consumption of at least 1 standard drink

The effect of alcohol use on psychological distress when controlling for age, gender, ethnicity and living situation is presented in Table 5.14. There is no evidence of an association once these demographic factors are controlled for (-0.0008; p=0.858). When typical 4-week alcohol consumption is held constant, along with the other demographics, there is a significant association of gender with psychological distress. Compared to women, men's K-10 scores are 1.39 points lower (p=0.001).

For the analysis reported in Table 5.15, the alcohol-related problems and second-hand effects of alcohol were added to the previous model. This was not because these problems were considered to confound the association, but because they were hypothesised to be partial mediators of any causal relationship between alcohol and psychological distress.

Table 5.15. *Association of typical 4-week alcohol consumption with psychological distress in current drinkers*. Linear regression model adjusted for demographic factors, alcohol problems and second hand effects of alcohol use (n=2270)*

Psychological distress score (K-10)	Coefficient	Standard Error	t	P-value	Confidence interval (95%)	R-Squared
Typical 4-week alcohol consumption	-0.01	0.003	-3.26	0.001	(-0.02, -0.01)	0.0774
Age	-0.04	0.09	-0.48	0.632	(-0.22, 0.13)	
Gender						
Women	reference					
Men	-1.13	0.28	-4.00	0.000	(-1.68, -0.57)	
Ethnicity						
European	reference					
Maori	-0.24	0.28	-0.84	0.402	(-0.80, 0.32)	
Pacific	0.33	1.06	0.31	0.754	(-1.71, 2.40)	
Asian	1.72	0.60	2.87	0.004	(0.54, 2.91)	
MELAA	2.54	1.86	1.37	0.172	(-1.11, 6.20)	
Other	5.90	2.32	2.54	0.011	(1.34, 10.47)	
Living situation						
Flat	reference					
Hall	-0.14	0.39	0.37	0.713	(-0.62, 0.91)	
With parents	0.87	0.35	2.49	0.013	(0.19, 1.55)	
Own home	-0.23	0.74	-0.31	0.757	(-1.69, 1.23)	
Boarding	1.75	0.92	1.91	0.056	(-0.05, 3.55)	
Elsewhere	3.32	1.95	1.70	0.089	(-0.51, 7.15)	
Alcohol problem scale: personal						
Yes	0.99	0.31	3.21	0.001	(0.39, 1.60)	
No	reference					
Prefer not to answer	5.70	3.65	1.57	0.117	(-1.43, 12.83)	
Alcohol problem scale: *sexual*						
Yes	1.09	0.40	2.69	0.007	(0.29, 1.87)	
No	reference					
Prefer not to answer	-0.40	1.79	-0.22	0.823	(-3.93, 3.12)	
Alcohol problem scale: *social*						
Yes	0.84	0.34	2.44	0.015	(0.16, 1.52)	
No	reference					
Prefer not to answer	-0.92	2.38	-0.39	0.698	(-5.57, 3.74)	
Second-hand effects- Assaultive						
Yes	0.42	0.43	0.96	0.340	(-0.43, 1.27)	
No	reference					
Prefer not to answer	-6.13	3.55	-1.73	0.085	(-13.09, 0.84)	
Second-hand effects- non-assaultive						
0	reference					
1	0.49	0.35	1.39	0.016	(-0.20, 1.18)	
2	1.40	0.39	3.59	0.001	(0.64, 2.17)	
3	2.27	0.45	4.99	0.001	(1.41, 3.14)	
4	2.72	0.58	4.64	0.001	(1.52, 3.71)	
5	5.19	0.83	6.19	0.001	(3.97, 6.85)	
6	3.42	1.17	2.91	0.004	(1.31, 5.79)	
7	8.06	2.54	3.17	0.002	(3.07, 13.33)	

F(29, 2761) =7.97, p<0.0000

* Current drinkers were those who had a typical total 4-week alcohol consumption of at least 1 standard drink

When alcohol-related problems were controlled for, an increase in typical consumption of one drink was found to be associated with psychological distress scores of 0.01 points lower (p=0.001). This represents a very small but significant direct negative association between alcohol consumption and psychological distress, independent of any effect of alcohol on psychological distress through increasing alcohol problems.

Problems from one's own drinking were found to be significantly associated with psychological distress. Experiencing alcohol-related personal problems was associated with an increase of 0.99 K-10 units (p=0.001), independent of level of drinking. Alcohol-related sexual problems were associated with an increase of 1.09 K-10 units (p=0.007) and alcohol-related social problems were associated with a 0.84 K-10 unit increase (p=0.015), again independent of level of drinking. The assaultive second-hand effects of alcohol were not associated with psychological distress, however, the non-assaultive effects were. These included being insulted/humiliated, having a serious argument/quarrel, having property damaged, having to 'baby-sit' or take care of another student who drank too much, finding vomit in their place of residence, having study or sleep interrupted and, having experienced an unwanted sexual advance. With increasing numbers of non-assaultive effects experienced, there was a corresponding increase in K-10 scores compared with not experiencing any effects. At the lowest level, experiencing one non-assaultive effect was associated with a 0.49 K-10 unit increase (p=0.016) and at the highest level, seven non-assaultive experiences were associated with a 8.06 K-10 unit increase (p=0.002).

5.8. Sensitivity analysis

5.8.1. Inclusion versus exclusion of non-current drinkers

Linear regression analysis was repeated to include those who had consumed no alcohol in a typical 4-week period in the model but who had consumed alcohol in the past 12 months. Tables 5.16 and 5.17 are provided for comparison with Tables 5.12 and 5.15.

Table 5.16. *Association of psychological distress with typical 4-week alcohol consumption in all drinkers. Linear regression model adjusted for demographic factors, alcohol problems and second hand effects of alcohol use (n=2360)*

Typical 4-week consumption (standard drinks)	Coefficient	Standard Error	t	P-value	Confidence interval (95%)
Psychological distress score (K-10)	- 0.087	0.14	-0.64	0.528	(-0.352, 0.18)
Age	- 1.51	2.15	1.52	0.129	(-0.95, 7.51)
Gender					
Women	reference				
Men	17.11	2.26	7.58	0.001	(12.69,21.54)
Ethnicity					
European	reference				
Maori	3.27	2.15	1.52	0.129	(-0.95,7.50)
Pacific	- 7.04	4.48	-1.57	0.116	(-15.83,1.74)
Asian	-21.98	2.24	-9.80	0.001	(-26.37,-17.57)
MELAA	-22.38	4.82	-4.64	0.001	(-31.84,-12.93)
Other	-19.46	4.76	-4.08	0.001	(-28.81,-10.12)
Living situation					
Flat	reference				
Hall	- 2.81	3.06	-0.92	0.359	(-8.81,3.19)
With parents	-18.01	2.17	-8.29	0.001	(-22.27,-13,75)
Own home	-15.71	3.19	-4.91	0.001	(-21.98,-9.44)
Boarding	- 3.42	7.12	-0.48	0.632	(-17.39, 10.56)
Elsewhere	-11.83	6.10	-1.94	0.053	(-23.79, 0.13)

.

Table 5.17. *Association of typical 4-week alcohol consumption with psychological distress in all drinkers. Linear regression model adjusted for demographic factors, alcohol problems and second hand effects of alcohol use (n=2360)*

Psychological distress score (K-10)	Coefficient	Standard Error	t	P-value	Confidence interval (95%)
Typical 4-week consumption (standard drinks)	- 0.01	0.003	-3.64	0.000	(-0.02, -0.01)
Age	- 0.004	0.08	-0.05	0.958	(-0.17, 0.16)
Gender					
Women	reference				
Men	- 0.97	0.26	-3.70	0.000	(-1.49, -0.46)
Ethnicity					
European	reference				
Maori	- 0.18	0.28	-0.64	0.523	(-0.72, 0.36)
Pacific	0.93	0.88	1.05	0.295	(-0.81, 2.66)
Asian	1.13	0.46	2.48	0.013	(0.24, 2.02)
MELAA	2.09	1.19	1.74	0.081	(-0.26, 4.43)
Other	3.74	1.66	2.25	0.025	(0.48, 6.70)
Living situation					
Flat	Reference				
Hall	- 0.11	0.36	-0.31	0.758	(-0.82, 0.60)
With parents	0.81	0.33	2.48	0.013	(0.17, 1.45)
Own home	- 0.26	0.66	-0.40	0.689	(-1.56, 1.03)
Boarding	0.68	0.82	0.83	0.405	(-0.93, 2.29)
Elsewhere	2.24	1.45	1.55	0.122	(-0.60, 5.08)
Alcohol problem scale: personal					
Yes	0.94	0.32	2.96	0.003	(0.32, 1.56)
No	reference				
Prefer not to answer	9.65	3.58	2.69	0.007	(2.62, 16.68)
Alcohol problem scale: sexual					
Yes	1.04	0.42	2.49	0.013	(0.22, 1.85)
No	Reference				
Prefer not to answer	-0.07	1.78	-0.04	0.971	(-3.56, 3.43)
Alcohol problem scale: social					
Yes					
No	0.81	0.35	2.28	0.023	(0.11, 1.50)
Prefer not to answer	Reference				
	-0.45	2.46	-0.18	0.854	(-5.27, 4.36)
Second-hand effects- Assaultive					
Yes	0.464	0.43	1.08	0.282	(-0.38, 1.31)
No	Reference				
Prefer not to answer	-6.12	3.69	-1.67	0.095	(-13.39, 1.07)
Second-hand effects- non-assaultive					
0	reference				
1	0.79	0.33	2.42	0.016	(0.15, 1.43)
2	1.46	0.37	3.98	0.000	(0.74, 2.18)
3	2.27	0.44	5.14	0.000	(1.41, 3.14)
4	2.61	0.56	4.70	0.000	(1.52, 3.71)
5	5.55	0.81	6.88	0.000	(3.97, 7,13)
6	3.55	1.14	3.11	0.002	(1.31, 5.79)
7	7.08	2.17	3.26	0.001	(2.82, 11.33)

The results outlined in Tables 5.16 and 5.17 are similar to those in Tables 5.12 and 5.15. As shown in Table 5.16, a K-10 unit increase in psychological distress is associated with 0.087 standard drink decrease in typical total 4-week alcohol consumption at a non-significant level (p=0.528). This is compared to the non-significant 0.0029 standard drink decrease in Table 5.12. In Table 5.17, an increase of one standard drink is significantly associated with

0.01 decrease in K-10 units of psychological distress. The same association was reported in Table 5.15. It is thus concluded that the inclusion of those who had consumed no alcohol in a typical 4 week period does not alter the associations between psychological distress and alcohol consumption

5.8.2. Analysis of abstainers

Abstainers were not included in the previous analyses. A logistic regression model was used to investigate the association between psychological distress and abstention, and results are summarised in Table 5.18. After adjusting for demographic variables and second-hand effects of alcohol use, there was no significant difference in the odds of being an abstainer at moderate, high or very high levels of psychological distress compared to low levels. There was some evidence that abstainers were more likely to report non-assaultive SHE than drinkers.

Table 5.18. *The odds of being an abstainer at different levels of psychological distress. Logistic regression analysis adjusted for demographic variables and second-hand effects. (n=2808)*

Abstention	Odds ratio	P-value	95% Confidence Interval
Psychological distress			
Low	1.00	-	
Moderate	1.10	0.728	(0.65-1.88)
High	1.18	0.615	(0.62-2.26)
Very high	0.58	0.198	(0.25-1.31)
Gender			
Women	1.00		
Men	0.71	0.150	(0.45-1.12)
Age			
<18	1.00		
18-20	0.85	0.859	(0.13-5.39)
20-22	0.99	0.996	(0.16-6.26)
22-24	0.98	0.983	(0.15-6.48)
24-25	1.06	0.958	(0.14-8.28)
Ethnicity			
European	1.00		
Maori	0.89	0.713	(0.47-1.68)
Pacific	0.17	0.000	(0.06-0.43)
Asian	0.11	0.000	(0.04-0.19)
MELAA	0.03	0.000	(0.01-0.09)
Other	0.03	0.000	(0.01-0.11)
Living situation			
Flat	1.00		
Hall	0.54	0.064	(0.28-1.04)
With parents	0.58	0.067	(0.33-1.04)
Own home	0.59	0.309	(0.21-1.63)
Boarding	0.80	0.729	(0.22-2.88)
Elsewhere	0.31	0.156	(0.06-1.56)
Second-hand effects- Assaultive			
Yes	2.86	0.168	(0.64-12.76)
No	1.00		
Second-hand effects- non-assaultive			
0	1.00		
1	1.39	0.266	(0.78-2.49)
2	2.16	0.038	(1.05-4.56)
3	2.93	0.024	(1.15-7.41)
4	2.13	0.222	(0.63-7.16)
5	28.86	0.003	(31.00-68.79)
6	2.49	0.413	(0.28-22.11)
7	0.23	0.105	(0.04-1.36)

5.9. Results overview

5.9.1. Alcohol use and related problems

The majority of participants had consumed alcohol in the past 12 months with only 6.9% abstaining. On average, participants drank on 4.4 days in a typical 4-week period. When they drank, they consumed an average of 5.2 standard drinks. In a typical 4-week period there were on average 2.4 heavy drinking occasions where 6 or more standards drinks were consumed. Men drank significantly more than women. Experiencing personal problems as a result of their drinking was reported in a third of participants while over a tenth reported sexual problems and a quarter reported social problems. Those who reported an alcohol-related

problem consumed significantly more alcohol over a typical 4-week period. Experiencing assault as a result of another person's drinking was reported by 9.8% of participants and was more common in men than women. Experiencing at least one less serious adverse effect of another's drinking was common with only 35% of students experiencing none.

5.9.2. Psychological distress

The mean K-10 score for psychological distress was 19 which is categorised as a moderate level of psychological distress. Mean K-10 scores for psychological distress were significantly higher in women than men and the proportion of women experiencing high levels was also significantly greater. Almost a third of women and over a fifth of men scored in the high or very high categories. The distribution of psychological distress scores was similar across ethnicities and living situations.

5.9.3. Associations between alcohol use and psychological distress

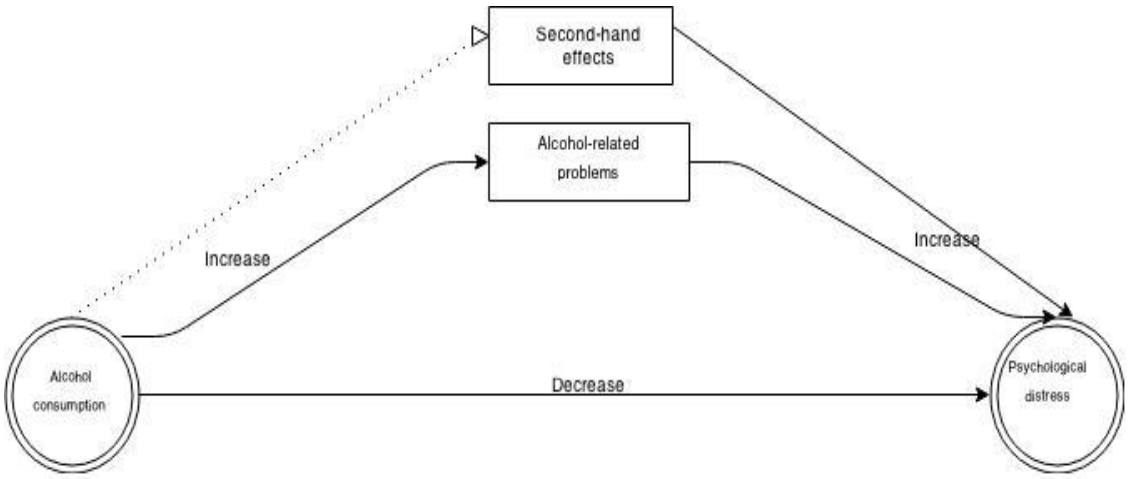

Figure 5.9. Conceptual model of associations for alcohol consumption and psychological distress

At lower levels of alcohol consumption, psychological distress was at its highest, and as consumption increased, there was a linear decrease in psychological distress. When focusing on a possible effect of psychological distress on alcohol we found K-10 scores and typical total 4-week alcohol consumption were not significantly associated even after adjusting for potential demographic confounders. Based on these findings, there was no evidence to suggest an effect of psychological distress on alcohol consumption.

In considering the effect of alcohol consumption on psychological distress, alcohol-related problems and second-hand effects of other students' drinking were potential mediators

(see Figure 5.9). It was theorised that consuming alcohol could increase alcohol-related problems and that the experience of alcohol-related problems could increase psychological distress. Consuming alcohol may also increase the experience of second-hand effects of others' drinking as it would increase contact with other drinkers, and in turn, experiencing second-hand effects may increase psychological distress. When the three alcohol-related problems variables and the two second-hand effects variables were adjusted for in conjunction with the demographic variables, a very small direct negative association between alcohol consumption and psychological distress was found, but as theorised, experiencing alcohol-related problems was positively associated with psychological distress. Non-assaultive second-hand effects were also positively associated with psychological distress but assaultive second-hand effects were not.

Based on these findings, after adjusting for demographics, alcohol-related problems, and second-hand effects, there is a small direct negative association of alcohol consumption with psychological distress and a positive association between alcohol-related problems and non-assaultive second-hand effects, and psychological distress

Chapter 6. Discussion

6.1. Introduction

The discussion of study results is structured as recommended by The British Medical Journal (Docherty & Smith, 1999). A summary of the main findings is followed by critical analysis of the strengths and limitations of the study. Comparisons are drawn between the current results and previous research on the topic. The meaning and potential implications of this research are explored and recommendations for future research are offered.

6.2. Summary of main findings

6.2.1. Systematic review of the literature

The first objective of this thesis was to systematically review the existing research on alcohol consumption and psychological distress in young people. This was important as there was no current systematic review on the topic. Initial search results returned 496 studies, after reading the abstracts this was reduced to 123, and reading the entire article reduced the pool to 31. Six studies included specific psychological distress measures. The rest of the studies measured stress, depression, anxiety, social anxiety or a combination of these.

Overall, the quality of the studies limited interpretation. The majority of studies were cross-sectional and a surprising number did not contain important information about study procedures. Following review of all studies, the 13 strongest were reviewed together. Among these studies, as in the wider review, there was incongruence. Over half suggested a pattern in which psychological distress was lowest at moderate levels of consumption and highest in heavy drinkers and either non-drinkers, ex-drinkers or low levels of consumption. Four studies found no association, and four studies found a positive association between alcohol consumption and psychological distress.

6.2.2. Patterns of alcohol consumption

The first aim of this study was to characterise alcohol consumption in the New Zealand university population and examine differences in consumption by demographic variables. Alcohol use in this population was similar to other university populations both in New Zealand and abroad where previous research has repeatedly reported that alcohol use in students is

heavy overall and characterised by infrequent heavy drinking occasions and alcohol-related problems. As expected, men drank more than women, alcohol consumption was highest in Māori and European students compared to other ethnicities, and men and women living in flats or halls of residence drank more than those in other living situations. Problems relating to students' own alcohol consumption and other's alcohol consumption were common.

6.2.3. Patterns of psychological distress

The second aim of the study was to examine psychological distress in university students and how it varied demographically as there was no existing research on psychological distress in New Zealand university students. Psychological distress was found to be common in this population. The average level of psychological distress experienced was in the moderate range. As expected, women experienced higher levels of psychological distress than men. A third of women and over a fifth of men were experiencing psychological distress at high or very high levels, indicating a high risk of mental disorder. There was no significant difference in psychological distress by ethnic group or living situation.

6.2.4. Association between alcohol consumption and psychological distress

The third aim of the study was to investigate the association between alcohol consumption and psychological distress. The association was analysed first with alcohol consumption as the outcome and then with psychological distress as the outcome. There was no significant association between alcohol consumption and psychological distress found. The models were adjusted for demographic factors that could confound a relationship between alcohol consumption and psychological distress. After this adjustment there was still no significant association between the factors.

Alcohol-related problems and second-hand effects were considered as potential mediators of the effect of alcohol consumption on psychological distress. When added to the model with psychological distress as the outcome, there was a small negative association between alcohol consumption and psychological distress and a large positive association between alcohol-related problems and psychological distress, and a positive association between non-assaultive second-hand effects and psychological distress.

It was concluded from these results that the evidence was not consistent with a direct or indirect effect of psychological distress on alcohol consumption. The results are suggestive of a small direct negative effect of alcohol consumption on psychological distress when the

positive effect of alcohol-related problems and non-assaultive second-hand effects is accounted for.

It is hypothesised that alcohol-related problems, and indirectly alcohol consumption, are key risk factors for psychological distress. The experience of alcohol-related problems was common in students. Those who experienced alcohol-related problems consumed significantly more alcohol over a typical 4-week period than those who did not. It is thought that experiencing these acute effects of alcohol consumption may then cause an increase in psychological distress. Although this is considered the most likely explanation, the possibility exists that those who are experiencing psychological distress are pre-disposed to experiencing alcohol-related problems when they drink. It is also possible that psychological distress both increases the experience of alcohol-related problems and alcohol-related problems in turn increase psychological distress.

It is also hypothesised that experiencing non-assaultive second-hand effects of other students drinking may increase psychological distress. Unlike alcohol-related problems, alcohol consumption is unlikely to directly cause a student to experience second-hand effects of another's drinking, however, consuming alcohol is likely to bring students into contact with other students who are drinking and by doing so may make them more likely to be affected by these students' drinking. There is a question of whether experiencing second-hand effects of another student's drinking affects their own drinking. It is possible that the experience may influence a student to drink less themselves. However, in this study, it was considered more likely that increased alcohol consumption would contribute to the experience of second-hand effects than second-hand effects would contribute to a decrease in alcohol consumption.

6.3. Strengths and limitations of the study

6.3.1. Strengths

Unlike many of the studies systematically reviewed, this study has minimised the risk of sampling error. Sampling error occurs when the sample population is not representative of larger population it is drawn from because it is too small. There is an element of chance in sampling error occurring in a study. The chance is reduced with increased study numbers. The current study is at low risk of sampling error due to the employment of a large sample of 2921 university students.

Questionnaire studies often introduce error through non-coverage as they traditionally require postal addresses, phone numbers or volunteers. Non-coverage error results from some members of a population being excluded from the sampling frame used, the common example being the members of a population who do not have a phone will be excluded from a phone survey. The current study had 100% coverage as all members of the university populations were included in the sampling frame. All students provided contact details upon enrollment and were allocated university email addresses. As a result, all member of this population were equally likely to be invited to participate in the study.

In this study, questions were answered with response options rather than open-ended answers. The questions were also coded so that previous answers dictated which subsequent questions participants answered. For example, non-drinkers were not asked questions about problems resulting from their drinking, reducing respondent burden and opportunities for mistakes with skip patterns. Missing data were also minimised as participants were not able to continue to the next section of the questionnaire until all question items had been responded to. A particular strength of web-based surveys is the privacy allowed by the medium which makes participants feel more comfortable answering honestly (Huang, 2006). Many potential problems with the web survey have been dealt with in previous iterations.

Other strengths of the study included having detailed alcohol information allowing selection of the most appropriate measure for our question. The study also used a validated instrument (K-10) to measure psychological distress, for which general New Zealand population values were available. Data on a range of potential confounders were also collected including the university-specific confounder of type of residence.

6.3.2. Limitations

There are three key limitations to the current study: the cross-sectional nature of the data, the response fraction, and unmeasured confounders.

The cross-sectional nature of the study limits interpretation of associations and causal inference. Cross-sectional studies can estimate the prevalence of factors of interest, describe the demographics of the sample, and establish associations between factors, but do not provide the temporality necessary to firmly establish a causal relationship. In this study, establishing a temporal relationship is of particular interest. As described in the results, the hypothesised relationship between alcohol consumption and psychological distress is complex and may involve mediating factors. We cannot for example firmly establish that an

increase in psychological distress is the result of alcohol-related problems when it is possible psychological distress preceded the experience alcohol-related problems. Although cross-sectional data do not provide enough evidence to determine causality, the results can be used to discuss whether the associations are consistent with a causal relationship.

The second limitation of the study is the response fraction. As mentioned previously, the response fraction was 54% in women and 46% in men and varied between campuses. It is possible that as a result, some biases have been introduced to the study. Any potential effects of incomplete response depend on whether the likelihood of responding relates to variables of interest: the exposures, confounders, mediators and outcomes. Prevalence estimates are likely to be affected to some extent. Previous research has suggested that non-responders are likely to be heavier drinkers than responders (Ahacic, Kåreholt, Helgason, & Allebeck, 2013; Hill, Roberts, Ewings, & Gunnell, 1997; Lahaut, Jansen, van de Mheen, & Garretsen, 2002), and this has been explored in previous iterations of this national university survey. However, it is less clear how non-response may bias estimates of psychological distress. Studies have found associations between poor mental health at baseline and non-response in follow up studies, however the magnitude of the associations described varies from very small associations to moderate associations (de Graaf, Bijl, Smit, Ravelli, & Vollebergh, 2000; Eaton, Anthony, Tepper, & Dryman, 1992; Heath et al., 2001). If the current study was in line with these studies, it would be expected that poor mental health is at least slightly under-represented in the responders.

The final limitation of the study is unmeasured potential confounders. Paschall et al. (2005) identified physical health as an important confounder to the alcohol consumption-depression relationship. When analyses were adjusted for physical health, moderate consumption was no longer associated with decreased depression compared to other levels of drinking and the U-shaped relationship disappeared. As discussed in Chapter 2, psychological health and physical health are related. It is possible that poor physical health could be related to both psychological distress and alcohol consumption. If that was the case, an association between alcohol consumption and psychological distress may be overestimated or obscured.

Another confounder that might exaggerate or obscure associations between alcohol consumption and psychological distress in university students is course-load. Depending on the papers students are taking and their year of study, they may have a larger or smaller course-load than other students. It is theorised that with larger course-loads, it's more likely that students feel unable to meet the demands and so experience stress. If stress is

experienced it could lead to psychological distress. At the same time, the demands of large course-loads may leave less time for alcohol consumption due to competing academic commitments. Although this confounder was not considered in any research in Chapter 3, it is worthy of attention as it could go some way to explain why university students experience elevated levels of psychological distress compared to their non-university counterparts.

Although, socio economic status (SES) is an important confounder in most population surveys, it was not included in this study of university students. Common SES indicators such as educational level, occupation, income and New Zealand Deprivation Index (NZDep), do not translate well to student populations. For example, using educational level, all university students have high SES, while on NZDep they may be rated inappropriately low since many students from wealthy families live in “deprived” neighbourhoods while at university. If available, SES information about the student’s family of origin, or a measure such as “first in the family to attend university” could be used to explore confounding by SES.

6.4. Comparison with previous studies

There were no previous studies examining the prevalence of psychological distress in New Zealand university students. The New Zealand Health Survey (2006/07) estimated the prevalence of high and very high psychological distress in the general population aged 15-24 as 12% among women and 7% among men (Ministry of Health, 2008). In comparison, the prevalence of high and very high psychological distress estimated for university students in the current study is markedly higher at 31% among women and 23% among men. This difference in psychological distress in university students compared to the general population of the same age was also reported in Australian research. Stallman (2010) reported university student’s psychological distress was four times higher than the general Australian population of the same age.

Similarly, no research was identified on the association between alcohol consumption and psychological distress in New Zealand young people. On a related topic, a recent study of New Zealand university students evaluated the association between alcohol use and psychological well-being. It found a negative association between hazardous alcohol consumption and mental wellbeing in men and women (Blank, 2014). Although the current study did not find a direct positive association between alcohol consumption and psychological distress, there was a positive association between alcohol-related problems and non-assaultive second-hand effects and psychological distress.

Internationally, Hansell et al. (1999), Balogun et al. (2014) and Perera et al. (2011) found no association between psychological distress and alcohol consumption. In initial and demographically adjusted analysis the current investigation also found no association between alcohol consumption and psychological distress. The possibility exists that as these studies did not control for alcohol-related problems, a negative association between alcohol use and psychological distress was cancelled out by the positive association of alcohol-related problems and second-hand effects with psychological distress so that there appears to be no overall association.

Geisner et al. (2004) did measure alcohol-related problems in their study of alcohol consumption and psychological distress in young people. They found a positive initial association between alcohol consumption and psychological distress. After adjusting for alcohol-related problems, they found the positive association between alcohol consumption and psychological distress was smaller than the association between alcohol-related problems and psychological distress. Although, this study differs in the direction of the direct association, it is in agreement that experiencing alcohol-related problems is associated with psychological distress to a greater extent than alcohol consumption independently of problems.

Some existing research on the association between alcohol consumption and stress, anxiety, depression, or psychological distress has found a non-linear J or U-shaped relationship. Cable and Sacker (2007) and Power et al., (1998) described a U-shaped relationship between alcohol consumption and psychological distress in young people where moderate alcohol consumption was associated with the lowest levels of psychological distress. However, this could be partly due to unmeasured confounders. Neither study measured alcohol-related problems or physical health. Physical health has been proposed as a confounding variable that may explain why moderate drinkers appear to have lower psychological distress than those who consume more or less alcohol (Paschall, 2005). If analysis were adjusted for physical health, a non-linear trend may no longer be observed (Paschall, 2005). The current study did not detect a non-linear relationship between alcohol consumption and psychological distress in analysis of the spread and density of the variable. However, with more sophisticated statistical techniques, this could be further investigated.

6.5. Implications of the study

The findings of this study highlight the need for the prevention of alcohol-related harm and promotion of psychological health in university students.

Acute alcohol-related harm in the form of personal, social and sexual alcohol-related problems and non-assaultive second-hand effects of other student's drinking were commonly experienced. Research has repeatedly indicated key strategies to reduce alcohol-related harm centering on supply control, demand reduction and problem limitation of alcohol (Babor, 2010; Towl, 2004). These strategies have existed on the agenda of policy makers for the past decade (Alcohol Advisory Council of New Zealand and Ministry of Health, 2001). The results of the current study support wider implementation of these strategies to reduce alcohol-related harm by reducing alcohol consumption in the population, with a focus on young people.

While total quantity of alcohol consumed does effect health, there is evidence to suggest that heavy drinking occasions are a stronger predictor of acute alcohol-related harm than overall consumption (Babor, 2010; Carlfjord & Johansson, 2012). The current study, found that on average, students drank on 4.4 days in 4-week period and 2.4 out of the drinking days in a 4-week period were heavy drinking occasions. Alcohol consumption is a big a part of the culture of New Zealand universities. Based on the findings of this study, it is suggested that a settings-approach to alcohol harm prevention in the university community be considered, in addition to population-wide measures. Research in the U.S. has provided support for community based programs to reduce alcohol related harm by employing strategies that address many facets of the drinking culture specifically in university populations (Gorman, Speer, Gruenewald, & Labouvie, 2001; Hingson & Howland, 2002; Holder et al., 2000; Saltz, Paschall, McGaffigan, & Nygaard, 2010), although widespread problems remain. In a recent study in New Zealand university students, Cousins et al. (2014) found a reduction in student drinking and some alcohol-related problems following the implementation of a campus watch programme. Interestingly, the programme was not targeting alcohol problems specifically but focussed on pastoral care of students and improving liaison with the local community.

The current study identified a positive association between alcohol-related problems and second-hand effects of other's drinking, and psychological distress. Due to the cross-sectional nature of the data causal inference needs to be cautious. However, taken together with evidence from other research, it is hypothesised that the experience of alcohol-related problems and second-hand effects may be contributing to the experience of psychological distress. If this is the case, strategies to reduce alcohol-related harm may also have a positive impact on levels of psychological distress in university populations.

This study found the prevalence of psychological distress to be almost three times higher in university students than the general population of the same age. Since it is unclear

whether measures to reduce alcohol-related harm will reduce psychological distress, or when that will happen, steps should be taken to promote psychological health among students. In the first instance, universities need to ensure mental health services are available, easily accessible and well-advertised so that individuals experiencing psychological distress know the options available to them and how to access them. Recent research in the UK supports the effectiveness of a “books on prescription” programme that might be appropriate in university populations. Doctors and other health professionals prescribe self-help books for psychological distress and mental disorders that can be accessed from the local library. In some cases, researchers found the self-help books more effective than psychotherapy (Furness & Casselden, 2012; Williams et al., 2013). The programme has recently been adopted in the Otago and Southland regions of New Zealand, with books available at libraries, including at the University of Otago. The libraries provide online and hard-copy catalogues of books by health condition so that the books can also be accessed without prescription (Well-South, 2014). Considering university students are likely to have regular contact with a library, this could be an effective setting for mental health promotion.

6.6. Unanswered questions and future research

The current study identifies high and very high psychological distress in a third of women and a fifth of men. The prevalence in young people of the same age in the general population is almost three times lower (Ministry of Health, 2008). This is the first New Zealand study to report the prevalence of psychological distress in university students. Further research is needed to explore what is contributing to increased psychological distress in university students.

In particular, further research on the role of alcohol consumption and alcohol-related problems in psychological distress is warranted. The current investigation found no evidence suggesting a direct effect of psychological distress on alcohol consumption and initially found no evidence suggesting an effect of alcohol consumption on psychological distress. The further analysis, suggested a small negative direct effect of alcohol consumption on psychological distress and a positive indirect effect through problems associated with one’s own or other people’s drinking. Longitudinal study of these associations will be required to firmly establish the direction and magnitude of the relationships. It is probable that existing birth cohort studies contain measurements of psychological distress, alcohol consumption and alcohol-related problems that could be used to further study this question.

Future research on psychological distress and alcohol consumption in New Zealand would also benefit from consideration of additional confounders. In the general population, physical health may confound the relationship, so that moderate drinkers' better psychological health may not be related to their drinking per se. In the university population it is hypothesised that higher course-loads may be having an effect on both psychological distress and alcohol consumption level, and so may be an important confounder.

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Appendix A: Letter of Invitation

<first name> <surname>
<address 1>
<address 2>
<address 3>
<address 4>

30 April 2009

Dear <first name>,

We invite you to complete a confidential 10-15 minute web survey as part of the Tertiary Student Health Project. We are doing the survey to gather information which will assist universities to put in place programmes to help students achieve academic success.

Your participation is important to us. <University name> has given its support to this research project and provided us with a list of full time students aged 17-25, from which we have drawn a random sample of approximately 1 in 30 persons. Students from six universities in New Zealand have been selected to take part. Previous studies at a New Zealand university resulted in response rates above 80%. For the results to be useful it is important that a high proportion of sampled individuals participate.

The study has the approval of the Multi-region Ethics Committee.

If you do not wish to participate, we respect your decision but please e-mail to let us know (tshp@otago.ac.nz) and we will not send you a reminder e-mail or letter.

You can complete the survey by entering the following text into the address field of your web browser.

<URL>

In the next few days we will also send you an e-mail containing a hyperlink. When you click on the link it should take you directly to the web survey.

If you have any questions or comments please send an e-mail to **tshp@otago.ac.nz** or call us for free on **0800 150033** and we will do all we can to help.

Sincerely,

Kimberly Cousins
Project Co-ordinator

Professor John Langley
Director

Tertiary Student Health Project

Injury Prevention Research Unit
Department of Preventive and Social Medicine, PO Box 913, Dunedin 9054, New Zealand.
Tel 0800 150033 • Email tshp@otago.ac.nz

Appendix B. Unformatted Tertiary Student Health Survey

Page 1

TERTIARY STUDENT HEALTH SURVEY 2009

This survey is part of a research project on the health of tertiary students. A random sample of students (approximately 1 in 30) has been selected from seven university campuses. **Your participation is important to us.** The main focus of this particular questionnaire is:

- student alcohol use and its consequences
- the environments in which alcohol is purchased and consumed

It also contains some questions on the use of herbal highs (party pills) and on sexual health.

The survey will take you approximately 10-15 minutes to complete. Even if you don't drink alcohol, we would still like you to complete it.

The information you provide is **confidential**. The site is protected by secure socket layer (SSL) technology such that all data are encrypted during transmission. Your answers will be used only for the purpose of producing summary statistics.

There is space at the end for comments, and if you have any questions, you can email us at tshp@ipru.otago.ac.nz or call **0800 150033**.

Approval for the study was given by the Multi-region Ethics Committee. If you do not wish to participate, we respect your decision but please e-mail and let us know (tshp@otago.ac.nz) so that we know not to send reminder e-mails.

To begin, please click the 'Next' button below.

Research Team
(Display photos)

Dr. Kyp Kypri Dr. Jennie Connor Kim Cousins Brandon de Graaf

Next
Load unfinished survey

Page 2

YOUR DEMOGRAPHIC DETAILS

What is your gender?
Radio buttons:
- Female
- Male

What is your age?
Choose one of the following answers
Radio buttons:
- 17…29

Where do you live during term time?
Radio buttons:
- Share a rented flat or house (flatting)
- Living in a residential college or hall
- Living with my parent(s) or guardian(s)
- Living in my own home (including renting)
- Boarding
- Living elsewhere

Where you live during term time is:
Radio buttons:
- less than 3 km (<30 mins walk) from the campus you attend
- between 3 and 10 km from the campus you attend
- more than 10 km from the campus you attend

Please choose the option(s) that best describes your ethnicity:
Check any that apply
Tick boxes:
- NZ European
- Maori
- Samoan
- Cook Island Maori
- Tongan
- Niuean
- Chinese
- Indian
- Prefer not to say
- Other ethnicity: (TEXT)

Please check your answers before continuing.
Next
Resume later

Page 3

YOUR PAST USE OF ALCOHOL

Dynamic coding instruction: If respondent is female 'xx' = 4; If respondent is male 'xx' = 6.

In your last year of high school, how often did you have more than 'xx' standard drinks per drinking occasion?
Radio buttons

- Never
- Less than once per month
- Once a month
- Once every two weeks
- Once per week
- Twice per week
- Three times per week
- Four or more times per week
- Prefer not to answer

Have you had a drink containing alcohol in the last 12 months?
Radio buttons

- Yes
- No

SKIP INSTRUCTIONS: IF respondent selects "No", they go automatically to Page 13

INCLUDE STANDARD DRINKS GRAPHIC

Please check your answers before continuing.
Next
Resume later

Page 4 NEW DYNAMIC CODING

YOUR CURRENT DRINKING PATTERN

Thank you. The next questions concern your current consumption of alcohol.

Use the definitions of Standard Drinks at the side of the page as a guide. We understand that it can be difficult to remember exactly. For these questions **please give your best estimates.**

On how many days in a typical 4-week period would you drink alcohol?
Drop-down menu:
- 0…28
- No answer

On average, how many drinks would you have per drinking day?
Drop-down menu:
- 0…24
- 25 - 29
- 30 or more
- No answer

Dynamic coding instruction: If respondent is female ask '4 or more' question; If respondent is male skip to '6 or more' question. NB Ask both males and females '6 or more' question.

On how many days in a typical 4-week period would you have 4 or more standard drinks on one occasion?
Drop-down menu:
- 0…28
- No answer

On how many days in a typical 4-week period would you have 6 or more standard drinks on one occasion?
Drop-down menu:
- 0…28
- No answer

INCLUDE STANDARD DRINKS GRAPHIC

Please check your answers before continuing.
Next
Resume later

Page 5

HAVE YOU CONSUMED ALCOHOL IN THE LAST 7 DAYS

Have you consumed alcohol in the last 7days?
Radio buttons:
- Yes
- No

Next
Resume later

SKIP INSTRUCTION: IF respondent indicates no alcohol use in last 7 days, send them to Page 8

Page 6

WHERE YOU HAVE CONSUMED ALCOHOL IN THE LAST 7 DAYS

Thank you. The following question is about the locations at which you have consumed alcohol in the **last 7 days**, working back from yesterday.

*Please indicate at which of the following locations you have consumed alcohol, in the **last 7 days**.*
Tick boxes:
- Pub, Bar, Nightclub
- A Flat or House
- Hall of Residence
- Other locations (e.g., a restaurant, a sports club, a function, a sports ground, etc.)

Please check your answers before continuing.
Next
Resume later

Page 7

DRINKING DIARY

INCLUDE STANDARD DRINKS GRAPHIC

Thank you. The following questions ask for more detailed information about your drinking **the last 7 days**.

For **each location** you specified, please indicate the number of standard drinks you consumed there, and the number of hours over which the drinking lasted. You need only answer for the days on which you **consumed alcohol at the location specified**.

Use the definitions of Standard Drinks at the side of the page as a guide. We understand it can be difficult to remember exactly. For these questions **please give your best estimates.** Thank you for being patient.

Pub/Bar/Nightclub

*For the days you drank at "a pub/bar/nightclub", please specify the **number of standard drinks** you had and the **number of hours** over which the drinking lasted (to the nearest whole hour).*

Day	How many drinks?	How many hours?
Yesterday	drinks*	hours**
Sunday, March 20, 2005	drinks	hours
Saturday, March 19, 2005	drinks	hours
Friday, March 18, 2005	drinks	hours
Thursday, March 17, 2005	drinks	hours
Wednesday, March 16, 2005	drinks	hours
Tuesday, March 15, 2005	drinks	hours

A Flat or House

*For the days you drank at "a flat or house", please specify the **number of standard drink** you had and the **number of hours** over which the drinking lasted (to the nearest whole hour).*

Day	How many drinks?	How many hours?
Yesterday	drinks	hours
Sunday, March 20, 2005	drinks	hours
Saturday, March 19, 2005	drinks	hours
Friday, March 18, 2005	drinks	hours
Thursday, March 17, 2005	drinks	hours
Wednesday, March 16, 2005	drinks	hours
Tuesday, March 15, 2005	drinks	hours

Halls of Residence

*For the days you drank at "a hall of residence", please specify the **number of standard drinks** you had and the **number of hours** over which the drinking lasted (to the nearest whole hour).*

Day	How many drinks?	How many hours?
Yesterday	drinks	hours
Sunday, March 20, 2005	drinks	hours
Saturday, March 19, 2005	drinks	hours
Friday, March 18, 2005	drinks	hours
Thursday, March 17, 2005	drinks	hours
Wednesday, March 16, 2005	drinks	hours
Tuesday, March 15, 2005	drinks	hours

Other Locations

*For the days you drank at "these other locations, (e.g., a restaurant, a sports club, a funct a sports ground, etc.)", please specify the **number of standard drinks** you had and the **number of hours** over which the drinking lasted (to the nearest whole hour) across all of these locations.*

Day	How many drinks?	How many hours?
Yesterday	drinks	hours
Sunday, March 20, 2005	drinks	hours
Saturday, March 19, 2005	drinks	hours
Friday, March 18, 2005	drinks	hours
Thursday, March 17, 2005	drinks	hours
Wednesday, March 16, 2005	drinks	hours
Tuesday, March 15, 2005	drinks	hours

*Response options for drinks reads:
Drop down menu 1-24, then
- 25-29
- 30 or more
- Prefer not to answer

**Response options for hours reads:
- Drop down menu 1-24

Please specify at which "other locations" you consumed alcohol in the last 7 days (e.g. a restaurant, a sports club, a function, a sports ground, etc.)

Your Weight and Height

*For the purpose of estimating a blood alcohol concentration (BAC) for each of these drink days, please give your best estimate of your weight in **kilograms** (to the nearest kilogram OR give your weight in pounds:*

kgs

OR

lbs

*Please give your height in **cm** or give your height in feet and inches:*

cms

OR

(Feet)

&

(Inches)

Please check your answers before continuing.
Next
Resume later

Page 8

YOUR PERCEPTION OF THE DRINKING ENVIRONMENT ON AND AROUND YOUR CAMPUS

The following statements relate to places **on or around your campus** where alcohol can be purchased. "Around campus" means places you can walk to from campus in less than 30 minutes.

Please indicate how much you agree or disagree with the following statements:
Radio Buttons:

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- I don't know/not applicable

It's easy to get served in pubs on and around campus if you are under 18

Drunkenness is very common in pubs on and around campus

There are lots of underage drinkers in pubs on and around campus

Police often walk through pubs on and around campus

The police turn a blind eye to underage drinking in pubs on and around campus

The police often apprehend people who are drunk in pubs on and around campus

I usually get asked for ID when buying a drink in pubs on and around campus

There are lots of alcohol specials in pubs on and around campus

There are lots of midweek specials in pubs on and around campus

People can usually get into a pub on or around campus even if they look drunk

People can usually get served alcohol in a pub on or around campus even if they look drunk

When someone gets very drunk in a pub on or around campus management asks them to leave

Please check your answers before continuing.
Next
Resume later

Page 9

YOUR PERCEPTION OF THE DRINKING ENVIRONMENT CONTINUED

The following statements also relate to places **on or around your campus** where alcohol can be purchased.

Please indicate how much you agree or disagree with these statements:
Radio Buttons:

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- I don't know/not applicable

Food is always available in **pubs** on and around campus

Drunkenness is very common in **sports clubs** on and around campus

Food is always available in **sports clubs** on and around campus

I usually get asked for ID when buying alcohol from a **bottle shop/liquor store** in the campus area

I usually get asked for ID when buying alcohol from a **dairy or convenience store** in the campus area

Lots of underage people purchase alcohol from **supermarkets** in the campus area

I usually get asked for ID when purchasing alcohol at a **supermarket** in the campus area

There are lots of alcohol specials in **supermarkets** in the campus area

Not many students get drunk at **student events** where alcohol is available

I see a lot of alcohol advertising **on the campus** I attend

I see a lot of alcohol advertising in the area **surrounding the campus** I attend

Please check your answers before continuing.
Next
Resume later

Page 10

HAVE YOU CONSUMED ALCOHOL IN THE LAST 4 WEEKS

Have you consumed alcohol in the last 4 weeks?
Radio buttons:

- Yes
- No

Next
Resume later

SKIP INSTRUCTION: IF respondent indicates no alcohol use in last 4 weeks, send them to Page 13

Page 11

ALCOHOL RELATED CONSEQUENCES

Thank you. These next questions are about your recent experiences with alcohol.

As a result of drinking alcohol, have you experienced the following over the **last 4 weeks:**
Radio Buttons:

- No
- Yes
- Prefer not to answer

A hangover

An emotional outburst

Vomiting

A heated argument

You were physically aggressive towards someone

A period of time that you could not remember (blackouts)

An inability to pay your bills as a result of spending too much money on alcohol

Unsafe sex

A sexual situation you weren't happy about **at the time**

A sexual encounter you **later** regretted

You suffered an injury which required medical attention (e.g. at a hospital, your doctor, or Student Health)

You drove a car after you had perhaps too much to drink to be able to drive safely

You were a passenger in a vehicle where the driver had perhaps too much to drink to be able to drive safely

You stole private or public property (e.g. sign, shopping trolley)

You committed an act of vandalism (e.g. damaged a parking meter, fence)

You were removed or banned from a pub or club

You were arrested

Please check your answers before continuing.
Next
Resume later

Page 12

INDIVIDUAL EFFECTS OF ALCOHOL

Drinking affects the way people feel in many different ways. We would like to learn what effects drinking may have for you. When you drink, how true would you say each of thes statements is for you?

How true is it that when you drink . . .
Radio Buttons:
Usually true
Sometimes true
Never true
Not applicable
Prefer not to answer

You find it easier to be open with other people?

You find it easier to talk to your present partner about your feelings or problems?

You feel less inhibited about sex?

Sexual activity is more pleasurable for you?

You feel more sexually attractive?

You become more aggressive toward other people?

Please check your answers before continuing.
Next
Resume later

Page 13

EFFECTS OF OTHER STUDENTS' DRINKING ON YOU

*In the **last 4 weeks**, which of the following have you experienced because of other students' drinking?*
Radio buttons:

- No
- Yes
- Prefer not to answer

Been insulted or humiliated

Had a serious argument or quarrel

Been pushed, hit or otherwise assaulted

Had your property damaged

Had to "baby-sit" or take care of another student who drank too much

Found vomit in the halls or bathroom of your residence

Had your studying or sleep interrupted

Experienced an unwanted sexual advance

Been a victim of sexual assault or date rape

Been a victim of another crime **on** campus

Been a victim of another crime **off** campus

Please check your answers before continuing.
Next
Resume later

Page 14

YOUR SEXUAL HEALTH

The next questions ask about your sexual relationships. Please remember that all of your responses are completely confidential.

Have you ever had sexual intercourse?
Radio buttons:
- Yes
- No
- Prefer not to answer

Next
Resume later

Skip instruction: If respondent ticks "No" or "Prefer not to answer" send them to page 16.

Page 15

YOUR SEXUAL RELATIONSHIPS

The next questions concern your sexual health and experiences.

*How many people have you had sexual intercourse with **in your life**?*

Radio buttons:
- 0…9
- 10-19
- 20 or more
- Prefer not to answer

How old were you when you first had sexual intercourse?

Radio buttons:
- Younger than 14
- 14…25
- Prefer not to answer

*How many people have you had sexual intercourse with **in the last 12 months**?*

Radio buttons:
- 0…9
- 10-19
- 20 or more
- Prefer not to answer

Did you use a condom the last time you had sex?

Radio buttons:
- No
- Yes
- Prefer not to answer

Had you been drinking alcohol the last time you had sex?

Radio buttons:
- Not at all
- A little
- Quite a lot
- Prefer not to answer

Thinking about last time you had sex, which best describes you and your partner?
Radio buttons:
- We had just met for the first time
- We had met recently
- We had known each other for a while but didn't have a steady relationship
- We had a steady relationship at the time
- We were living together or engaged or married
- Prefer not to answer

Dynamic coding instruction: If respondent is female ask 'become pregnant' question; If respondent is male ask 'get someone pregnant' question.

Have you ever become pregnant unintentionally? **OR**

Have you ever got someone pregnant unintentionally?

Radio buttons:

- Never
- Once
- Twice
- More than twice
- Prefer not to answer

Did this result in a termination of pregnancy (abortion)?

Radio buttons:

- Never
- Once
- Twice
- More than twice
- Don't know Dynamic coding instruction: This option for males only
- Prefer not to answer

Please check your answers before continuing.
Next
Resume later

Page 16

SEXUAL ATTRACTION

What best describes who you feel attracted to?

Radio buttons:

- Opposite sex only
- Opposite sex mainly
- Both sexes equally
- Same sex mainly
- Same sex only
- No attraction
- Prefer not to answer

Please check your answer before continuing.
Next
Resume later

Page 17

HOW YOU'VE BEEN FEELING IN THE LAST 4 WEEKS

These questions concern how you've been feeling in the **last four weeks**. For each question, choose the option that best describes the amount of time you felt that way.

*In the **last four weeks**, about how often did you feel…*

Radio Buttons:

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time
- Prefer not to answer

tired out for no good reason?

nervous?

so nervous that nothing could calm you down?

hopeless?

restless or fidgety?

so restless you could not sit still?

depressed?

that everything was an effort?

so sad that nothing could cheer you up?

worthless?

Please check your answers before continuing.
Next
Resume later

Page 18

YOUR USE OF HERBAL HIGHS

Herbal highs (party pills) such as Groove, Luv, and Mr Happy are legal drugs which have become popular over the past few years.

Have you ever tried herbal high pills?
Radio buttons:

- Yes
- No
- Prefer not to answer

Next
Resume later

Skip instruction: If respondent ticks “No” or “Prefer not to answer” send them to page 20.

Page 19

HERBAL HIGHS

The next three questions are about your experiences with these pills.

*In the **last 12 months** how often have you used herbal highs (party pills)?*
Radio buttons:

- Not used in the last 12 months
- Less than once per month
- Once a month
- Once every two weeks
- Once a week
- Two or three times a week
- Four or more times a week
- Prefer not to answer

*What **dose** of herbal high pills do you consume on a typical occasion when you use them?*
Radio buttons:

- Less than the dose recommended on the packaging
- The dose recommended on the packaging
- More than the dose recommended on the packaging
- I don't know what the dose recommended on the packaging is
- Prefer not to answer

Do you consume alcohol when you have taken herbal highs?
Radio buttons:

- No
- Yes, occasionally
- Yes, often
- Yes, always
- Prefer not to answer

*Compared to a typical drinking occasion for you, **how much alcohol** do you typically consume when you have taken herbal highs?*
Radio buttons:

- I don't consume alcohol when I have taken herbal highs
- Less than usual
- About the same amount as usual
- More than usual
- Prefer not to answer

Please check your answers before continuing.
Next
Resume later

Page 20

Skip instruction: If respondent is NOT an Otago student, send them to final page (THANKS page 24).

CAMPUS WATCH AT THE UNIVERSITY OF OTAGO

In 2007, the University of Otago introduced Campus Watch in and around the campus area The following questions are about your experience with Campus Watch.

Do you live in an area where Campus Watch operates?
Radio buttons:

- Yes
- No
- I don't know

Please indicate whether or not you have seen or encountered Campus Watch staff in the following situations:
Tick boxes:

I have seen them walking around the university campus

I have seen them walking around the North Dunedin area, off campus

I was at a party/event and so were they

They have visited my home/flat

They helped me once/more than once

They have approached me to discuss something

I have seen them in some other situation

I have **never** seen or encountered Campus Watch staff

Please check your answers before continuing.
Next
Resume later

Skip instruction: IF respondent selects 'never seen Campus Watch', send them to 'Your Perceptions of Campus Watch'(page 22).

Page 21

YOUR EXPERIENCE OF CAMPUS WATCH

How often do you see/encounter Campus Watch staff?
Radio buttons:
- Every day or almost every day
- 3-5 days per week
- About once a week
- 2-3 days per month
- Monthly or less than monthly

***Since the start of 2009**, how many times have you personally encountered Campus Watch staff (i.e. you talked to them or they approached you to discuss an issue or to have a chat)?*
Radio buttons:
- 0…9
- 10 or more

*Thinking back to the **last time** that you talked to Campus Watch staff, how did this happen?*
Radio buttons:
- I have not talked to any Campus Watch staff
- We just said hello to each other
- I asked them a question / I asked for help
- They offered to give me a ride/walk me home
- They offered some other assistance to me
- They were just checking that I was all right
- They wanted to talk to me about an event that they thought I might know something about
- I was doing something that they didn't think I should be doing
- I had a complaint about a neighbour, landlord, or someone else
- A neighbour, landlord, or someone else had complained about something they thought I was doing
- Other reason: (TEXT BOX)

The next questions ask about what your general impressions were of Campus Watch the last time that you encountered them.
Radio Buttons:
- Yes
- No
- Not applicable

Were they friendly?

Did they take you seriously?

Were they genuinely interested in talking to you about the issue, and hearing your opinion or your side of the story?

Do you think they did enough to help?

Do you think they overreacted?

Should they have got involved?

How satisfied were you with the outcome of your last encounter with Campus Watch?
Radio buttons:

- Very satisfied
- Somewhat satisfied
- Somewhat dissatisfied
- Very dissatisfied
- Not applicable

Please check your answers before continuing.
Next
Resume later

Page 22

YOUR PERCEPTIONS OF CAMPUS WATCH

The following statements relate to the things that Campus Watch might do in the community.

Please indicate how effective, in general, you think Campus Watch is at helping community members by…
Radio buttons:

- Very effective
- Moderately effective
- Not effective at all
- I don't know

Helping students who are new at flatting?

Keeping parties under control?

Keeping an eye out for suspicious looking people?

Walking people home late at night?

Referring problems to the proctor?

Getting the police involved where needed?

Preventing things from getting out of hand by stopping them earlier rather than later?

Listening to people's complaints?

Helping neighbours resolve problems among themselves?

Helping students resolve problems with landlords (or vice versa)?

Keeping the neighbourhood tidy?

Making the neighbourhood feel safer?

Please check your answers before continuing.
Next
Resume later

Page 23

YOUR PERCEPTIONS OF CAMPUS WATCH, CONTINUED

The following statements relate to your perceptions of Campus Watch.

Please indicate how much you agree or disagree with the following statements:
Radio buttons:

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- I don't know

Campus Watch seems to be making a positive difference in North Dunedin.

It is good that the university initiated Campus Watch to do something about anti-social behaviour among some students.

On the whole Campus Watch has been a help to students who live in the area.

Campus Watch should only operate on campus.

On the whole, Campus Watch is making things worse for students.

Campus Watch is making things worse for the whole community.

It is too soon to know whether Campus Watch has made a difference one way or the other.

Please check your answers before continuing.
Next
Resume later

Page 24

Thanks

Thank you for assisting with the Tertiary Student Health Survey.

We would welcome any comments here:

If you are concerned about any issues raised by this survey, please contact your Student Health Service.

The Alcohol Helpline is a confidential information, advice and referral service for people with questions about their own or someone else's drinking.
Alcohol Helpline: 0800 787 797

For general information about the effects of alcohol, visit the Alcohol Advisory Council web site at www.alcohol.org.nz.

Lifeline provides free professional and confidential telephone counselling, support and information services. They deal with many kinds of personal problems including depression, loneliness and stress.

Lifeline: 09 522 2999 (within Auckland)
0800 111 777 outside Auckland

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