

A longitudinal examination of the impact of self-esteem on alcohol use in untreated heavy
drinkers

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Abbreviations

ACOA – Adult Children Of Alcoholics

BUHD – Birmingham Untreated Heavy Drinkers

CBT – Cognitive Behavioural Therapy

CI – Confidence Interval

GGT - Gamma-glutamyltransferase

LDQ - Leeds Dependence Questionnaire

NICE – National Institute for health and Care Excellence

RG – Reference Group

SES – Socio-Economic Status

SF-36 – 36-Item Short Form Health Survey

WHO – World Health Organisation

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1. Abstract

Approximately one third of men and 16% of women regularly drink over the weekly UK alcohol guidelines (Stats Team, NHS Digital, 2017). There is a public health requirement to identify factors that reduce heavy drinking, due to the harm this level of drinking can cause. Most of the previous research has excluded heavy drinkers who are not alcohol dependent. The processes by which heavy drinking is maintained or reduced are thus unclear in this population (Sobell, Ellingstad, & Sobell, 2000). Clinical research has suggested that individuals with lower self-esteem may drink alcohol to moderate stress levels or cope with different situations. A literature review of the research in this area suggested that the relationship between self-esteem and alcohol use was unclear, partially due to the limited controlling for potential confounders in previous research. This study therefore sought to address this gap by examining the relationship between self-esteem and heavy alcohol use, from both a cross sectional and longitudinal perspective. Data was utilised from the Birmingham Untreated Heavy Drinkers cohort. This dataset had repeated measures of multiple measures of alcohol use, self-esteem and other sociodemographic and clinical variables of interest. The results of the multiple linear regression models suggested that over time heavy drinkers with higher self-esteem drank more alcohol on a weekly basis and had lower number of abstinent days. However, individuals with lower self-esteem reported more disadvantages of drinking alcohol and had higher levels of alcohol dependency. The variables which affect the relationship between self-esteem and alcohol use appeared to vary based on the different alcohol outcomes. The results of this study have important implications for individualised formulations in clinical psychology. Further research is required in this area, particularly more longitudinal research from other cohort studies of high quality design.

2. Research Summary

2.1 Chapter introduction

This chapter will explore and critique the current literature on the association between heavy alcohol use and self-esteem. In order to appraise the previous literature, a narrative review exploring the relationship between alcohol use, self-esteem and potential confounders was conducted as well as a systematic review of the relationship between heavy alcohol use and self-esteem in non-treatment seeking populations. This research seeks to measure both the cross-sectional and longitudinal impact of self-esteem on alcohol consumption.

2.2 Alcohol use and clinical guidelines

Although alcohol consumption has been part of society since recorded history (Room, Babor, & Rehm, 2005) it has had a major impact on global health for a long period of time. The World Health Organisation (WHO) reported that in 2014, 5.1% of the global burden of disease and injury were attributable to alcohol consumption (WHO, 2014). In the UK, between 2015 and 2016 there were approximately 1.1 million hospital admissions related to alcohol consumption (Stats Team, NHS Digital, 2017) which represents approximately 7% of all hospital admissions. In addition to health concerns alcohol use also has significant social implications. In England alone alcohol related crime has been estimated to cost £11 billion per year (ONS, 2011).

Many countries have developed 'low-risk' drinking guidelines which state the amount of alcohol people can drink to minimise their risk of harm (Kalinowski & Humphreys, 2016). The guidelines may include information on the amount of alcohol that can be consumed on a weekly and/or daily basis, levels that can be drunk when driving a car and advice on drinking during pregnancy (Furtwaengler & de Visser, 2013). Countries often choose to set different guidelines for men and women due to average differences in body size and possible differences in metabolic rates (Graham, Wilsnack, Dawson, & Vogelanz, 1998), although

there is no current consensus as to how to accurately adjust for these differences when setting alcohol limits. Consequently, the guidelines for the maximum amount of alcohol that can be safely drunk set by different countries vary greatly (Furtwaengler & de Visser, 2013; Kalinowski & Humphreys, 2016). A recent review of the current alcohol guidelines by Furtwaengler and de Visser (2013) across 57 countries suggested that women should not drink more than 12 standard drinks per week (equivalent to 15 UK alcohol units) and men no more than 18 standard drink per week (equivalent to 22.5 UK alcohol units). However, Kalinowski and Humphreys (2016) found that despite the World Health Organisation guidelines stating a standard drink is equivalent to 10g of ethanol this does not seem to be adopted in different governmental guidelines. These findings indicate the lack of consensus that exists around the low-risk drinking levels and what therefore constitutes as heavier drinking levels.

The current UK drinking guidelines recommend drinking no more than 14 UK units of alcohol (1 unit = 8g ethanol) per week for both men and women (Department of Health, 2016). In a recent national survey 66% of men reported they drank alcohol in the past week compared to 54% of women (Stats Team, NHS Digital, 2017) and 31% of men reported drinking over 14 units regularly compared to 16% of women (Stats Team, NHS Digital, 2017). The exact figures are likely to be higher than this though as population surveys report lower levels of alcohol being drunk that would be expected based on alcohol sales (ONS, 2012). This is perhaps due to a lack of understanding about the amount of alcohol in one UK unit. For example, one study found that when participants were asked to pour a standard drink 42% overestimated and 19% underestimated the amount of spirits poured (Boniface, Kneale, & Shelton, 2013). Adults who regularly drink above the recommended limits are at increased risk of physical or psychological harm. In the UK, men who drink more than 50 units per week and women who drink more than 35 units per week are classed as drinking at

a higher risk level (NICE, 2010; ONS, 2012). 6% of men and 4% of women report drinking above this level regularly in the UK (Stats Team, NHS Digital, 2017).

There is a public health requirement to identify factors that reduce heavy drinking, both at an individual and population level. Several treatment options are currently available from alcohol treatment services if individuals want to reduce their alcohol use. These include motivational interviewing, cognitive behavioural therapy and residential rehabilitation, (NICE, 2011) however, individuals may not attempt to access this treatment if they believe they are not dependent on alcohol. Also, research has shown that many people with alcohol use disorders actually reduce their alcohol consumption without treatment from addiction services (Watson & Sher, 1998). However, the processes by which heavy drinking is maintained or reduced are unclear, due to the limited amount of research in this area (Sobell, Ellingstad, & Sobell, 2000). One model which attempts to predict whether an individual will carry out a health related behaviour is the theory of planned behaviour (Ajzen, 1991). This model assumes that a person's intention to complete a behaviour is the strongest indicator of whether a behaviour is completed. This is influenced by the person's attitudes towards the behaviour (which includes both positive and negative evaluations of the behaviour), the subjective norm (the person's perceptions of social approval or disapproval for completing the behaviour) and their perceived behavioural control (perceptions of how easily the behaviour can be completed in the context of both internal and external barriers). Figure 1 below illustrates this process. All three of the initial predictors can individually influence whether the persons to complete a behaviour (Ajzen, 1991). Thus, if for example the person judges a behaviour will be condemned by society (such as illegal drug taking) but they know they were able to access drugs with no consequences in the past and they found the effects of

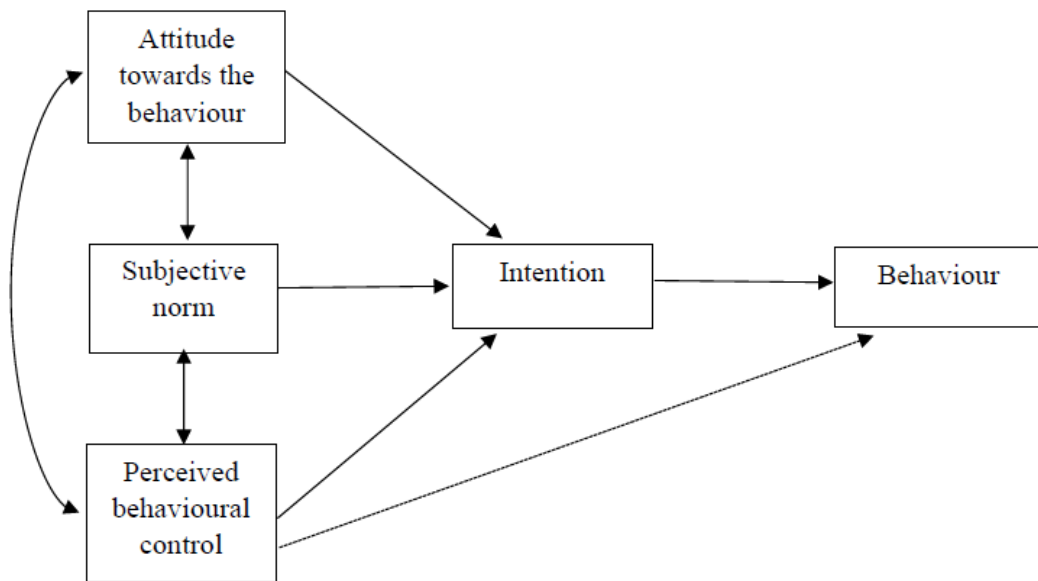


Figure 1. Theory of planned behaviour (Ajzen, 1991)

taking drugs pleasurable they may still take drugs despite the negative evaluation of the ‘subjective norm’ factor. Meta-analytical reviews have found support for this theory predicting many health-related behaviours including physical activity, dietary behaviour and safer sex (McEachan, Conner, Taylor, & Lawton, 2011). Additionally, when the theory of planned behaviour has been applied to alcohol consumption, attitudes towards alcohol consumption have been found to have the strongest relationship with intention to drink, followed by subjective norms (Cooke, Dahdah, Norman, & French, 2016). Qualitative research from the Birmingham Untreated Heavy Drinkers (BUHD) project indicated that individuals who reduced their drinking without specialist help reported changes in drinking resulted from confidence in self-sufficiency to change, internalised social pressure for change, and social collaboration with other drinkers for changing drinking (Webb, Rolfe, Orford, & Dalton, 2007). This suggests that these drinkers changed their drinking patterns due to changes in their subjective norms of drinking and perceiving drinking alcohol had

more negative consequences than they previously believed. These results also indicate that confidence or self-esteem can directly impact on alcohol drinking levels over time.

2.3 Self-Esteem

Esteem can be viewed as either a single global construct or comprised of several different concepts (Baker & Gallant, 1984). Self-esteem can be defined as “the sense of contentment and self acceptance that results from a person's appraisal of his own worth, significance, attractiveness, competence, and ability to satisfy his aspirations” (Robson, 1989, p.514) and is developed through life experiences (Beck, 1967). This process of self-evaluation is thought to be affected by social and cultural guidelines which changes throughout the person's life (Baker & Gallant, 1984). Although at times the terms are used interchangeably self-esteem and self-efficacy are different constructs (Lane, Lane, & Kyprianou, 2004). Self-efficacy has been defined as “people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives” (Bandura, 1994). Thus whether a person is able to complete specific tasks could potentially affect global self-worth (i.e. self-esteem) but it may not (Lane, et al., 2004).

Individuals with low self-esteem may often experience negative thoughts and feelings about themselves. In order to reduce the stress caused by these feelings they may consume alcohol, which in turn may lead to alcohol related problems. This model is known as the stress-response dampening model (Levenson, Sher, Grossman, Newman, & Newlin, 1980). It suggests that consumption of alcohol leads to a reduction in both physical and psychological stress, although the mechanisms through which this occur are not clear. One possible mechanism suggested by Levenson et al., (1980) is that alcohol may have a direct effect on the person's cognitive processes leading to the person either being able to ignore the stressor more or reducing the perceived threat of the stressor. An alternative model could be adopted from the psychological treatment literature, using a cognitive model of low self-esteem

(Fennell, 1998). This model postulates that low self-esteem in individuals arises from the development of negative core beliefs about themselves which leads them to make negative predictions about how they will cope in specific situations. In response to the predictions made individuals may carry out what could be viewed as maladaptive behaviours, such as avoidance, which lead the individual to confirm their core-belief. Using the cognitive model of low self-esteem proposed by Fennell (1998), it could be hypothesised that alcohol is used by individuals with low self-esteem as a maladaptive way of coping, which maintains low self-esteem.

Based on both the stress-response dampening model and cognitive model of low self-esteem, it could be hypothesised that self-esteem is negatively related to alcohol consumption (i.e. as self-esteem reduces alcohol consumption increases). This has been found for both university students (Backer-Fulghum, Patock-Peckham, King, Roufa, & Hagen, 2012; Tomaka, Morales-Monks, & Shamaley, 2013) and in community heavy drinking populations (Zhai et al., 2015). However, other research has found positive associations between self-esteem and alcohol consumption (Neumann, Leffingwell, Wagner, Mignogna, & Mignogna, 2009) and even null associations have been reported (Trucco, Connery, Griffin, & Greenfield, 2007). Given these conflicting findings, the relationship between alcohol consumption and self-esteem remains unclear.

2.4 The potential effect of confounders

When measuring the strength of a relationship between two variables, it is critical to be aware of potential confounding variables which can affect the relationship. A variable can be classed as a confounder if it meets the following three criteria: the variable must have an association with the exposure variable, it must have an association with the outcome variable (i.e. the dependent variable) and it must not be an effect of the exposure (Jager, Zoccali, MacLeod, & Dekker, 2008). When researchers investigate the strength of a relationship

between two variables, failure to adjust for a confounding variable can lead the researcher to either over or under estimate the association (Mehio-Sibai, Feinleib, Sibai, & Armenian, 2005). This process is illustrated by Figure 2 below for this study. Confounding can potentially be adjusted for using multi-variate analysis (Jager et al., 2008), for example by adjusting for potential confounders when fitting regression models.

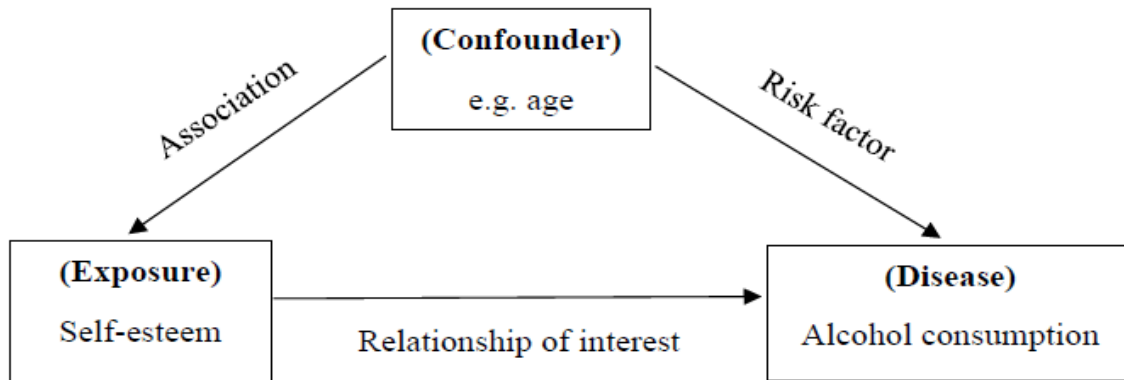


Figure 2. Diagram demonstrating the properties of a confounder as applied to this study.

It has been hypothesised that many demographic and psychosocial variables may affect the relationship between alcohol and self-esteem. One narrative review which aimed to investigate the consequences of high self-esteem examined the relationship between self-esteem and multiple psychosocial factors (Baumeister, Campbell, Krueger, & Vohs, 2003). The authors concluded that people with high self-esteem were less likely to be depressed and more likely to report being happier. However, the relationship between self-esteem and other variables was less clear. Self-esteem was not found to affect school performance and did not reliably predict aggressive behaviour or smoking. Additionally, weak positive correlations between job performance and self-esteem were noted. In regard to alcohol use the review reported the link between alcohol use and self-esteem was inconsistent. Some studies reported low self-esteem was associated with alcohol use and others vice-versa. Although the

authors of this review reported that they focused on longitudinal studies to investigate causal relationships between self-esteem and alcohol use, they did not report if there were any changes in the results following adjustments for potential confounders. Additionally, the majority of the data reported by Baumeister et al., (2003) on alcohol use described studies which recruited adolescents as participants, although a small amount of data was taken from adults and college students. This means that most of the findings may not be generalisable to an adult population. Therefore, the differing results could have been due to potential confounders including other psychosocial variables or demographic factors.

Demographic factors such as age (Dearing, Witkiewitz, Connors, & Walitzer, 2013) and gender (Neumann, Leffingwell, Wagner, Mignogna, & Mignogna, 2009) have been found to be moderators in the relationship between alcohol consumption and self-esteem. A moderator can be defined as “a variable that modifies the form or strength of the relation between an independent and a dependent variable” (MacKinnon, 2011, p.670). A moderator differs from a confounder because the relationship between the two variables of interest will differ according to the values of the moderator, unlike it could with a confounder (MacKinnon, 2011).

2.5 Narrative review exploring the relationship between alcohol use, self-esteem and potential confounders

Although strengths of the review conducted by Baumeister et al. (2003) included they encompassed a significant amount of data and it investigated the relationship between self-esteem and multiple psychosocial variables, it had several limitations. These limitations included: it was not clear if the review was a systematic one (for example it was unclear how many studies were included in the final review although the authors did report their search terms and some inclusion/exclusion criteria); it did not measure the relationship between self-esteem and demographic factors; it focused mainly on longitudinal studies; it excluded

studies that investigated the cause of self-esteem; it did not investigate the effect of potential confounders in the relationship between self-esteem and the psychosocial variables. To the author's knowledge, no narrative review has been published examining the impact of self-esteem on heavy alcohol use. Therefore, a narrative search was conducted as part of this thesis. A narrative review aims to give a broad overview of a research area and gives a simple description of study findings (as opposed to a systematic review which uses more diverse search engines and extracts data and attempts to synthesis it; (Pae, 2015)). This review aimed to address the limitations above of Baumeister et al. (2003) and provide a more in-depth, detailed coverage of the previous literature examining the relationship between self-esteem and alcohol use in adults incorporating additional studies published in the last 15 years. The review question was 'for alcohol users, does having low self-esteem (compared to high) impact on alcohol use?'. The search was conducted using three electronic databases (PsychINFO, Medline and CINAHL) with no date limiters. The three databases were chosen due to their emphasis on interdisciplinary research, their broad content coverage and their inclusivity of all study designs. It was felt this would enable the researcher to systematically record the varying effects of any potential confounders that affect the relationship between alcohol use and self-esteem. Initially, the researcher considered whether to combine the results to produce a meta-analysis. However, it was felt this would be very difficult to complete. This was because of the high number of different alcohol and self-esteem measures used, the different populations that were studied, the missing information and/or results from some papers and because many studies included people that did not drink alcohol in their samples. Due to the high number of studies and the heterogeneity highlighted above it was felt it would be very difficult to critically analyse these results in the form of a more critical systematic review, within the scope of this thesis. Therefore, the account below is not meant

to provide a comprehensive overview but to summarise the main findings from the review in a narrative format.

When the narrative review was initially designed the inclusion criteria were carefully considered. It was decided that the inclusion criteria would be kept very broad and include all papers which recorded alcohol consumption or measured levels of problem drinking/dependence of alcohol, as oppose to those that only reported 'heavy drinking'. This decision was made for several reasons. The first reason relates to the definition of 'heavy' drinking. Guidelines for recommended alcohol consumption levels vary greatly across countries (Furtwaengler & de Visser, 2013; Kalinowski & Humphreys, 2016). This meant that if only heavy drinkers were included the sample could be very heterogeneous. Additionally, initial searches of this area suggested that most research alcohol papers do not clearly state if their participants are heavy drinkers (who are not dependent on alcohol). Therefore, it was felt that if only papers which stated they included heavy drinkers were included this would lead to a large amount of data being excluded. Finally, as highlighted above many variables are hypothesised to affect the relationship between alcohol use and self-esteem but this has not been systematically examined before. It was therefore felt a more inclusive review would allow the researcher to capture a clearer picture of possible confounders of the association between alcohol use and self-esteem. This would help guide the researcher to select possible confounders when designing the analytical plan, as if confounders are known adjustments to multivariate analysis can be made at this stage of the research (Jager et al., 2008). As this thesis focused on the longitudinal impact of self-esteem on alcohol use, it was also considered whether only longitudinal studies should be included. However, it was felt this would lead to a significant amount of data being excluded, as most of the previous research in this area is cross sectional. Finally, this review only included people over the age of 17 as the researcher wanted to focus on the relationship between self-

esteem and alcohol use in adults. Therefore, the final inclusion criteria were studies that: (i) utilised an empirical measure of self-esteem (ii) recorded participants current alcohol use and/or drinking status (iii) included participants aged 18 years or older (during at least one data collection point) (iv) were published in a peer-reviewed journal. The search terms used are outlined below in Table 1. Studies that were published in languages other than English were excluded due to practical reasons, such as the cost of hiring a translator. Studies which included results from both participants under and over 18 were included if the results of these two age groups were reported separately.

Table 1

Databases Searched, Search Terms, Limiters and Results of each Search

Search No.	Databases	Search Term/ Limiters	Results
1	CINAHL Complete/ Medline/ PsychINFO	(Abstract) "alcohol*" OR (Abstract) "ethanol" OR "binge drinking" (Abstract)	442,122
2	CINAHL Complete/ Medline/ PsychINFO	"self esteem" (Abstract) OR "self-esteem" (Abstract)	57,593
3	CINAHL Complete/ Medline/ PsychINFO	#2 AND #3	2,348
4	CINAHL Complete/ Medline/ PsychINFO	Limiter- English Language	2,202
5	CINAHL Complete/ Medline/ PsychINFO	Limiter- Participants 18 or over only	1,231

Figure 3 below illustrates the screening process using a PRISMA flow diagram. The initial search resulted in a total of 2348 studies of which 1231 remained after the limiters were applied. After the removal of duplicate records, the titles and abstracts of the studies were screened and 514 were excluded as they did not meet the above inclusion criteria. The main reason for exclusion was the research was not peer-reviewed empirical research (n=203). Following this screening, 381 abstracts were found to meet the inclusion criteria. The remaining full text of these papers were then reviewed, of which 218 were found to meet the criteria. Data was extracted from these articles and recorded in an evidence table. This table

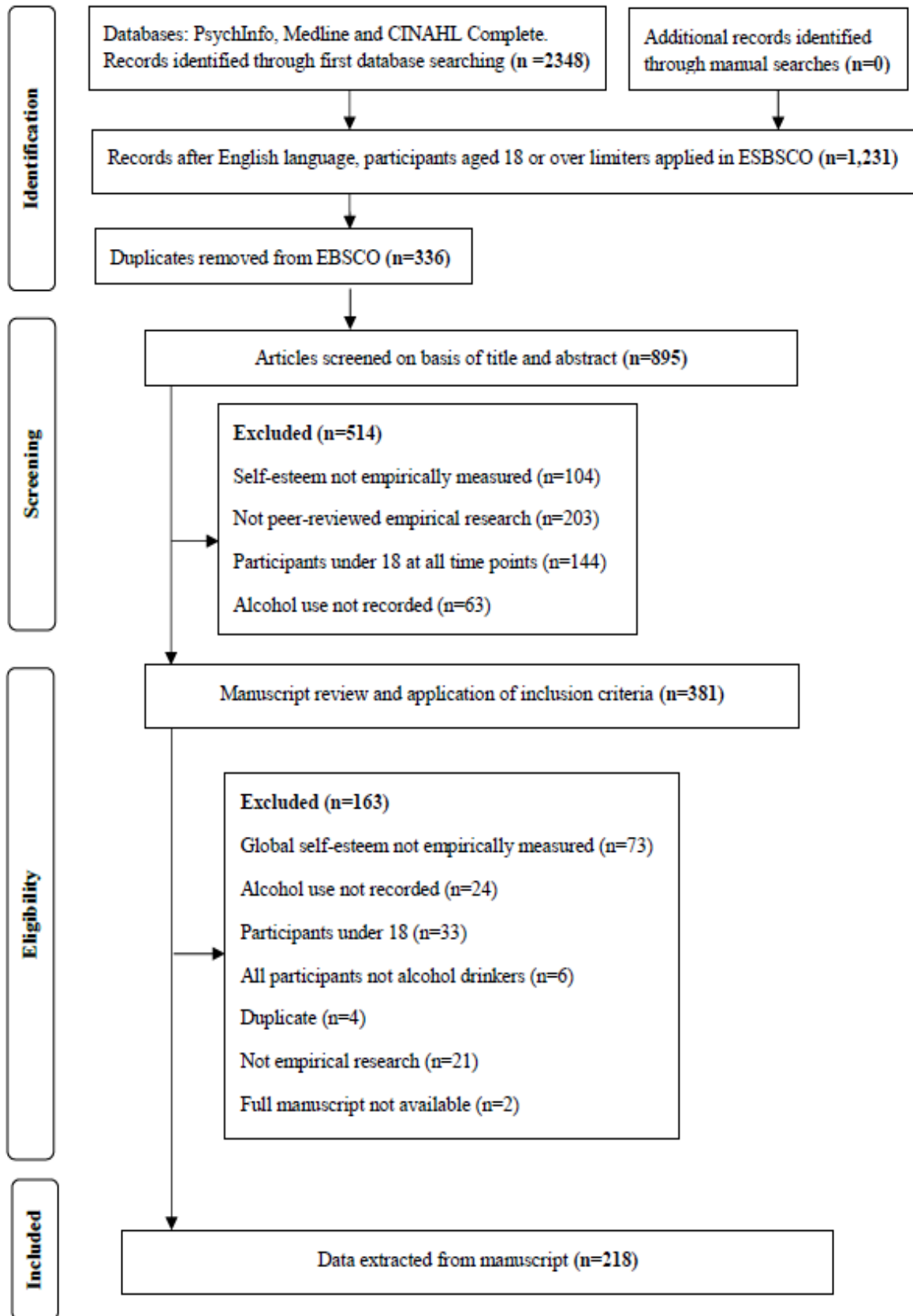


Figure 3. Flowchart of the search strategy

included information about study design, target population, measures of alcohol use and self-esteem, confounders adjusted for and results of the relevant analyses.

2.5.1 The relationship between alcohol use and self-esteem

The relationship between alcohol use and self-esteem results will now be separated and discussed based upon the design of the studies.

2.5.1.1 Cross sectional studies of alcohol use and self-esteem

140 (64%) of the studies had a cross sectional design. Of these approximately one third recruited students from universities and the results reporting the strength of the relationship between alcohol use and self-esteem varied. As hypothesised, Schaeffer, Schuckit and Morrissey (1976) reported that those who drank alcohol on a heavier basis (more than four times a week) were significantly more likely to have lower self-esteem scores ($F=3.25, p<0.02$) compared to abstainers, light or moderate drinkers. In contrast, several studies found a significant positive correlation between alcohol use and self-esteem. For example, Neighbors, Larimer, Markman Geisner and Knee (2004) reported self-esteem significantly correlated with frequency of alcohol use ($r=0.17, p<0.05$) and with alcohol related problems ($r=0.21, p<0.01$). A minority found no relationship between the two variables. For instance, Zeigler-Hill, Stubbs and Madson (2013) reported that self-esteem did not significantly correlate with the amount of alcohol consumed. This inconsistent pattern of results in similar university student populations implies that the relationship between alcohol use and self-esteem is not straightforward. Lewis and O'Neill (2000) found students classified as 'problem drinkers' scored significantly lower in self-esteem and Zeigler-Hill, Madson and Ricedorf, (2012) reported that self-esteem was negatively associated with harmful drinking patterns as opposed to the amount of alcohol consumed. Thus, it may be that lower self-esteem does not impact on the amount of alcohol consumed but is a characteristic that

predisposes individuals to developing alcohol related problems. However, care should be taken not to merge the results from the general populations and university students, as students have been found to have unique drinking patterns and different risk factors related to heavier drinking patterns (Ham & Hope, 2003).

Studies which recruited participants outside student populations more commonly reported that alcohol use was associated with lower self-esteem, although the results were still not consistent. In a community sample of homosexual men, lower self-esteem was found to significantly predict both alcohol and drug abuse (Ghindia & Kola, 1996) but in a sample of homosexual women a significant positive correlation was found between excessive alcohol use and self-esteem (Kerby, Wilson, Nicholson, & White, 2005). As 60% of the latter study sample were aged 18-34 it is possible that this replicated result of drinking being associated with higher self-esteem (similar to college student drinking patterns from other studies) may indicate that age is a confounding factor of this relationship in younger adults. Conversely, female current alcohol users recruited from homeless shelters had significantly lower self-esteem when compared to previous drinkers or abstainers (Nyamathi, Keenan, & Bayley, 1998). Additionally, Mookherjee (1986) found that for participants convicted of driving under the influence of alcohol, those classed as alcohol dependent were significantly more likely to have lower self-esteem than those without alcohol dependence. It is possible that the relationship between alcohol use and self-esteem is significantly affected by other factors. Cornelius et al. (1995) found that patients recruited from an inpatient psychiatric population had the lowest self-esteem level if they had a combination of depression and alcohol dependence (in comparison to those with depression or alcohol dependence alone). However, as different factors have not been systematically studied across different populations it is difficult to draw any conclusions from the cross sectional studies included in this review. Additionally a number of cross-sectional studies reported a null relationship between self-

esteem and alcohol use (Lawton, 2012; Steffenhagen, & Steffenhagen, 1985). However, as all of these studies are cross sectional it is impossible to conclude whether varying levels of self-esteem lead to changes in alcohol consumption or vice versa. This is because cross-sectional studies are simply a representation of a population at one point in time. Due to the variation in the above results it is difficult to draw any firm conclusions about the relationship between alcohol use and self-esteem, although there is some indication the relationship is more likely to be positive in younger adults.

2.5.1.2 Case control studies of alcohol use and self-esteem

22 (10%) of the studies in this review were case control studies. Case control studies allow for two groups (one who have the outcome of interest and one that does not) to be compared retrospectively to study whether an exposure is associated with an increased likelihood of a particular outcome (Lewallen & Courtright, 1998). Additionally, if cases are matched with controls then the potential effect of confounders may be reduced (Lewallen & Courtright, 1998). Multiple studies comparing people receiving treatment for alcohol dependence with healthy controls reported that those diagnosed with alcohol dependence had significantly lower self-esteem (Beckman, Day, Bardsley, & Seeman, 1980; Boyd et al., 2002; Silvia, Sorell, & Busch-Rossnagel, 1988; Turnbull, & Gomberg, 1990). However, none of the case-control studies measured levels of alcohol consumption – the alcohol measures utilised were either questionnaires designed to measure a clinical diagnosis of alcohol dependence or a screening measure to look for potential alcohol abuse. This means that it can only be concluded from these studies that people with alcohol dependence are more likely to have lower self-esteem (compared to healthy controls) but not heavy drinkers alone as such. Additionally, many studies did not report if they matched the group of interest with a matched control group or carried out adjusted regression analysis controlling for confounders. This means that the relationship between alcohol use and self-esteem could have been

affected by confounders. Mohagheghi, Amiri, Rizi and Safikhanlou (2015) reported those with alcohol dependence had significantly lower emotional intelligence including problem-solving skills and stress tolerance. Therefore, based on the stress-response dampening model (Levenson, et al., 1980) it is possible low levels of these skills lead to the person drinking more as a way of coping, which leads to an increased risk of developing alcohol dependence.

2.5.1.3 Non randomised and randomised controlled trials

Around 10% of the studies included in this review were trials, most of which examined the efficacy of different treatments for people with alcohol dependence. Therefore, the results of this section are difficult to generalise outside alcohol dependent populations. The majority of the studies reported there was a significant improvement in both alcohol use and self-esteem following treatment for alcohol dependence (Polcin, Prindle, & Bostrom, 2002; Small, & Lewis, 2004; Wood, Englander-Golden, Golden, & Pillai, 2010). However, most of the studies did not adjust for potential confounders and it is therefore unclear if these results are due to other factors. This is of particular importance to the studies which were not sufficiently powered to detect group differences based on their sample size, hence the confounders were not equally dispersed across the groups. However, it is of note that this improvement in self-esteem occurred in studies who recruited only men (Malcolm, 2004) and only women (Corrigan, Butler, & Camasso, 1995).

When participants treated for alcohol dependence received different treatments though, differences between treatment groups in self-esteem were rarely found. For example, Alwyn, John, Hodgson and Phillips (2004) reported no significant difference between treatment groups in self-esteem when half of the participants were offered a standard home detoxification programme and the other half were offered the detoxification and a brief psychological intervention (which focused on improving motivation, coping skills and social

support). This suggests that treatments focusing on alcohol use specifically are unlikely to indirectly improve self-esteem levels. Additionally Timko, Moos, Finney, Moos and Kaplowitz (1999) noted that participants who approached a treatment centre but decided not to have treatment, reported their self-esteem significantly improved and their alcohol intake reduced over time. This suggests that it may not be the treatment for alcohol dependence that leads to an individual's self-esteem improving but the self-recognition they may need to change their alcohol use.

2.5.1.4 Longitudinal studies of alcohol use and self-esteem

In order to be able to measure the effects of one variable on another over time a longitudinal study design must usually be utilised (although some short term inferences can also be made from some randomised controlled trials). However, only 32 (15%) of the studies included in this review utilised this study design. This suggests that the previous review conducted by Baumeister et al. (2003) which focused only on longitudinal studies did not cover a significant amount of literature, which this review addressed through its wider inclusion criteria. There was some evidence from the longitudinal study results that self-esteem affected alcohol consumption patterns over time. Huurre et al. (2010) reported that lower self-esteem at age at 16 significantly predicted problem drinking at age 32 in males only. It should be noted though that when this regression model was adjusted for a range of socio-demographic factors during adolescence (including social class, school performance, relationship with parents, depressive symptoms, drinking level and smoking) self-esteem was no longer a significant predictor of problem alcohol drinking. However, Hammer and Pape (1997) reported that low self-esteem was a significant predictor for alcohol-related problems for men only (in addition to registered criminality and cannabis use). However, this study adjusted for fewer sociodemographic variables than Hurree et al. (2010) which could account for the difference in adjusted results.

In a national survey completed in Canada examining the relationship between work organisation conditions and alcohol misuse, low self-esteem increased the risk of alcohol misuse by 17% after adjustment for a range of workplace variables and socio-demographic variables (including age, gender, household income, social support, stressful childhood events and education level) (Saade & Marchand, 2013). However, in this study only 6-8% of the sample were classed as misusing alcohol (which was defined as a man drinking more than 14 drinks per week and a women more than 9 drinks per week). In another study in which a higher percentage of men and women drank heavily (93% of men and 88% of women reported drinking more than five drinks on one occasion) these results were not replicated (Poikolainen, Tuulio-Henriksson, Aalto-Setälä, Marttunen, & Lonngvist, 2001). The authors reported that drinking 13 or more drinks and higher overall volume of alcohol intake was significantly predicted by gender, relief drinking and relief smoking but not by self-esteem. Collectively, the results from the longitudinal studies considered in this review were more indicative of a relationship between low-self-esteem and excessive alcohol use over time, although it appears likely that the relationship is affected by a range of factors. Furthermore, many of these studies had a low proportion of heavy drinkers. For example Poikolainen, et al. (2001) reported for men the average alcohol consumption was 15.3g per day for men (equivalent to just under 2 UK units). This would mean that most for the sample were drinking just below the UK recommended drinking limit of 14 units per week. This means that it is difficult to draw any conclusions based on this data about the relationship between self-esteem and consistent heavier alcohol use.

2.5.2 Factors associated with both alcohol use and self-esteem

The narrative search highlighted a number of demographic and psychosocial variables associated with both alcohol use and self-esteem. For some of these variables there was evidence they could act as a potential confounder on the relationship. This was due to the

relationship between self-esteem and alcohol changing when the variable was adjusted for and the variable itself could not feasibly be on the casual pathway. The section below focuses on the variables with the strongest evidence for possible confounding or those which are commonly investigated in the literature.

2.5.2.1 Demographic variables

2.5.2.1.1 Age

As described above, the results from cross sectional studies imply that the relationship between being younger, alcohol use and self-esteem is conflicting although, it seems that a positive relationship is more likely with younger adults. Although multiple studies completing regression analysis to measure predictors of self-esteem or alcohol use adjusted for age, this was not consistently found to be a significant predictor. For example, Tucker et al. (2005) and Cervantes, Gilbert, de Snyder and Padilla (1991) found age was not a significant predictor for drinking levels. However other studies from a range of populations did report age was a significant predictor of either self-esteem or alcohol use. Seeman and Seeman (1992) reported that in a community sample of men aged 21 age was a significant predictor of drinking frequency and Trucco et al., (2007) reported for participants undergoing treatment for alcohol dependence, being younger significantly predicted lower self-esteem after treatment.

2.5.2.1.2 Gender

Men are more likely to exceed the UK weekly consumptions guidelines (Stats Team, NHS Digital, 2017) and male USA college students have been observed to drink higher levels of alcohol than female students (Zeigler-Hill et al., 2013). A number of the studies included in this review reported that both self-esteem and alcohol use significantly correlated with gender (Graham, & Streitel, 2010). Gender was also found to be a significant predictor of

alcohol use. Amongst college students lower self-esteem and being male significantly predicted alcohol use (Maney, 1990; Tyssen, Vaglum, Aasland, Gronvold, & Ekeberg, 1998). A longitudinal study recruiting from a normal population also found that higher alcohol intake or consuming 13 or more drinks in one sitting was significantly related to being male (Poikolainen, et al., 2001). This evidence collectively suggests that gender is a potential confounder in the relationship between alcohol use and self-esteem.

2.5.2.1.3 Ethnicity

Historically people from some ethnic minority groups report drinking lower levels of alcohol in the UK, although there is evidence these drinking patterns in some cultures are changing (Hurcombe, Bayley, & Goodman, 2010). However, the relationship between ethnicity and self-esteem from this review was unclear due to the limited number of studies which adjusted for ethnicity. Turner and Kopiec (2006) reported that white university students were significantly more likely to report symptoms of either alcohol abuse or dependency. In contrast, another study reported homeless adults self-esteem significantly positively correlated with being African American (Stein, Dixon, & Nyamathi, 2008) whereas university students with “brown” skin had lower levels of self-esteem in comparison with students from other ethnic groups (Ortiz-Hernandez, Compean-Dardon, Verde-Flota, & Flores-Martinez, 2011). Thus, there is tentative evidence that ethnicity could act as a confounder in the relationship between alcohol use and self-esteem, although it should be acknowledged the evidence is limited.

2.5.2.1.4 Religion

Many religions prohibit the use of substances, which is likely to influence people’s attitudes towards alcohol consumption (Assanangkornchai, Conigrave, & Saunders, 2002). It has been suggested that religiosity (which can comprise of religious affirmation, religious

beliefs or spirituality among other factors) is a protective factor for alcohol use (Chitwood, Weiss, & Leukefeld, 2008). Discriminate analysis of college students with high and low spiritual well-being indicated that those with low spiritual wellbeing were significantly more likely to have lower self-esteem, drink more alcoholic drinks per day and get drunk more often (Hammermeister & Peterson, 2001). Additionally, in a general population community sample self-esteem was found to mediate the relationship between religious beliefs and health behaviours, including alcohol use (Holt, Roth, Clark, & Debnam, 2014). Tyssen et al. (1998) also found that no reported religious activity in college students was a significant predictor of drinking to intoxication. These results suggest that religion or spiritual well-being can have a significant impact on alcohol use and that self-esteem influences this relationship. However, it is possible this relationship varies depending on how the person defines their self-esteem as Crocker (2002) found that students who based their self-worth/self-esteem on their faith (as opposed to other factors such as their appearance) were less likely to use alcohol or drugs.

2.5.2.1.5 Socioeconomic status/Education

Highest level of education attainment has been used as a measure of current socioeconomic status for adults (Grittner, Kuntsche, Gmel, & Bloomfield, 2013). A recent meta-analysis reported that higher proportions of drinkers (measured as any alcohol use in the past 12 months) were found in countries with higher levels of education (Grittner et al., 2013). However, men with lower education levels were more likely to binge drink whereas the opposite result was found for women. Similarly, some studies included in this narrative review indicated that lower levels of education was negatively associated with higher drinking frequency (Neff, Prihoda, & Hoppe, 1991; Seeman & Seeman, 1992). This provides evidence of at least a correlational nature between education, drinking frequency and self-esteem, although the direction of the relationships is not consistent.

2.5.2.1.6 Marital Status

Marital status has been linked to both alcohol use and self-esteem level. Older adults who are divorced, separated, or single are more likely to have an unhealthy drinking pattern (Merrick, et al., 2008). Additionally, being single has been shown to significantly predict lower levels of self-esteem in the general population (McMullin, & Cairney, 2004). Compared to women without alcohol dependency, women with alcohol dependency have been found to be more likely to be unmarried and have lower self-esteem (Schlesinger, Susman, & Koenigsberg, 1990). Conversely, Trucco et al., (2007) reported that married women who recently underwent treatment for alcohol dependence had lower self-esteem, than unmarried women. They noted, however, this difference was only significant after treatment for alcohol dependency had been completed suggesting that marital status may have a long-term effect on self-esteem and that further research is required to examine this relationship.

2.5.2.2 Psychosocial variables

2.5.2.2.1 Smoking

Hypothetically, smoking could lead to a reduction in self-esteem and vice versa. People with lower self-esteem may smoke to cope with their difficulties or those with high self-esteem could seek to experiment by smoking. On the other hand, self-esteem may reduce after an individual starts smoking as they could feel stigmatised (Baumeister et al., 2003). A previous review of this area of literature suggested there may be a positive association between self-esteem and smoking, moderated by gender, although a number of null findings were reported (Baumeister et al., 2003). There were few studies included in this narrative review for this thesis, however, that measured smoking. Kastbom, Sydsjo, Bladh, Priebe and Svedin (2015) reported from a national survey individuals with lower self-esteem were 39%

more likely to smoke cigarettes and a longitudinal study reported that relief smoking (if participants indicated they smoked when they were nervous) significantly predicted both frequency of alcohol consumption and consumption of 13 or more drinks in one sitting (Poikolainen, et al., 2001). This provides tentative evidence that heavier drinking and lower self-esteem is associated with smoking tobacco.

2.5.2.2.2 Illicit drug use

In the same way as alcohol, the interpretation of findings for drug use in research is complex due to the different phenomenon of experimental use, heavy use and addiction rarely being separated (Baumeister et al., 2003). The review of the effects of high self-esteem found there was limited evidence this was associated with drug use (Baumeister et al., 2003). However, this review found evidence across a range of populations that drug use was related to lower self-esteem and alcohol use. In a community sample of homosexual men alcohol consumption significantly correlated with both cannabis and cocaine use and regression analysis suggested that lower self-esteem predicted both alcohol and drug use (Ghindia & Kola, 1996). Additionally, in a sample of homeless women current drug or alcohol users had significantly lower self-esteem when compared with those who had never used substances (Nyamathi, et al., 1998). Moreover, Klein, Elifson and Sterk (2010) found that in a sample of young adults using ecstasy, self-esteem was a significant predictor of number of alcohol problems and total amount of illegal drug use, even after controlling for a number of demographic variables. This suggests that illicit drug use is associated with both alcohol use and low self-esteem, although the mechanisms behind this relationship remain unclear.

2.5.2.2.3 Depression

People with high self-esteem are less likely to be depressed generally and following difficult events although further research is required before this relationship is fully

understood (Baumeister et al., 2003). The narrative review conducted for this thesis found strong evidence that depression, self-esteem and alcohol could be interlinked. In a study of college students from the USA depression significantly correlated with frequency of alcohol use, as well as self-esteem (DeSimone, Murray, & Lester, 1994). Additionally, Tucker et al. (2005) reported that frequency of drinking to intoxication was significantly predicted by both lower self-esteem and depression whereas Nyamathi, et al. (1998) reported that low self-esteem and having had treatment for alcohol difficulties were significant predictors for depression. In a national longitudinal study both drinking alcohol or taking substances once a week and having lower self-esteem significantly predicted symptoms of depressed mood (Costello, Swendsen, Rose, & Dierker, 2008). However, it should be noted that Costello et al. (2008) combined using alcohol, tobacco or other drugs once a week into one variable. Thus, it is not clear whether the alcohol use or other substances significantly predicted depressed mood.

2.5.2.2.4 Other mental health difficulties

The results of this review examining the association between self-esteem, alcohol use and other mental health difficulties were less clear than the above findings for depression. Trucco et al. (2007) reported that clinical diagnoses other than depression or substance use significantly predicted levels of self-esteem. However, they did not report what diagnoses this included specifically in their sample which makes it difficult to draw any conclusions from these results. Previous research has suggested that drinking alcohol can make certain individuals more prone to aggression (NIAAA, 1997). Yet, despite several studies being conducted there is no consistent evidence of a link between self-esteem and aggression (Baumeister et al., 2003). This review found only two studies that reported self-esteem was significantly negatively predicted by anger levels (Pekala, Kumar, Maurer, Elliott-Carter, & Moon, 2009; VandeWeerd, Paveza, Walsh, & Corvin, 2013). However, both studies were

cross sectional in nature, which means that the effect of the variables on each other over time could not be measured.

This review also found limited evidence for the role of anxiety as a confounder of the relationship between alcohol use and self-esteem. Clinical and epidemiological studies have reported a frequent co-occurrence of alcohol dependence and anxiety disorders (Grant, et al., 2004; Schneider et al., 2001). One study included in this review reported that anxiety significantly predicted self-esteem levels for patients undergoing substance abuse treatment (Pekala, et al., 2009). Additionally, in a general population cohort study early onset anxiety disorders in women were found to significantly predict lower levels of self-esteem (Kendler, Edwards, & Gardner, 2015). These studies therefore provide tentative grounds to consider that self-esteem and alcohol may be related to both anger and anxiety levels, although it should be noted this evidence is limited.

2.5.2.2.5 Social support

Reports indicate that people with higher self-esteem claim their social lives are better and richer than those with lower self-esteem (Baumeister et al., 2003). Additionally Lakey, Tardiff and Drew (1994) found that people with lower self-esteem report having less social support and more negative interactions. This review found evidence that social support is a significant predictor of both alcohol misuse and self-esteem. For example both lower social support and self-esteem were found to predict alcohol misuse (Saade & Marchand, 2013; Stein et al., 2008). Also, for women completing treatment for substance misuse those with higher levels of social support had higher levels of self-esteem (Dodge & Potocky, 2000). This suggests that social support is a significant predictor of both alcohol misuse (although not necessarily volume of alcohol drunk) and self-esteem.

2.5.2.2.6 Childhood abuse

Findings from both clinical samples and the general population suggest that individuals who experience childhood abuse are more likely to have impaired mental health (including lower self-esteem) as a result (Jumper, 1995). This review found that experiencing childhood abuse was significantly related to both alcohol use and self-esteem, a factor rarely controlled for in many studies. A longitudinal cohort study found that after controlling for socio-demographic, family functioning and child factors, adults who had experienced childhood abuse had significantly lower self-esteem scores and were more likely to develop alcohol dependence (Fergusson, McLeod, & Horwood, 2013). Additionally, Pekala et al. (2009) reported that childhood abuse significantly predicted lower self-esteem levels, after controlling for other confounding variables including anxiety in patients undergoing treatment for substance misuse. Furthermore, Kendler et al. (2015) found that a significant predictor for men who developed alcohol dependency was childhood sexual abuse. This evidence collectively indicates childhood abuse may affect both self-esteem and alcohol use in adults. However, the results may not be generalisable outside a population diagnosed with alcohol dependence.

2.5.3 Alcohol outcome measures

There was a wide variety of alcohol measures used. Many studies utilised tools used to screen for alcohol dependence or abuse including the Michigan Alcoholism Screening Test (Selzer, 1971) and the CAGE (Ewing, 1984). However, although heavy drinkers may score positive on these tests, these questionnaires do not measure level of alcohol consumption, although it could be argued that individuals who are alcohol dependent are highly likely to be drinking at heavy levels. Given these measures typically focus on problems people are experiencing due to alcohol (e.g. felt guilty about their drinking), they are likely to be more helpful for screening in people with clinical alcohol dependence.

Some studies attempted to collect data about the frequency of alcohol use which occasionally was done using a standardised questionnaire. For example, Neighbors et al. (2004) measured peak alcohol consumption and frequency of alcohol use using questions from the Frequency-Quantity questionnaire (Dimeff, Baer, Kivlahan, & Marlatt, 1999). However, on a number of occasions the authors reported they asked about alcohol use but it was unclear how this was carried out. For example, Kinoti, Jason and Harper (2011) reported their questions assessed use of “local brewed alcohol” and “western style bottled alcohol” but gave no further information and Schaeffer, Schuckit and Morrissey (1976) stated they used a set of questions measuring the “frequency of drugs and alcohol”. This lack of clear information makes it not only difficult for the results to be interpreted but also the studies are impossible to replicate by other researchers.

The third group of alcohol outcome measures that were used were ones which measured clinical diagnoses of alcohol dependence, such as the Structured Clinical Interview for the DSM (Spitzer, Williams, Gibbon, & First, 1990). This type of outcome measure was mainly used in studies that recruited participants from treatment centres. However, this leads to only people with alcohol dependence being recruited which is a population that significantly differs from those who are heavy drinkers without symptoms of dependence (Babor, 1994).

However, some studies did use a combination of these measures. For example, Alwyn, John, Hodgson and Phillips (2004) recorded severity of alcohol dependence using the Severity of Alcohol Dependence questionnaire (Stockwell, Hodgson, Edwards, Taylor, & Rankin, 1979) and past three months alcohol consumption patterns using the Form 90 (Miller, 1996). This allowed the researchers to specify both the volume of alcohol drunk and whether participants were dependent on alcohol. Additionally, the Alcohol Use Disorders Identification Test (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) questionnaire which was utilised by

some studies contains some limited questions on alcohol consumption patterns and can also be used to measure alcohol dependence.

2.5.4 Self-esteem measures

Unsurprisingly, given it is estimated there are over 200 different measures of self-esteem (Baker & Gallant, 1984), self-esteem was measured using several different questionnaires. 56% of the studies included in this review used a form of the 10 item Rosenberg self-esteem questionnaire to measure self-esteem. The Rosenberg questionnaire has been shown to have good validity and reliability ratings and research has suggested that this scale is a good measure of the underlying construct of self-esteem (Baker & Gallant, 1984). However, Baker and Gallant (1984) noted that there is some confusion about the exact way of coding and reporting the scores of the Rosenberg measure, possibly due to its use of a Guttman scale. During the process of this review it was noted that some studies reported the total mean score of the Rosenberg questionnaire (Boyd et al., 2002; Gillespie & Blackwell, 2009; Mimiaga et al., 2013), others reported the mean score for each question (Pritchard, Wilson, & Yamnitz, 2007; Rodrigues et al., 2013; Trucco et al., 2007) and some did not report any mean self-esteem value (Fielder, Walsh, Carey, & Carey, 2013; Moore, Harrison, Young, & Ochshorn, 2008). It was also observed that the vast majority of studies that reported the mean self-esteem level, stated it was significantly above 15. As Rosenberg (1965) reported that total scores of below 15 suggest low self-esteem this implies that many studies may not have recruited many participants with lower self-esteem. This occurred across samples drawn from both clinical (Dodge & Potocky, 2000; Jelic, Vukic, Peco, Vojnovic, & Zoricic, 2014) and non-clinical populations (DeHart, Tennen, Armeli, Todd, & Mohr, 2009; Serdar et al., 2011).

There were also a handful of other standardised questionnaires used. These included the shortened six version item of the Rosenberg scale (Rosenberg, 1979), the Coopersmith self-

esteem inventory (Coopersmith, 1967) which was used in 19 studies and one study used the Robson self-concept questionnaire (Robson, 1989). Small and Lewis (2004) reported they choose to use the Robson self-concept questionnaire over the Rosenberg 10 item scale as they felt it covered a wider domain of topics. This implies that self-esteem does not have a clear global definition. This means that it is possible the different self-esteem measures may not be measuring the same concept. However, the Robson self-concept questionnaire was reported to correlate highly with the 10 item Rosenberg questionnaire with both participants from a general community population ($r=0.80, p<0.01$) and participants ($r=0.85, p<0.01$) who met the criteria for a generalised anxiety disorder diagnosis (Robson, 1989). These findings imply that the two questionnaires do measure similar concepts. Additionally, a number of studies used measures that had not been fully standardised (Li et al., 2012; Liao, Hunter, & Weinman, 1995; Rubio et al., 2011) or did not report the full details of the questions they used to measure self-esteem (Kerby et al., 2005; Polcin et al., 2002; Siegel, Palamara Mesagno, Chen, & Christ, 1989). This makes it very difficult to conclude whether the studies measured levels of self-esteem accurately.

2.5.5 Conclusion of narrative review

In summary, there is a wealth of research examining the relationship between alcohol and self-esteem. However, due to the large body of research it is difficult to critically appraise this literature. Babor (1994) argues that there are two separate groups of people who may struggle with alcohol difficulties which require different approaches in regards to clinical management. The first comprises of individuals typically treated in specialist addiction services who report severe dependence and focus more on the consequences of more chronic drinking, whereas the other is characterised by the reporting of heavy drinking and the acute consequences of intoxication but not higher alcohol dependency levels. However, in clinical psychology practice which focuses on formulation as opposed to

diagnosis the distinction may not always be clear cut. Although many people who fall into the second drinking category reduce their levels of alcohol consumption without specialist help (Watson & Sher, 1998) the processes by which this occurs are unclear (Sobell et al., 2000). Despite the high numbers of people drinking at heavy levels this population has been largely excluded from research (Dalton & Orford, 2001). This means that the findings of the initial narrative review cannot necessarily be generalised to untreated heavy drinking populations. The researcher will therefore now systematically review and critically appraise the literature which specifically applies to this specialist under researched population.

2.6 Systematic review of the relationship between heavy alcohol use and self-esteem in non-treatment seeking populations

Following selection of the 218 papers using the search terms outlined in Table 1 for the narrative review (see section 2.5), three further inclusion criteria were applied for this systematic review of the relationship between heavy alcohol consumption and self-esteem. These were: (i) participants not in treatment for alcohol dependency (ii) the study reported they recruited 'heavy or heavier drinkers' or presented separate analyses for a subset of their sample drinking at heavy levels (iii) a measure of alcohol consumption was used (as opposed to a measure of problematic alcohol use or disorder). No further databases were searched. Further manual searching was completed and the reference lists of the included papers were also checked. However, this searching retrieved no other papers that satisfied the above inclusion and exclusion criteria.

2.6.1 Study Quality Grading

As part of this critical review process it was felt important to evaluate the quality of the studies included. This is because any deficiencies in the design and conduct of the different aspects of the studies can lead to biased reporting or interpretation of the results (Ip, et al., 2007). Due to the mix of study designs in this review it was felt a generic grading

system applicable to each study design would be used to rate the quality of the studies. The researcher assessed each of the studies using a three category grading system (A, B and C) which was originally proposed by Ip et al. (2007) and also used by Walfisch, Sermer, Cressman and Koren (2013) in their systematic review of the relationship between breast milk and cognitive development. The grading system is:

- A (good): A study that adheres mostly to the commonly held concepts of high quality including the following: clear description of the population, setting, interventions and comparison groups; appropriate measurement of outcomes; appropriate statistical/analytic methods and reporting; no reporting errors; less than 20% attrition; clear reporting of dropouts and appropriate consideration and adjustment for potential confounders.
- B (fair/moderate): Category B studies do not meet all the criteria in category A because they have some deficiencies, but none of them are likely to cause major biases. For example, the study may have suboptimal adjustment for potential confounders. The study may also be missing information, making it difficult to assess limitations and potential problems.
- C (poor): Category C studies either did not consider potential confounders or did not adjust for them appropriately. These studies may have serious shortcomings in design, analysis or reporting; have large amounts of missing information, or discrepancies in reporting.

2.6.2 Study Characteristics

10 studies met all of the inclusion criteria. The studies were published between 1976 and 2015. The number of participants recruited varied from 100 to 2370. Six of the studies were cross sectional surveys, three were longitudinal cohort studies and one was a case control study. Extracted data was compiled in an evidence table (see Table 2 below). This

Table 2
The relationship between heavy alcohol use and self-esteem in non-treatment seeking populations

Author and year	Design	Study Population	Unadjusted results	Confounders adjusted for	Adjusted results	Study Quality Grading
DeHart et al. (2009)	Longitudinal cohort	Community sample of moderate to heavy drinkers from USA (n=100). Women drank an average of 12 standard drinks per week and men 15 standard drinks per week	Participants consumed at least one alcoholic drink on 72% of the days and drank an average of 2.68 standard drinks per day across the 30 days. Mean self-esteem was 3.44 (SD=0.42).	Gender and marital status	Participants with low self-esteem drank more on days when they experienced more negative relationship interactions. Participants with high and low self-esteem reduced their drinking in response to negative non-romantic relationship events, but people with low self-esteem decreased their drinking less.	B
Domenico and Windle (1993)	Case control	Community sample of female adult children of alcoholics (ACOA) and female non ACOAs from the USA (n=616).	Average past month alcohol consumption for ACOAS was 4.92ozs (UK units=17.40) and for non-ACOAs 4.82 (UK units=17.09). For ACOAs mean self-esteem was 21.23 (SD=2.62) and for non ACOAs mean=21.92 (SD=2.53). ACOAs had lower levels of self-esteem ($F=7.28, p<0.01$) than non-ACOAs.	No adjusted analysis completed	N/A	C
Jung & Lee (2015)	Cross sectional	Nurses working in multiple care areas who worked shifts in a hospital in South Korea (n=660)	Mean score of self-esteem was 11.8. Frequency of heavy drinkers not reported.	Age, no.of children, morningness, self-esteem, social support, job stress, BMI, heavy drinking, physical activity, working hours and number of night shifts.	Self-esteem positively sig. predicted insomnia, fatigue levels and depression level. Shift work tolerance was negatively sig. predicted by self-esteem. Heavy drinking significantly negatively predicted fatigue levels only ($\beta= -0.29, p<0.05$).	B

Author and year	Design	Study Population	Unadjusted results	Confounders adjusted for	Adjusted results	Study Quality Grading
Nystrom (1992)	Cross sectional	First year university students from Finland (n=2370)	<p>Mean alcohol consumption (users only) of females was 2.9 ± 0.06 kg/year calculated as pure ethanol and for male students 6.9 ± 0.18 kg/year. 4.9% of the female students and 11.6% of the male students were heavy drinkers.</p> <p>Positive ($r=0.36$ for males and $r=0.43$ for females) and negative ($r=0.52$ for males and $r=0.54$ for females) consequences of drinking positively correlated with alcohol consumption.</p> <p>Drinking for intoxication also positively correlated with both positive ($r=0.44$ for males and $r=0.48$ for females) and negative consequences ($r=0.59$ for both genders).</p> <p>Students with a positive self-esteem and a positive life situation reported less positive and more negative consequences of alcohol drinking.</p>	No adjusted analysis completed	N/A	C
Poikolainen, et al. (2001)	Longitudinal cohort	Young adults from the community in Finland (n=706)	<p>Mean daily alcohol consumption for men was 15.3g and for women 7.9g. 64% of men had drunk 13 or more drinks on one occasion as had 23% of women. Self-esteem did not significantly correlate with alcohol consumption. For men, age at first alcohol use ($r=-0.20$), somatic symptom score at baseline ($r=0.16$), grade point average in 1998 ($r=-0.17$), relief drinking at baseline ($r=0.18$) and relief smoking at baseline ($r=0.22$) significantly correlated with alcohol intake. For women age at first alcohol use ($r=-0.26$), negative life events at baseline ($r=0.10$), grade point average in 1998 ($r=-0.19$), relief drinking at baseline ($r=0.28$), relief smoking at baseline ($r=0.28$) and immature defence style ($r=0.18$) significantly correlated with alcohol intake.</p>	Gender, relief drinking, relief smoking, parental alcohol problems, social group, social support, trait anxiety, number negative life events, self-esteem, grade point average, somatic symptom score, three defence style clusters.	Multivariate models showed that higher alcohol intake was significantly related to male gender, relief drinking, relief smoking and interaction of the latter two variables. The consumption of 13 or more drinks (i.e. heavy drinking) was predicted by the same variables as listed above.	A

Author and year	Design	Study Population	Unadjusted results	Confounders adjusted for	Adjusted results	Study Quality Grading
Ratliff & Burkhart (1984)	Cross sectional	University students from the USA who drank at least 6oz of alcohol per year (UK units=21) (n=140)	5 MANOVAS completed with sex and alcohol use as dependent variables. Drinking category significantly differed by sensation seeking, anxiety, anxiety while drinking, antecedents and consequences of drinking and attitudes towards alcohol use. However, self-esteem alone did not significantly differ based on drinking group or gender.	No adjusted analysis completed	N/A	B
Schaeffer et al. (1976)	Cross sectional	University students from USA (n=390)	86% drank beer (3% at a heavy level), 83% drank wine (1% at a heavy level) and 88% (1% at a heavy level). Heavy use of alcohol was significantly related to low self-esteem scores ($F=3.25, p<0.02$).	No adjusted analysis completed	N/A	C
Testa & Dermen (1999)	Cross sectional	Single women from the community in USA (n=190)	Mean weekly alcohol consumption was 15.90 drinks. Mean self-esteem was 31.59 (SD=5.61). Women who had experienced sexual coercion were significantly more likely to have lower self-esteem. There was a significant group difference between women who had been sexually coerced or raped and drank alcohol (when ethnicity and education were used in the MANOVA). Women who had experienced rape had significantly higher weekly alcohol consumption.	No adjusted analysis completed	N/A	B

Author and year	Design	Study Population	Unadjusted results	Confounders adjusted for	Adjusted results	Study Quality Grading
Winefield, Winefield, Tiggemann and Goldney (1989)	Longitudinal cohort	Young adults (aged 19) recruited from the general population living in the community in Australia (n=1028)	<p>33.80% and 33.10% of subjects in 1984 and 1987 drank no alcohol; consumption was light for 40.00% and 39.90%; moderate for 14.20% and 13.70%; heavy for 12.10% and 13.40%. Men drank significantly more than women. Dissatisfied employed and unemployed groups were most likely (20.30% in both cases) to report drinking at a heavy level at baseline only. At both time points heavy drinking in males was associated with high social alienation. Decreased consumption was more likely amongst the satisfied (25.70%) or dissatisfied employed (21.60%) than amongst students (13.60%) and the unemployed (10.00%).</p> <p>Mean self-esteem was 3.95 (SD=0.80) The average reported number of standard drinks per week was 7.77. 45% were classed as infrequent drinkers, 31% as moderate and 24% as heavy drinkers. Self-esteem significantly negatively correlated with harmful drinking patterns ($r = -0.19, p < 0.001$) and negative consequences of alcohol use ($r = -0.19, p < 0.001$) (but not amount of alcohol consumed; $r = -0.06, p > 0.05$).</p>	Gender	Discriminant function analyses were performed to contrast the 85 males who increased their alcohol consumption with the 45 who decreased it, and the 63 females who increased consumption with the 58 who decreased it. However, significant linear combinations of predictor variables to maximize group differences could not be obtained in either case, and prediction of group membership was unsuccessful.	B
Zeigler-Hill et al. (2013)	Cross sectional	University undergraduate students from the Southern Region of the USA (n=623)	<p>Mean self-esteem was 3.95 (SD=0.80) The average reported number of standard drinks per week was 7.77. 45% were classed as infrequent drinkers, 31% as moderate and 24% as heavy drinkers. Self-esteem significantly negatively correlated with harmful drinking patterns ($r = -0.19, p < 0.001$) and negative consequences of alcohol use ($r = -0.19, p < 0.001$) (but not amount of alcohol consumed; $r = -0.06, p > 0.05$).</p>	Amount of alcohol consumed, gender, contingent self-esteem	Regression analysis looked at predictors of negative alcohol outcomes. Self-esteem significantly predicted both harmful drinking patterns ($\beta = -0.15, p < 0.001$) and negative consequences of alcohol use ($\beta = -0.15, p < 0.001$).	A

included information about the study design, the target population, measurement of both alcohol consumption and self-esteem, summary of the unadjusted results, a list of all confounders adjusted for, the adjusted results and study quality grading. The results of these studies will now be discussed and critiqued in relation to their study design.

The results across the cross sectional studies varied greatly. Only Zeigler-Hill et al. (2013) reported whether self-esteem levels correlated with the amount of alcohol consumed and this study reported a null result. Ratliff and Burkhart (1984) stated that self-esteem levels did not significantly differ between heavy and light drinkers. Conversely, Schaeffer et al. (1976) reported heavy use of alcohol was significantly related to low self-esteem scores. The lack of commenting on this relationship in the other three cross-sectional studies and varying results makes it difficult to conclude anything about the strength of this relationship in heavy drinkers. Of note, Ratliff and Burkhart (1984) reported that drinking category (light drinking men, light drinking women, heavy drinking men, heavy drinking women) significantly differed by self-reported antecedents and consequences of drinking ($F=14.58, p<0.001$). Zeigler-Hill et al. (2013) also reported self-esteem significantly negatively correlated with harmful drinking patterns ($r=-0.19, p<0.001$) and negative consequences of alcohol use ($r=-0.19, p<0.001$). Conversely, Nystrom (1992) reported that students with higher self-esteem reported significantly less positive and more negative consequences of alcohol drinking. The reason for this conflict in results is unclear given both studies recruited large samples of university students with similar proportions of males and females (Nystrom, 1992; Zeigler-Hill et al., 2013). However, it could be due to other demographic differences. For example, Ratliff and Burkhart (1984) recruited students from the USA (many of whom would have been not legally allowed to drink at the time of data collection) whereas Nystrom (1992) recruited students from Finland where the legal age individuals can drink is 18. Alternatively, Zeigler-Hill et al. (2013) recruited a much higher proportion of heavy drinkers than the other

cross-sectional studies, thus potentially their sample was more at risk of more negative consequences of alcohol use.

The findings for the relationship between alcohol use, self-esteem and possible confounders varied greatly also. For example, in the narrative review of factors associated with both self-esteem and alcohol consumption reported in section 2.5 of this thesis, depression was reported as a potential confounder of this relationship. However, the results found in this systematic review of heavy untreated drinkers were inconsistent. Nystrom (1992) reported depression and anxiety levels did not significantly correlate with level of alcohol consumption or consequences of drinking. Conversely, Jung and Lee (2015) reported self-esteem was a significant predictor for depression but heavy drinking was not. Additionally, childhood abuse has consistently been reported as a predictor of low self-esteem in adulthood (Jumper, 1995) and consistent with this Testa and Dermen, (1999) found that women who had been raped had significantly higher weekly alcohol consumption. However, most of these studies made no attempt to control for other potential confounders. This means that these results could be largely affected by residual confounding. Support for this hypothesis comes from the study by Ratliff and Burkhart (1984) who found that gender and drinking category significantly differed by antecedents and consequences of drinking when included in the statistical models alone but, the results were not significant when the interaction between these two were introduced. However, due to the cross sectional design of these studies it was impossible to calculate whether self-esteem and alcohol use impacted on each other over time.

The only case control study included in this review compared female adult children of alcoholics (ACOAs) with female children of non-alcoholics (non ACOAs) (Domenico & Windle, 1993). The results revealed that there were no significant differences between the two groups based on levels of alcohol consumption (comparing abstainers, light, moderate

and heavy drinkers) but ACOAs did have significantly lower levels of self-esteem. However, it should be noted that this statistically significant difference is unlikely to be clinically relevant as the mean self-esteem score only differed by 0.69, although this is not definite as Domenico and Windle (1993) did not use a standardised measure of self-esteem. Additionally, the authors did not attempt to complete any adjusted analysis to control for any confounders.

The results from the three longitudinal studies did not provide conclusive evidence about the relationship between alcohol consumption and self-esteem in heavy drinkers. For example, Poikolainen et al. (2001) reported that self-esteem did not significantly correlate with alcohol consumption (although the results were not reported specifically for heavy drinkers which comprised of 64% of the total sample of men and 23% of the women). Thus, this result may not be representative of the relationship for heavy drinkers. Winefield et al. (1989) did not comment on the relationship between drinking levels and self-esteem – it is unclear whether this was due to a null result or the analysis had not been completed. Additionally, DeHart et al. (2009) reported that self-esteem did not significantly predict alcohol consumption in a multi-level model which controlled for relationship events but no other factors. Thus, similar to the cross-sectional studies it is possible these findings are due to the effect of confounders as few confounders were controlled for in the above analysis. For example, Poikolainen et al. (2001) found that heavy drinking (defined as drinking more than 13 drinks in one sitting) was significantly predicted by male gender, relief drinking, relief smoking and an interaction of the latter two variables (although self-esteem was not entered into this model). Winefield et al. (1989) did attempt to calculate predictors of males and females who changed their alcohol consumption between the two time points but they reported that significant linear combinations of predictor variables to maximise group differences could not be found. Females were less likely to change their alcohol consumption

and those who were employed were more likely to reduce their drinking levels (compared to students and people who were unemployed). Thus, it is unclear from these results whether self-esteem impacts on alcohol consumption over time and what other factors may affect this. For example, a number of variables were found to significantly correlate with alcohol consumption by Poikolainen et al. (2001) including age at first alcohol use, somatic symptoms, grade point average, relief drinking at baseline, relief smoking at baseline and immature defence style but, the relationship between these variables and self-esteem was not investigated. Thus, although the evidence is more suggestive of a null result than in the previous narrative review discussed in section 2.5 of this thesis, the relationship between alcohol use and self-esteem in heavy drinkers remains unclear.

2.6.3 Validity and methodological quality

2.6.3.1 Sample biases

Only one of the studies included in this review recruited heavy drinkers exclusively (DeHart et al., 2009). DeHart et al. (2009) recruited women who drank on average 12 standard drinks per week and men who drank 15 standard drinks per week whereas others recruited participants drinking at varying levels, some of whom did not drink at all. Schaeffer et al. (1976) reported only 2.80% of their sample drank beer heavily, 0.80% drank wine heavily and 0.60% drank hard liqueur at this level. Additionally, Jung and Lee (2015) did not report the number of people who met criteria for heavy drinking. This means that the effect of self-esteem on alcohol use for these studies may not be generalisable to an exclusively heavy drinking population.

In addition to the concerns raised about the proportion of heavy drinkers, it should be noted that not all the studies reported if all the participants they recruited drank alcohol. Poikolainen et al. (2001) reported a high proportion of their sample were heavy drinkers but

they did not exclude participants if they did not drink and Winfield et al. (1989) reported approximately 33% of their participants drank no alcohol. This means that any reported changes in alcohol use may have significantly differed in these studies as opposed to others which included people who abstained from alcohol.

The populations of the studies in this review could be seen as quite homogenous. Six of the studies recruited participants from the USA, two from Finland, one from Australia and the other from South Korea. Additionally, three studies from the USA (Ratliff & Burkhart, 1984; Schaeffer et al., 1976; Zeigler-Hill et al., 2013) and one from Finland (Nystrom, 1992) recruited only university students. Furthermore, three studies reported 98% or more of their sample were female (Domenico & Windle, 1993; Jung & Lee, 2015; Testa & Dermen, 1999) and seven of the studies reported their mean age of participants was between 19-24.40 years old (Nystrom, 1992; Poikolainen, et al., 2001; Ratliff & Burkhart, 1984; Schaeffer et al., 1976; Testa & Dermen, 1999; Winfield, et al., 1989; Zeigler-Hill et al., 2013). Furthermore, three studies reported 92% or more of their sample had a White ethnic background (DeHart et al., 2009; Domenico & Windle, 1993; Schaeffer et al., 1976). However, given that five studies did not clearly state the ethnic background of their participants, it is difficult to know whether any difference in the results of the studies is due to Ethnicity or other factors.

Although limited by the amount of missing information, this means that the generalisability of the results may be limited outside a younger, White, student population living in the USA.

The results indicated that the average self-esteem level across the different studies significantly varied. Seven of the studies used the Rosenberg scale to measure self-esteem, however three of them (Poikolainen, et al., 2001; Ratliff & Burkhart, 1984; Winfield, et al., 1989) did not report the mean score, which makes it very difficult to quantify the level of self-esteem the sample had. Jung and Lee (2015) reported mean self-esteem was 11.80 out of a maximum of 40 (indicating low self-esteem), which was far lower than any of the other

studies who reported their mean Rosenberg score, the results of which ranged from 31.60 to 39.50 (all indicating normal levels of self-esteem) (DeHart et al., 2009; Testa & Dermen, 1999; Zeigler-Hill et al., 2013). It could be hypothesised that this discrepancy is due to cultural differences as Jung and Lee (2015) conducted their study in South Korea (a collectivist culture country), whereas the other samples were all recruited from the USA (an individualist culture country). However, although there is evidence that individualism-collectivism can moderate self-evaluation, relatively high scores on the Rosenberg scale have been found across a range of cultures (Schmitt & Allik, 2005) suggesting this is not the only reason for the significant difference in average self-esteem rating.

2.6.3.2 Methodological issues

The definition of heavy drinkers varied greatly across the ten studies, with some studies focusing on frequency of use, amount consumed or a combination of these two factors. For example, Schaeffer et al. (1976) classified heavy drinking as drinking more than four times per week whereas Winefield et al. (1989) two studies classed it as drinking 15 or more drinks in the past week. In contrast, Domenico and Windle (1993) created a quantity frequency index measure combining alcohol amount with drinking frequency. Furthermore, alcohol use was measured using a range of standardised and non-standardised questionnaires. This variance in the definition of heavy drinkers and the measurement of the phenomenon makes the results very challenging to compare. Additionally, this could have led to different drinking populations being recruited, which could explain any differences between the results with alcohol use, self-esteem and other variables.

The quality of the papers included in this review varied greatly, with two rated as being of good quality (Poikolainen, et al., 2001; Zeigler-Hill et al., 2013), five rated as fair/moderate quality (DeHart et al., 2009; Jung & Lee, 2015; Ratliff & Burkhart, 1984; Testa

& Dermen, 1999; Winefield, et al., 1989) and three rated as poor quality (Domenico & Windle, 1993; Nystrom, 1992; Schaeffer et al., 1976). Overall there was a trend towards the cross sectional studies being rated as poorer in quality, despite the use of a rating scale which was inclusive of all study designs. Most of the studies rated as fair or poor did not appear to adequately consider potential confounders or adjust for them appropriately, leading to the relationship between alcohol use and self-esteem being unclear. Additionally two of the studies rated as poor did not use a standardised measure of self-esteem and were unclear in their description of the exact questions given to participants (Domenico & Windle, 1993; Nystrom, 1992) which makes it difficult to comment on the validity of these measures.

The sample sizes of the studies varied greatly. However, none of the studies reported if they had completed a power calculation. Additionally, as highlighted above some studies did not appear to adequately control for potential confounding variables. Therefore, there is a risk that some of the significant results found could be due to chance and thus type I errors may have been made (Cohen, 1992).

A number of different alcohol measures were used including the Daily Drinking Questionnaire (Testa & Dermen, 1999; Zeigler-Hill et al., 2013), the Khavari Alcohol test (Ratliff & Burkhart, 1984) and other non-standardised measures of alcohol use (Jung & Lee, 2015). Thus, although some of the studies measured alcohol use in similar ways it is possible different results may have been obtained if the studies used a different questionnaire. None of the studies reported checking the validity of these results against biological measures, such as breathalysers. However, research in this area has suggested that self-report is both a reliable and valid method of measuring alcohol use (Del Boca, & Darkes, 2003) and most biomarkers are only short-term measures of alcohol consumption as opposed to measures which examine longer term patterns of alcohol use.

2.6.3.3 Ethical considerations

None of the studies included in this review had a randomised controlled trial design. This design is largely considered the ‘gold standard’ for evaluating the evidence of the effectiveness of an intervention (Akobeng, 2005). Currently, one randomised control trial is being conducted which is assigning participants to either drink 15g of alcohol per day (equivalent to two units a day which on a weekly basis is the equivalence of the UK drinking weekly limits) or to being abstinent - the ‘Moderate Alcohol and Cardiovascular Health Trial’(U.S National Library of Medicine, 2018). The trial though is still in the process of recruiting participants and therefore no results have yet been reported. However, participants recruited for the BUHD were drinking at much higher levels than this and it would potentially be unethical to assign participants to drink at this heavy level. Thus this review has only drawn upon evidence from cohort, case-control and cross-sectional studies.

2.6.4 Discussion

The results of this review on the relationship between self-esteem and heavy alcohol use in untreated drinkers revealed that the current evidence base is inconclusive. This was due to both the mixed study results and variety of the quality of the studies included in the review. There was insufficient evidence in solely community heavy drinking populations – four of the 10 studies included in the systematic review were recruited from student populations. Collectively, the studies were more indicative of a null relationship between alcohol consumption and self-esteem levels, although it should be noted some of the studies did not report the results of any analysis examining this association. There was some evidence that perceived consequences of alcohol use were related to self-esteem levels, although the direction of this relationship was unclear. A number of variables (including gender, smoking, sensation seeking, anxiety, depression) were found to either correlate or significantly predict either alcohol use and self-esteem or sometimes both but, they were not

consistently controlled for across the studies. Thus it remains unclear whether the findings of this review are due to lack of controlling for the potential confounders or a measure of the association between alcohol use and self-esteem in heavy drinking populations.

2.5.4.1 Strengths and limitations of current review

The methodological quality of this review is limited by the varying quality of the studies. Over half of the studies had a cross sectional design which meant that the impact of self-esteem on alcohol use over time could not be measured. Additionally, only two of the studies (Poikolainen, et al., 2001; Zeigler-Hill et al., 2013) were rated as high in quality and only a limited number of potential confounders were regularly controlled for. Gender was controlled for in three of the studies (DeHart et al., 2009; Poikolainen, et al., 2001; Zeigler-Hill et al., 2013) but other than this the variables controlled for varied greatly. This variance in quality raises significant concerns about the validity of the studies, which make it difficult to make definitive conclusions from this review. Furthermore, due to the small number of studies, the variance in definition of heavy drinkers, study design and outcome measures completing a meta-analysis was not appropriate. Thus it is not possible to produce a single estimate of the association between self-esteem and alcohol given the heterogeneity in the measures used.

This review had a number of limitations, which should be considered when interpreting the results. Firstly, only peer-reviewed evidence was included, which excluded grey literature. This is likely to have introduced a publication bias, as null results are historically more difficult to publish than positive results (Fanelli, 2012). This is potentially a greater issue in the field of alcohol research, as it is an area which the WHO has placed great importance on reducing the harm at a population level (WHO, 2014). Thus, researchers may be under greater pressure to conduct research and produce positive results in this area of

research. However, the selection of only peer reviewed papers is likely to have led to the selection of higher quality papers with regards to methodology. Additionally, although strict inclusion criteria were specified, only one researcher completed the literature search and rated the quality of the studies. This potentially increases the risk of relevant studies being accidentally excluded and the study quality ratings being less reliable. Also, although the reference lists of the papers were checked and manual searching was carried out it is possible that more studies would have been included in this review if other electronic databases were searched. However, it should be noted that the three databases selected and the broad inclusive criteria chosen covered a comprehensive amount of previous literature, so it is questionable how much the conclusions of this review would have been affected if another study had been found, especially given the heterogeneity of the other studies. Furthermore, many studies that were excluded did not separate their heavier and lighter drinkers during the analysis, which could have led to studies being excluded despite recruiting a significant proportion of heavy drinkers.

However, this review also had a number of strengths. The initial narrative review with its broad inclusive terms led to a large amount of papers being manually screened to check if they met the heavy drinking criteria review. As many of the papers did not clearly state in the abstract or title if they recruited heavy drinkers, this could have otherwise led to a smaller pool of papers being included. Additionally, no limitations were placed on the study design or outcome measures, which meant the review was more inclusive. Furthermore, this review excluded studies which recruited participants from alcohol treatment settings. This means that the results are more likely to represent untreated heavy drinkers, a population which is vastly understudied and who the changes in alcohol consumption are poorly understood (Sobell et al., 2000).

2.6.4.2 Implications for clinical practice/research

Historically in treatment services, alcohol use and psychological difficulties (including low self-esteem) are treated separately. However, untreated heavy drinkers do not attend alcohol treatment services (Watson & Sher, 1998) and higher self-esteem is one factor associated with recovery from alcohol dependence without treatment from alcohol services (Russell et al., 2001). Although the results of this systematic review were inconclusive, the conflicting results suggest that it could still be hypothesised that self-esteem may impact on alcohol consumption. This is very important information for clinicians for two reasons. Firstly, it is valuable for clinicians to know if there are sub-groups of people to which alcohol consumption is at a higher risk of increasing, as tailored interventions can then be provided to these groups of people. Secondly, individuals with lower self-esteem have been found to be more likely to develop poorer mental health including alcohol dependence (Silverstone & Salsali, 2003). Thus, if it is recognised that improving self-esteem can indirectly impact on alcohol consumption over time, targeting this in interventions is likely to provide both a clinically and cost efficient way of reducing both individual and society harm.

2.6.5 Conclusion and recommendations for future work

The relationship between self-esteem and alcohol use in heavy drinkers remains unclear despite this literature review due both the low number of studies conducted and their varying methodological quality. Studies rarely adequately control for multiple confounders and few studies have been conducted on the longer term impact of self-esteem on alcohol use with untreated heavy drinkers (as a high proportion of studies conducted are cross-sectional surveys). These gaps in the literature exist despite a significant number of people drinking at a heavy level (Stats Team, NHS Digital, 2017) and the drinking trajectories of people who have not undergone treatment being very different from those with treated alcohol dependence (Fein & Landman, 2005). Additionally, a high proportion of studies have been

conducted with younger university students, the results of which have limited generalisability outside this population, as students have been found to have unique drinking patterns and different risk factors related to heavier drinking patterns (Ham & Hope, 2003). Furthermore, none of the studies included in the systematic review of the association between self-esteem and heavy alcohol consumption were conducted in the UK. This gap is of significance as the UK has the unique healthcare setting of the NHS, clinicians of whom liaise with the government when setting UK drinking guidelines alongside other agencies.

2.7 Proposed Study

This study aimed to build upon the research gaps highlighted above. It investigated the impact of self-esteem on alcohol consumption over time, whilst controlling for multiple potential confounders. Unlike much of the previous research, the researcher used data from a cohort study of exclusively heavy drinkers recruited in the UK. This cohort was the BUHD (Rolfe, Orford, & Martin, 2009). This project recruited a heterogeneous sample of heavy drinkers from the community who were not receiving treatment for their alcohol use. Data was recorded over six waves on alcohol use, self-esteem, demographic and psychosocial variables. Several publications have already been produced from this project including a study examining the relationship between aggression and heavy drinking (Rolfe et al., 2006), an exploration of how heavy drinking is maintained (Orford et al., 2002) and another report which focused on the relationship between mental health and frequency of heavy drinking days (Bell, Orford, & Britton, 2015). Also, previous results from qualitative interviews conducted as part of the project noted some individuals who changed their alcohol use noticed changes in their self-esteem (Rolfe et al., 2009). However, no quantitative analysis has yet been conducted directly examining the relationship between alcohol consumption and self-esteem using this dataset.

2.8 Aims and Objectives

This study aimed to examine the impact of self-esteem on heavy alcohol consumption, whilst adjusting for potential confounders including demographic and psychosocial variables. The two overall objectives of this project were: 1) examine the relationship between demographic and psychosocial variables with both self-esteem and alcohol use and 2) to examine whether self-esteem is predictive of alcohol consumption over time, after adjustment for potential confounders.

3. Method

3.1 Chapter Introduction

The following chapter will outline details about the design, participants recruited, research procedure and analytical plan used to complete this thesis. The researcher's epistemological position will also be considered.

3.2 Epistemological position

A research paradigm includes the researcher's ontology, epistemology, method and methods (Scotland, 2012), all of which influence each other. Ontology and epistemology together inform the theoretical perspective (which then influence the method and exact methodology) (Crotty, 1998). Ontology is concerned with what constitutes reality whereas epistemology focuses on how knowledge can be learnt and understood about reality (Scotland, 2012). Thus one is focused on what reality is and the other on how can we create and learn this knowledge. Across the psychology domain many different epistemological positions exist and researchers are not necessarily bound exclusively to one.

Historically in science one of the earlier most dominant philosophies was positivism (Alvesson & Skoldberg, 2009). Principles of positivism are that science is directly observable (and thus measurable), objective and value free (Barker, Pistrang, & Elliott, 2015). Thus, this type of epistemology lends itself more towards quantitative research traditionally as opposed to qualitative but this may not strictly be the case. Therefore, if this project drew upon this epistemological position it would assume that self-esteem and alcohol consumption are able to be accurately measured by the researcher. Cohort studies purport to measure a number of different variables at different time points and the BUHD is not an exception to this and several different questionnaires were used alongside interviews. However, positivism has been widely criticised. It has been argued it places less emphasis on an individual understanding or constructing their own reality (Darlaston-Jones, 2007) and therefore some

constructs which are less directly measurable cannot be investigated using this stance (Barker, et al., 2015). During data collection for the BUHD although the researchers used standardised questionnaires where possible, some information was captured through collaborative dynamic interviews between the researchers and participants. Additionally, individuals who are presented with questionnaires or interviews are likely to interpret the words with different connotations depending on their age, education, beliefs, values and potentially memory. This detracts from there being one single reality or truth. Therefore, post positivist psychologists developed a different paradigm which still emphasised the importance of objectivity and generalisability but researchers stated their findings were based on being probable, rather than absolutely certain (Mertens, 2015). This paradigm consisted of different variants but the one of particular relevance to this project is critical realism.

Critical realism is commonly associated with the work of Roy Bhaskar and it has been argued was named by combining the different phrases ‘transcendental realism’ and ‘critical naturalism’ (Archer, Bhaskar, Collier, Lawson, & Norrie, 1998). It has been suggested as an alternative to another post positivist paradigm social constructionism, which assumes reality is socially constructed (Alvesson & Skoldberg, 2009). Critical realists emphasise scientific study but argue that the researcher should focus less on the surface level patterns positivists may focus on and more on the underlying mechanisms, which may include not just objects but also ideas and discourses (Alvesson & Skoldberg, 2009). It can therefore be seen as combining both objective scientific study typical of the physical sciences, alongside taking into account a researchers and subjects perceptions and interpretations of the world.

The aim of this study was to examine the impact of self-esteem on alcohol use in heavy drinkers both from a cross-sectional and longitudinal perspective. Data was collected at multiple time points by trained researchers using standardised questionnaires in an objective, scientific manner. However, some data was collected using a collaborative method

by the researcher interviewing participants. As such it is felt this research project is most closely aligned with a critical realist position. In line with this position, the researcher believes that the findings of this project are only speculative and will need to be validated in other cultures and sub-populations of participants.

3.3 Design

This project was an analysis of existing quantitative data from a prospective cohort study. As this thesis aimed to explore the impact of self-esteem on alcohol use over time it was essential to use longitudinal data. Using the BUHD cohort allowed the researcher to have access to a large sample of participants from a previously under-researched population over multiple time points with a large and diverse number of variables. Although concerns have been raised about potential sources of bias that can occur with a longitudinal cohort study design and in making inferences from smaller samples to larger populations (Bell & Britton, 2014; Parascandola, 1998), it was felt this design was the most feasible, ethical option for this project.

3.4 Participants

Participants were recruited for the BUHD study from the West Midlands area in the UK between 1996 and 1997, using a number of recruitment strategies. This included placing local advertisements, snowballing or personal introduction to the project (Orford et al., 2002). In order to take part participants had to be aged between 25-55 years old, currently drinking at least 35 UK units per week if they were female or 50 UK units per week if they were male for at least 27 weeks in the past year and not be seeking treatment for alcohol use or have sought treatment in the past ten years. Potential participants were excluded only if they did not meet the above three criteria – no further exclusion criteria were applied. Over 1000 people volunteered for the study and following screening based on the above criteria 800 were found to be eligible. 300 people either did not attend the first interview or were found

not to be eligible at the first interview, thus the total participants recruited at wave one of the study was 500 (75% were male). The follow-up rate at each wave declined steadily (see Table 3 below). A number of steps were taken to maximise follow-up rates including: use of a 'warm-up' letter prior to the interview; having one person with primary responsibility for contacting the participants (to improve rapport); conducting interviews at a convenient time and place; contacting participants through a range of methods; obtaining another contact the research team could contact if they were unable to locate the participant; checking the electoral register to locate participants who moved address. At the final wave of data collection 259 (52% of the original sample) participants took part. Of these 259 participants, 229 (88%) had been interviewed at all six waves of the research study. All interviewers who collected data for this project were given a week of training and supervised throughout the data collection process. Interviews were also taped and monitored for quality.

Table 3
Retention rates at follow up waves

Phase	Number of participants	Percentage of original sample interviewed (%)
Wave 1 (Baseline)	500	N/A
Wave 2	403	81
Wave 3	350	70
Wave 4	321	64
Wave 5	280	56
Wave 6	259	52

During the study 41 (8%) participants formally withdrew from the project, five had to be excluded and 18 were found to have died. Thus at the final follow up 177 (35%) of the original sample were not accounted for.

3.5 Measures

3.5.1 Self-Esteem

In the BUHD project self-esteem was measured at waves one, two and three of data collection. Self-esteem was measured using the Robson Self-Concept Questionnaire (see Appendix A) (Robson, 1989). This questionnaire contains 30 items, which are scored on a seven point Likert scale. Participants were asked to rate how much they agreed or disagreed with each question, according to how they typically feel. The maximum score is 210, with a high score representing high self-esteem. The average score of this questionnaire in a sample of 151 participants from the general population was reported to be 140 (standard deviation=20.00) and in a sample of 20 alcohol dependent participants the average score was reported to be 108 (standard deviation=34.80) (Robson, personal communication, 21st November 2017). This scale has been reported to have good reliability in both general (Cronbach's alpha= 0.89) and clinical populations (split half correlation= 0.96) (Robson, 1989). Also, when these populations were administered the Rosenberg Self-Esteem scale the correlations were 0.80 for the general population and 0.85 in the clinical population, indicating high convergent validity. Additionally, nine clinicians in the same study were asked to rate the participant's self-esteem levels on a visual analogue scale and the results were compared to the patient's questionnaires. The correlation between the two was 0.70, suggesting this measure is a valid measure of self-esteem in a clinical population.

3.5.2 Alcohol consumption

The interviewers collected data on participant's drinking patterns in the week prior to the interview, using the Time Line Follow Back form (Sobell & Sobell, 1992). An example of the instructions typically given to individuals completing the questionnaire with a calendar can be viewed in Appendix B. This questionnaire has been used to collect data on alcohol in a number of general and clinical populations including university students (Sobell, Sobell,

Klajner, Pavan, & Basian, 1986) psychiatric outpatients (Carey, 1997) and outpatient heavy drinkers (Roy et al., 2008). Additionally, the participants were asked about any changes in their drinking habits over the past two years (i.e. between study waves) and other alcohol variables of interest (e.g. number of abstinent days they had in the past year). Interviewers had a designated chart to enable them to calculate the number of UK alcohol units in a given drink based on strength (alcohol by volume, ABV) and amount consumed (e.g. glass, bottle or can size). Test-retest reliability for this method of data collection has been found to vary with findings of 0.79 and 0.96 correlations observed across different populations (Sobell & Sobell, 2000). The questionnaire has also been found to have good validity when compared to informant reports with correlations for days abstinent ranging from 0.79 to 0.92 and from 0.41 to 0.95 for reports on heavy and light drinking days respectively. Using this method a number of variables measuring alcohol consumption were recorded including:

- Total weekly units – Using a combination of the Time Line Follow back form and the additional questionnaires described above about participant’s alcohol use the interviewer calculated the total number of UK units the participant drank in the previous week.
- Abstinent days – Using the process described above the interviewer calculated approximately how many days the participant had been abstinent from alcohol over the previous year.
- Number of days women drank seven or more units or men drank 10 or more – In a similar method to the abstinent days variable, the interviewer calculated the approximate number of days female participants drank seven or more units and male participants drank 10 or more units over the past year. This was a limit set which measured heavier drinking days agreed between the original research team and the Department of Health (Rolfe et al., 2009). This variable is likely to reflect a binge

drinking pattern of behaviour. The limits set for binge drinking vary although one definition commonly used is drinking over eight units in a single session for men and over six units for women (ONS, 2017).

In addition to measures of alcohol consumption it was felt important as part of this thesis to include a measure of the perceived benefits and drawbacks of drinking as outcome measures. This is due to the results of the heavy drinkers systematic review which indicated that light drinkers and heavy drinkers differed according to antecedents and consequences of drinking (Ratliff & Burkhart, 1984) and self-esteem both significantly correlated with and was a significant predictor of negative consequences of alcohol use (Zeigler-Hill et al., 2013). The original investigators of the BUHD study devised a new method of measuring both the participant's perceived benefits and disadvantages of drinking, using information both from preliminary interviews with heavy drinkers and an analysis of the content of existing measures (Orford et al., 2002). A new measure was devised as the researchers felt none of the existing measures met a combination of desired criteria including: not overlapping with other questionnaires utilised in the study; asked participants about their recent experiences; included both beneficial and negative effects of alcohol consumption. The new measure involved a semi-structured detailed interview asking participants about thirteen areas of their life (such as physical wellbeing or friendships) and whether alcohol had been an advantage in this area, disadvantage or neither of these. For the full list of topics please see Appendix C (Orford et al., 2002). The participant was then asked to rate any of the areas they reported had benefitted or been negatively affected by their alcohol use on a four point Likert scale from zero to three. A total score was derived for both perceived advantages and disadvantages of drinking by combining the previous individual item scores. The minimum score for this questionnaire is 0 and the maximum is 78. To this researcher's knowledge, the validity and reliability of this questionnaire has not been formally tested.

The final alcohol outcome utilised in this thesis is the level of alcohol dependence reported. It was felt important to utilise this measure because this may bridge the gap between exclusively alcohol dependent samples with the heavy drinking sample utilised in this study. This was measured using the Leeds Dependence Questionnaire (LDQ; Raistrick et al., (1994)) (see Appendix D). This is a 10 item measure which asks the respondent to rate, on a Likert scale of zero to three, how often they experience clinical symptoms of alcohol dependency such as feeling compelled to drink alcohol and developing tolerance. Individual item scores are combined to produce a total score, with higher scores reflecting higher levels of alcohol dependence. The internal consistency of this measure as well as concurrent and convergent validity has been shown to be high across a number of different samples of participants misusing substances (Heather, Raistrick, Tober, Godfrey, & Parrott, 2001; Kelly, Magill, Slaymaker, & Kahler, 2010; Raistrick, et al., 1994).

3.5.3 Other variables

Many socio-demographic and clinical variables were also recorded as part of the interview process. A number of these were selected for use in the statistical analysis for this thesis, as listed below. Each of these variables were selected because during the narrative review reported in section 2.5 of this thesis, the overall evidence suggested that they were significantly related to both alcohol use and self-esteem and theoretically could potentially act as a confounder between the two variables. Although childhood abuse and social support were found to meet these criteria, these variables were not measured in the BUHD project and therefore could not be controlled for. However, it could be argued that marital status (which analyses were adjusted for in this study) is a potential indicator/proxy of social support. The following variables were controlled for as part of this thesis:

- Gender - The gender of participants was recorded at baseline.
- Age - The age of participants was recorded at each stage of data collection.

- Ethnicity - Ethnicity was recorded at baseline, with 10 ethnic groups being reported in this cohort. These groups were: White UK, Irish, Indian, Black African, Black Caribbean, Pakistani, Asian other, Black other, White other, Other origins. However, as 84% of the cohort were classified as White UK and all the other ethnic groups separately equated to 3% or less of the total sample, a new binary variable was created coding participants as either White UK or 'other' with regards to ethnicity. The former category was coded zero whereas the latter was coded one.
- Religion - Religious/spiritual beliefs and practice were recorded at baseline. Data was coded under seven different categories which were: no religion, religious but not practicing, religious and occasionally practicing, religious and regularly practicing, religious and daily practicing, religious and mainly practicing and no religion but have spiritual beliefs. 75% of the cohort identified they had religious or spiritual beliefs. There was no evidence from the systematic review to indicate that the researcher should separately control for whether participants were individually practicing religion as opposed to having beliefs alone. Thus, a new binary variable was created in which participants were classified as either not religious or currently having religious/spiritual beliefs. Participants who were not religious were coded as zero and participants who had religious/spiritual beliefs were coded as one.
- Socio-economic status - Socio-economic status was measured at each wave of data collection, based on occupation. This was assessed using a variable which measured occupational social class. The six different categories were: professional, managerial technical, skilled non-manual, skilled manual, partly skilled, unskilled. This measure of social class is linked to occupation and approximate socio-economic group (ONS, 2005). The six categories were collapsed by the researcher into three categories – these were high socioeconomic status (included professional and managerial

technical; coded as zero), intermediate socioeconomic status (included skilled non-manual and skilled manual; coded as one) and low socioeconomic status (included partly skilled and unskilled; coded as two).

- **Marital Status** - Marital status was recorded at each stage of data collection and consisted of seven categories: single in relationship, single no relationship, married/cohabiting, separated/divorced in relationship, separated/divorced no relationship, widowed no relationship, widowed in relationship. The results of the systematic review suggested that level of self-esteem and alcohol use differed based on whether an individual was married or not. Thus, marital status was collapsed into two categories – married/cohabiting was coded as zero and any other marital status was coded as one.
- **Smoking** - Information on smoking status was ascertained at each wave of data collection. The original researchers recorded whether participants had ever smoked (coded as yes or no) and the number of cigarettes they smoked on a daily basis at the time. Using these two variables a new binary smoking variable was created. This coded participants who reported they had never smoked as and those who currently smoked no cigarettes (i.e. former smokers) as a non-smoker and those who smoked any cigarettes as a smoker. Non-smokers were coded as zero and smokers were coded as one in the database.
- **Illicit drug use** - Drug use was recorded at each stage of data collection. Participants reported whether they had used a range of illicit drugs one year prior to the interview. The original study team then created a binary variable denoting whether or not the person had used any illicit drugs in the past year. No drug use was coded as zero and any drug use was coded as one.

- Mental health - The evidence from the systematic review suggested that depression could be a potential confounder in the relationship between self-esteem and alcohol use. However, the original researchers did not include a measure of depression in their battery of measures. They did though ask participants to complete the 36-Item Short Form Health Survey (SF-36) (Ware & Sherbourne, 1992). This measure of health-status comprises of eight scales including vitality, physical functioning, bodily pain, general health perceptions, physical role functioning, emotional role functioning, social role functioning and mental health. Please see Appendix E for a copy of the individual items of this questionnaire. To calculate the score each scale is weighted and then directly transformed into a 0-100 scale and these totals are then summed. This process is completed through a statistical software package. Higher scores are indicative of better health. This questionnaire has been found to have high reliability and validity in alcohol dependent patients (Daepfen, Krieg, Burnand, & Yersin, 1998). Specifically, the mental health sub-scale was found to have high internal consistency (as demonstrated by a Cronbach's alpha value of 0.87) and good test-retest reliability (as demonstrated by an intra-class correlation coefficient of 0.79). Additionally, it significantly correlated with other scales measuring mental health including the Hamilton Depression Scale (Hamilton, 1967) and the psychiatric sub-scale of the Addiction Severity Index (McLellan, Luborsky, Woody, & O'Brien, 1980), further suggesting high validity.
- Overall health - As part of the summary statistics and correlational analyses overall health as measured by the SF-36 was included. However, this variable was not included in the regression analyses due to the mental health scale being part of this total score. Additionally, the narrative review did not find strong evidence that overall health was a potential confounder of self-esteem and alcohol use.

3.6 Research procedure

The BUHD project received ethical approval from the ethical committee of the School of Psychology at the University of Birmingham (see Appendix F for confirmation). A number of recruitment strategies were used to recruit participants including placing advertisements in newspapers, on city buses, delivering letters, giving out leaflets, displaying posters, snowballing or personal introduction to the project (Orford et al., 2002). Snowballing or personal introduction recruited the highest number of participants (23% of the final sample). Potential participants were then screened for eligibility and those who attended this screening and were eligible were then interviewed for the first wave of data collection. Prior to each interview informed consent was sought from participants (see Appendix G for an example consent form). Each interview took around two hours and was conducted at a venue convenient for the participant. The interviews combined a mixture of techniques including a computer assisted method, written exercises and qualitative focused interviews. The interviews were carried out at two year intervals over six waves. Following the interviews, quantitative data was entered into a Statistical Package for the Social Sciences file and qualitative data was recorded in the form of a summary report, as the interviews were not tape recorded.

For this thesis ethical approval was granted by the University of Essex research ethics board (see Appendix H for confirmation) to complete an analysis of existing data. Next, the narrative search outlined in section 2.5 was completed to identify potential covariates that could confound the relationship between alcohol use and self-esteem. Based on the results of this search, the analytical plan was developed. The development of an analytical plan prior to analysis helped to prevent the selection of variables which may have a statistical association with the outcome variables but have no rationale for this association (Bell, Kivimäki, & Batty, 2015). It was also important to avoid unintentionally selecting results that have

positive findings, a statistical phenomenon known as “fishing” for data (Humphreys, Sanchez de la Sierra, & van der Windt, 2013). During the development of this plan the specific coding of some variables and data frequencies were checked but no analysis took place. Once the analytical plan was finalised data cleaning was carried out. Next, the data analysis was completed as described in section 3.9 below and the final report was written.

3.7 Ethical issues

Ethical approval for the original project was granted. All participants gave their written informed consent to participate prior to each interview and were reminded of their right to withdraw from the study at any time without needing to provide a reason. As part of this consent process they consented to their anonymised data being used for research purposes by the Drinking Research Group. The researcher has had personal communication with the principal investigator and chief data custodian of the study (Professor Jim Orford, University of Birmingham) who has confirmed that the aims of this study fall under the remit of the original investigation and therefore the researcher was classified as a member of this team as a collaborator (see Appendix F for confirmation). Therefore, ethical approval was only required from the University of Essex, provided the data was used in a manner originally specified by the ethics committee at the University of Birmingham.

Once data was collected it was stored in an anonymised form in an electronic database, with participants being allocated participant numbers. This dataset was stored on an encrypted password protected memory stick. Also, data was kept and destroyed in fulfilment of the requirements of the Data Protection Act, 1998. In order to protect anonymity further data was only presented in an aggregate form by the researcher. As this project was a doctoral thesis the research supervisors had access to the data but only for supervisory purposes.

In order to investigate the proposed research questions it was felt important to use longitudinal data from an existing source. This is because it would be ethically unjust to assign participants to drink high levels of alcohol and ask them to maintain this on a regular basis, as would be expected in an experimental trial. Additionally it would be difficult, if not impossible, to assign an individual to a particular self-esteem group. As the researcher's interest was focused on the long term effects of self-esteem it was felt appropriate to use an existing data source, particularly in the context of a Doctorate thesis, rather than collecting original data. This is because collecting original data would have burdened potential participants with research that is not necessary, take multiple years to set up and incur high costs in order to achieve the sample size recruited by the BUHD.

3.8 Sample size

There are different statistical guidelines for the minimum sample size required when conducting regression analyses (Field, 2009). These are often based on both the minimum sample size and number of predictors. Green (1991) recommends for determining the minimum sample size required two guidelines should be followed. The first is based on whether the researcher wants to test the overall fit of the regression model in which case he recommends a sample size of $50+8k$, in which k is the number of predictors. The second rule is based on whether the researcher wants to test the individual predictors within the model in which case he recommends a sample size of $104+k$ (again in which k is the number of predictors). The maximum number of predictors the researcher planned to use was ten – self-esteem, age, gender, ethnicity, religion, marital status, socio-economic status, smoking, illicit drug use and mental health. This gives a minimum sample size of 130 based on the first rule and 114 based on the second rule. However, this does not take into account the effect size. To calculate a sample size the effect size is needed, alongside the value of alpha and appropriate level of power (Miles & Shevlin, 2001). Conventionally, alpha is set at 0.05 and power is set

at 0.80 (Cohen, 1992). Miles and Shevlin (2001) report that if 10 predictors are entered into a regression model with the alpha and power levels set at the above values, for a large effect size approximately 60 participants would be required, approximately 120 for a medium one and over 600 for a small effect size. Given the sample sizes collected at each wave (see Table 3) any significant effect sizes can be assumed to be either medium or large only.

3.9 Analytical plan

The analysis was carried out in six distinct stages using the statistical package Stata Version 15 (StataCorp., 2017). These steps are summarised in Figure 4 below. The researcher will now outline the process of these different steps below in this section.

3.9.1 Data cleaning

Prior to beginning statistical analyses a number of data cleaning steps were completed. This included ensuring missing values were coded, creating new categorical variables and checking data for potential human errors. Further details about this process can be found in section 4.2. No data were imputed as the methods of analysis used assumed that data is missing at random and additionally for linear regression models complete-case analysis is the usual standard implemented.

3.9.2 Summary statistics

Cross-tabulations of categorical variables were conducted and appropriate measures of central tendencies of continuous variables calculated. This included socio-demographic variables at baseline, the self-esteem total at each of the three waves data was collected and the alcohol outcomes at baseline. For all of the alcohol outcomes and self-esteem the distributions of the variables at baseline were checked for normality. This involved creating a histogram for each variable of interest and calculating the skewness and kurtosis values.

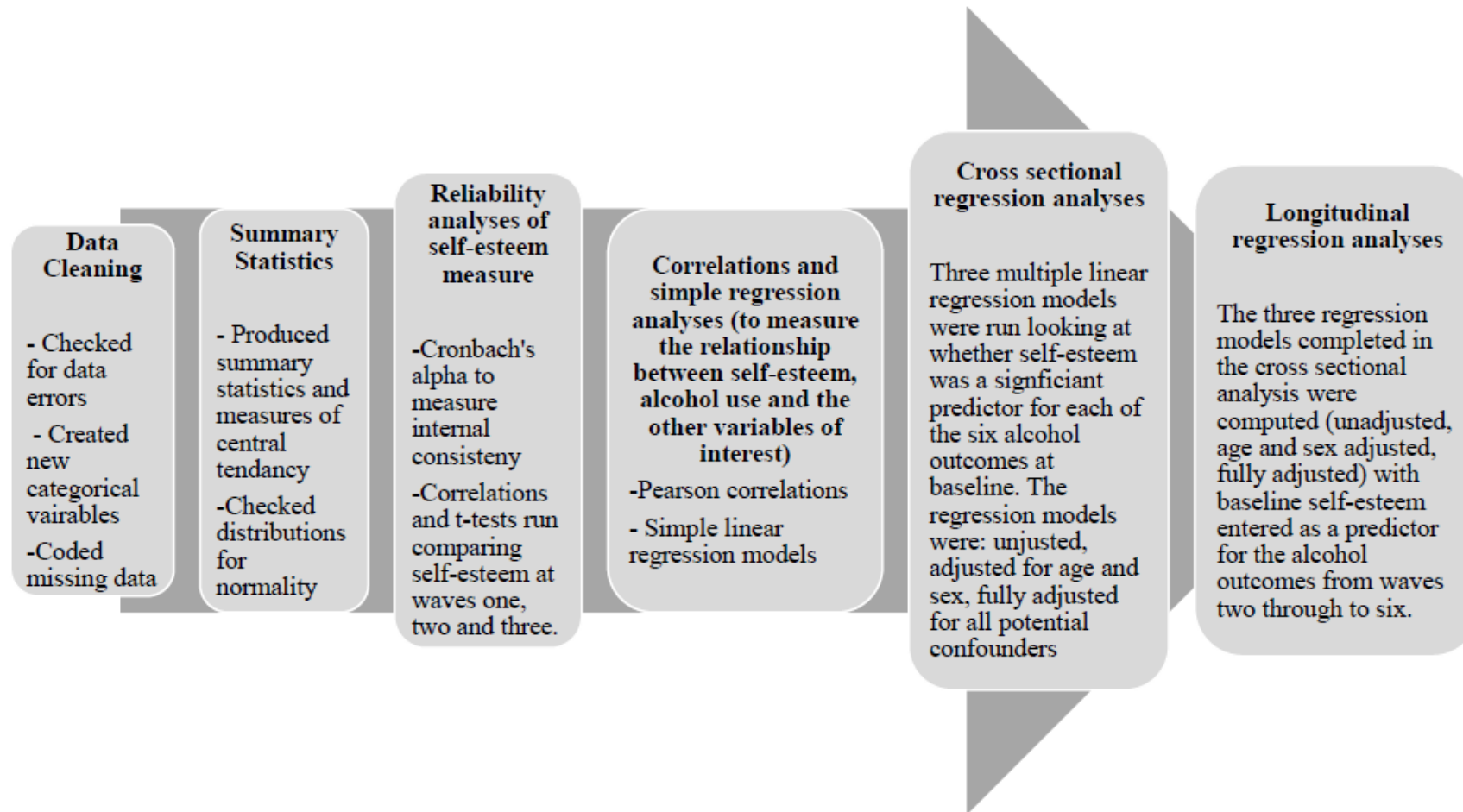


Figure 4. Flow-chart of the different stages of data analysis

3.9.3 Self-esteem measure analyses

It was important to complete reliability analyses of the self-esteem measure as to the researcher's knowledge this questionnaire has not been validated in a population drinking large amounts of alcohol previously. The internal consistency of the self-esteem measure was examined by calculating the Cronbach's alpha value (Hogan, Benjamin, & Brezinski, 2000). The stability of the self-esteem across the three waves of data was examined using test-retest stability correlations and three t-tests were computed to examine whether self-esteem significantly changed between any of the three time points (i.e. comparing overall self-esteem at waves one and two, waves two and three and one and three).

3.9.4 Exploring the relationship between self-esteem, alcohol use and potential confounding variables

3.9.4.1 Cross sectional analyses

Initially, pairwise correlation analysis was completed (i.e. correlations were computed between each pair of specified variables for all participants that did not have missing values for these two variables). This was done to measure the correlations between self-esteem, the alcohol outcomes and continuous socio-demographic/clinical variables. The relationship between the categorical socio-demographic/clinical variables and self-esteem and alcohol outcomes was measured using individual linear regression models.

Next, the researcher investigated whether self-esteem at baseline was a significant predictor of any of the alcohol outcomes at baseline, whilst controlling for potential confounders. To investigate this for each of the six alcohol outcomes three linear regression models were computed. The first model included self-esteem as a predictor, the second further adjusted for age and sex and the third adjusted for all nine socio-demographic and clinical variables of interest (age, gender, ethnicity, religion, marital status, socio-economic status, smoking, illicit drug use, mental health) as well as self-esteem. Additionally, as some

of the correlations between two of the predictors in the regression models were above 0.4, the Variance Inflation Factors (VIF) were computed for the regression models which controlled for self-esteem and the nine socio-demographic variables of interest to check for multicollinearity. Higher correlations between two predictor variables in regression models can be indicative of multi-collinearity (Field, 2009), which can lead to the results for individual predictors being invalid. However, there is no general consensus on how high correlations must be to confirm multi-collinearity (Besley, 1991). Thus, the VIFs were calculated for all of the fully adjusted cross-sectional and longitudinal regression models (steps five and six of the analysis as reported in Figure 4). The VIF suggests if a predictor has a strong linear relationship with other predictors (Field, 2009). It has been suggested that if the VIF is greater than 10 caution should be taken about interpreting the regression coefficient (O'Brien, 2007) as this can be a sign of severe multi-collinearity.

3.9.4.2 Longitudinal analyses

Next, the researcher completed a series of regression models in order to measure the longitudinal effect of baseline self-esteem over time on each of the six alcohol outcomes. The researcher completed the same three regression models listed above (unadjusted, age and sex adjusted, fully adjusted) entering baseline self-esteem as a predictor for the alcohol outcomes from waves two through to six. Following this the procedure was repeated using self-esteem values from waves two and three. Self-esteem at waves two and three were entered as predictors to examine if the overall effects remained stable, given that previous research has shown self-esteem can change following life experiences. All of the other predictor variables were taken from baseline values, with the exception of age which was taken from the same wave self-esteem was measured at.

3.9.4.3 Correction for multiple testing

As this thesis aimed to complete multiple regression models, it was considered whether corrections should be made during the analysis to attempt to control for Type I errors. Type I errors occur if a researcher believes they have found a significant result but this actually is not correct (Field, 2009) and in the case of conducting multiple tests could have been found by chance. The standard significance level accepted generally is $p \leq 0.05$. This means that any significant results have a 95% chance of having occurred due to the observed results and 5% chance of occurring due to chance. Thus, it is argued that the more tests which are run, the higher the chances of a result being found due to chance. It is therefore important when conducting multiple testing to have an *a priori* analytical plan designed based upon pre-defined hypotheses to ensure the researcher is not ‘fishing’ for significant results (Bell, Kivimäki, et al., 2015), as this thesis has.

Different methods have been suggested to attempt to control for Type I errors based on multiple testing. One of the most commonly used methods is Bonferroni’s correction (Bland & Altman, 2011). This method sets the new accepted standard significance level to 0.05 divided by the number of comparisons made. Given that the number of longitudinal regression models planned when baseline self-esteem is entered into the models is 90 (6 outcomes x 5 waves of data x 3 regression models), this would have set the alpha level at 0.0006. This is an extremely low level to set the alpha and does not take into account the correlation between outcomes (e.g. total weekly units, number of abstinent days and heavy drinking days are highly correlated so one would anticipate similar associations, as well as over time, but these would be separately penalised through the adaption of a Bonferroni correction). The use Bonferroni’s test has been criticised in the wider literature (Perneger, 1998; Rothman, 1990). It has been noted also that reducing the alpha level significantly also increases the risk of Type II errors (when a researcher does not find a significant outcome in

the data when it does in fact exist; (Field, 2009)). Given this research involved the statistical comparison of multiple pre-selected, correlated outcomes it was thus considered that applying a Bonferroni's correction might be overly stringent (especially considering the overall sample size). The findings presented in this thesis should therefore be interpreted with this in mind.

3.10 Dissemination

This project was conducted as a thesis for a Doctorate in Clinical Psychology and therefore the thesis will be available for viewing through the ETHOS University of Essex library system. A copy of the final report will also be shared with researchers who originally collected the data. The results will also be published in a peer reviewed journal. This may include a more generic journal which publishes articles in the field of clinical psychology (such as *Psychological Medicine*) or an addictive behavioural journal (such as *Addiction*). Finally, it is hoped that the results will be presented at a relevant conference, such as the annual 'Kjetil Bruun Society' conference. This international society focus on social and epidemiological research conducted on alcohol.

3.11 Funding

The original study was funded by the Department of Health but this project received no funding from this or any other sources. The doctoral student received an NHS salary in order to complete their doctoral training program but no restrictions were placed by the NHS on their research project choices. Any publications or other dissemination arising from this project will state that the results do not necessarily reflect the views of the Department of Health.

4. Results

4.1 Chapter introduction

This chapter will present the results of the analyses completed for this thesis. It will first discuss the data cleaning procedures, followed by descriptive statistics and reliability analyses of the self-esteem measure utilised. Finally, the cross sectional and longitudinal analyses examining whether self-esteem predicted any of the alcohol outcomes will be presented.

4.2 Data cleaning

As outlined in Figure 4 the first stage of the data analysis process was the data cleaning. Initially, all six alcohol outcomes of interest, the self-esteem variables and potential confounders were checked to see if any values outside a plausible range (e.g. total score exceeding the maximum questionnaire score) were recorded. No errors of this type were found, although a number of variables were found to not have missing values correctly and this was therefore corrected.

Next, for most of the variables of interest for which individual scale items were recorded, the total scale scores were checked for errors. The only variables which were not checked were the SF-36 scales, as these were calculated by the original study team using a specific proprietary algorithm and analysis package not available to the researcher. These errors were corrected by either replacing the individual's total items scores or by recalculating the total scale score. The former method was used for four participants for total benefits of drinking scores at different waves, seven participants for total disadvantages at different waves and 14 participants for level of dependency. The self-esteem scores at wave two were re-calculated due to nine participants having total scores which were incorrect based on the raw item scores. The correction of this data (as opposed to exclusion) meant that no cases were unnecessarily excluded. Additionally, as reported in section 3.5.3 five new categorical

variables were created. The four binary variables were: a variable which recorded Ethnicity (White British or other); a variable measuring whether the person was currently smoking tobacco (smoker or currently non-smoker); a variable measuring whether the person reported they currently had religious beliefs or not (no beliefs or has religious/spiritual beliefs); a variable measuring whether the person was married or cohabiting (married or other marital status). Furthermore, socioeconomic status was collapsed from six categories into three categories (high, intermediate or low).

4.3 Descriptive statistics

As outlined in the next step of the analytical plan (see section 3.9.2) the second stage of the data analysis process involved calculating the summary statistics for the sociodemographic/clinical variables of interest, the alcohol outcomes and self-esteem. Table 4 shows the descriptive statistics of the socio-demographic and clinical variables at baseline and Table 5 contains the same information for the alcohol outcomes across all the waves of data collection.

Table 4
Descriptive statistics at baseline for socio-demographic and clinical variables

Variable	N	N (%) or Mean (S.D)
Age	500	37.63 (8.60)
Gender	500	
<i>Male</i>		372 (74)
<i>Female</i>		128 (26)
Ethnicity	500	
<i>White UK</i>		422 (84)
<i>Non White UK</i>		78 (16)
Religion	499	
<i>Not religious</i>		125 (25)
<i>Religious/ Have beliefs</i>		374 (75)
Marital status	500	
<i>Single</i>		208 (42)
<i>Married/Cohabiting</i>		170 (34)
<i>Separated/Divorced</i>		117 (23)
<i>Widowed</i>		5 (1)
Socio-economic status	491	
<i>Professional</i>		20 (4)
<i>Managerial Technical</i>		124 (25)
<i>Skilled non manual</i>		95 (19)
<i>Skilled manual</i>		91 (19)
<i>Partly skilled</i>		125 (25)
<i>Unskilled</i>		36 (7)
Current smoker	497	
<i>Never smoked/ Not currently smoking</i>		207 (42)
<i>Current smoker</i>		290 (58)
Illicit drug use	500	
<i>No drug use in past year</i>		213 (43)
<i>Used drugs in past year</i>		287 (57)
SF-36 Total	493	582.16 (145.93)
<i>Physical functioning</i>	500	93.83 (52.42)
<i>Role limitations due to physical health</i>	500	80.85 (62.27)
<i>Role limitations due to emotional problems</i>	500	72.73 (75.11)
<i>Energy/fatigue</i>	496	65.01 (85.33)
<i>Mental Health</i>	499	66.02 (20.74)
<i>Social functioning</i>	498	89.19 (75.67)
<i>Pain</i>	499	82.84 (76.97)
<i>General health</i>	499	69.34 (67.41)
<i>Perceived change in health</i>	500	56.85 (57.30)

Table 5

Descriptive statistics for alcohol measures at each wave

Stage of data collection	Alcohol Measure	N	Mean (S.D)
Wave 1	Total weekly units	500	85.01 (54.30)
	Number abstinent days in past year	497	66.18 (61.25)
	Drank more than 7 (women)/10 (men) in past year	495	194.87 (103.26)
	Benefits of drinking	494	14.40 (6.40)
	Drawbacks of drinking	496	9.33 (7.03)
	Leeds dependence score	497	7.36 (5.59)
Wave 2	Total weekly units	403	68.41 (57.22)
	Number abstinent days in past year	403	88.97 (85.03)
	Drank more than 7 (women)/10 (men) in past year	403	158.46 (117.81)
	Benefits of drinking	401	14.30 (6.43)
	Drawbacks of drinking	402	9.61 (7.27)
	Leeds dependence score	403	6.58 (5.50)
Wave 3	Total weekly units	350	65.66 (55.89)
	Number abstinent days in past year	350	102.81 (102.65)
	Drank more than 7 (women)/10 (men) in past year	350	165.35 (123.77)
	Benefits of drinking	350	13.03 (6.76)
	Drawbacks of drinking	350	7.57 (7.01)
	Leeds dependence score	350	5.90 (5.40)
Wave 4	Total weekly units	321	62.35 (57.15)
	Number abstinent days in past year	321	111.31 (107.21)
	Drank more than 7 (women)/10 (men) in past year	321	146.01 (123.03)
	Benefits of drinking	320	12.83 (6.11)
	Drawbacks of drinking	320	8.82 (7.47)
	Leeds dependence score	321	4.93 (4.72)

Stage of data collection	Alcohol Measure	N	Mean (S.D)
Wave 5	Total weekly units	280	59.05 (56.55)
	Number abstinent days in past year	280	105.96 (109.40)
	Drank more than 7 (women)/10 (men) in past year	280	138.98 (126.05)
	Benefits of drinking	280	10.16 (6.79)
	Drawbacks of drinking	280	6.33 (5.80)
	Leeds dependence score	280	5.17 (4.85)
Wave 6	Total weekly units	259	50.36 (50.44)
	Number abstinent days in past year	259	113.77 (115.42)
	Drank more than 7 (women)/10 (men) in past year	259	129.34 (127.01)
	Benefits of drinking	259	10.90 (6.53)
	Drawbacks of drinking	259	7.00 (6.64)
	Leeds dependence score	259	4.58 (4.69)

Next, summary statistics for the self-esteem measure were computed – these are reported in Table 6. The mean self-esteem score at each wave was similar to a population with no reported psychological disorder (Robson, 1989).

Table 6
Summary statistics for self-esteem

Stage of data collection	N	Mean (S.D)
Wave 1	492	138.15 (29.25)
Wave 2	402	139.57 (28.79)
Wave 3	349	142.73 (27.63)

4.4 Testing of baseline alcohol outcomes and self-esteem for normality

In order to further examine the shape of each distribution a histogram was generated for each variable of interest, with a normal approximation curve fitted (see Appendix I). Additionally, skewness and kurtosis values were computed. Kline (2010) suggests a distribution can be assumed to be approximately normal if the value of skewness is less than three and the absolute value of the kurtosis is less than 10. Table 7 below indicates that all of the potential alcohol outcomes and baseline self-esteem can be assumed to be approximately normal.

Table 7
Skewness and kurtosis values of alcohol outcome variables at baseline

Measure	Skewness	Kurtosis
Total weekly units	2.02	9.07
Number abstinent days in past year	0.87	2.91
No. of days drank more than 7 (women)/10 units in past year (men)	0.11	2.04
Benefits of drinking	0.01	2.66
Drawbacks of drinking	0.93	3.65
Leeds dependence score	1.08	4.06
Baseline self-esteem	-0.31	2.96

4.5 Reliability and stability testing of self-esteem

The third stage of the analysis involved testing the reliability and stability of the self-esteem measure utilised in this project (as shown in Figure 4). Three, paired, two-tailed t-tests

were carried out to look at whether the mean total self-esteem score significantly changed between follow up periods. There was no significant difference in the scores at wave one and wave two; $t(394) = -0.61, p=0.54$. However, there was a significant difference between wave one and wave three ($t(341) = -2.46, p=0.01$) and wave two and wave three ($t(337) = -2.29, p=0.02$). It is possible that the increase in self-esteem at wave three reflects a selection effect because those with higher levels of self-esteem may have been more likely to have been retained at follow up. However, although the t-tests indicated a statistically significant difference, the increase of mean self-esteem of 4.5 points on a scale of which the maximum score is 210 is unlikely to be clinically significant. A correlation matrix of self-esteem at each stage of data collection was also computed. Table 8 illustrates these results.

Table 8

Correlation matrix of total self-esteem at each stage of data collection

	Wave 1	Wave 2	Wave 3
Wave 1	1.00		
Wave 2	0.72***	1.00	
Wave 3	0.71***	0.82***	1.00

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

The results from Table 8 indicate that self-esteem at each wave remained significantly correlated with all the other waves. This suggests that self-esteem remained relatively stable over time.

Next, in order to measure the internal reliability of the self-esteem measure the Cronbach's alpha level at each wave of data collection was computed. The results are displayed in Table 9 below.

Table 9

Summary statistics for self-esteem

Stage of data collection	N	Cronbach's alpha scale value	Average inter-item correlation
Wave 1	500	0.90	0.86
Wave 2	402	0.90	0.83
Wave 3	349	0.90	0.77

Table 9 suggests that given the high overall Cronbach's alpha values (above 0.7) for self-esteem at all three time points it can be assumed that this scale has good internal reliability in this population (Kline, 1999). For the full results of this analysis please see Appendix J. The combination of the summary statistics and reliability analyses for self-esteem suggest that in this sample self-esteem was a fairly stable trait which was measured using a scale with high internal consistency.

4.6 Cross sectional analyses

4.6.1 Relationship between alcohol outcomes, self-esteem and sociodemographic/clinical variables of interest

The first part of this stage of the analysis as outlined in Figure 4 involved exploring the relationship between alcohol use, self-esteem and the other variables of interest at a cross sectional level to measure the level of association between the variables. Using baseline values, Pearson's correlations were computed if both variables were continuous and linear regression models were computed if the sociodemographic/clinical variable was categorical. All measures were taken from baseline values. Table 10 displays a correlation matrix of the different alcohol outcomes and self-esteem. Self-esteem was found to significantly negatively correlate with total units consumed ($r = -0.09, p \leq 0.05$) disadvantages of drinking ($r = -0.34, p \leq 0.001$) and level of dependency ($r = -0.44, p \leq 0.001$). This means that those with higher self-esteem had a tendency to drink less alcohol, reported fewer disadvantages of drinking and were less dependent on alcohol.

Table 10

Correlation matrix of alcohol outcomes and self-esteem at baseline

	Self-esteem	Total weekly units	No. abstinent days in past year	No of days drank 7+/10+ units in past year	Advantages of drinking	Disadvantages of drinking	Level of dependency
Self-esteem	1						
Total weekly units	-0.09*	1					
No. abstinent days in past year	-0.03	-0.21***	1				
No of days drank 7+/10+ units in past year	-0.07	0.52***	-0.32*	1			
Advantages of drinking	-0.03	-0.03	0.02	-0.03	1		
Disadvantages of drinking	-0.34***	0.12**	0.08	0.13**	0.23***	1	
Level of dependency	-0.44***	0.38***	-0.04	0.26***	0.10*	0.37***	1

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Next, the correlations between continuous sociodemographic/clinical variables of interest (mental health, overall wellbeing and age) and alcohol outcomes were computed. This was completed to measure the level of association between the covariates and the alcohol outcomes. The results are displayed below in Table 11.

Table 11
Correlations between socio-demographic/clinical variables and alcohol outcomes at baseline

	Total weekly units	No. abstinent days in past year	No. days drunk 7+/10+ units in past year	Advantages of drinking	Disadvantages of drinking	Level of dependency
Overall wellbeing	-0.12**	-0.02	-0.15***	0.01	-0.39***	-0.40***
Mental health	-0.10*	0.01	-0.11*	-0.06	-0.37***	-0.44***
Age	0.09*	-0.26***	0.12**	-0.05	-0.10*	0.03

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

The six alcohol outcomes significantly correlated with different socio-demographic/clinical variables. Total weekly units significantly positively correlated with age ($r = 0.09$, $p \leq 0.05$) and significantly negatively correlated with overall wellbeing ($r = -0.12$, $p \leq 0.01$) and mental health ($r = -0.10$, $p \leq 0.05$). Number of abstinent days significantly negatively correlated with age only ($r = -0.26$, $p \leq 0.001$). Number of days individuals drank more than seven or 10 units in the past year significantly negatively correlated with mental health ($r = -0.11$, $p \leq 0.05$) and overall wellbeing ($r = -0.15$, $p \leq 0.001$) and significantly positively correlated with age ($r = 0.12$, $p \leq 0.01$). Advantages of drinking did not significantly correlate with any of the factors whereas disadvantages of drinking significantly negatively correlated with all of them. Total level of dependency negatively correlated with overall wellbeing ($r = -0.40$, $p \leq 0.001$) and mental health ($r = -0.44$, $p \leq 0.001$).

Next, the regression co-efficient for the categorical variables of interest and alcohol outcome were computed. These results are reported below in Table 12. The results indicated that different categorical variables were associated with each alcohol outcome of interest. Participants who drank higher numbers of weekly units were significantly more likely to be male ($\beta = -35.19$, CI= -45.68 to -24.69), from an intermediate ($\beta = 15.25$, CI= 3.68 to 26.82), or lower social class ($\beta = 30.62$, CI= 18.66 to 42.57), a smoker ($\beta = 17.45$, CI= 7.89 to 27.01) and having used illicit drugs in the past year ($\beta = 9.85$, CI= 0.24 to 19.47). Participants with higher number of abstinent days were less likely to be married/cohabiting ($\beta = 0.27$, CI= 0.00 to 0.54). Participants from either an intermediate ($\beta = 29.68$, CI= 7.42 to 51.95) or lower socio-economic background ($\beta = 49.20$, CI= 7.42 to 51.95) were significantly more likely to have higher number of days drinking at a heavier level (seven units for women and 10 units for men in one day). White British participants reported more advantages of drinking ($\beta = -1.86$, CI= -3.41 to -0.32) whereas participants who reported more disadvantages of drinking were more likely to be from a low socioeconomic background ($\beta = 2.53$, CI= 0.95 to 4.10), to have used illicit drugs in the past year ($\beta = 2.65$, CI= 1.42 to 3.89) and less likely to be married/cohabiting ($\beta = 2.57$, CI= 1.28 to 3.86). Furthermore, participants who reported higher levels of alcohol dependency were more likely to be male ($\beta = -1.19$, CI= -2.31 to -0.07), from an intermediate ($\beta = 1.34$, CI= 2.36 to 4.80) or lower social class ($\beta = -3.58$, CI= 2.36 to 4.80), a current smoker ($\beta = 1.55$, CI= 0.57 to 2.53), user of illicit drugs ($\beta = 2.48$, 1.51 to 3.45) and less likely to be married/cohabiting ($\beta = 1.46$, CI= 0.43 to 2.50).

Table 12

Regression coefficients between categorical sociodemographic/clinical variables and alcohol outcomes [95% Confidence Interval (CI)]

Individual predictors	Total weekly units	No. abstinent days in past year	No. days drunk 7+/10+ units in past year	Advantages of drinking	Disadvantages of drinking	Level of dependency
Gender (RG: Male)	-35.19*** [-45.68, -24.69]	-0.17 [-0.47, 0.12]	-14.01 [-34.88, 6.85]	-0.30 [-1.59, 0.99]	-0.31 [1.73, 1.11]	-1.19* [-2.31, -0.07]
Ethnicity (RG: White British)	-3.71 [-16.87, 9.45]	-0.17 [-0.52, 0.19]	-16.13 [-41.41, 9.15]	-1.86* [-3.41, -0.32]	0.14 [-1.57, 1.84]	0.49 [-0.87, 1.85]
Religion (RG: Not religious)	-7.44 [-18.47, 3.58]	0.14 [-0.16, 0.44]	-12.71 [-33.75, 8.32]	-0.75 [-2.06, 0.56]	0.01 [-1.43, 1.44]	-0.19 [-1.33, 0.94]
Marital Status (RG: Married/ Cohabiting)	6.82 [-3.24, 16.88]	0.27* [0.00, 0.54]	2.43 [-16.87, 21.73]	0.82 [-0.37, 2.01]	2.57*** [1.28, 3.86]	1.46** [0.43, 2.50]
Intermediate SES (RG: High SES)	15.25** [3.68, 26.82]	-0.01 [-0.32, 0.31]	29.68** [7.42, 51.95]	-0.19 [-1.58, 1.21]	0.80 [-0.73, 2.32]	1.34* [0.16, 2.52]
Low SES (RG: High SES)	30.62*** [18.66, 42.57]	0.34 [0.01, 0.67]	49.20*** [7.42, 51.95]	-1.17 [-2.61, 0.27]	2.53** [0.95, 4.10]	3.58*** [2.36, 4.80]
Smoking (RG: Non smoker)	17.45*** [7.89, 27.01]	0.08 [-0.18, 0.35]	39.31 [21.12, 57.49]	-0.03 [-1.17, 1.12]	0.79 [-0.46, 2.05]	1.55** [0.57, 2.53]
Illicit drug use (RG: No drug use)	9.85* [0.24, 19.47]	0.26 [-0.004, 0.52]	0.90 [-17.56, 19.36]	1.01 [-0.13, 2.15]	2.65*** [1.42, 3.89]	2.48*** [1.51, 3.45]

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; RG= Reference Group; SES= Socio-economic Status

Next, the relationships between the sociodemographic and clinical variables and self-esteem were examined. The correlations between self-esteem and the continuous socio-demographic and clinical variables were computed – these results are displayed in Table 13.

Table 13
Correlation matrix between continuous socio-demographic/clinical variables and self-esteem

Individual predictors	Self-Esteem	Overall wellbeing	Mental Health	Age
Self-Esteem	1			
Overall wellbeing	0.51***	1		
Mental Health	0.58***	0.77***	1	
Age	-0.03	-0.07	-0.10	1

Note: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 13 suggests that overall self-esteem only significantly correlated with mental health ($r=0.58$, $p \leq 0.001$) and overall wellbeing ($r=0.51$, $p \leq 0.001$). The relationship was positive suggesting as self-esteem increased so did psychological and overall wellbeing.

Next, the regression coefficients of the association of the categorical variables of interest and self-esteem outcome were computed.

Table 14
Regression coefficients between categorical sociodemographic/clinical variables and self-esteem [95% CI]

Gender (RG: Male)	-1.99 [-7.91, 3.94]
Ethnicity (RG: White British)	-2.17 [-9.27, 4.93]
Religion (RG: Not religious)	4.76 [-1.22, 10.73]
Marital Status (RG: Married/ Cohabiting)	-7.79** [-13.23, -2.35]
Socio-economic status (RG: High)	
Intermediate	-3.88 [-10.20, 2.44]
Low	-13.51*** [-20.04, -6.98]
Smoking (RG: Non smoker)	-4.49 [-9.74, 0.77]
Illicit drug use (RG: No drug use)	-3.25 [-8.49, 1.98]

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; RG= Reference Group

The results displayed in Table 14 indicated that participants with higher self-esteem were more likely to be married ($\beta = -7.79$, CI= -13.23 to -2.35) and from a high (compared to low) socio-economic background ($\beta = -13.51$, CI= -20.04 to -6.98).

4.6.2 Cross sectional regression analysis

Next, three linear regression models were run for each alcohol outcome at baseline. These models were fit to investigate if self-esteem at baseline significantly predicted the alcohol outcome at the same point in time. The first model was unadjusted, the second adjusted for age and sex and the final model adjusted for all the socio-demographic/clinical variables it was hypothesised could be confounders in the relationship (age, gender, ethnicity, religion, marital status, socio-economic status, smoking, illicit drug use and mental health) as well as self-esteem.

Additionally, due to multiple variables being adjusted for in the regression models, some of which have been found to correlate highly with each other in previous research, it was considered whether multi-collinearity could be present in the regression models. However, as all the VIFs for the fully adjusted regression models were found to be less than two this suggests that the models were not severely affected by multi-collinearity (O'Brien, 2007). The results of the cross sectional regression models are displayed below in Tables 15 to 20.

Table 15
Cross sectional regression model results for total weekly units

Predictors	Total weekly units [95% CI]
<i>Unadjusted model results (n=492)</i>	
Self-esteem	-0.17* [-0.33, -0.00]
Constant	107.78*** [84.54, 131.01]
<i>Adjusted R²</i>	<i>0.01</i>
<i>Age and gender adjusted model results (n=492)</i>	
Self-esteem	-0.18* [-0.33, -0.02]
Gender (RG: Male)	-34.55*** [-45.09, -24.00]
Age	0.50 [-0.04, 1.03]
Constant	99.52*** [68.70, 130.34]
<i>Adjusted R²</i>	<i>0.09</i>
<i>Fully adjusted model results (n=480)</i>	
Self-esteem	0.01 [-0.18, 0.20]
Gender (RG: Male)	-34.62*** [-45.23, -24.04]
Age	0.78** [0.21, 1.34]
Religion (RG: Not religious)	-2.81 [-13.55, 7.93]
Socio-economic status (RG: High)	
<i>Intermediate</i>	10.93 [-0.36, 22.23]
<i>Low</i>	23.45*** [11.28 to 35.62]
Marital status (RG: Married/ Cohabiting)	0.33 [-9.65, 10.30]
Smoking (RG: Non smoker)	9.83 [-0.20, 19.87]
Drug use (RG: No drug use)	8.47 [-1.62, 18.55]
Mental Health	-0.31* [-0.58, -0.03]
Ethnicity (RG: White British)	-1.13 [-13.88, 11.62]
Constant	62.58** [25.17, 99.98]
<i>Adjusted R²</i>	<i>0.14</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; RG= Reference Group

The unadjusted regression model suggested that self-esteem was a significant predictor of total weekly units ($\beta = -0.17$, 95% CI= -0.33 to -0.00, $p \leq 0.05$). However, the effect of self-esteem was attenuated after inclusion of all the predictors in the fully adjusted model ($\beta = 0.01$, 95% CI= -0.18 to 0.20, $p > 0.05$). Participants who drank higher numbers of weekly units were more likely to be male ($\beta = -34.62$, 95% CI= -45.23 to -24.04, $p \leq 0.001$), be older ($\beta = 0.78$, 95% CI= 0.21 to 1.34, $p \leq 0.01$), have low socioeconomic status ($\beta = 23.45$, 95% CI= 11.28 to 35.62, $p \leq 0.001$) and have poorer mental health ($\beta = -0.31$, 95% CI= -0.58 to -0.03, $p \leq 0.05$).

Table 16

Cross sectional regression model results for number of abstinent days in the past year

Predictors	Number of abstinent days in the past year [95% CI]
<i>Unadjusted model results (n=492)</i>	
Self-esteem	-0.01* [-0.01,-0.00]
Constant	1.75*** [1.13, 2.37]
<i>Adjusted R²</i>	<i>0.01</i>
<i>Age and gender adjusted model results (n=492)</i>	
Self-esteem	-0.01* [-0.01, -0.001]
Gender (RG: Male)	-0.23 [-0.52, 0.06]
Age	-0.02** [-0.04, -0.01]
Constant	2.71*** [1.86, 3.56]
<i>Adjusted R²</i>	<i>0.03</i>
<i>Fully adjusted model results (n=480)</i>	
Self-esteem	-0.00 [-0.01, 0.00]
Gender (RG: Male)	-0.24 [-0.54, 0.07]
Age	-0.02* [-0.04, -0.00]
Religion (RG: Not religious)	0.25 [-0.05, 0.56]
Socio-economic status (RG: High)	
<i>Intermediate</i>	-0.04 [-0.37, 0.28]
<i>Low</i>	0.21 [-0.13, 0.56]
Marital status (RG: Married/ Cohabiting)	0.21 [-0.08, 0.49]
Smoking (RG: Non smoker)	-0.04 [-0.32, 0.25]
Drug use (RG: No drug use)	0.05 [-0.24, 0.34]
Mental Health	-0.00 [-0.01, 0.01]
Ethnicity (RG: White British)	-0.24 [-0.61, 0.12]
Constant	2.16*** [1.07, 3.24]
<i>Adjusted R²</i>	<i>0.02</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; RG= Reference Group

In a similar pattern to the outcome total weekly units, self-esteem was a significant predictor for number of abstinent days in the unadjusted regression model ($\beta = -0.01$, 95% CI= -0.01 to -0.00, $p \leq 0.05$) but not in the fully adjusted one ($\beta = -0.00$, 95% CI= -0.01 to 0.00, $p > 0.05$).

However, participants who had higher number of abstinent days were more likely to be younger ($\beta = -0.02$, 95% CI= -0.04 to -0.00, $p \leq 0.05$).

Table 17

Cross sectional regression model results for number of days females drank 7+ units/men drank 10+ units in the past year

Predictors	Number of days females drank 7+ units/men drank 10+ units in the past year [95% CI]
<i>Unadjusted model results (n=488)</i>	
Self-esteem	-0.27 [-0.58, 0.50]
Constant	230.86*** [186.29, 275.41]
<i>Adjusted R²</i>	<i>0.00</i>
<i>Age and gender adjusted model results (n=488)</i>	
Self-esteem	-0.26 [-0.57, 0.05]
Gender (RG: Male)	-11.59 [-32.50, 9.32]
Age	1.36* [0.29, 2.42]
Constant	182.09*** [120.87, 243.32]
<i>Adjusted R²</i>	<i>0.02</i>
<i>Fully adjusted model results (n=476)</i>	
Self-esteem	0.04 [-0.35, 0.42]
Gender (RG: Male)	-11.50 [-32.60, 9.60]
Age	1.62** [0.48, 2.75]
Religion (RG: Not religious)	-10.79 [-32.15, 10.57]
Socio-economic status (RG: High)	
<i>Intermediate</i>	24.49* [2.03, 46.95]
<i>Low</i>	38.13** [13.89, 62.36]
Marital status (RG: Married/ Cohabiting)	-4.53 [-24.43, 15.36]
Smoking (RG: Non smoker)	31.78** [11.80, 51.75]
Drug use (RG: No drug use)	-3.19 [-23.34, 16.97]
Mental Health	-0.49 [-1.04, 0.06]
Ethnicity (RG: White British)	-12.47 [-38.14, 13.19]
Constant	137.94*** [62.59, 213.30]
<i>Adjusted R²</i>	<i>0.06</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; RG= Reference Group

Self-esteem was not found to be a significant predictor of whether women drank seven or more units or men drank 10 or more units in a single day in any of the cross sectional regression models (see Table 17). Participants who had more days drinking at this heavier level were more likely to be older ($\beta = 1.62$, 95% CI= 0.48 to 2.75, $p \leq 0.01$), from an intermediate ($\beta = 24.49$, 95% CI= 2.03 to 46.95, $p \leq 0.05$) or lower ($\beta = 38.13$, 95% CI= 13.89 to 62.36, $p \leq 0.01$) social economic background and be a current smoker ($\beta = 31.78$, 95% CI= 11.80 to 51.75, $p \leq 0.01$).

Table 18
Cross sectional regression model results for advantages of drinking

Predictors	Advantages of drinking [95% CI]
<i>Unadjusted model results (n=488)</i>	
Self-esteem	-0.01 [-0.03, 0.01]
Constant	15.29*** [12.54, 18.04]
<i>Adjusted R²</i>	<i>0.00</i>
<i>Age and gender adjusted model results (n=488)</i>	
Self-esteem	-0.01 [-0.03, 0.01]
Gender (RG: Male)	-0.37 [1.69, 0.93]
Age	-0.05 [-0.12, 0.02]
Constant	17.31*** [13.49, 21.12]
<i>Adjusted R²</i>	<i>0.00</i>
<i>Fully adjusted model results (n=477)</i>	
Self-esteem	0.00 [-0.02, 0.03]
Gender (RG: Male)	-0.48 [-1.81, 0.85]
Age	-0.03 [-0.10, 0.04]
Religion (RG: Not religious)	-0.42 [-1.78, 0.93]
Socio-economic status (RG: High)	
<i>Intermediate</i>	-0.32 [-1.73, 1.10]
<i>Low</i>	-1.53* [-3.06, -0.01]
Marital status (RG: Married/ Cohabiting)	0.83 [-0.42, 2.08]
Smoking (RG: Non smoker)	-0.63 [-1.88, 0.63]
Drug use (RG: No drug use)	0.78 [-0.49, 2.04]
Mental Health	-0.02 [-0.06, 0.01]
Ethnicity (RG: White British)	-1.75* [-3.35, -0.16]
Constant	17.66*** [12.89, 22.42]
<i>Adjusted R²</i>	<i>0.01</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; RG= Reference Group

Self-esteem was not found to be a significant predictor of reported advantages of drinking in any of the cross-sectional regression models. Participants were more likely to report more advantages of drinking if they were from a low socio-economic class ($\beta = 1.53$, 95% CI = -3.06 to -0.01, $p \leq 0.05$) or were White British ($\beta = -1.75$, 95% CI = -3.35 to -0.16, $p \leq 0.05$).

Table 19

Cross sectional regression model results for disadvantages of drinking

Predictors	Disadvantages of drinking [95% CI]
<i>Unadjusted model results (n=489)</i>	
Self-esteem	-0.08*** [-0.10, -0.06]
Constant	20.74*** [17.90, 23.59]
<i>Adjusted R²</i>	<i>0.12</i>
<i>Age and gender adjusted model results (n=489)</i>	
Self-esteem	-0.08*** [-0.10, -0.06]
Gender (RG: Male)	-0.56 [-1.90, 0.78]
Age	-0.09** [-0.16, -0.02]
Constant	24.47*** [20.55, 28.39]
<i>Adjusted R²</i>	<i>0.13</i>
<i>Fully adjusted model results (n=478)</i>	
Self-esteem	-0.04*** [-0.07, -0.02]
Gender (RG: Male)	-0.87 [-2.21, 0.47]
Age	-0.05 [-0.12, 0.02]
Religion (RG: Not religious)	0.45 [-0.91, 1.82]
Socio-economic status (RG: High)	
<i>Intermediate</i>	0.36 [-1.06, 1.79]
<i>Low</i>	0.93 [-0.60, 2.47]
Marital status (RG: Married/ Cohabiting)	1.22 [-0.05, 2.48]
Smoking (RG: Non smoker)	-1.00 [-2.27, 0.27]
Drug use (RG: No drug use)	2.05** [0.77, 3.32]
Mental Health	-0.08*** [-0.12, -0.05]
Ethnicity (RG: White British)	-0.59 [-2.20, 1.02]
Constant	20.99*** [16.22, 25.77]
<i>Adjusted R²</i>	<i>0.19</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; RG= Reference Group

In the fully adjusted model self-esteem was found to be a significant predictor of total disadvantages of drinking ($\beta = -0.04$, 95% CI= -0.07 to -0.02, $p \leq 0.001$). Additionally, participants who reported more disadvantages of drinking had poorer mental health ($\beta = -0.08$, 95% CI= -0.12 to -0.05, $p \leq 0.001$) and were more likely to have used illicit drugs in the past year ($\beta = 2.05$, 95% CI= 0.77 to 3.32, $p \leq 0.01$). Self-esteem alone explained 12% of the variance in reported disadvantages of drinking, prior to adjustment for other variables.

Table 20

Cross sectional regression model results for level of dependency

Predictors	Level of dependency [95% CI]
<i>Unadjusted model results (n=490)</i>	
Self-esteem	-0.08*** [-0.10, -0.07]
Constant	18.95*** [16.81, 21.09]
<i>Adjusted R²</i>	<i>0.19</i>
<i>Age and gender adjusted model results (n=490)</i>	
Self-esteem	-0.08*** [-0.10, -0.07]
Gender (RG: Male)	-1.27* [-2.28, -0.26]
Age	0.01 [-0.05, 0.06]
Constant	19.14*** [16.20, 22.09]
<i>Adjusted R²</i>	<i>0.20</i>
<i>Fully adjusted model results (n=478)</i>	
Self-esteem	-0.05*** [-0.07, -0.03]
Gender (RG: Male)	-1.35** [-2.32, -0.38]
Age	0.05 [-0.01, 0.10]
Religion (RG: Not religious)	0.15 [-0.84, 1.13]
Socio-economic-status (RG: High)	
<i>Intermediate</i>	0.87 [-0.17, 1.90]
<i>Low</i>	1.81** [0.69, 2.92]
Marital status (RG: Married/ Cohabiting)	-0.02 [-0.94, 0.89]
Smoking (RG: Non smoker)	0.12 [-0.80, 1.04]
Drug use (RG: No drug use)	2.10*** [1.18, 3.02]
Mental Health	-0.07*** [-0.10, -0.05]
Ethnicity (RG: White British)	0.19 [-0.08, 1.37]
Constant	14.97*** [11.52, 18.43]
<i>Adjusted R²</i>	<i>0.30</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; RG= Reference Group

In all three regression models self-esteem was found to be a significant predictor of level of alcohol dependency (see Table 20). Additionally, participants with higher levels of alcohol dependency were more likely to be male ($\beta = -1.35$, 95% CI= -2.32 to -0.38, $p \leq 0.01$), from a low socioeconomic background ($\beta = 1.81$, 95% CI= 0.69 to 2.92, $p \leq 0.01$), have used drugs in the past year ($\beta = 2.10$, 95% CI= 1.18 to 3.02, $p \leq 0.001$) and have poorer mental health ($\beta = -0.07$, 95% CI= -0.10 to -0.05, $p \leq 0.001$). Self-esteem alone accounted for 19% of the variance in level of alcohol dependency, prior to adjustment for the other variables.

4.7 Longitudinal analyses

The final stage of the analysis (as shown in Figure 4) was to investigate the longitudinal association between self-esteem for each alcohol outcome. This enabled the researcher to measure the effect self-esteem has over time on the alcohol outcomes, whilst controlling for possible confounders. Firstly, three regression models were run to estimate whether self-esteem at baseline was a significant predictor of the first alcohol outcome of interest (total weekly units) at wave 2. The three regression models run at each time point were the same as in the cross sectional regression analyses (unadjusted, adjusted for age and gender, and fully adjusted). These three regression models were then re-run with the outcome total weekly units at waves three, four, five and six. The process was then repeated for the other five alcohol outcomes. Finally, these regression models were repeated with self-esteem at waves two and three entered as the predictors (the results for these analyses are reported in Appendix K) instead of baseline self-esteem. All the covariates were taken from baseline values, with the exception of age which was matched with self-esteem. The results of the longitudinal regression models with baseline self-esteem entered as a predictor, are displayed below in Tables 21 to 25.

Table 21
 Longitudinal regression model results for total weekly units

Predictors	Total weekly units outcome [95% CI]				
	W2	W3	W4	W5	W6
<i>Unadjusted model results</i>					
Self-esteem	0.12 [-0.07, 0.31]	0.24* [0.04, 0.45]	0.30** [0.08, 0.51]	0.21 [-0.02, 0.43]	0.12 [-0.09, 0.33]
Constant	51.32*** [23.87, 78.76]	31.07* [1.89, 60.26]	21.80 [-9.31, 52.90]	29.97 [-2.20, 62.14]	33.15* [3.34, 62.96]
Adj. R ² (n=)	0.00 (n=396)	0.01 (n=343)	0.02 (n=316)	0.01 (n=277)	0.00 (n=256)
<i>Age and gender adjusted model results</i>					
Self-esteem	0.10 [-0.09, 0.29]	0.22* [0.02, 0.42]	0.28* [0.06, 0.49]	0.19 [-0.03, 0.41]	0.11 [-0.10, 0.32]
Gender (RG: Male)	-23.25*** [-35.79, 10.71]	-25.77*** [-38.45, 13.09]	-25.06*** [-38.55, 11.57]	-23.94*** [-38.06, -9.83]	-18.20** [-31.68, -4.71]
Age	0.63 [-0.01, 1.28]	0.54 [-0.13, 1.20]	0.74* [0.03, 1.46]	0.87* [0.09, 1.65]	0.34 [-0.38, 1.07]
Constant	36.01 [-0.85, 72.88]	21.16 [-17.54, 59.87]	3.78 [-38.11, 45.67]	5.94 [-38.17, 50.06]	27.06 [-13.09, 67.20]
Adj. R ² (n=)	0.04 (n=396)	0.06 (n=343)	0.07 (n=316)	0.06 (n=277)	0.03 (n=256)
<i>Fully adjusted model results</i>					
Self-esteem	0.26* [0.03, 0.48]	0.36** [0.12, 0.59]	0.44*** [0.18, 0.69]	0.35* [0.08, 0.61]	0.18 [-0.06, 0.43]
Gender (RG: Male)	-23.35*** [-36.01, -10.70]	-26.60*** [-39.48, -13.72]	-27.59*** [-41.23, -13.96]	-25.67*** [-39.91, -11.44]	-19.17** [-32.66, -5.68]
Age	0.94** [0.26, 1.63]	0.88* [0.16, 1.61]	1.09** [0.31, 1.87]	1.14** [0.30, 1.98]	0.71 [-0.08, 1.49]
Religion (RG: Not religious)	-11.42 [-24.92, 2.08]	-11.17 [-25.18, 2.83]	-5.19 [-20.23, 9.84]	-4.45 [-20.50, 11.60]	-8.63 [-22.99, 5.72]
SES (RG: High)					
Intermediate	6.06 [-7.49, 19.62]	-1.86 [-15.64, 11.93]	-3.15 [-17.80, 11.49]	-0.29 [-15.90, 15.31]	6.24 [-8.40, 20.89]
Low	15.11* [0.25, 29.96]	6.89 [-8.27, 22.06]	19.55* [3.40, 35.71]	14.18 [-2.84, 31.20]	14.16 [-1.71, 30.03]
Marital status (RG: Married/ Cohabiting)	3.28 [-8.79, 15.35]	8.75 [-3.68, 21.17]	-4.23 [-17.52, 9.06]	4.33 [-9.73, 18.39]	11.41 [-1.58, 24.41]
Smoking (RG: Non smoker)	4.35 [-7.74, 16.43]	7.50 [-4.74, 19.74]	0.46 [-12.65, 13.58]	4.91 [-8.85, 18.68]	14.39* [1.45, 27.33]
Drug use (RG: No drug use)	11.02 [-1.35, 23.39]	7.66 [-5.11, 20.42]	18.16* [4.31, 32.01]	13.90 [-0.40, 28.21]	7.53 [-6.01, 21.07]
Mental health	-0.26 [-0.59, 0.07]	-0.23 [-0.57, 0.10]	-0.31 [-0.67, 0.06]	-0.24 [-0.62, 0.15]	-0.04 [-0.39, 0.32]
Ethnicity (RG: White British)	-5.90 [-21.44, 9.65]	2.10 [-14.78, 18.97]	1.25 [-16.72, 19.22]	2.13 [-17.37, 21.63]	-12.00 [-29.91, 5.90]
Constant	11.78 [-33.88, 57.45]	-2.80 [-50.02, 44.43]	-18.88 [-70.38, 32.61]	-23.54 [-77.19, 30.10]	-11.12 [-60.35, 38.10]
Adj. R ² (n=)	0.09 (n=390)	0.08 (n=338)	0.10 (n=311)	0.08 (n=272)	0.08 (n=251)

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R²= Adjusted R-squared

In the unadjusted model baseline self-esteem was a significant predictor of total weekly units at waves three ($\beta=0.24$, 95% CI=0.04 to 0.45, $p \leq 0.05$) and four ($\beta=0.30$, 95% CI=0.08 to 0.51, $p \leq 0.01$) only. Individuals with higher levels of self-esteem were more likely to drink higher levels of alcohol. The same pattern was also found when age and gender were adjusted

for. Additionally, the same pattern was found when self-esteem at wave two was entered as a predictor instead but, when self-esteem at wave three was entered self-esteem did not significantly predict total weekly units at any time (see Tables K.1 and K.7 in Appendix K). Self-esteem explained between 0 to 2% of the variance in total weekly units reported at different waves.

However, after adjustment for other covariates in the final regression model baseline self-esteem was found to be a significant predictor of higher numbers of weekly units consumed at all time points, except at wave six. This suggests that levels of self-esteem can impact average weekly alcohol consumption for many years. Individuals who were older and male were more likely to drink higher levels of alcohol. This pattern of results was identical to the other regression models which entered self-esteem at waves two and three as a predictor, instead of the baseline value (see Tables K.1 and K.7 in Appendix K).

Table 22
 Longitudinal regression model results for number of abstinent days in past year

Predictors	Number of abstinent days in past year [95% CI]				
	W2	W3	W4	W5	W6
<i>Unadjusted model results</i>					
Self-esteem	-0.35* [-0.64, -0.06]	-0.37 [-0.75, 0.01]	-0.33 [-0.74, 0.08]	-0.27 [-0.71, 0.16]	-0.37 [-0.85, 0.11]
Constant	137.81*** [97.25, 178.37]	154.56*** [100.28, 208.84]	156.54*** [98.09, 214.98]	144.60*** [82.05, 207.14]	165.17*** [96.66, 233.69]
Adj. R ² (n=)	0.01 (n=396)	0.01 (n=343)	0.00 (n=316)	0.00 (n=277)	0.01 (n=256)
<i>Age and gender adjusted model results</i>					
Self-esteem	-0.36* [-0.64, -0.08]	-0.37 [-0.75, 0.01]	-0.36 [-0.77, 0.05]	-0.27 [-0.71, 0.16]	-0.34 [-0.82, 0.14]
Gender (RG: Male)	-8.96 [-27.41, 9.50]	4.31 [-19.64, 28.25]	-8.70 [-34.38, 16.97]	9.40 [-18.64, 37.45]	14.91 [-16.13, 45.95]
Age	-2.17*** [-3.12, -1.22]	-1.82** [-3.08, -0.56]	-2.10** [-3.46, -0.74]	-1.64* [-3.19, -0.10]	-2.11* [-3.77, -0.45]
Constant	224.03*** [169.79, 278.27]	222.45*** [149.36, 295.53]	242.95*** [163.22, 322.69]	204.32*** [116.66, 291.98]	237.38*** [144.97, 329.80]
Adj. R ² (n=)	0.06 (n=396)	0.03 (n=343)	0.03 (n=316)	0.01 (n=277)	0.03 (n=256)
<i>Fully adjusted model results</i>					
Self-esteem	-0.50** [-0.84,-0.16]	-0.55* [-1.00,-0.10]	-0.54* [-1.03,-0.06]	-0.54* [-1.07,-0.00]	-0.41 [-0.98,0.17]
Gender (RG: Male)	-6.16 [-25.21,12.89]	8.60 [-15.84,33.04]	-5.39 [-31.68,20.91]	14.23 [-14.42,42.88]	14.95 [-16.74,46.64]
Age	-1.94*** [-2.97,-0.90]	-1.75* [-3.12,-0.38]	-1.81* [-3.31,-0.31]	-1.64 [-3.33,0.04]	-2.15* [-4.00,-0.30]
Religion (RG: Not religious)	8.38 [-11.94,28.71]	23.94 [-2.64,50.52]	24.99 [-4.01,53.98]	27.85 [-4.46,60.15]	10.93 [-22.79,44.66]
SES (RG: High)					
Intermediate	10.72 [-9.69,31.13]	16.74 [-9.42,42.90]	22.29 [-5.96,50.53]	9.53 [-21.88,40.94]	18.47 [-15.94,52.87]
Low	18.35 [-4.01,40.72]	34.64* [5.85,63.42]	16.44 [14.72,47.60]	24.21 [-10.06,58.47]	37.06 [-0.23,74.35]
Marital status (RG: Married/ Cohabiting)	-11.68 [-29.86,6.49]	2.22 [-21.36,25.81]	9.39 [-16.25,35.03]	9.63 [-18.68,37.93]	-1.74 [-32.28,28.80]
Smoking (RG: Non smoker)	2.37 [-15.84,20.57]	-17.06 [-40.29,6.17]	-1.10 [-26.39,24.20]	-9.23 [-36.94,18.48]	-16.39 [-46.78,14.01]
Drug use (RG: No drug use)	9.43 [-9.19,28.05]	6.23 [-17.99,30.45]	-3.23 [-29.95,23.49]	-3.84 [-32.63,24.95]	-11.28 [-43.09,20.53]
Mental health	0.42 [-0.09,0.92]	0.53 [-0.12,1.17]	0.54 [-0.16,1.24]	0.73 [-0.05,1.50]	0.37 [-0.47,1.21]
Ethnicity (RG: White British)	5.52 [-17.89,28.93]	-6.03 [-38.05,25.99]	19.07 [-15.60,53.74]	-4.10 [-43.35,35.14]	25.14 [-16.93,67.21]
Constant	189.96*** [121.21,258.71]	178.10*** [88.48,267.72]	180.63*** [81.31,279.96]	159.78** [51.81,267.76]	209.31*** [93.67,324.95]
Adj. R ² (n=)	0.06 (n=390)	0.04 (n=338)	0.03 (n=311)	0.02 (n=272)	0.03 (n=251)

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R²= Adjusted R-squared

In the unadjusted model, individuals with lower self-esteem appeared to have a significantly higher number of abstinent days at wave two ($\beta = -0.35$, 95% CI= -0.64 to -0.06, $p \leq 0.05$).

When the regression model was adjusted for age and gender, only age appeared to be a

consistent significant predictor of number of abstinent days. This result was replicated in the other regression models which entered self-esteem at waves two or three as a predictor (see Tables K.2 and K.8 in Appendix K). The results consistently suggested that individuals who were younger had a higher number of abstinent days.

In the fully adjusted model individuals with lower baseline self-esteem had significantly higher numbers of abstinent days at all waves of data collection, except at wave six. Age remained a significant predictor of self-esteem across multiple time points. However, the results for the regression models which used the other values for self-esteem were not as consistent. Self-esteem at wave two was only a significant predictor of number of abstinent days at waves three ($\beta=-0.75$, 95% CI= -1.19 to -0.32, $p\leq 0.001$) and five ($\beta= -0.55$, 95% CI= -1.08 to -0.02, $p\leq 0.05$). However, self-esteem at wave three did not significantly predict number of abstinent days at any time point (see Table K.8 in Appendix K).

Table 23

Longitudinal regression model results for number of days drank 7+/10+ units in past year

Predictors	Number of days drank 7+/10+ units in past year [95% CI]				
	W2	W3	W4	W5	W6
<i>Unadjusted model results</i>					
Self-esteem	0.18 [-0.22,0.57]	0.16 [-0.30,0.62]	0.25 [-0.22,0.73]	0.22 [-0.28,0.73]	0.60* [0.08,1.13]
Constant	132.73*** [76.51, 188.94]	141.86*** [76.23, 207.49]	110.76** [43.37, 178.14]	106.74** [35.04, 178.43]	44.79 [-29.84, 119.41]
Adj. R ² (n=)	-0.00 (n=396)	-0.00 (n=343)	0.00 (n=316)	-0.00 (n=277)	0.02 (n=256)
<i>Age and gender adjusted model results</i>					
Self-esteem	0.17 [-0.22,0.57]	0.15 [-0.30,0.61]	0.27 [-0.20,0.74]	0.23 [-0.27,0.73]	0.58* [0.05,1.10]
Gender (RG: Male)	-9.47 [-35.54, 16.60]	-15.04 [-43.95, 13.86]	-1.45 [-31.09, 28.18]	-1.99 [-34.26, 30.28]	-9.34 [-43.36, 24.68]
Age	1.50* [0.16,2.84]	2.21** [0.69,3.73]	2.37** [0.79,3.94]	1.56 [-0.22,3.33]	1.82 [-0.00,3.63]
Constant	79.12* [2.49, 155.76]	63.44 [-24.79, 151.66]	18.46 [-73.58, 110.50]	47.38 [-53.48, 148.24]	-18.56 [-119.84, 82.72]
Adj. R ² (n=)	0.01 (n=396)	0.02 (n=343)	0.02 (n=316)	0.00 (n=277)	0.02 (n=256)
<i>Fully adjusted model results</i>					
Self-esteem	0.37 [-0.10,0.85]	0.34 [-0.20,0.88]	0.34 [-0.21,0.90]	0.48 [-0.13,1.10]	0.84** [0.23,1.46]
Gender (RG: Male)	-9.29 [-35.73,17.16]	-14.83 [-44.16,14.50]	-1.51 [-31.62,28.60]	-4.23 [-37.24,28.78]	-14.15 [-47.77,19.46]
Age	2.10** [0.66,3.53]	2.75** [1.11,4.40]	2.91*** [1.20,4.63]	1.67 [-0.28,3.61]	2.24* [0.28, 4.20]
Religion (RG: Not religious)	-15.79 [-44.00,12.42]	-32.31* [-64.21,-0.41]	-21.79 [-54.98,11.40]	-15.45 [-52.67,21.76]	-31.25 [-67.02,4.52]
SES (RG: High)					
Intermediate	12.96 [-15.37,41.29]	1.85 [-29.54,33.24]	-4.20 [-36.53,28.14]	14.30 [-21.88,50.49]	-15.60 [-52.09,20.89]
Low	38.82* [7.78,69.86]	16.74 [-17.79,51.27]	40.43* [4.75,76.10]	49.67* [10.20,89.14]	14.63 [-24.92,54.19]
Marital status (RG: Married/ Cohabiting)	-2.85 [-28.08,22.38]	19.52 [-8.78,47.82]	4.20 [-25.15,33.56]	-2.21 [-34.81,30.40]	14.24 [-18.16,46.63]
Smoking (RG: Non smoker)	26.65* [1.38,51.91]	35.09* [7.21,62.96]	25.93 [-3.04,54.89]	14.40 [-17.52,46.32]	59.52*** [27.28,91.76]
Drug use (RG: No drug use)	13.89 [-11.96,39.73]	-3.12 [-32.18,25.94]	14.40 [-16.19,44.99]	6.83 [-26.34,40.00]	-2.74 [-36.48,31.00]
Mental health	-0.24 [-0.94,0.45]	-0.22 [- 0.99,0.55]	0.17 [- 0.63,0.98]	-0.31 [-1.20,0.59]	-0.33 [-1.22, 0.56]
Ethnicity (RG: White British)	-9.13 [-41.62,23.36]	-4.11 [-42.53,34.31]	-9.04 [-48.73,30.65]	-9.46 [-54.67,35.75]	-4.99 [-49.61,39.64]
Constant	19.25 [-76.18,114.68]	19.96 [-87.57,127.50]	-39.71 [-153.43,74.00]	11.98 [-112.41,136.37]	-61.65 [-184.30,61.01]
Adj. R ² (n=)	0.03 (n=390)	0.04 (n=338)	0.05 (n=311)	0.01 (n=272)	0.09 (n=251)

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R²= Adjusted R-squared

In the unadjusted model individuals with higher levels of self-esteem at baseline drank at this higher level of alcohol consumption significantly more frequently at wave six ($\beta = 0.60$, 95% CI=0.08 to 1.13, $p \leq 0.05$). This lagged effect was not seen when self-esteem measured at

waves two and three were entered as predictors into the regression models (see Tables K.3 and K.9 in Appendix K). When baseline self-esteem was entered as a predictor, older individuals were found to be significantly more likely to drink at this heavier level at waves two, three and four. Gender was not found to be a significant predictor at any time point. This pattern of results was also observed in the other regression models when self-esteem from waves two or three were entered as predictors (see Tables K.3 and K.9 in Appendix K).

The fully adjusted model showed that baseline self-esteem continued to significantly predict the number of days individuals drank seven or 10 units at wave six ($\beta = 0.84$, 95% CI=0.23 to 1.46, $p \leq 0.01$). Self-esteem at wave two and wave three did not significantly predict this outcome except from on one occasion when self-esteem at wave two significantly predicted the number of days individuals drank seven or 10 units at wave three ($\beta = 0.54$, 95% CI=0.02 to 1.07, $p \leq 0.05$; see Tables K.3 and K.9 in Appendix K). When baseline self-esteem was entered as a predictor, age was found to be significant predictor at all time points except wave five. Age was also found to be a consistent predictor in the other regression models which entered self-esteem at waves two and three (see Tables K.3 and K.9 in Appendix K).

Additionally, being from a low socio-economic class was a significant predictor of this alcohol outcome at waves two, four and five. Table 23 also shows that at waves two, three and six individuals who smoked at baseline were significantly more likely to have higher number of days drinking at this heavier level. This inconsistent lagged effect was also observed in the regression models which entered self-esteem at waves two and three as a predictor of alcohol consumption (7+/10+ units daily) (see Tables K.3 and K.9 in Appendix K).

Table 24
Longitudinal regression model results for advantages of drinking

Predictor	Advantages of drinking [95% CI]				
	W2	W3	W4	W5	W6
<i>Unadjusted model results</i>					
Self-esteem	-0.02 [-0.04,0.00]	-0.02 [-0.04,0.01]	-0.01 [-0.03,0.02]	0.00 [-0.02,0.03]	0.01 [-0.02,0.03]
Constant	16.73*** [13.64, 19.81]	15.19*** [11.59, 18.80]	14.02*** [10.65, 17.40]	9.77*** [5.87, 13.67]	10.18*** [6.29, 14.06]
<i>Adj. R² (n=)</i>	<i>0.00 (n=394)</i>	<i>0.00 (n=343)</i>	<i>-0.00 (n=315)</i>	<i>-0.00 (n=277)</i>	<i>-0.00 (n=256)</i>
<i>Age and gender adjusted model results</i>					
Self-esteem	-0.02 [-0.04,0.00]	-0.02 [-0.04,0.01]	-0.01 [-0.03,0.01]	0.00 [-0.03,0.03]	0.01 [-0.02,0.03]
Gender	-1.78* [-3.21, -0.35]	-0.60 [-2.21, 1.01]	0.03 [-1.46, 1.53]	-1.57 [-3.32, 0.17]	-1.07 [-2.84, 0.70]
Age	0.02 [-0.06, 0.09]	-0.003 [-0.09, 0.08]	-0.09* [-0.17, -0.01]	-0.09 [-0.19, 0.00]	-0.08 [-0.18, 0.01]
Constant	16.71*** [12.52, 20.91]	15.54*** [10.63, 20.45]	17.53*** [12.89, 22.17]	13.94*** [8.49, 19.40]	13.57** [8.29, 18.85]
<i>Adj. R² (n=)</i>	<i>0.01 (n=394)</i>	<i>-0.00 (n=343)</i>	<i>0.01 (n=315)</i>	<i>0.01 (n=277)</i>	<i>0.00 (n=256)</i>
<i>Fully adjusted model results</i>					
Self-esteem	-0.02 [-0.04,0.01]	0.00 [-0.03,0.03]	-0.01 [-0.04,0.02]	0.03 [-0.01,0.06]	0.01 [-0.02,0.04]
Gender (RG: Male)	-1.70* [-3.17,-0.23]	-0.84 [-2.50,0.81]	0.10 [-1.43,1.64]	-1.89* [-3.66,-0.13]	-0.97 [-2.78,0.84]
Age	0.01 [-0.07,0.09]	-0.01 [-0.10,0.08]	-0.08 [-0.17,0.00]	-0.09 [-0.20,0.01]	-0.08 [-0.19,0.02]
Religion (RG: Not religious)	-0.65 [-2.22,0.92]	-0.15 [-1.94,1.65]	-0.86 [-2.55,0.84]	-0.76 [-2.75,1.23]	-1.36 [-3.29,0.57]
SES (RG: High)					
Intermediate	0.08 [-1.50,1.65]	0.09 [-1.68,1.86]	-1.46 [-3.11,0.19]	-0.63 [-2.56,1.31]	-1.28 [-3.25,0.69]
Low	0.06 [-1.66,1.79]	0.46 [-1.48,2.41]	-0.99 [-2.81,0.84]	-1.87 [-3.98,0.25]	-0.71 [-2.84,1.43]
Marital status (RG: Married/Cohabiting)	0.10 [-1.30,1.50]	1.28 [-0.31,2.88]	0.49 [-1.01,1.99]	0.67 [-1.07,2.42]	-0.28 [-2.02,1.47]
Smoking (RG: Non smoker)	-0.73 [-2.13,0.67]	-1.35 [-2.92,0.22]	-0.85 [-2.34,0.63]	-0.80 [-2.50,0.91]	-0.38 [-2.12,1.36]
Drug use (RG: No drug use)	-0.33 [-1.77,1.11]	-0.27 [-1.91,1.37]	0.99 [-0.57,2.55]	0.66 [-1.12,2.43]	0.44 [-1.38,2.26]
Mental health	-0.00 [-0.04,0.04]	-0.04 [-0.08,0.00]	-0.00 [-0.04,0.04]	-0.07** [-0.12,-0.02]	-0.01 [-0.06,0.04]
Ethnicity (RG: White British)	-0.18 [-1.98,1.63]	-0.46 [-2.63,1.70]	-0.97 [-3.01,1.07]	-1.12 [-3.54,1.29]	-0.97 [-3.38,1.43]
Constant	17.87*** [12.57,23.16]	15.86*** [9.81,21.92]	18.47*** [12.67,24.27]	16.29*** [9.64,22.94]	15.54*** [8.92,22.15]
<i>Adj. R² (n=)</i>	<i>-0.00 (n=388)</i>	<i>-0.00 (n=338)</i>	<i>0.01 (n=310)</i>	<i>0.04 (n=272)</i>	<i>-0.00 (n=251)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R²= Adjusted R-squared

Baseline self-esteem did not significantly predict total advantages of drinking at any future time point in any of the three regression models reported in Table 24. Additionally, when self-esteem at waves two and three were entered as predictors into the unadjusted models self-esteem was not found to significantly predict this alcohol outcome at any time point (see

Tables K.4 and K.10 in Appendix K). In the adjusted models none of the covariates were found to consistently significantly predict reported advantages of drinking. However, baseline poorer mental health was found to be a significant predictor of reported advantages of drinking at wave five ($\beta = -0.07$, 95% CI = -0.12 to -0.02, $p \leq 0.01$).

Table 25
Regression model results for disadvantages of drinking

Predictor	Disadvantages of drinking [95% CI]				
	W2	W3	W4	W5	W6
<i>Unadjusted model results</i>					
Self-esteem	-0.06*** [-0.09, -0.04]	-0.06*** [-0.09, -0.04]	-0.06*** [-0.09, -0.03]	-0.04** [-0.06, -0.01]	0.01 [-0.02, 0.03]
Constant	18.54*** [15.16, 21.92]	16.48*** [12.90, 20.06]	17.08*** [13.08, 21.09]	11.43*** [8.15, 14.71]	10.18*** [6.29, 14.06]
<i>Adj. R² (n=)</i>	<i>0.06 (n=395)</i>	<i>0.07 (n=343)</i>	<i>0.05 (n=315)</i>	<i>0.03 (n=277)</i>	<i>0.03 (n=256)</i>
<i>Age and gender adjusted model results</i>					
Self-esteem	-0.06*** [-0.09, -0.04]	-0.07*** [-0.09, -0.04]	-0.06*** [-0.09, -0.03]	-0.04** [-0.06, -0.01]	-0.04** [-0.07, -0.01]
Gender	-0.56 [-2.13, 1.01]	-1.03 [-2.62, 0.55]	-0.17 [-1.95, 1.61]	-0.15 [-1.62, 1.32]	-1.49 [-3.23, 0.25]
Age	-0.06 [-0.14, 0.02]	-0.08 [-0.16, 0.01]	-0.09 [-0.19, 0.00]	-0.10* [-0.18, -0.01]	-0.15** [-0.24, -0.06]
Constant	20.92*** [16.31, 25.53]	19.85*** [15.01, 24.69]	20.76*** [15.23, 26.28]	15.19*** [10.60, 19.79]	18.38*** [13.20, 23.57]
<i>Adj. R² (n=)</i>	<i>0.07 (n=395)</i>	<i>0.07 (n=343)</i>	<i>0.05 (n=315)</i>	<i>0.04 (n=277)</i>	<i>0.06 (n=256)</i>
<i>Fully adjusted model results</i>					
Self-esteem	-0.05** [-0.08, -0.02]	-0.04* [-0.06, -0.01]	-0.03 [-0.06, 0.00]	-0.01 [-0.04, 0.02]	-0.01 [-0.04, 0.02]
Gender (RG: Male)	-0.75 [-2.35, 0.85]	-1.41 [-3.00, 0.17]	-0.89 [-2.66, 0.88]	-0.51 [-2.00, 0.98]	-2.04* [-3.66, -0.42]
Age	-0.01 [-0.10, 0.08]	-0.04 [-0.13, 0.05]	-0.04 [-0.14, 0.07]	-0.07 [] [-0.16, 0.02]	-0.09 [-0.18, 0.00]
Religion (RG: Not religious)	0.79 [-0.92, 2.50]	0.05 [-1.68, 1.77]	1.15 [-0.81, 3.10]	-0.46 [-2.14, 1.22]	-0.22 [-1.95, 1.50]
SES (RG: High)					
Intermediate	0.19 [-1.53, 1.90]	0.27 [-1.42, 1.97]	-1.52 [-3.43, 0.38]	0.14 [-1.49, 1.78]	1.34 [-0.42, 3.11]
Low	1.82 [-0.06, 3.70]	2.40* [0.53, 4.26]	-0.34 [-2.44, 1.77]	0.35 [-1.43, 2.13]	3.74*** [1.84, 5.65]
Marital status (RG: Married/ Cohabiting)	0.98 [-0.55, 2.51]	-0.32 [-1.85, 1.21]	1.31 [-0.42, 3.04]	1.00 [-0.47, 2.47]	-0.32 [-1.88, 1.24]
Smoking (RG: Non smoker)	-0.07 [-1.60, 1.46]	-1.58* [-3.09, -0.07]	0.52 [-1.19, 2.23]	-0.32 [-1.76, 1.12]	-0.73 [-2.28, 0.83]
Drug use (RG: No drug use)	1.29 [-0.28, 2.85]	2.04* [0.47, 3.61]	2.28* [0.48, 4.09]	1.56* [0.06, 3.05]	1.55 [-0.08, 3.18]
Mental health	-0.03 [-0.07, 0.01]	-0.07*** [-0.11, -0.03]	-0.07** [-0.12, -0.03]	-0.06** [-0.10, -0.02]	0.06** [-0.11, -0.02]
Ethnicity (RG: White British)	0.29 [-1.68, 2.26]	-0.05 [-2.13, 2.03]	0.41 [-1.95, 2.76]	-0.29 [-2.33, 1.75]	2.46* [0.31, 4.61]
Constant	16.28*** [10.50, 22.07]	18.19*** [12.38, 24.01]	16.85*** [10.15, 23.55]	13.23*** [7.61, 18.84]	14.17*** [8.25, 20.09]
<i>Adj. R² (n=)</i>	<i>0.08 (n=389)</i>	<i>0.13 (n=338)</i>	<i>0.11 (n=310)</i>	<i>0.07 (n=272)</i>	<i>0.17 (n=251)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R²= Adjusted R-squared

The unadjusted results reported in Table 25 indicate that individuals with higher levels of self-esteem reported fewer disadvantages of drinking from waves two through to five. When self-esteem at waves two and three were entered into the unadjusted models they were also found to be significant predictors of reported disadvantages of drinking at all time points (see

Tables K.5 and K.11 in Appendix K). Self-esteem alone explained between 3 and 7% of the variance in reported disadvantages at different times.

However, in the fully adjusted models self-esteem predicted disadvantages of drinking but not in a consistent pattern. Baseline self-esteem significantly predicted reported disadvantages of drinking at waves two ($\beta = -0.05$, 95% CI= -0.08 to -0.02, $p \leq 0.01$) and three ($\beta = -0.04$, 95% CI= -0.06 to -0.01, $p \leq 0.05$). Self-esteem at wave two significantly predicted disadvantages of drinking at waves three ($\beta = -0.04$, 95% CI= -0.07 to -0.01, $p \leq 0.05$), four ($\beta = -0.04$, 95% CI= -0.07 to -0.01, $p \leq 0.05$) and six ($\beta = -0.03$, 95% CI= -0.06 to -0.00, $p \leq 0.05$) (see Table K.5 in Appendix K). Additionally, self-esteem at wave three significantly predicted disadvantages of drinking at waves four ($\beta = -0.04$, 95% CI= -0.07 to -0.00, $p \leq 0.05$) and six ($\beta = -0.05$, 95% CI= -0.08 to -0.02, $p \leq 0.01$). Mental health significantly predicted reported disadvantages of drinking at all data collection points, except at wave six when self-esteem recorded at wave three was inputted into the regression model (see Tables 25, K.5 and K.11). Individuals with better mental health consistently reported fewer disadvantages of drinking. Additionally, individuals who used illicit drugs across all the regression models often reported more disadvantages of drinking.

Table 26
Regression model results for level of alcohol dependency

Predictor	Total level of alcohol dependency [95% CI]				
	W2	W3	W4	W5	W6
<i>Unadjusted model results</i>					
Self-esteem	-0.06*** [-0.08, -0.04]	-0.05*** [-0.07, -0.03]	-0.04*** [-0.06, -0.02]	-0.04*** [-0.06, -0.02]	-0.03*** [-0.05, -0.02]
Constant	14.70*** [12.28, 17.13]	12.77*** [10.03, 15.51]	10.77*** [8.28, 13.25]	10.25*** [7.59, 12.91]	9.20*** [6.54, 11.87]
Adj. R ² (n=)	0.10 (n=396)	0.07 (n=343)	0.06 (n=316)	0.05 (n=277)	0.04 (n=256)
<i>Age and gender adjusted model results</i>					
Self-esteem	-0.06*** [-0.08, -0.04]	-0.05*** [-0.07, -0.03]	-0.04*** [-0.06, -0.03]	-0.04*** [-0.06, -0.02]	-0.03*** [-0.05, -0.02]
Gender	-0.64 [-1.77, 0.49]	-0.80 [-2.02, 0.42]	-0.80 [-1.91, 0.30]	-1.32* [-2.52, -0.13]	-0.95 [-2.17, 0.27]
Age	-0.03 [-0.09, 0.03]	-0.02 [-0.08, 0.05]	-0.02 [-0.08, 0.04]	-0.01 [-0.08, 0.05]	-0.02 [-0.09, 0.04]
Constant	16.03*** [12.71, 19.35]	13.71*** [9.98, 17.43]	11.91*** [8.48, 15.34]	11.20*** [7.46, 14.93]	10.34*** [6.71, 13.98]
Adj. R ² (n=)	0.10 (n=396)	0.07 (n=343)	0.07 (n=316)	0.06 (n=277)	0.05 (n=256)
<i>Fully adjusted model results</i>					
Self-esteem	-0.03** [-0.05,-0.01]	-0.03* [-0.05,-0.01]	-0.02* [-0.04,-0.00]	-0.01 [-0.04,0.01]	-0.01 [-0.03,0.01]
Gender (RG: Male)	-0.99 [-2.08,0.10]	-1.10 [-2.32,0.12]	-1.14* [-2.23,-0.05]	-1.62** [-2.80,-0.44]	-1.35* [-2.57,-0.13]
Age	0.01 [-0.05,0.07]	0.03 [-0.04,0.10]	0.03 [-0.03,0.09]	0.01 [-0.06,0.08]	-0.01 [-0.08,0.06]
Religion (RG: Not religious)	0.16 [-1.01,1.33]	-0.40 [-1.73,0.93]	-0.14 [-1.34,1.06]	0.45 [-0.88,1.77]	0.10 [-1.20,1.40]
SES (RG: High)					
Intermediate	-0.07 [-1.24,1.10]	0.24 [-1.07,1.55]	-0.20 [-1.37,0.97]	0.31 [-0.98,1.60]	0.46 [-0.87,1.78]
Low	1.83** [0.54,3.11]	1.14 [-0.30,2.58]	0.65 [-0.64,1.94]	0.30 [-1.11,1.71]	1.29 [-0.15,2.73]
Marital status (RG: Married/Cohabiting)	1.14* [0.10,2.19]	0.31 [-0.87,1.49]	0.63 [-0.43,1.69]	0.30 [-0.86,1.47]	0.22 [-0.96,1.39]
Smoking (RG: Non smoker)	-0.28 [-1.33,0.76]	0.46 [0.70,1.62]	0.44 [-0.61,1.48]	-0.04 [-1.18,1.10]	0.24 [-0.93,1.41]
Drug use (RG: No drug use)	1.37* [0.30,2.44]	1.57* [0.35,2.78]	1.50** [0.39,2.60]	1.62** [0.43,2.80]	1.10 [-0.13,2.32]
Mental health	-0.06*** [-0.09,-0.03]	-0.05** [-0.08,-0.02]	-0.05** [-0.07,-0.02]	-0.06*** [-0.09,-0.03]	-0.05** [-0.08,-0.02]
Ethnicity (RG: White British)	0.01 [-1.33,1.35]	0.52 [-1.08,2.12]	0.93 [-0.50,2.37]	-0.22 [-1.83,1.39]	-1.06 [-2.68,0.56]
Constant	12.39*** [8.45,16.34]	10.48*** [6.00,14.96]	8.53*** [4.42,12.64]	9.19*** [4.75,13.62]	8.77*** [4.31,13.22]
Adj. R ² (n=)	0.19 (n=390)	0.12 (n=338)	0.13 (n=311)	0.11 (n=272)	0.09 (n=251)

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$; Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R²= Adjusted R-squared

Self-esteem values at all three waves significantly predicted level of alcohol dependency at all time points across the unadjusted regression models. Individuals with higher levels of self-esteem were more likely to have lower levels of alcohol dependency. This effect remained after adjustment for both age and gender. In the final fully adjusted models, self-esteem at

waves two and three remained a significant predictor for level of alcohol dependency at all time points (see Tables K.6 and K.12 in Appendix K). However, as shown in Table 26 baseline self-esteem was not a significant predictor of level of alcohol dependency at waves five and six, possibly suggesting self-esteem has a limited lag effect on alcohol dependency. At wave two self-esteem explained 10% of the variance in level of alcohol dependency, but this reduced to 4% by wave six.

In the fully adjusted models mental health significantly predicted level of alcohol dependency when self-esteem at all three time points was entered into the regression models. The general trend indicated that those with poorer mental health were more likely to have higher levels of alcohol dependency. Additionally, individuals who used drugs were significantly more likely to have a higher level of alcohol dependency – except at wave six when baseline self-esteem was entered as a predictor. When baseline self-esteem was entered into the fully adjusted model, individuals of a low socio-economic status were significantly more likely to report higher levels of alcohol dependency at wave two only ($\beta = 1.83$, 95% CI= 0.55 to 3.10, $p \leq 0.01$). Furthermore, gender (specifically being male) was a significant predictor of alcohol dependence at waves four, five and six (when baseline self-esteem was entered as a predictor). This lagged effect was also found for the regression models which included self-esteem at waves two and three into the regression models (see Tables K.6 and K.12 in Appendix K). When baseline self-esteem was entered in the models, the variance explained in level of dependency was 19% at wave two and reduced to 9% by wave six.

Sensitivity Analyses

As highlighted above only 229 participants provided data at every wave of the study (46 % of the original sample). Therefore, a sensitivity analysis was carried out *post hoc* to compare the results of participants who had data recorded at every time point to those with missing information at least one time point. An initial comparison of the means of these two

samples suggested that the pattern of alcohol consumption, level of dependency and attitudes towards alcohol were very similar (see Tables L.1-L.6 in Appendix L). Overall mean alcohol consumption decreased over time, which is consistent with the results of other large-scale cohort studies (Britton, Ben-Shlomo, Benzeval, Kuh, & Bell, 2015). In line with this both samples level of alcohol dependency also decreased.

To determine the extent to which attrition over time may have biased the findings presented in the Results chapter, the primary longitudinal regression analysis was also re-run limited to only participants who attended every wave of data collection (see Tables L.7-L.12 in Appendix L for the full regression results). The findings from this analysis indicated that the regression coefficients in the fully adjusted model were very similar, compared to when the whole sample was included in the regression models, indicating little evidence of distortion of effect and therefore the latter results were preferred given their greater statistical power.

5. Discussion

5.1 Chapter Introduction

This chapter will focus on summarising the findings, discuss them in relation to previous research and consider the theoretical and clinical implications of this thesis. The strengths and limitations of this study will also be reflected upon, as well as recommendations for future areas of research.

5.2 Summary of findings and comparison to other studies

5.2.1 Summary statistics and self-esteem measure analyses

The descriptive statistics show that the participants of this study were predominantly male, White British, middle aged and from a range of social classes. The average self-esteem score of 138.15 at baseline was similar to a sample from the general population (Robson, 1989) and significantly higher than average scores reported in adult psychiatric and alcohol dependent patients (Robson, personal communication, 21st November 2017). This suggests that most of the participants from this study had normal (and potentially relatively good) levels of self-esteem at the outset of the study. At baseline, the BUHD participants average weekly consumption of alcohol was around six times the current UK weekly limit of 14 units (Department of Health, 2016). However, their average score on the LDQ of 7.36 was almost identical to the mean scores of a sample of university students conducted in a previous study and much lower than the mean score of 16.30 found in people attending an alcohol treatment centre in the UK (Raistrick, et al., 1994). This suggests that despite the overall heavy drinking levels of participants in this study, the sample had low levels of self-reported alcohol dependency (although these results were not validated by other people such as clinicians or family members). This relatively low level of alcohol dependency also potentially explains the limited number of disadvantages of drinking reported (in comparison to the advantages of drinking). This is because a diagnosis of alcohol dependence is not based on the amount of

alcohol consumed but as to how much alcohol is affecting the person's life and the extent to which they are prioritising it over other parts of their lives (WHO, 1992). When comparing the results of this study with the previous literature it is therefore important to bear in mind this samples' characteristics including the high levels of alcohol consumption but low dependency and relatively normal levels of self-esteem. This means that this sample are not likely to be typical of people attending mental health services (based on the self-esteem score) or alcohol treatment services (according to the low levels of dependency and self-esteem score).

In comparison to an average British population of a similar age (Jenkinson, Coulter, & Wright, 1993), the BUHD participants overall functioning was at an average level based on the SF-36 results. However, they scored lower than would be expected on the mental health scale and having role limitations due to emotional problems. This suggests that their general mental health could be viewed as poorer than the general population. 75% of the sample reported they had religious or spiritual beliefs. Given the high level of drinking in this sample this result was unexpected as many religions forbid the use of substances and previous research has shown that students with higher spiritual wellbeing drink less alcoholic drinks per day (Hammermeister & Peterson, 2001). However, those with higher spiritual wellbeing had higher levels of self-esteem. Additionally, just over half the sample were smokers and had used illicit drugs in the past year. It is possible that illicit drug use may be higher than this reported figure as participants were only asked if they had used illicit drugs over the past year, although they were re-interviewed every two years. This level of drug use is much higher than the UK general population – in 2016 it was reported that 9% of adults aged 16-59 had taken a drug in the past year (National Statistics, 2017). Given the heavy alcohol consumption of this sample the high proportion of tobacco and illicit drug use is not unsurprising. Poikolainen et al. (2001) reported relief smoking (measured by asking

participants to indicate if they smoked when they were nervous) significantly predicted both frequency of alcohol consumption and consumption of 13 or more drinks in one sitting. Also, Ghindia and Kola (1996) found cannabis and cocaine use significantly correlated with alcohol use. However, studies have reported drug use is typically associated with lower levels of self-esteem (Ghindia & Kola, 1996; Nyamathi, et al., 1998), as opposed to the higher levels of self-esteem found in this sample. Additionally, from a theoretical perspective using either the stress-dampening model (Levenson, et al., 1980) or Fennell's cognitive model of low self-esteem (Fennell, 1998) this combination of high alcohol consumption and relatively high proportion of tobacco and drug use is unexpected alongside normal levels of self-esteem. The results from the cross sectional and longitudinal analyses which will be commented on in sections 5.2.2 and 5.2.3 will attempt to make sense of the possible mechanisms underlying these factors for the BUHD participants.

As part of this thesis, the reliability and the stability of the self-esteem measure was examined. The results of the t-tests suggested that there was a significant difference between self-esteem at baseline and wave three and between waves two and three. However, upon inspection of the means it was found that the differences were relatively small (the mean difference between baseline and wave three was 4.58 and between waves two and three was 3.16; see section 4.5). The significant difference in results is therefore likely to be due to the large sample size, as opposed to clinical significance. Thus, the similar scores in overall self-esteem at each time point combined with the high significant correlations between self-esteem at the three different time points suggested that self-esteem remained relatively stable over time. This is interesting as research has suggested self-esteem can fluctuate following life experiences (Baumeister et al., 2003) but these results indicate self-esteem is a relatively stable trait. Additionally, the scale was found to have good internal reliability, as indicated by

the high Cronbach's alpha values. This suggests that this questionnaire is a reliable measure of self-esteem in this specific population.

5.2.2 Cross sectional analyses

The results of the correlation analyses indicated that participants with lower self-esteem drank more alcohol on a weekly basis and had higher levels of alcohol dependency. This is in contrast to findings reported by Zeigler-Hill et al. (2013) who noted no significant correlations between the amount of alcohol consumed and self-esteem in a student population. However, they did report harmful drinking patterns negatively correlated with self-esteem which is similar to other research conducted by Tyssen et al. (1998) who found hazardous drinking was significantly predicted by low self-esteem. Also, the results of this thesis showed that those with poorer mental health drank more alcohol, had a higher number of binge drinking days, reported more disadvantages of drinking, higher levels of alcohol dependency and lower self-esteem. Other cross sectional studies have reported similar results with regards to all of these outcomes in both populations of clinically alcohol dependent patients and students (DeSimone, et al., 1994; Lewis & O'Neill, 2000; Silvia et al., 1988; Tucker, et al., 2005). Additionally younger participants from the BUHD cohort tended to drink more, have less abstinent days, partake in more binge drinking days and report fewer disadvantages of drinking. This heavier level of drinking is similar to those reported in university student surveys, despite the BUHD participants sample being older than this population. Additionally, being from a low socio-economic group was a significant predictor of drinking more alcohol, having a higher number of binge drinking days, reporting more disadvantages of drinking, having higher levels of alcohol dependency and lower self-esteem. Previous studies have found that lower levels of education was negatively associated with drinking frequency (Neff, Prihoda, & Hoppe, 1991; Seeman & Seeman, 1992) and for

patients who had undergone treatment for alcohol use, self-esteem at follow up was likely to be lower if they had lower levels of education (Trucco et al., 2007).

The results of the cross sectional regression analyses showed that after controlling for multiple sociodemographic and clinical factors, self-esteem was only a significant predictor of two alcohol outcomes - reported disadvantages of drinking and level of alcohol dependency. Individuals with lower self-esteem reported more disadvantages of drinking and had higher levels of dependency. This link between disadvantages of drinking and self-esteem is unsurprising given that previous research has found that self-efficacy is strongly related to attitudes towards drinking (Cooke et al., 2016). However, it should be noted that although self-efficacy and self-esteem overlap significantly they have different definitions (see section 2.3 for a further discussion of this). These results are supported by previous research found in both clinical and student populations. Zeigler-Hill et al. (2013) also reported that in a sample of students', self-esteem negatively correlated with negative consequences of alcohol use but not total amount consumed. It is possible therefore based on the theory of planned behaviour (Ajzen, 1991), individuals with lower self-esteem still drink alcohol as they feel they must comply with the subjective norm behaviour and this outweighs even high numbers of disadvantages (i.e. attitudes towards the behaviour). Given that patients diagnosed with alcohol dependence generally have lower self-esteem than those who are not dependent (Beckman et al., 1980; Turnbull, & Gomberg, 1990) these results that low self-esteem predicted level of alcohol dependency could be viewed as not particularly surprising. However, it should be remembered that the BUHD participants had overall very low symptoms of alcohol dependence and were not patients attending treatment centres.

The other variables adjusted for were not consistently significant predictors for all of the alcohol outcomes. Although males were significantly more likely to drink more units, gender was not found to be a predictor of either abstinent days or binge drinking days.

5.2.3 Longitudinal analyses

The findings from the longitudinal analyses will now be summarised. As previously discussed in sections 2.5 and 2.6, there is a paucity of longitudinal studies completed examining the longitudinal impact of self-esteem on alcohol consumption, which makes comparison with previous literature more challenging. The results of the fully adjusted regression models for the outcome total weekly units suggested that individuals with higher levels of self-esteem (across all three waves self-esteem was assessed at) tended to drink more alcohol on a weekly basis. These results are not consistent with Poikolainen et al. (2001) who found self-esteem was not a significant predictor of overall alcohol consumption. Potential reasons for this difference could be because Poikolainen et al. (2001) recruited a much younger sample or that the self-esteem levels differed between the samples. However, as Poikolainen et al. (2001) did not report the mean self-esteem levels it is impossible to compare this with the BUHD cohort. The level of predictability self-esteem had for the number of weekly UK units drunk gradually increased over time until wave four, following which the linear effect began to reduce. This reduction in effect size could be due to either reduction in the overall sample size due to attrition or potentially a high proportion of heavier drinkers not being retained specifically. Partial support for this hypothesis comes from the finding that in the final sample interviewed at wave six participants drank significantly less alcohol on a weekly basis, compared to the baseline sample (Rolfe et al., 2009).

Additionally, individuals with higher levels of self-esteem consistently reported a lower number of abstinent days over time, although the effect reduced over time. This is not consistent with the findings of the heavy drinkers systematic review included in chapter two of this thesis, which collectively indicated a null association between alcohol consumption and self-esteem (although these results were from a combination of cross sectional, case-control and longitudinal studies). However, only one of the ten studies reported average

weekly alcohol consumption (Testa & Dermen, 1999) and this study did not complete any regression or longitudinal analyses and used a cross sectional design. Furthermore, none of the studies reported the number of abstinent days in the past week or year, which makes the results impossible to compare to previous literature. Of note, the cross-sectional results of this study indicated that baseline self-esteem was not a significant predictor of baseline number of abstinent days, after adjustment for all the sociodemographic and clinical variables. Thus, the combination of the cross-sectional results and the longitudinal analyses of this study results that only 0-1% of the variance in number of abstinent days was explained by self-esteem alone suggests that self-esteem had very low predictability for number of abstinent days.

The longitudinal results also suggested that self-esteem did not significantly predict the number of days women drank seven or more units or men drank 10 or more units uniformly during observation. This result is similar to Poikolainen et al. (2001) who reported that drinking 13 drinks in one sitting was not significantly predicted by self-esteem. However, it was noted that after full adjustment, baseline self-esteem was a significant predictor of this alcohol outcome a decade later at wave six only (those with higher levels of self-esteem reported drinking more often at this level) and prior to this although the results were not statistically significant, individuals with higher self-esteem were more likely to drink at this heavier level. It is interesting this increase in effect size at wave six occurred, despite participants interviewed at the final wave having significantly less heavy drinking days, compared to the baseline sample (Rolfe et al., 2009). This highlights the impact self-esteem may have on binge drinking even after several years. Of note, the results of this thesis indicated those who smoked at baseline drank significantly more often at this heavier level, which Poikolainen et al. (2001) also reported.

Self-esteem was not found to be a significant predictor for advantages of drinking in any of the analyses. Additionally, none of the other variables adjusted for were found to be

consistent predictors of this alcohol outcome. This raises questions as to whether the correct predictors for advantages of drinking were highlighted in the narrative review (see section 2.5) conducted for this thesis. It could be argued that reporting a large number of advantages indicates attributing positive consequences to an external object. This suggests a low internal locus of control, more typical of people with lower self-esteem. Thus given the BUHD participants had on average normal levels of self-esteem this may be the reason why self-esteem was not found to predict reported levels of advantages. Further research should consider investigating a wider array of variables to better understand this result.

After adjustment for age and sex only, baseline self-esteem was found to be a significant predictor of reported disadvantages of drinking at all data collection points however, the effect size was significantly reduced after adjustment for other sociodemographic and clinical variables. The increased amount of variance explained at each wave increased from between one and 11% at different waves suggesting these variables accounted for a significant amount of the variance. Participants were more likely to report more disadvantages of drinking if they had lower self-esteem, used illicit drugs and had poorer mental health. This combination of predictors suggest that from a clinical perspective these clients are likely to be more chaotic if they present at services for treatment and thus care would need to be taken to engage them. Yet if these clients do attend services and already report a number of disadvantages of drinking it may be that psychological interventions which build on these beliefs they have about the disadvantages of drinking may be helpful for them to reduce their alcohol use. This could include CBT (Beck, 2011) or motivational interviewing (Miller & Rollnick, 1991), both of which are recommend by NICE guidance (NICE, 2011). These results replicate previous cross sectional findings by Hammer and Pape (1997) who found that cannabis use significantly positively correlated with problems attributed to drinking in a student population. However, as most studies don't

measure disadvantages of drinking, it is difficult to compare these results with previous longitudinal research.

Finally, participants with lower self-esteem reported higher levels of alcohol dependency, although this effect size diminished over time. It could be hypothesised this drop in effect size was due to a high proportion of more dependent drinkers leaving the study (perhaps to enter treatment) but previous analyses have shown this is not the case (Rolfe et al., 2009). This finding replicates similar results reported by Huurre et al. (2010) who reported that lower self-esteem at age 16 predicted more problematic drinking (based on the Alcohol Use Disorder Identification Test) 16 years later. This replication occurred despite the use of different measures to record levels of alcohol dependency. At wave two baseline self-esteem accounted for 10% of the variance (increasing to 19% after full adjustment) suggesting self-esteem accounted for a significant amount of variance in levels of alcohol dependency.

In summary, self-esteem was a significant predictor of some alcohol outcomes over time but not others. There was evidence that after adjustment, individuals with higher self-esteem drank higher amounts of units over a week and had lower number of abstinent days. Individuals with lower self-esteem reported more disadvantages of drinking and were more likely to report higher levels of alcohol dependency over 10 years. Self-esteem was not a consistent significant predictor for reported advantages of drinking or number of days drank at a heavier level (7+/10+ units).

5.3 Strengths and limitations of this study

5.3.1 Design

This study was an analysis of existing data from a prospective cohort study. The use of this design had a number of advantages. The BUHD was a large cohort study which

required a team of researchers to collect, clean and enter data into a database for over a decade and a significant amount of funding, the data of which was utilised for free by the researcher to answer important clinical questions. It allowed the researcher to investigate the effect of self-esteem on multiple alcohol outcomes over ten years in untreated heavy drinkers which is a substantially neglected research area (Dalton & Orford, 2001). Heavy drinkers are often underrepresented in population level surveys and cohort studies (Bell, 2013), thus having this amount of data on this sample size of heavy drinking individuals is particularly unusual within the alcohol research field. Also, the use of this design allowed for a large amount of data to be collected, including a number of alcohol variables. This meant that the effect of a number of confounders on six different alcohol outcomes was explored in this thesis, which as highlighted above is rarely completed. Additionally, participants admitted to heavy drinking when they were recruited, which potentially reduces the chance of underreporting due to embarrassment which is a concern when collecting data of a more sensitive nature (Krumpal, 2013).

However, one disadvantage of this design is that the researcher relied upon other researchers to collect and correctly enter a large amount of data. In order to check data entry the researcher for this project completed data cleaning to check for scores outside plausible ranges and also computed the total scores for some measures (such as the LDQ). However, as the researcher did not have access to the original questionnaires they were unable to check some of the data for inaccuracies. It should be noted though that the original researchers who collected data for this study were trained, had regular supervision and tapes of interviews with participants were regularly monitored for quality. As the researcher utilised existing data from a cohort study they were restricted to utilising the measures used by the BUHD study team. However, all of the scales used in this study either had high validity and reliability ratings (such as the Robson self-concept questionnaire) or were specifically created for this

study (such as the measurement of the disadvantages of drinking) suggesting they had high face validity and were potentially more clinically useful in comparison to questionnaires not applicable to this population.

Another limitation of this study design is that inevitably some participants are not followed up at each time point. At the final follow-up 35% of the original sample were not accounted for. When the final sample at wave six and baseline sample were compared a number of significant differences were found between the two samples. It has been reported that those who dropped out of the study were more likely to: drink more alcohol (when measured by total weekly units); be using Class A drugs at baseline; have appeared in court in the last year; have been in a fight or ejected from a licensed premises whilst intoxicated; have engaged in aggressive behaviour after drinking (Rolfe et al., 2009). Surprisingly, based on the readiness to change questionnaire (Rollnick, Heather, Gold, & Hall, 2010) they were also more likely to be categorised as in the 'action' stage in regards to wanting to change their drinking (indicating they had made a commitment to change and had taken some action to do this). It could be speculated that if the participant was preparing to change their drinking habits they may have potentially been ashamed of their drinking habits suggesting potentially they had lower self-esteem and were thus less likely to decide to participate during the later stages of data collection. The difference between participants recruited in the initial baseline sample and those retained at wave six on a number of key variables could lead to the production of skewed analyses which could significantly impact on the generalisability of the findings (Delgado-Rodríguez & Llorca, 2004) of this research in a heavy drinking population. However, it should be noted that despite some participants not being interviewed at all the stages of data collection, this study was still able to measure the longitudinal impact of self-esteem and multiple other variables on six different alcohol outcomes over a ten year time period, in a sample which is underrepresented in the current research literature.

5.3.2 Methodology

5.3.2.1 Measures utilised

5.3.2.1.1 Measurement of self-esteem

Self-esteem was measured in this study using the Robson self-concept questionnaire. As previously outlined in section 3.5 this questionnaire has previously been reported to have good reliability in general and clinical populations (Robson, 1989) and analyses conducted during this project suggested that this is true in this specific population. However, this questionnaire is not commonly used in comparison to other questionnaires such as the Rosenberg self-esteem scale and in fact during the literature search carried out for this thesis only one other study reported using this questionnaire. This makes it difficult to compare the results with the majority of other studies which used other questionnaires given that self-esteem does not have a clear definition and thus the questionnaires may be based upon different concepts (Baumeister et al., 2003). It has also been reported that when self-esteem is measured using different questionnaires skewed distributions are typically reported, with most participants scoring significantly above the midpoint of the scale (Baumeister, Tice, & Hutton, 1989). This can lead to the correlational relationship between self-esteem and other covariates being underestimated as correlations with skewed distributions tend to be smaller (Baumeister et al., 2003). However, the skewness value of self-esteem at baseline was -0.31 and the kurtosis value was 2.96, suggesting that this distribution was not significantly skewed. This implies that the Robson self-concept questionnaire does not produce a skewed distribution of results in this study population.

Given the unclear definition of self-esteem it could be viewed as difficult to subjectively measure as a whole concept. Multiple factor analyses have been conducted to investigate whether the Robson self-concept questionnaire could be viewed as being comprised of separate sub-scales and thus different components. Based upon face validity

alone it has been suggested the scale comprises of seven scales (Robson, 1989) but factor analysis of 200 participants from a non-clinical population suggested that this questionnaire comprises of five factors – ‘attractiveness, approval by others’, ‘contentment, worthiness, significance’, ‘autonomous self-regard’, ‘competence, self-efficacy’ and ‘the value of existence’ (Robson, personal communication, 21st November 2017). However, this finding is not consistently observed across different populations. For example, Ghaderi (2005) conducted principal components analysis in three separate samples from Sweden (a representative sample of young women, students and a clinical sample) and reported that their analysis revealed a five factor structure that accounted for 48% of the variance but these factors differed from those reported by Robson (personal communication, 21st November 2017). Addeo, Greene and Geisser (1994) reported a three factor solution in a sample of US students (which accounted for 33% of the variance). Thus, the factors in this questionnaire do not appear to be universal and as such it was considered that analyses using specific factors would likely be problematic and therefore findings are reported for the total score only.

5.3.2.1.2 Measurement of alcohol consumption levels

This study measured a number of variables related to the specific levels of alcohol consumption. Alcohol use is a difficult variable to measure accurately as drinking patterns for one individual typically change depending on the day of the week, special occasions and the time of year (Bellis et al., 2015). The combined use of the Time Line Follow Back form which takes into account both a person’s typical drinking habits and drinking at special occasions alongside other questions as part of a structured interview meant that alcohol consumption was less likely to be under-estimated in this cohort study, which can occur with some other means of assessing alcohol consumption (Dawson, 1998; Rehm et al., 1999). However, one limitation of this measure is that it is based upon self-report particularly given this sample consisted of exclusively heavy drinkers as they have been shown to under report

their alcohol consumption levels (Boniface, Kneale, & Shelton, 2014; Livingston, & Callinan, 2015). This can be in part due to fears the researcher will negatively judge the participant for their alcohol consumption levels. Other reporting biases can also occur if participants feel the researcher desires a particular answer from them can ‘collaborate’ with researchers and give answers in the direction they perceive are of interest (Delgado-Rodríguez & Llorca, 2004). However, it could be argued though that as all participants admitted at recruitment to being heavy drinkers and the interview was conducted with a non-judgemental objective researcher (as opposed to potentially a clinician whom they may of felt would judge them for engaging in potentially health damaging behaviours) the effects of this were reduced.

However, despite the efforts made by the BUHD study team to maximise the validity of the alcohol frequency measures, there is still potential for reporting biases (possibly in part due to memory difficulties of participants) to have affected the data collection (Leffingwell et al., 2013). One alternative method of measuring alcohol consumption is to use objective measures such as biomarkers of heavy alcohol use in blood, urine or hair. For example, Gamma-glutamyltransferase (GGT) is a liver enzyme which is known to rise after drinking heavily for several weeks and testing for this enzyme through a blood test is inexpensive (Allen, Sillanaukee, Strid, & Litten, 2004). Elevated levels of this enzyme typically indicate continuous patterns of drinking rather than heavy episodic periods. This is one of the most widely used markers for alcohol abuse in clinical settings (Allen, et al., 2004). Given the drinking patterns of the BUHD cohort who drank at high levels but had few abstinent days (more indicative of a pattern of continuous heavy drinking) this measure could potentially have been a suitable measure for alcohol use in this cohort study. However, GGT levels may also rise due to other health conditions including obesity, diabetes and hepatobiliary diseases (Sillanaukee, 1996). Additionally, alcohol biomarkers are not typically measured in cohort

studies (Bell, 2013) and they were not measured in the BUHD. The ethics of measuring them in future cohort studies would need to be balanced with the ethics of asking participants to complete a potentially unnecessary invasive task. Additionally, the measurement of biomarkers alone (such as GGT) does not provide information on the patterns of the person's drinking and provides limited sensitivity and specificity (Conigrave, Davies, Haber, & Whitfield, 2003). One possible non-invasive measure for future cohort studies is the use of transdermal sensors alcohol that is excreted through the skin (Leffingwell et al., 2013) but this method of measuring alcohol consumption is also subject to individual differences in results and costs.

5.3.2.1.3 Measurement of advantages and disadvantages of drinking

As discussed in section 3.5.2 of this thesis, the BUHD project measured participant's perceived advantages and disadvantages of drinking through a measure designed specifically for this study (Orford et al., 2002). A new questionnaire was designed as it was felt no other standardised questionnaires were suitable, which measured perceived benefits and disadvantages of drinking in both a structured and less structured way. The areas of life participants were asked about was devised through an analysis of the content of existing measures and from conducting preliminary interviews with heavy drinkers (Orford et al., 2002). It could be argued that the use of this scale is particularly clinically relevant as it allows the impact of alcohol on multiple areas of an individual's lives to be measured. This may link with people's motivations to change compared to traditional methods used by doctors such as physical health checks. It should be remembered that this measure has not been standardised so although the face validity is high, the exact validity and reliability values are unknown. However, at baseline the BUHD study team interviewed 50 family members of the original sample and utilised this questionnaire as part of the interview (Rolfe et al., 2009). The results showed that although the family members recognised significantly

less benefits than the participants, they did report a similar number of disadvantages of drinking.

5.3.2.1.4 Measurement of level of dependency

Level of alcohol dependency was measured by the LDQ (Raistrick, et al., 1994). Although this questionnaire has been validated in a number of samples who drink alcohol (Raistrick, et al., 1994), it has had limited use within heavy drinkers populations not seeking treatment. Additionally, it has been noted that for people seeking help the LDQ offers a good measure of substance use but for those who are socially stable, employed and have functional families heavy drinking is less well correlated with dependence (CLAHRC, n.d.). Given that 57% of the sample were employed and 66% of the sample were in a relationship at baseline the sample could be more likely to score lower than someone drinking at the same level of consumption but who was single and unemployed.

5.3.2.1.5 Measurement of co-variates

It could be argued that most of the covariates measured (such as illicit drug use) are subject to the same reporting biases as highlighted above for the other variables. However, as the narrative review completed found evidence they were all associated with alcohol use and self-esteem independently this is unlikely to have significantly biased the results of this thesis. Mental health was measured using the SF-36 which has been found to have high reliability and validity in many populations including alcohol dependent patients (Daeppen, Krieg, Burnand, & Yersin, 1998), although not necessarily heavy drinkers without dependence. However, the narrative review found much more evidence for the relationship between depression, alcohol use and self-esteem than other mental health conditions. In spite of this finding as the BUHD did not administer a separate measure of depression this could not be specifically controlled for. It was considered whether the researcher could utilise items which only measured depression from the mental health sub-scale. However, closer

inspection of this scale suggested that only two items ‘(Have you felt so down in the dumps that nothing could cheer you up?’ and ‘Have you felt downhearted and blue?’) reported as depressive symptoms only (as opposed to anxiety). Additionally, there are no known reported studies which have looked at the validity and reliability of these items alone. Thus, mental health as a whole was measured using the mental health subscale of this measure.

5.3.2.2 Sample

As highlighted earlier the BUHD project is a unique cohort which recruited adults in the community drinking alcohol at very heavy levels but who were not seeking treatment for their consumption, which is a previously under-researched area. However, the sample recruited could be seen as a particularly niche one which makes it difficult to generalise the results of this study to other populations. As highlighted in section 2.6.3.2 of this thesis, the definition of heavy drinkers varies greatly, thus the results may not generalise to other heavy drinking populations. The BUHD used a definition of heavy drinkers being women who drank 35 units or more per week and men who drank 50 or more per week which is not a drinking limit set by the UK or any other country, which makes comparisons with other studies more difficult. In addition, this sample was recruited from a narrow geographical area around Birmingham in the UK, which is a particularly ethnically diverse area compared to the rest of the UK. In 2001 (four years after the study began) 66% of Birmingham residents were reported to be of White ethnicity and Birmingham is also a very deprived area (Department for Communities and Local Government, 2014). However, as 84% of the cohort at baseline reported that their ethnicity was White UK this suggests that the BUHD baseline sample was not necessarily representative of the local area. Although the mean mental health score of BUHD participants is lower than would be expected in a general population (Jenkinson et al., 1993), they scored much higher in mental and physical health when compared to an alcohol dependent population (Daeppen et al., 1998). This raises questions

about where this sample could potentially receive interventions from as they may be unlikely to attend either a specialist mental health or alcohol treatment service, especially in the current NHS climate of under-resourced services in which only the clients who are judged to be clinically more severe are treated in a specialist service. Thus, this sample may be far more likely to receive treatment for their alcohol use in a primary care setting.

5.3.2.3 Statistical analysis

Prior to undertaking any analysis for this thesis, a large narrative search was completed to help identify potential confounders in the relationship between alcohol use and self-esteem. However, it is possible that not all the potential confounders were considered during this process as the review was limited by a number of biases and based on previous published research only (Fekjaer, 2013) which could have led to residual confounding effects. Additionally, the narrative search showed that both childhood abuse and social support were independently associated with self-esteem and alcohol use but neither of these variables were controlled for as part of the statistical analysis due to not being available in the BUHD database. Childhood abuse was not controlled for as this was not discussed with participants and there was no direct measure of social support. It was considered whether social support could be measured by creating a new binary variable indicating if the participant was currently in a romantic relationship or not. However, since marital status was already being entered as a predictor into the regression models this would have led to multi-collinearity which would have biased the results. Additionally, the measurement of social support through the use of a variable looking at whether the person was in a romantic relationship or not would have excluded participants who were not in a romantic relationship but who had significant social support from friends and/or family.

The longitudinal analysis completed for this thesis involved fitting a series of multiple linear regression models, in a form similar to several quasi-experiments. One alternative

method of analysis that was considered during the design of this study was linear mixed models. The use of these models would have allowed for adjustment of relevant variables but also accounted for the correlations between repeated measurement from individual participants and the characteristics that vary between participants (Detry, & Ma, 2016). However, it was decided by the researcher that the first analysis option would be utilised as it not only allowed multiple potential confounders to be controlled for but the researcher could also accurately estimate the effect of the predictors at each wave (in comparison to linear mixed models which would have reported a single estimate of effect). This allowed for a more visual pattern of the overall effect size and how it changed for the different predictors at several time points. However, care needs to be taken to view the results overall as a full picture as the multiple results could be viewed as more confusing.

Complete case analysis was completed for all of the regression models. This means that participants who had either not been followed up at that time point or who had incomplete data for the variables of interest would not have been included in the analysis. This limited the sample size at times which would have impacted on the significance levels and it has been argued complete case analyses are inherently biased (Hernan, Hernández-Diaz, & Robins, 2004). One possible alternative would have been to impute data. However, it is unlikely that participants who were lost to follow up could be classified as missing at random which makes this more problematic and therefore bias in the estimates are likely to have been the same or greater than complete case analyses (Sterne et al., 2009). Additionally, given that the retention rate was 52% at wave six it could be argued imputation of data for all these missing individuals would have potentially created a significant bias. Thus, it was decided data would not be imputed.

It was noted that there was evidence of statistical suppression for the outcome of total weekly units in the longitudinal analysis. Suppression is indicated if the strength of a

relationship between two variables increases when a third variable is adjusted for (MacKinnon, Krull, & Lockwood, 2000). After adjustment for multiple sociodemographic and clinical variables the effect size for self-esteem increased significantly across all five consecutive data collection waves. The effect size reduced at wave six, this could potentially be due to the reduction in sample size. This result is in contrast to results reported by Poikolainen et al. (2001) who reported self-esteem was not a significant predictor of higher alcohol intake in heavy drinkers. However, although this study adjusted for a number of the same variables including gender and social status utilised in the researcher's regression models, it did not adjust for a number of others including mental health, age and religion. This could explain the difference in these results.

5.4 Implications of the study

This work suggests that heavy drinkers with lower self-esteem are more likely to develop higher levels of alcohol dependence over a 10 year period of time, as baseline self-esteem accounted for up to 10% of the variance in levels of alcohol dependency. Having higher levels of self-esteem may therefore be considered as potentially protective against developing alcohol dependency. Therefore, one clinical implication of this is that clinicians could target self-esteem for an intervention in order to reduce the risk of an individual developing alcohol dependence at a later date. In addition, it is possible that if a person receives treatment for alcohol misuse they may benefit from an intervention targeting self-esteem to reduce their chances of a more severe relapse if this does occur. There are limited policy guidelines that focus on the improvement of self-esteem as such, although this has recently been advocated in the public domain with campaigns such as the Dove Self-Esteem Project (Dove, n.d.). However, there is pressure on alcohol treatment services to treat more people with alcohol dependency. NICE and the Department of Health have recommended a target of 15 % of alcohol dependent drinkers receiving treatment in comparison to the 6%

which currently do (APPG, 2016) suggesting this is an area that requires more public investment. The All Party Parliamentary Group on Alcohol Misuse manifesto 2015 (APPG, 2016) highlighted that spending more money on this group of individuals could save the UK economy approximately £9.3 million pounds a year. Thus, it should be emphasised to policy developers that intervening more in these populations is likely to not only to have a positive effect for the individual but also be cost saving to the NHS long-term.

The results of this study showed that over time people with higher self-esteem were more likely to drink higher amounts of alcohol on a weekly basis but not have higher levels of alcohol dependence. Additionally, poorer mental health was not a significant predictor of this outcome. This is despite clinical literature such as Fennel's model of low self-esteem (Fennell, 1998) which suggests that people with low self-esteem may engage in 'unhelpful behaviours' such as substance use to cope with situations. Therefore, clinicians should not assume that if clients are engaging in health damaging behaviours that they have low self-esteem and it is crucial they investigate the reasons behind their drinking patterns for each individual. A review of the literature found that the attitudes component (which includes the individual's positive or negative evaluation of performing the behaviour) of the theory of planned behaviour (Ajzen, 1991) is the strongest indicator of whether a person will drink alcohol (compared to perceived behavioural control and subjective norms) (Cooke et al., 2016) suggesting this should be explored with individuals. This can be completed within an individual formulation, which should always be created in Clinical Psychology practice. For example, if completing an assessment for Cognitive Behavioural Therapy (CBT) the person's reasons for drinking could be explored in the context of their beliefs about themselves, others and the world. Thus one person may report drinking as they believe this is an enjoyable way to socialise in a world they perceive as safe whereas another person may report drinking to cope with social anxiety as they believe others may be critical of them otherwise. Clinicians

should be aware that clients who report a high number of disadvantages of their drinking are more likely to have a lower sense of self-esteem. However, it should not be advocated to clients that if they drink alcohol at heavy levels and report many advantages of drinking but have high self-esteem they should continue to do this. This is due to both the physical health complications which can be caused by heavy drinking (Barclay, Barbour, Stewart, Day, & Gilvarry, 2008) as well as the link between alcohol misuse and development of poorer mental health (Grant, et al., 2004; O' Hare, 1995).

Participants with lower mental health scores were more likely to report a greater number of disadvantages of drinking and higher levels of alcohol dependency. This suggests that individuals with poorer mental health may be more vulnerable to the negative effects of alcohol. Currently mental health and addiction services are usually separated in the NHS (Morley et al., 2015) however, these results suggest that more integration of these services should be implemented so that psychoeducation and brief interventions for alcohol use is easily accessible for all clients attending mental health services at a national level. The results of this study highlighted, as described in the previous literature, that individuals can be consuming alcohol at very high levels but not seek treatment from alcohol services. There is evidence that opportunistic brief interventions for alcohol are effective for reducing alcohol consumption in a wide range of primary care settings (Kaner, et al., 2009; Platt et al., 2016). This therefore indicates that brief interventions delivered by GPs and other primary care practitioners may be a potential way to offer individuals advice about reducing their drinking levels. To demonstrate clinical efficacy and cost-effectiveness those who receive these interventions should be followed up over longer periods of time than services traditionally use as the results of this study suggest the effects may have a lagged effect which would not typically be captured in a service which rapidly discharges patients.

The results of this study also indicated that participants from a low social class were more likely to have a higher number of days drinking at heavier levels and report more disadvantages of drinking over time. Health damaging behaviours are typically over-represented in the lower social classes (Elstad, 1998) and people living in deprived areas are disproportionately more likely to experience alcohol-related crime and alcohol-related health conditions (APPG, 2016). It could be argued that people from lower social classes are more likely to experience significant levels of stress as there is an association between inequality in society and negative emotions indicative of stress (Elstad, 1998). From a theoretical perspective they could be therefore seen as more likely to use alcohol to reduce this stress (Levenson, et al., 1980) which could explain the results found in this study. However, research indicates that this population are both less likely to approach mental health services for treatment and also that traditional interventions do not typically fully address the barriers that prevent them from engaging in treatment (Levy & O'Hara, 2010). Furthermore, when they do approach services they are less likely to be offered treatment, compared to middle class patients (Kugelmass, 2016). This suggests that interventions to reduce this high risk level of drinking in people from lower social classes may require a different approach, such as one based in the Community. The 'Time to Change' campaign is aiming to improve understanding of mental health in the community and reduce stigma of mental health through targeting community areas such as schools, employers and social media (Time to Change, n.d.). Thus people from lower social classes could be offered interventions for their drinking in the community as opposed to specialist services to help reduce treatment barriers.

5.5 Suggested directions for future research

Despite self-esteem being a field of interest for many years there is still not a consensus on the ideal definition for this concept. Additionally, it is hypothesised that self-esteem can be seen as an absolute value or consist of different components which are not

clear (Baker & Gallant, 1984). This confusion has led to multiple questionnaires being devised all purporting to measure self-esteem. Further research should therefore focus on defining the sub-components of self-esteem and the validity and reliability of measuring this across different populations.

The results of this thesis suggest that higher self-esteem is potentially a protective factor for alcohol dependency in heavy drinkers. However, self-esteem is not commonly measured in clinical trials of participants with alcohol dependence and low self-esteem in the NHS is usually treated within the context of a specialist mental health service. Thus conducting clinical trials which aim to target self-esteem in heavy drinkers and following up participants over a number of years to see whether their alcohol dependency levels increased or reduced may be helpful to further test this emerging hypothesis. The results of this will also have important clinical implications as highlighted above.

Many studies previously conducted have not appropriately adjusted for potential confounders. The results of this thesis indicate that for multiple alcohol related outcomes this is important to do as the effect size was seen to change significantly before and after adjustment. For example, Table 21 (see section 4.7) shows self-esteem was not a significant predictor of weekly units drunk in an unadjusted regression model two, eight and ten years later. However, after adjustment for multiple socio-demographic and clinical variables the effect size for self-esteem greatly increased at each wave and baseline self-esteem was a significant predictor for total weekly units drunk two, four, six and eight years later. This illustrates that in order to study the relationship further between alcohol use and self-esteem appropriate adjustments should be made in analyses, based on the current literature.

Future research could attempt to build on the work of this thesis by further investigating the pathways illustrated in the results through the use of mediation or

moderation analyses. Mediation analysis focuses on looking at potential links between the exposure variable and outcome of interest, through potential a third variable (MacKinnon et al., 2000). Future research could therefore focus on how self-esteem specifically influences the amount people drink or the possible pathways through which it is associated with level of alcohol dependency. This could lead to mediators being clinically targeted – for example if being in an abusive relationship was found to mediate this relationship this population could be targeted by setting up outreach clinics in the local areas. Conversely, moderation analyses estimates whether a third variable affects the strength and/or direction of the relationship between the exposure and outcome of interest (MacKinnon, 2011). Identification of potential moderators could lead to clinical targeting in the same manner as described for potential mediators.

5.6 Conclusion

The heavy drinkers in this cohort study had similar levels of self-esteem to students and individuals from the general population, as opposed to individuals receiving treatment for their alcohol use. The use of this unique cohort allowed the researcher to measure the longitudinal impact of self-esteem on multiple alcohol outcomes, whilst adjusting for multiple other variables. Over time, heavy drinkers with higher self-esteem were more likely to drink more alcohol on a weekly basis and have lower number of abstinent days. However, individuals with lower self-esteem were more likely to report more disadvantages of drinking alcohol and have higher levels of alcohol dependency. This population of heavy drinkers were also more likely to have lower levels of mental health. The variables which affect the relationship between different alcohol outcomes and self-esteem appear to vary based on the different outcomes. The results of this study have important implications for individualised formulations in clinical psychology. It should be emphasised that the BUHD is a unique cohort study thus these findings should be interpreted with caution until the results have been

replicated in alternate populations. These includes samples drawn from drinkers who are more dependent, from other areas of the UK and outside this country and from different age ranges.

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Appendices

Appendix A: The Robson Self-Concept Questionnaire

Name

Date:

This questionnaire deals with attitudes and beliefs which some people have about themselves.

Please indicate how much you agree or disagree with each statement by ringing the single number in each section which represents how you typically feel most of the time.

Since people vary so much in the opinions they hold, there are no right or wrong answers.

	<i>Completely Disagree</i>	<i>Disagree</i>	<i>Agree</i>	<i>Completely Agree</i>
1. I have control over my own life.	0	1	2	3
2. I'm easy to like.	0	1	2	3
3. I never feel down in the dumps for very long.	0	1	2	3
4: I can never seem to achieve anything worthwhile.	0	1	2	3
5: There are lots of things I'd change about myself if I could.	0	1	2	3
6. I am not embarrassed to let people know my opinions.	0	1	2	3
7: I don't care what happens to me.	0	1	2	3
8: I seem to be very unlucky.	0	1	2	3
9. Most people find me reasonably attractive.	0	1	2	3
10. I'm glad I'm who I am.	0	1	2	3
11: Most people would take advantage of me if they could.	0	1	2	3
12. I am a reliable person.	0	1	2	3
13: It would be boring if I talked about myself.	0	1	2	3
14: When I'm successful, there's usually a lot of luck involved.	0	1	2	3
15. I have a pleasant personality.	0	1	2	3
16. If a task is difficult, that just makes me all the more determined.	0	1	2	3
17: I often feel humiliated.	0	1	2	3
18. I can usually make up my mind and stick to it.	0	1	2	3
19: Everyone else seems much more confident and contented than me.	0	1	2	3

20: Even when I quite enjoy myself, there doesn't seem much purpose to it all.	0	1	2	3	4	5	6	7
21: I often worry about what other people are thinking about me.	0	1	2	3	4	5	6	7
22: There's a lot of truth in the saying "What will be, will be".	0	1	2	3	4	5	6	7
23: I look awful these days.	0	1	2	3	4	5	6	7
24: If I really try, I can overcome most of my problems.	0	1	2	3	4	5	6	7
25: It's pretty tough to be me.	0	1	2	3	4	5	6	7
26: I feel emotionally mature.	0	1	2	3	4	5	6	7
27: When people criticise me, I often feel helpless and second-rate.	0	1	2	3	4	5	6	7
28: When progress is difficult, I often find myself thinking it's just not worth the effort.	0	1	2	3	4	5	6	7
29: I can like myself even when others don't.	0	1	2	3	4	5	6	7
30: Those who know me well are fond of me.	0	1	2	3	4	5	6	7

Please check that you have responded to every statement

Appendix B: Example instructions for Timeline follow back questionnaire**INSTRUCTIONS FOR COMPLETING THE TIMELINE DRINKING CALENDAR**

Using the attached calendar, we would like you to reconstruct your drinking for the time period indicated on the calendar. This is not a difficult task, especially when you use the calendar for reference. We have found calendars useful in helping people recall their *drinking*. The following are instructions and tips for completing the calendar:

INSTRUCTIONS:

1. It is important that for *each* day listed on the calendar, there is a number *indicating the* number drinks you consumed. In reporting your total daily consumption, we would like you to report it in STANDARD DRINKS (use the standard drink equivalent card).
2. On the days that you did not drink any alcoholic beverages mark those days with a "0".
3. On the days that you did consume a beverage containing alcohol, write in the total number of Standard Drinks that you drank on those days. This includes days of combined beverage use. For example, if you drank a glass of wine with dinner and a drink containing 1-1/2 oz. of hard liquor after dinner, you would count that as 2 standard drinks for that day. **The important thing is to make sure that something is filled-in for each day.**
4. In filling out the calendar, we would like you to be as accurate as possible. However, if you cannot recall whether you consumed an alcoholic beverage on Monday or Thursday of a certain week, or whether it was the week of November 9th or the week of November 16th, **give it your best shot!**

The purpose of the calendar is to get as accurate a picture of what your drinking has been like for the indicated time period in terms of number of drinking days and number of drinks per day.

HELPFUL HINTS:

- A) If you have an **appointment book** or a **daily diary** available, you can use it to help you recall your drinking,
- B) As you will notice, **standard holiday days** are **marked on the calendar** to help your recall; you can also write in special holidays such as birthdays, vacations, celebrations.
- C) Some people have **regular drinking patterns** and this can help them in filling out the calendar. For example, you may have a **weekend/weekday change** in your drinking or your drinking may be different depending on the season, or whether you are on holidays or business trips.

ADDITIONAL SUGGESTIONS FOR ASKING FOR TIMELINE FOLLOW-BACK**INFORMATION:**

**Incarcerations or Confinements:*

When interviewing alcohol abusers, if they mention hospitalizations, treatment stays, or jail periods that occurred in the recall period, it is often easy to start with those events as they are discrete and time bound.

For example, the interviewer can ask: "You said that you were in a hospital sometime in the last year. What were the dates you were there? Did you have anything to drink during this time?"

NOTE: Stays in jails, hospitals, or residential treatment programs do not preclude frequent drug or alcohol use. Thus, to obtain accurate data, it is important to assess alcohol use during periods of incarcerations. On the calendar, these days are coded as both incarcerated and an amount consumed is listed.

**Probing Extended Abstinent or Drinking Periods:*

"Were there any times in this recall period when you had nothing at all to drink, not even a drop of alcohol?"

"What was the longest period of total abstinence during this time?"

"What was the next longest period of total abstinence?"

"What was the longest number of continuous days in a row you were drinking during this period?" (determine dates and amounts of alcohol consumed on each day)

"What was the next longest period of continuous drinking days?"

**Other Events:*

Sometimes when being interviewed people will report not drinking during a particular period. For example, a person may say "I wasn't working during October, so I had no money to drink, but when I returned to work in May I started drinking." These time periods can be listed on the calendar and then questions can be directed to the time periods around such events.

Sometimes people drink routinely after or at particular events (e.g., bowling on Mondays; hockey on Thursdays; playing pool). To this end, the interviewer can specifically ask the person:

"Were there any times or events where you almost always drank alcohol? For example,"

**Completing the Calendar in a Flexible Manner.*

Wherever people feel comfortable in filling out the calendar can be the starting date. People can go forwards or backwards from the interview date or jump around from month to month.

If a person has trouble recalling his/her drinking, try working back from when the person entered treatment. Say "What about this past month, what was your drinking like then?" The

most recent months should be the most familiar, and the person might find it easier to reflect upon those periods. Ask questions about special occasions (**birthdays, weddings**) and use these days as anchors or reference points to help the person better recall his/her drinking.

Appendix C: Screenshot of computer options for advantages of drinking

Please fill in a number (1, 2 or 3) for any items for which your drinking has had a positive effect. If there are items that your drinking has not had an effect on, please enter '0'.

None	A little	Quite a bit	A lot
0	1	2	3

<input type="checkbox"/> Eating	<input type="checkbox"/> Marriage/close relationships	<input type="checkbox"/> Neighbourhood/Community
<input type="checkbox"/> Sleeping	<input type="checkbox"/> Friendships	<input type="checkbox"/> Companionship/company
<input type="checkbox"/> Physical well being	<input type="checkbox"/> Sex life	<input type="checkbox"/> Fun/humour
<input type="checkbox"/> Self confidence	<input type="checkbox"/> Financial/business	
<input type="checkbox"/> Relaxation	<input type="checkbox"/> Social life	

<input type="button" value="OK"/>	<input type="button" value="Click here for negative drinking effects"/>
-----------------------------------	---

Appendix D: The Leeds Dependence Questionnaire

On this page there are questions about the importance of alcohol and/or other drugs in your life.

Think about your drinking/other drug use in the last week and answer each question ticking the closest answer to how you see yourself.

	Never	Sometimes	Often	Nearly always
1. Do you find yourself thinking about when you will next be able to have another drink or take more drugs?				
2. Is drinking or taking drugs more important than anything else you might do during the day?				
3. Do you feel that your need for drink or drugs is too strong to control?				
4. Do you plan your days around getting and taking drink or drugs?				
5. Do you drink or take drugs in a particular way in order to increase the effect it gives you?				
6. Do you take drink or other drugs morning, afternoon and evening?				
7. Do you feel you have to carry on drinking or taking drugs once you have started?				
8. Is getting the effect you want more important than the particular drink or drug you use?				
9. Do you want to take more drink or drugs when the effect starts to wear off?				
10. Do you find it difficult to cope with life without drink or drugs?				

Appendix E: 36-Item Short Form Health Survey (SF-36)

SF-36 QUESTIONNAIRE

Name: _____

Ref. Dr: _____

Date: _____

ID#: _____

Age: _____

Gender: M / F

Please answer the 36 questions of the Health Survey completely, honestly, and without interruptions.

GENERAL HEALTH:

In general, would you say your health is:

- Excellent Very Good Good Fair Poor

Compared to one year ago, how would you rate your health in general now?

- Much better now than one year ago
 Somewhat better now than one year ago
 About the same
 Somewhat worse now than one year ago
 Much worse than one year ago

LIMITATIONS OF ACTIVITIES:

The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports.

- Yes, Limited a lot Yes, Limited a Little No, Not Limited at all

Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf

- Yes, Limited a Lot Yes, Limited a Little No, Not Limited at all

Lifting or carrying groceries

- Yes, Limited a Lot Yes, Limited a Little No, Not Limited at all

Climbing several flights of stairs

- Yes, Limited a Lot Yes, Limited a Little No, Not Limited at all

Climbing one flight of stairs

- Yes, Limited a Lot Yes, Limited a Little No, Not Limited at all

Bending, kneeling, or stooping

- Yes, Limited a Lot Yes, Limited a Little No, Not Limited at all

Walking more than a mile

- Yes, Limited a Lot Yes, Limited a Little No, Not Limited at all

Walking several blocks

- Yes, Limited a Lot Yes, Limited a Little No, Not Limited at all

Walking one block

- Yes, Limited a Lot Yes, Limited a Little No, Not Limited at all

Bathing or dressing yourself

Yes, Limited a Lot

Yes, Limited a Little

No, Not Limited at all

PHYSICAL HEALTH PROBLEMS:

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

Cut down the amount of time you spent on work or other activities

Yes

No

Accomplished less than you would like

Yes

No

Were limited in the kind of work or other activities

Yes

No

Had difficulty performing the work or other activities (for example, it took extra effort)

Yes

No

EMOTIONAL HEALTH PROBLEMS:

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

Cut down the amount of time you spent on work or other activities

Yes

No

Accomplished less than you would like

Yes

No

Didn't do work or other activities as carefully as usual

Yes

No

SOCIAL ACTIVITIES:

Emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

Not at all

Slightly

Moderately

Severe

Very Severe

PAIN:

How much bodily pain have you had during the past 4 weeks?

None

Very Mild

Mild

Moderate

Severe

Very Severe

During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all

A little bit

Moderately

Quite a bit

Extremely

ENERGY AND EMOTIONS:

These questions are about how you feel and how things have been with you during the last 4 weeks. For each question, please give the answer that comes closest to the way you have been feeling.

Did you feel full of pep?

- All of the time
- Most of the time
- A good Bit of the Time
- Some of the time
- A little bit of the time
- None of the Time

Have you been a very nervous person?

- All of the time
- Most of the time
- A good Bit of the Time
- Some of the time
- A little bit of the time
- None of the Time

Have you felt so down in the dumps that nothing could cheer you up?

- All of the time
- Most of the time
- A good Bit of the Time
- Some of the time
- A little bit of the time
- None of the Time

Have you felt calm and peaceful?

- All of the time
- Most of the time
- A good Bit of the Time
- Some of the time
- A little bit of the time
- None of the Time

Did you have a lot of energy?

- All of the time
- Most of the time
- A good Bit of the Time
- Some of the time
- A little bit of the time
- None of the Time

Have you felt downhearted and blue?

- All of the time
- Most of the time
- A good Bit of the Time
- Some of the time
- A little bit of the time
- None of the Time

Did you feel worn out?

- All of the time
- Most of the time
- A good Bit of the Time
- Some of the time
- A little bit of the time
- None of the Time

Have you been a happy person?

- All of the time
- Most of the time
- A good Bit of the Time
- Some of the time
- A little bit of the time
- None of the Time

Did you feel tired?

- All of the time
- Most of the time
- A good Bit of the Time
- Some of the time
- A little bit of the time
- None of the Time

SOCIAL ACTIVITIES:

During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

- All of the time
- Most of the time
- Some of the time
- A little bit of the time
- None of the Time

GENERAL HEALTH:

How true or false is each of the following statements for you?

I seem to get sick a little easier than other people

- Definitely true Mostly true Don't know Mostly false Definitely false

I am as healthy as anybody I know

- Definitely true Mostly true Don't know Mostly false Definitely false

I expect my health to get worse

- Definitely true Mostly true Don't know Mostly false Definitely false

My health is excellent

- Definitely true Mostly true Don't know Mostly false Definitely false

Appendix F: Email from Professor Jim Orford confirming his agreement for the researcher to use the dataset for this thesis as well as details on the original ethical approval

From: James Orford <[REDACTED]>
Sent: 22 August 2016 11:04
To: Dean, Madeleine L C
Cc: Andrews, Leanne
Subject: RE: Thesis proposal on self-esteem and alcohol using BUHD cohort

Dear Madeleine,

I am delighted to hear that, following our discussions, you would like to use the Birmingham Untreated Heavy Drinkers (BUHD) dataset for your Doctorate in Clinical Psychology thesis. I can confirm the following:

- 1) I am the chief custodian of the BUHD dataset
- 2) I have read your proposal and I am happy for you to use the dataset as outlined in the proposal for a Doctorate in Clinical Psychology thesis
- 3) As far as I am aware this specific analysis has not been carried out before with this dataset
- 4) I received ethical approval to conduct the original study from the University of Birmingham
- 5) The data are kept in an anonymised data file form as required by the original ethical approval and no restrictions were imposed on how long such data could be kept
- 6) The original ethical approval required that access to the data be confined to members of the Drinking Research Group based at the University of Birmingham. I can confirm that it is been agreed that you, Madeleine Dean, will be classed as a collaborating member of the Drinking Research Group for the purposes of carrying out the analyses outlined in your proposal
- 7) Although the Department of Health funded the original study, there is no longer any expectation on their part about being consulted about dissemination of findings arising from any analyses of these data. In the case of any publication(s) arising from the proposed analyses, I would expect to be invited to be a co-author.

Please let me know if you need any further information. I very much look forward to seeing the results of the proposed analyses in due course.

Jim Orford, Emeritus Professor of Clinical and Community Psychology, University of Birmingham.

Appendix G: Copy of consent form given to participants

Drinking Research Group Participant's Informed Consent Form (2005 Interview)

Thank you for agreeing to be interviewed for our study. This sheet gives you some general information about the project, so that you understand what this study is about, and what to expect. If anything is unclear, please ask the interviewer for further explanation before signing the form.

Why we are carrying out the study

This study has been commissioned by the Department of Health to discover more about people's drinking patterns, lifestyles and well-being.

What we will expect of you

The interview will last about two hours. During this time a trained interviewer will ask you a series of questions. Many of the questions will be of a personal nature, and we will give you the time you will need to answer these questions fully, and to explain details you feel important.

So that we can see the ways in which your drinking and life may change over the years, we would like to interview you at two-year intervals. Reimbursement of expenses will be made separately for any further interviews.

What you can expect of us

During the interview we will record what you say on a computer, or tape and by taking notes. Any information you give us will be coded to protect your identity, and will be securely locked away. We will also be discreet when contacting you by telephone or mail. There will be no identification of individuals in any research reports. All records of the interview will be kept strictly confidential to the Drinking Research Group. The only exception to this would be if the interviewer was concerned that a child was at risk of serious harm.

We are not here to criticise, judge or provide treatment. However, if anyone requests information on where to get help after the interview, we will be happy to provide it.

Consent

I have read and understood the above information regarding this research project. I consent to be interviewed on the basis of the above, and understand I may withdraw at any time.

Signed _____ Date _____

Name (print) _____ Interviewer _____

Post interview confirmation of consent

I consent to the audio-tape and notes from this interview being used for research purposes.

Signed _____ Date _____

Name (print) _____ Interviewer _____

Appendix H: University of Essex ethics board confirmation of approval for thesis

University of Essex

27 September 2016

MS M. DEAN
77 FLEEMING ROAD
WALTHAMSTOW
LONDON
E17 5ET

Dear Madeleine,

Re: Ethical Approval Application (iRef 15047)

Further to your application for ethical approval, please find enclosed a copy of your application which has now been approved by the School Ethics Representative on behalf of the Faculty Ethics Committee.

Yours sincerely,

Lisa McKee
Ethics Administrator
School of Health and Human Sciences

cc. Research Governance and Planning Manager, REO
Supervisor

Colchester Campus
Wivenhoe Park
Colchester CO4 3SQ
United Kingdom

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University of Essex

Application for Ethical Approval of Research Involving Human Participants

This application form must be completed for any research involving human participants conducted in or by the University. 'Human participants' are defined as including living human beings, human beings who have recently died (cadavers, human remains and body parts), embryos and fetuses, human tissue and bodily fluids, and human data and records (such as, but not restricted to medical, genetic, financial, personnel, criminal or administrative records and test results including scholastic achievements). Research must not commence until written approval has been received (from departmental Director of Research/Ethics Officer, Faculty Ethics Sub-Committee (ESC) or the University's Ethics Committee). This should be borne in mind when setting a start date for the project. Ethical approval cannot be granted retrospectively and failure to obtain ethical approval prior to data collection will mean that these data cannot be used.

Applications must be made on this form, and submitted electronically, to your departmental Director of Research/Ethics Officer. A signed copy of the form should also be submitted. Applications will be assessed by the Director of Research/Ethics Officer in the first instance, and may then passed to the ESC, and then to the University's Ethics Committee. A copy of your research proposal and any necessary supporting documentation (e.g. consent form, recruiting materials, etc) should also be attached to this form.

A full copy of the signed application will be retained by the department/school for 6 years following completion of the project. The signed application form cover sheet (two pages) will be sent to the Research Governance and Planning Manager in the REO as Secretary of the University's Ethics Committee.

1. Title of project: Does self-esteem impact on heavy alcohol consumption over time in individuals not treated for alcohol use?

2. The title of your project will be published in the minutes of the University Ethics Committee. If you object, then a reference number will be used in place of the title.
Do you object to the title of your project being published? Yes / No

3. This Project is: Staff Research Project Student Project

4. Principal Investigator(s) (students should also include the name of their supervisor):

Name:	Department:
Madeleine Dean	Doctorate in Clinical Psychology, School of Health and Human Sciences
Dr. Leanne Andrews	School of Health and Human Sciences

5. Proposed start date: 01/10/2016

6. Probable duration: 1 year and 6 months

7. Will this project be externally funded? Yes / No
If Yes,

8. What is the source of the funding?
N/A

9. If external approval for this research has been given, then only this cover sheet needs to be submitted
External ethics approval obtained (attach evidence of approval) Yes / No

Declaration of Principal Investigator:

The information contained in this application, including any accompanying information, is, to the best of my knowledge, complete and correct. We have read the University's *Guidelines for Ethical Approval of Research Involving Human Participants* and accept responsibility for the conduct of the procedures set out in this application in accordance with the guidelines, the University's *Statement on Safeguarding Good Scientific Practice* and any other conditions laid down by the University's Ethics Committee. We have attempted to identify all risks related to the research that may arise in conducting this research and acknowledge my/our obligations and the rights of the participants.

Signature(s): ... *Madeleine D*

Name(s) in block capitals: ...MADELEINE DEAN.....

Date: 27/08/2016.....

Supervisor's recommendation (Student Projects only):

I have read and approved the quality of both the research proposal and this application.

Supervisor's signature: .. *T. Adams*

Outcome:

The departmental Director of Research (DoR) / Ethics Officer (EO) has reviewed this project and considers the methodological/technical aspects of the proposal to be appropriate to the tasks proposed. The DoR / EO considers that the investigator(s) has/have the necessary qualifications, experience and facilities to conduct the research set out in this application, and to deal with any emergencies and contingencies that may arise.

This application falls under Annex B and is approved on behalf of the ESC

This application is referred to the ESC because it does not fall under Annex B

This application is referred to the ESC because it requires independent scrutiny

Signature(s): *W. Adams*

Name(s) in block capitals: *W.A. Adams*

Department: *S.H.H.S*

Date: *26/9/16*

The application has been approved by the ESC

The application has not been approved by the ESC

The application is referred to the University Ethics Committee

Signature(s):

Name(s) in block capitals:

Faculty:

Date:

Appendix I: Histograms for alcohol outcomes and self-esteem at baseline

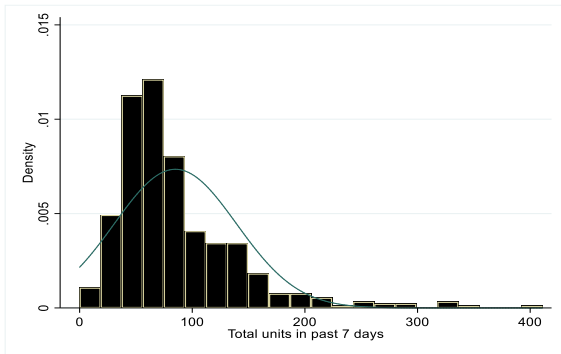


Figure I.1. Histogram displaying distribution of total weekly units.

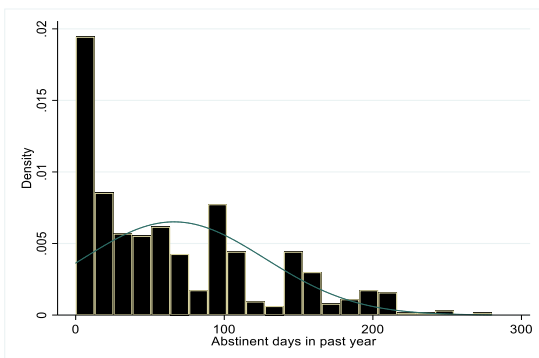


Figure I.2. Histogram displaying distribution of number of abstinent days in the past year.

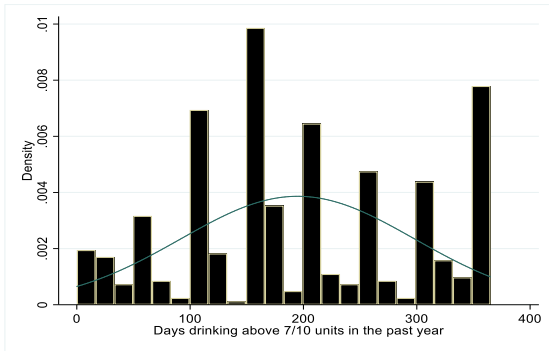


Figure I.3. Histogram displaying distribution of number of days drinking over either 7 units (for women) or 10 units (for men) in the past year.

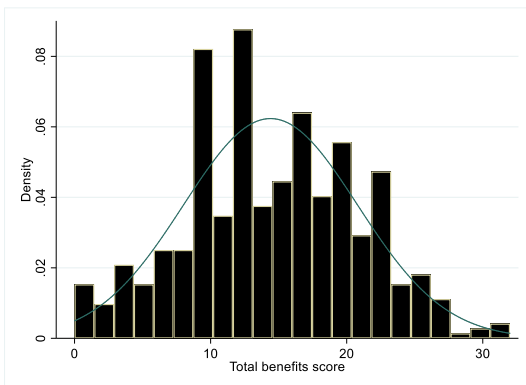


Figure I.4. Histogram displaying distribution of total reported benefits of drinking alcohol.

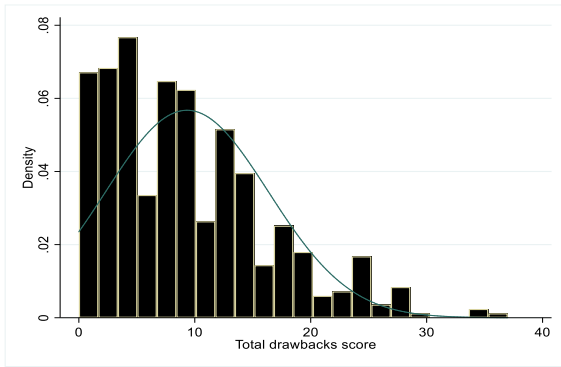


Figure I.5. Histogram displaying distribution of total reported disadvantages of drinking alcohol.

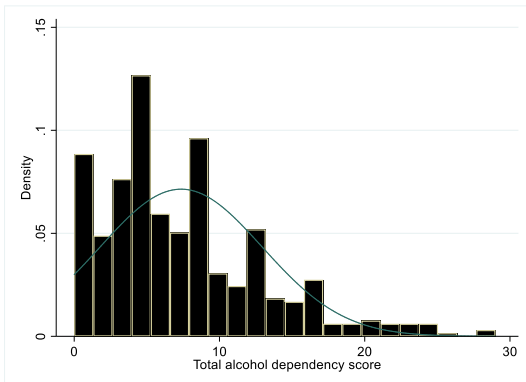


Figure I.6. Histogram displaying distribution of total alcohol dependency score.

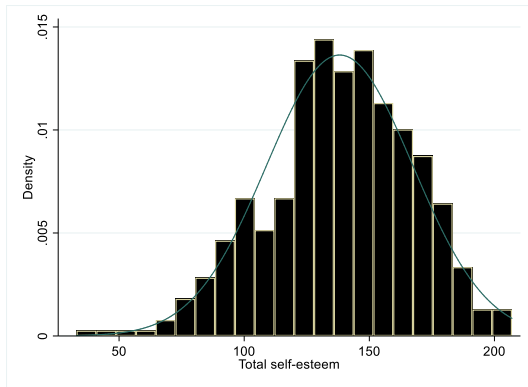


Figure I.7. Histogram displaying distribution of total self-esteem score.

Appendix J: Cronbach's alpha analysis results

Table J.1

Cronbach's alpha analysis results at wave 1

Item	N	Item-test correlation	Item-rest correlation	Average inter-item covariance	Alpha
Question 1	500	0.49	0.44	0.87	0.89
Question 2	500	0.45	0.41	0.88	0.89
Question 3	500	0.60	0.54	0.85	0.89
Question 4	500	0.64	0.60	0.84	0.89
Question 5	500	0.60	0.55	0.83	0.89
Question 6	500	0.35	0.30	0.89	0.89
Question 7	500	0.45	0.39	0.86	0.89
Question 8	500	0.50	0.44	0.85	0.89
Question 9	500	0.39	0.34	0.89	0.89
Question 10	500	0.58	0.54	0.86	0.89
Question 11	500	0.44	0.37	0.86	0.89
Question 12	500	0.35	0.31	0.89	0.89
Question 13	500	0.33	0.26	0.88	0.90
Question 14	500	0.41	0.35	0.87	0.89
Question 15	500	0.47	0.43	0.88	0.89
Question 16	500	0.38	0.33	0.88	0.89
Question 17	500	0.68	0.64	0.83	0.89
Question 18	500	0.45	0.39	0.87	0.89
Question 19	500	0.74	0.71	0.82	0.89
Question 20	500	0.66	0.61	0.83	0.89
Question 21	500	0.56	0.50	0.84	0.89
Question 22	500	0.14	0.07	0.91	0.90
Question 23	500	0.60	0.54	0.84	0.89
Question 24	500	0.52	0.48	0.87	0.89
Question 25	500	0.56	0.50	0.84	0.89
Question 26	500	0.42	0.37	0.87	0.89
Question 27	500	0.67	0.62	0.83	0.89
Question 28	500	0.62	0.58	0.84	0.89
Question 29	500	0.46	0.41	0.87	0.89
Question 30	500	0.46	0.43	0.89	0.89
Test scale				0.86	0.90

Table J.2

Cronbach's alpha analysis results at wave 2

Item	N	Item-test correlation	Item-rest correlation	Average inter-item covariance	Alpha
Question 1	402	0.54	0.49	0.83	0.90
Question 2	402	0.56	0.53	0.84	0.90
Question 3	402	0.63	0.59	0.81	0.90
Question 4	402	0.59	0.54	0.81	0.90
Question 5	402	0.61	0.56	0.81	0.90
Question 6	402	0.38	0.34	0.86	0.90
Question 7	402	0.42	0.36	0.84	0.90
Question 8	402	0.53	0.47	0.82	0.90
Question 9	402	0.51	0.47	0.85	0.90
Question 10	402	0.64	0.61	0.82	0.90
Question 11	402	0.52	0.45	0.82	0.90
Question 12	402	0.33	0.29	0.87	0.90
Question 13	402	0.39	0.33	0.84	0.90
Question 14	402	0.36	0.30	0.85	0.90
Question 15	402	0.52	0.49	0.85	0.90
Question 16	402	0.52	0.48	0.84	0.90
Question 17	402	0.66	0.62	0.81	0.90
Question 18	402	0.48	0.43	0.84	0.90
Question 19	402	0.76	0.73	0.79	0.90
Question 20	402	0.65	0.61	0.81	0.90
Question 21	402	0.57	0.51	0.82	0.90
Question 22	402	0.07	-0.0002	0.89	0.91
Question 23	402	0.58	0.53	0.82	0.90
Question 24	402	0.48	0.44	0.85	0.90
Question 25	402	0.64	0.59	0.80	0.90
Question 26	402	0.42	0.36	0.85	0.90
Question 27	402	0.66	0.62	0.80	0.90
Question 28	402	0.60	0.56	0.82	0.90
Question 29	402	0.47	0.42	0.84	0.90
Question 30	402	0.43	0.40	0.86	0.90
Test scale				0.83	0.90

Table J.3
Cronbach's alpha analysis results at wave 3

Item	N	Item-test correlation	Item-rest correlation	Average inter-item covariance	Alpha
Question 4	350	0.65	0.60	0.75	0.89
Question 5	350	0.57	0.52	0.75	0.90
Question 7	350	0.44	0.39	0.78	0.90
Question 8	350	0.59	0.53	0.74	0.90
Question 11	350	0.50	0.44	0.76	0.90
Question 13	350	0.40	0.33	0.77	0.90
Question 14	350	0.39	0.33	0.78	0.90
Question 17	350	0.62	0.58	0.76	0.90
Question 19	350	0.75	0.71	0.73	0.89
Question 20	350	0.70	0.66	0.74	0.89
Question 21	350	0.57	0.51	0.75	0.90
Question 22	350	0.07	-0.005	0.82	0.91
Question 23	350	0.54	0.48	0.76	0.90
Question 25	350	0.58	0.52	0.75	0.90
Question 27	350	0.66	0.62	0.74	0.90
Question 28	350	0.65	0.61	0.75	0.90
Question 1	350	0.51	0.47	0.77	0.90
Question 2	350	0.45	0.40	0.79	0.90
Question 3	350	0.62	0.57	0.75	0.90
Question 6	350	0.38	0.33	0.79	0.90
Question 9	350	0.42	0.36	0.78	0.90
Question 10	350	0.69	0.65	0.75	0.90
Question 12	350	0.41	0.37	0.79	0.90
Question 15	350	0.53	0.50	0.78	0.90
Question 16	350	0.48	0.44	0.77	0.90
Question 18	350	0.44	0.39	0.77	0.90
Question 24	350	0.49	0.45	0.78	0.90
Question 26	350	0.32	0.26	0.79	0.90
Question 29	350	0.49	0.44	0.77	0.90
Question 30	350	0.46	0.43	0.79	0.90
Test scale				0.77	0.90

**Appendix K: Regression analysis results for all alcohol outcomes, with self-esteem at
wave 2 or wave 3 entered as predictors**

Longitudinal regression model results with self-esteem at wave 2 entered as a predictor

Table K.1

Longitudinal regression results for total weekly units

Predictor	Total weekly units [95% CI]			
	W3	W4	W5	W6
<i>Unadjusted model results</i>				
Self-esteem (W2)	0.26*	0.26*	0.14	0.03
	[0.05,0.47]	[0.03,0.48]	[-0.09,0.37]	[-0.19,0.25]
Constant	28.81	26.38	39.90*	46.65**
	[-1.00,58.63]	[-5.65,58.41]	[6.67,73.13]	[15.14,78.15]
<i>Adj. R² (n=)</i>	<i>0.01 (n=339)</i>	<i>0.01 (n=314)</i>	<i>0.00 (n=274)</i>	<i>-0.00 (n=252)</i>
<i>Age and gender adjusted model results</i>				
Self-esteem (W2)	0.23*	0.23*	0.13	0.02
	[0.03,0.44]	[0.01,0.45]	[-0.10,0.35]	[-0.20,0.24]
Gender	-26.11***	-24.87***	-24.91***	-18.63**
(RG: Male)	[-38.92,-13.31]	[-38.41,-11.32]	[-39.24,-10.57]	[-32.43,-4.82]
Age (W2)	0.58	0.81*	0.82*	0.32
	[-0.10,1.25]	[0.09,1.53]	[0.03,1.61]	[-0.42,1.06]
Constant	16.95	4.92	16.30	40.52
	[-23.67,57.58]	[-38.60,48.45]	[-31.37,63.97]	[-3.62,84.66]
<i>Adj. R² (n=)</i>	<i>0.06 (n=339)</i>	<i>0.06 (n=314)</i>	<i>0.06 (n=274)</i>	<i>0.02 (n=252)</i>
<i>Fully adjusted model results</i>				
Self-esteem (W2)	0.39***	0.33*	0.23	0.13
	[0.16,0.62]	[0.08,0.58]	[-0.03,0.50]	[-0.12,0.38]
Gender	-26.13***	-26.43***	-25.25***	-17.80*
(RG: Male)	[-38.98,-13.28]	[-40.17,-12.69]	[-39.63,-10.88]	[-31.51,-4.09]
Age (W2)	0.91* [0.18,1.64]	1.17** [0.39,1.96]	1.16** [0.31,2.02]	0.74 [-0.06,1.54]
Religion	-11.07	-4.64	-3.93	-9.87
(RG: Not religious)	[-25.25,3.11]	[-19.87,10.58]	[-20.33,12.47]	[-24.56,4.82]
SES (RG: High)				
<i>Intermediate</i>	1.18	-1.14	0.60	7.39
	[-12.77,15.12]	[-16.03,13.74]	[-15.22,16.42]	[-7.58,22.35]
<i>Low</i>	8.00	18.96*	15.55	13.28
	[-7.40,23.40]	[2.45,35.46]	[-1.96,33.06]	[-3.06,29.63]
Marital status				
(RG: Married/ Cohabiting)	5.83	-4.11	4.85	11.37
	[-6.60,18.27]	[-17.50,9.29]	[-9.43,19.13]	[-1.86,24.60]
Smoking (RG: Non smoker)	9.08	1.57	5.39	14.32*
	[-3.25,21.41]	[-11.79,14.92]	[-8.65,19.42]	[1.07,27.58]
Drug use (RG: No drug use)	7.37	19.34**	14.57	8.66
	[-5.56,20.29]	[5.20,33.48]	[-0.06,29.20]	[-5.20,22.51]
Mental health	-0.28	-0.19	-0.10	0.03
	[-0.61,0.05]	[-0.54,0.17]	[-0.48,0.27]	[-0.32,0.37]
Ethnicity (RG: White British)	0.32	-1.79	1.01	-13.44
	[-16.76,17.39]	[-20.11,16.53]	[-18.96,20.98]	[-31.84,4.97]
Constant	-8.14	-20.69	-21.33	-10.48
	[-58.53,42.25]	[-75.79,34.40]	[-79.83,37.18]	[-64.91,43.95]
<i>Adj. R² (n=)</i>	<i>0.08 (n=332)</i>	<i>0.09 (n=307)</i>	<i>0.07 (n=268)</i>	<i>0.08 (n=246)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.2
 Longitudinal regression results for number of abstinent days

Predictor	Number of abstinent days in the past year [95% CI]			
	W3	W4	W5	W6
<i>Unadjusted model results</i>				
Self-esteem (W2)	-0.57** [-0.95,-0.19]	-0.33 [-0.76,0.09]	-0.33 [-0.77,0.12]	-0.31 [-0.82,0.19]
Constant	183.03*** [128.44, 237.61]	158.54*** [98.05, 219.03]	151.29*** [87.59, 215.00]	158.04*** [86.35, 229.74]
Adj. R ² (n=)	0.02 (n=339)	0.00 (n=314)	0.00 (n=274)	0.00 (n=252)
<i>Age and gender adjusted model results</i>				
Self-esteem (W2)	-0.58** [-0.96,-0.20]	-0.37 [-0.78,0.05]	-0.35 [-0.79,0.10]	-0.32 [-0.82,0.17]
Gender (RG: Male)	1.89 [-21.90,25.68]	-10.44 [-36.33,15.45]	7.74 [-20.40,35.87]	14.78 [-16.57,46.14]
Age (W2)	-1.90** [-3.15,-0.65]	-2.21** [-3.58,-0.84]	-1.53 [-3.08,0.03]	-2.41** [-4.08,-0.73]
Constant	259.85*** [184.36, 335.34]	254.24*** [171.05, 337.43]	212.77*** 119.20, 306.33]	251.96*** 151.73, 352.18]
Adj. R ² (n=)	0.04 (n=339)	0.03 (n=314)	0.01 (n=274)	0.03 (n=252)
<i>Fully adjusted model results</i>				
Self-esteem (W2)	-0.75*** [-1.19,-0.32]	-0.49 [-0.98,0.00]	-0.55* [-1.08,-0.02]	-0.36 [-0.94,0.22]
Gender (RG: Male)	6.48 [-17.70,30.65]	-7.81 [-34.32,18.70]	11.17 [-17.46,39.80]	12.27 [-19.64,44.18]
Age (W2)	-1.81** [-3.18,-0.44]	-1.90* [-3.43,-0.38]	-1.53 [-3.24,0.17]	-2.67** [-4.53,-0.80]
Religion (RG: Not religious)	20.44 [-6.24,47.13]	21.46 [-7.92,50.84]	23.45 [-9.20,56.11]	13.31 [-20.89,47.51]
SES (RG: High)				
Intermediate	12.56 [-13.69,38.80]	19.43 [-9.29,48.15]	10.49 [-21.01,42.00]	12.26 [-22.57,47.10]
Low	31.76* [2.78,60.74]	19.79 [-12.05,51.63]	25.67 [-9.20,60.53]	36.75 [-1.31,74.81]
Marital status (RG: Married/ Cohabiting)	2.54 [-20.86,25.94]	9.33 [-16.51,35.17]	9.27 [-19.17,37.72]	-1.92 [-32.72,28.89]
Smoking (RG: Non smoker)	-21.14 [-44.35,2.07]	-3.84 [-29.60,21.93]	-12.01 [-39.96,15.94]	-19.54 [-50.40,11.32]
Drug use (RG: No drug use)	8.81 [-15.52,33.13]	-1.45 [-28.72,25.82]	-1.51 [-30.64,27.62]	-15.67 [-47.93,16.59]
Mental health	0.64* [0.02,1.25]	0.54 [-0.15,1.23]	0.71 [-0.04,1.46]	0.29 [-0.52,1.10]
Ethnicity (RG: White British)	-4.58 [-36.70,27.55]	21.66 [-13.69,57.00]	0.15 [-39.62,39.92]	27.91 [-14.95,70.76]
Constant	212.52*** [117.69,307.34]	185.61*** [79.33,291.90]	165.75** [49.24,282.26]	240.02*** [113.31,366.73]
Adj. R ² (n=)	0.06 (n=332)	0.03 (n=307)	0.01 (n=268)	0.04 (n=246)

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.3

Longitudinal regression results for number of days drank 7+ or 10+ units in the past year

Predictor	Number of days drank 7+ or 10+ units in the past year [95% CI]			
	W3	W4	W5	W6
<i>Unadjusted model results</i>				
Self-esteem (W2)	0.26 [-0.20,0.72]	0.28 [-0.20,0.77]	0.01 [-0.51,0.53]	0.27 [-0.29,0.82]
Constant	128.84*** [62.37,195.31]	107.01** [37.54,176.47]	138.39*** [64.04,212.73]	94.00* [15.24,172.77]
<i>Adj. R² (n=)</i>	<i>0.00 (n=339)</i>	<i>0.00 (n=314)</i>	<i>-0.00 (n=274)</i>	<i>-0.00 (n=252)</i>
<i>Age and gender adjusted model results</i>				
Self-esteem (W2)	0.26 [-0.20,0.72]	0.30 [-0.18,0.78]	0.03 [-0.49,0.55]	0.27 [-0.28,0.82]
Gender (RG: Male)	-15.45 [-44.38,13.49]	-1.74 [-31.54,28.06]	-4.33 [-37.25,28.59]	-11.30 [-46.05,23.44]
Age (W2)	2.27** [0.74,3.79]	2.41** [0.83,3.99]	1.51 [-0.31,3.32]	1.94* [0.09,3.80]
Constant	43.12 [-48.69, 134.93]	8.87 [-86.89, 104.63]	76.25 [-33.23, 185.73]	17.95 [-93.13, 129.02]
<i>Adj. R² (n=)</i>	<i>0.02 (n=339)</i>	<i>0.02 (n=314)</i>	<i>-0.00 (n=274)</i>	<i>0.01 (n=252)</i>
<i>Fully adjusted model results</i>				
Self-esteem (W2)	0.54* [0.02,1.07]	0.42 [-0.14,0.97]	0.26 [-0.35,0.88]	0.48 [-0.14,1.11]
Gender	-14.69	-0.16	-4.02	-10.88
(RG: Male)	[-43.96,14.59]	[-30.33,30.01]	[-37.40,29.36]	[-45.13,23.37]
Age (W2)	2.73** [1.07,4.39]	2.96*** [1.22,4.69]	1.67 [-0.31,3.66]	2.50* [0.50,4.50]
Religion	-31.09	-18.95	-14.97	-32.49
(RG: Not religious)	[-63.40,1.21]	[-52.38,14.49]	[-53.04,23.11]	[-69.20,4.22]
SES (RG: High)				
Intermediate	5.44 [-26.34,37.22]	-3.39 [-36.07,29.29]	14.83 [-21.91,51.56]	-12.51 [-49.91,24.88]
Low	18.92 [- 16.16,54.01]	38.37* [2.13,74.60]	51.52* [10.87,92.18]	13.34 [-27.52,54.19]
Marital status (RG: Married/ Cohabiting)	15.05 [-13.28,43.39]	5.62 [-23.79,35.03]	-3.71 [-36.88,29.46]	11.42 [-21.64,44.49]
Smoking (RG: Non smoker)	35.57* [7.47,63.67]	26.80 [-2.52,56.12]	14.65 [-17.93,47.24]	59.75*** [26.63,92.88]
Drug use (RG: No drug use)	-3.77 [-33.23,25.68]	14.52 [-16.52,45.56]	7.80 [-26.17,41.76]	3.02 [-31.61,37.65]
Mental health	-0.39 [-1.14,0.35]	0.18 [-0.61,0.96]	-0.17 [-1.05,0.71]	-0.03 [-0.90,0.84]
Ethnicity (RG: White British)	-7.54 [-46.44,31.35]	-14.67 [-54.90,25.55]	-12.51 [-58.88,33.86]	-11.47 [-57.47,34.53]
Constant	-1.14 [-115.95,113.67]	-61.45 [-182.41,59.51]	29.86 [-105.99,165.70]	-47.07 [-183.09,88.95]
<i>Adj. R² (n=)</i>	<i>0.05 (n=332)</i>	<i>0.05 (n=307)</i>	<i>0.01 (n=268)</i>	<i>0.07 (n=246)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.4
Longitudinal regression results for total advantages of drinking

Predictor	Total advantages of drinking [95% CI]			
	W3	W4	W5	W6
<i>Unadjusted model results</i>				
Self-esteem (W2)	-0.02 [-0.05,0.00]	-0.01 [-0.04,0.01]	0.002 [-0.03,0.03]	-0.01 [-0.03,0.02]
Constant	16.30*** [12.65,19.95]	14.60*** [11.18,18.02]	9.88*** [5.92,13.85]	11.86*** [7.80,15.92]
<i>Adj. R² (n=)</i>	<i>0.01 (n=339)</i>	<i>0.00 (n=313)</i>	<i>-0.00 (n=274)</i>	<i>-0.00 (n=252)</i>
<i>Age and gender adjusted model results</i>				
Self-esteem (W2)	-0.02 [-0.05,0.00]	-0.01 [-0.04,0.01]	-0.00 [-0.03,0.03]	-0.01 [-0.04,0.02]
Gender (RG: Male)	-0.71 [-2.32,0.90]	0.06 [-1.42,1.54]	-1.46 [-3.21,0.28]	-1.02 [-2.82,0.77]
Age (W2)	-0.00 [-0.09,0.08]	-0.09* [-0.17,-0.01]	-0.10* [-0.20,-0.00]	-0.09 [-0.19,0.00]
Constant	16.74*** [11.63,21.86]	18.20*** [13.44,22.95]	14.85*** [9.05,20.65]	16.04*** [10.30,21.77]
<i>Adj. R² (n=)</i>	<i>0.00 (n=339)</i>	<i>0.01 (n=313)</i>	<i>0.01 (n=274)</i>	<i>0.01 (n=252)</i>
<i>Fully adjusted model results</i>				
Self-esteem (W2)	-0.02 [-0.05,0.01]	-0.01 [-0.04,0.01]	0.02 [-0.02,0.05]	-0.01 [-0.04,0.02]
Gender (RG: Male)	-0.90 [-2.55,0.75]	0.10 [-1.42,1.62]	-1.71 [-3.47,0.06]	-0.75 [-2.57,1.07]
Age (W2)	-0.02 [-0.11,0.08]	-0.09* [-0.18,-0.00]	-0.10 [-0.21,0.00]	-0.10 [-0.20,0.01]
Religion (RG: Not religious)	-0.31 [-2.14,1.51]	-0.58 [-2.26,1.11]	-0.32 [-2.33,1.69]	-1.33 [-3.28,0.63]
SES (RG: High)				
<i>Intermediate</i>	0.01 [-1.79,1.80]	-1.67* [-3.32,-0.02]	-0.77 [-2.71,1.17]	-1.49 [-3.48,0.50]
<i>Low</i>	0.28 [-1.71,2.26]	-1.17 [-3.00,0.66]	-1.97 [-4.12,0.18]	-1.04 [-3.21,1.13]
Marital status (RG: Married/ Cohabiting)	1.16 [-0.44,2.77]	0.58 [-0.90,2.07]	0.88 [-0.88,2.63]	-0.22 [-1.98,1.54]
Smoking (RG: Non smoker)	-1.30 [-2.89,0.29]	-0.95 [-2.44,0.53]	-0.77 [-2.50,0.95]	-0.60 [-2.37,1.16]
Drug use (RG: No drug use)	-0.24 [-1.91,1.42]	0.71 [-0.85,2.28]	0.49 [-1.31,2.29]	0.33 [-1.52,2.17]
Mental health	-0.03 [-0.07,0.01]	-0.00 [-0.04,0.04]	-0.06* [-0.10,-0.01]	0.00 [-0.04,0.05]
Ethnicity (RG: White British)	-0.52 [-2.72,1.67]	-1.00 [-3.04,1.04]	-1.30 [-3.75,1.16]	-1.22 [-3.67,1.23]
Constant	18.46*** [11.97,24.95]	19.90*** [13.80,25.99]	17.46*** [10.28,24.64]	18.61*** [11.37,25.85]
<i>Adj. R² (n=)</i>	<i>0.00 (n=332)</i>	<i>0.01 (n=306)</i>	<i>0.03 (n=268)</i>	<i>0.00 (n=246)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.5
Longitudinal regression results for total disadvantages of drinking

Predictor	Total disadvantages of drinking [95% CI]			
	W3	W4	W5	W6
<i>Unadjusted model results</i>				
Self-esteem (W2)	-0.06*** [-0.09,-0.04]	-0.07*** [-0.10,-0.04]	-0.04** [-0.06,-0.01]	-0.06*** [-0.08,-0.03]
Constant	16.18*** [12.50,19.87]	18.09*** [14.01,22.18]	11.52*** [8.17,14.86]	14.94*** [10.91,18.96]
<i>Adj. R² (n=)</i>	<i>0.06 (n=339)</i>	<i>0.06 (n=313)</i>	<i>0.03 (n=274)</i>	<i>0.05 (n=252)</i>
<i>Age and gender adjusted model results</i>				
Self-esteem (W2)	-0.06*** [-0.09,-0.04]	-0.07*** [-0.10,-0.04]	-0.04** [-0.06,-0.02]	-0.06*** [-0.09,-0.03]
Gender (RG: Male)	-1.04 [-2.65,0.57]	-0.20 [-1.96,1.57]	-0.22 [-1.69,1.25]	-1.62 [-3.35, 0.12]
Age (W2)	-0.10* [-0.18,-0.01]	-0.10* [-0.20,-0.01]	-0.10* [-0.19,-0.02]	-0.18*** [-0.27,-0.09]
Constant	20.72*** [15.60,25.84]	22.43*** [16.75,28.10]	16.08*** [11.19,20.97]	23.00*** [17.45, 28.54]
<i>Adj. R² (n=)</i>	<i>0.07 (n=339)</i>	<i>0.07 (n=313)</i>	<i>0.05 (n=274)</i>	<i>0.11 (n=252)</i>
<i>Fully adjusted model results</i>				
Self-esteem (W2)	-0.04* [-0.07,-0.01]	-0.04* [-0.07,-0.01]	-0.02 [-0.04,0.01]	-0.03* [-0.06,-0.00]
Gender (RG: Male)	-1.45 [-3.05,0.15]	-0.81 [-2.58,0.96]	-0.51 [-2.00,0.98]	-1.99* [-3.62,-0.37]
Age (W2)	-0.07 [-0.16,0.02]	-0.05 [-0.15,0.05]	-0.07 [-0.16,0.02]	-0.11* [-0.21,-0.02]
Religion (RG: Not religious)	-0.38 [-2.15,1.38]	0.85 [-1.11,2.82]	-0.43 [-2.13,1.27]	-0.39 [-2.13,1.35]
SES (RG: High)				
<i>Intermediate</i>	-0.25 [-1.99,1.48]	-1.64 [-3.55,0.28]	0.09 [-1.55,1.73]	1.16 [-0.62,2.93]
<i>Low</i>	2.33* [0.42,4.25]	-0.62 [-2.75,1.51]	0.17 [-1.64,1.99]	3.63*** [1.69,5.57]
Marital status (RG: Married/ Cohabiting)	-0.30 [-1.85,1.24]	1.16 [-0.56,2.89]	0.91 [-0.57,2.39]	-0.44 [-2.01,1.13]
Smoking (RG: Non smoker)	-1.82* [-3.36,-0.29]	0.51 [-1.22,2.23]	-0.22 [-1.67,1.24]	-1.07 [-2.64,0.50]
Drug use (RG: No drug use)	2.03* [0.42,3.64]	2.23* [0.41,4.05]	1.55* [0.04,3.07]	1.68* [0.04,3.33]
Mental health	-0.07*** [-0.11,-0.03]	-0.07** [-0.12,-0.02]	-0.05* [-0.09,-0.01]	-0.05* [-0.09,-0.01]
Ethnicity (RG: White British)	0.09 [-2.03,2.21]	0.78 [-1.60,3.16]	-0.19 [-2.26,1.88]	2.73* [0.54,4.91]
Constant	20.54*** [14.28,26.80]	18.67*** [11.57,25.76]	14.14*** [8.08,20.20]	18.07*** [11.61,24.52]
<i>Adj. R² (n=)</i>	<i>0.14 (n=332)</i>	<i>0.12 (n=306)</i>	<i>0.07 (n=268)</i>	<i>0.20 (n=246)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.6
Longitudinal regression results for level of alcohol dependency

Predictor	Level of alcohol dependency [95% CI]			
	W3	W4	W5	W6
<i>Unadjusted model results</i>				
Self-esteem (W2)	-0.07*** [-0.09,-0.05]	-0.06*** [-0.07,-0.04]	-0.05*** [-0.07,-0.03]	-0.05*** [-0.07,-0.03]
Constant	15.22*** [12.55,17.90]	12.88*** [10.37,15.39]	12.72*** [10.02,15.42]	11.71*** [8.92,14.50]
<i>Adj. R² (n=)</i>	<i>0.12 (n=339)</i>	<i>0.11 (n=314)</i>	<i>0.10 (n=274)</i>	<i>0.09 (n=252)</i>
<i>Age and gender adjusted model results</i>				
Self-esteem (W2)	-0.07*** [-0.09,-0.05]	-0.06*** [-0.08,-0.04]	-0.06*** [-0.07,-0.04]	-0.05*** [-0.07,-0.03]
Gender (RG: Male)	-0.95 [-2.13,0.23]	-0.93 [-2.02,0.16]	-1.57** [-2.76,-0.38]	-1.11 [-2.34,0.12]
Age (W2)	-0.02 [-0.08,0.04]	-0.02 [-0.08,0.04]	-0.03 [-0.09,0.04]	-0.04 [-0.10,0.03]
Constant	16.37*** [12.63,20.10]	14.10*** [10.61,17.59]	14.58*** [10.63,18.53]	13.72*** [9.78,17.66]
<i>Adj. R² (n=)</i>	<i>0.13 (n=339)</i>	<i>0.11 (n=314)</i>	<i>0.12 (n=274)</i>	<i>0.10 (n=252)</i>
<i>Fully adjusted model results</i>				
Self-esteem (W2)	-0.05*** [-0.07,-0.03]	-0.04*** [-0.06,-0.02]	-0.04*** [-0.06,-0.02]	-0.03** [-0.05,-0.01]
Gender (RG: Male)	-1.15 [-2.31,0.02]	-1.12* [-2.19,-0.05]	-1.64** [-2.80,-0.49]	-1.29* [-2.51,-0.07]
Age (W2)	0.03 [-0.04,0.09]	0.03 [-0.03,0.09]	0.01 [-0.06,0.08]	-0.01 [-0.09,0.06]
Religion (RG: Not religious)	-0.39 [-1.67,0.90]	-0.10 [-1.28,1.08]	0.47 [-0.85,1.79]	-0.09 [-1.40,1.21]
SES (RG: High)				
<i>Intermediate</i>	0.11 [-1.16,1.37]	-0.43 [-1.58,0.72]	0.17 [-1.10,1.44]	0.40 [-0.93,1.73]
<i>Low</i>	0.55 [-0.85,1.94]	0.35 [-0.93,1.63]	-0.00 [-1.41,1.41]	1.08 [-0.38,2.53]
Marital status (RG: Married/ Cohabiting)	0.09 [-1.04,1.22]	0.55 [-0.49,1.59]	0.14 [-1.01,1.29]	0.03 [-1.15,1.20]
Smoking (RG: Non smoker)	0.25 [-0.87,1.37]	0.34 [-0.70,1.38]	-0.03 [-1.16,1.10]	0.10 [-1.08,1.28]
Drug use (RG: No drug use)	1.56** [0.38,2.73]	1.59** [0.49,2.69]	1.66** [0.49,2.84]	1.19 [-0.04,2.42]
Mental health	-0.05** [-0.08,-0.02]	-0.03* [-0.06,-0.01]	-0.04** [-0.07,-0.01]	-0.04* [-0.07,-0.01]
Ethnicity (RG: White British)	0.82 [-0.73,2.37]	1.02 [-0.40,2.44]	-0.03 [-1.64,1.57]	-0.88 [-2.51,0.76]
Constant	13.90*** [9.32,18.47]	10.81*** [6.53,15.08]	12.19*** [7.49,16.89]	11.62*** [6.79,16.46]
<i>Adj. R² (n=)</i>	<i>0.17 (n=332)</i>	<i>0.17 (n=307)</i>	<i>0.15 (n=268)</i>	<i>0.12 (n=246)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Regression results for alcohol outcomes with self-esteem at wave 3 entered as a predictor

Table K.7

Longitudinal regression results for total weekly units

Predictor	Total weekly units [95% CI]		
	W4	W5	W6
<i>Unadjusted model results</i>			
Self-esteem (W3)	0.12 [-0.10, 0.34]	0.09 [-0.14, 0.32]	-0.00 [-0.24, 0.23]
Constant	44.26** [12.36, 76.15]	44.33** [11.03, 77.64]	50.22** [16.73, 83.72]
<i>Adj. R² (n=)</i>	<i>0.00 (n=310)</i>	<i>-0.00 (n=269)</i>	<i>-0.00 (n=245)</i>
<i>Age and gender adjusted model results</i>			
Self-esteem (W3)	0.11 [-0.11, 0.32]	0.08 [-0.15, 0.30]	-0.02 [-0.25, 0.21]
Gender (RG: Male)	-23.40*** [-36.41, -10.38]	-22.24** [-35.48, -8.99]	-17.67* [-31.45, -3.90]
Age (W3)	0.72* [0.04, 1.41]	0.81* [0.09, 1.53]	0.31 [-0.42, 1.04]
Constant	23.00 [-20.72, 66.72]	19.11 [-27.26, 65.48]	44.51 [-1.45, 90.47]
<i>Adj. R² (n=)</i>	<i>0.05 (n=310)</i>	<i>0.05 (n=269)</i>	<i>0.02 (n=245)</i>
<i>Fully adjusted model results</i>			
Self-esteem (W3)	0.17 [-0.08,0.42]	0.16 [-0.10,0.42]	0.02 [-0.24,0.28]
Gender	-23.99*** [-37.34,-10.64]	-21.28** [-34.55,-8.01]	-15.67* [-29.34,-1.99]
Age (W3)	1.10** [0.34,1.86]	1.21** [0.43,1.99]	0.79 [-0.00,1.59]
Religion (RG: Not religious)	-6.42 [-21.08,8.24]	-8.62 [-23.92,6.67]	-9.64 [-24.65,5.37]
SES (RG: High)			
<i>Intermediate</i>	-2.65 [-17.10,11.79]	0.50 [-14.12,15.12]	7.39 [-7.61,22.38]
<i>Low</i>	12.51 [-3.43,28.46]	5.99 [-10.05,22.04]	13.11 [-3.08,29.30]
Marital status (RG: Married/ Cohabiting)	-0.43 [-13.43,12.57]	7.90 [-5.33,21.13]	11.69 [-1.58,24.96]
Smoking (RG: Non smoker)	4.94 [-7.90,17.78]	9.27 [-3.62,22.16]	12.92 [-0.38,26.23]
Drug use (RG: No drug use)	14.92* [1.21,28.62]	10.44 [-3.11,24.00]	10.71 [-3.33,24.75]
Mental health	-0.09 [-0.43,0.25]	-0.01 [-0.36,0.34]	0.14 [-0.22,0.49]
Ethnicity (RG: White British)	3.81 [-13.77,21.39]	6.33 [-11.93,24.59]	-8.58 [-26.67,9.51]
Constant	-4.32 [-59.39,50.75]	-21.29 [-77.31,34.74]	-8.76 [-64.24,46.71]
<i>Adj. R² (n=)</i>	<i>0.07 (n=303)</i>	<i>0.06 (n=264)</i>	<i>0.07 (n=240)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.8
Longitudinal regression results for number of abstinent days in the past year

Predictor	Number of abstinent days in the past year [95% CI]		
	W4	W5	W6
<i>Unadjusted model results</i>			
Self-esteem (W3)	0.03 [-0.41, 0.47]	-0.09 [-0.57, 0.40]	-0.24 [-0.78, 0.29]
Constant	107.29*** [44.07, 170.50]	120.49*** [50.04, 190.95]	149.92*** [72.47, 227.37]
<i>Adj. R² (n=)</i>	<i>-0.00 (n=310)</i>	<i>-0.00 (n=269)</i>	<i>-0.00 (n=245)</i>
<i>Age and gender adjusted model results</i>			
Self-esteem (W3)	-0.02 [-0.45, 0.42]	-0.11 [-0.59, 0.38]	-0.24 [-0.77, 0.29]
Gender (RG: Male)	-12.12 [-38.19, 13.96]	6.89 [-21.77, 35.56]	10.49 [-21.30, 42.29]
Age (W3)	-2.14** [-3.51, -0.77]	-1.69* [-3.25, -0.13]	-2.34** [-4.03, -0.65]
Constant	206.69*** [119.10, 294.29]	191.89*** [91.53, 292.25]	244.62*** [138.50, 350.73]
<i>Adj. R² (n=)</i>	<i>0.02 (n=310)</i>	<i>0.01 (n=269)</i>	<i>0.02 (n=245)</i>
<i>Fully adjusted model results</i>			
Self-esteem (W3)	0.01 [-0.49,0.51]	-0.22 [-0.79,0.35]	-0.29 [-0.91,0.34]
Gender (RG: Male)	-11.89 [-38.79,15.00]	8.94 [-20.32,38.20]	8.89 [-23.66,41.45]
Age (W3)	-1.93* [-3.46,-0.41]	-1.81* [-3.53,-0.09]	-2.58** [-4.47,-0.69]
Religion (RG: Not religious)	24.80 [-4.74,54.33]	29.44 [-4.28,63.17]	12.26 [-23.46,47.99]
SES (RG: High)			
<i>Intermediate</i>	17.73 [-11.37,46.84]	6.93 [-25.31,39.17]	12.34 [-23.36,48.04]
<i>Low</i>	17.74 [-14.38,49.86]	28.66 [-6.73,64.05]	33.62 [-4.92,72.16]
Marital status (RG: Married/ Cohabiting)	10.33 [-15.87,36.53]	9.94 [-19.23,39.11]	-3.97 [-35.55,27.62]
Smoking (RG: Non smoker)	-6.82 [-32.68,19.05]	-13.49 [-41.91,14.94]	-13.61 [-45.28,18.06]
Drug use (RG: No drug use)	-2.36 [-29.98,25.26]	-4.38 [-34.27,25.51]	-17.69 [-51.12,15.73]
Mental health	0.14 [-0.55,0.82]	0.42 [-0.34,1.19]	0.20 [-0.64,1.04]
Ethnicity (RG: White British)	17.65 [-17.76,53.06]	-7.65 [-47.91,32.62]	21.18 [-21.89,64.25]
Constant	148.92** [37.96,259.88]	153.91* [30.37,277.46]	240.51*** [108.48,372.55]
<i>Adj. R² (n=)</i>	<i>0.02 (n=303)</i>	<i>0.01 (n=264)</i>	<i>0.02 (n=240)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.9

Longitudinal regression results for number of days drank 7+ or 10+ units in past year

Predictor	Number of days drank 7+ or 10+ units in past year [95% CI]		
	W4	W5	W6
<i>Unadjusted model results</i>			
Self-esteem (W3)	-0.09 [-0.59, 0.41]	-0.04 [-0.60, 0.51]	0.08 [-0.50, 0.67]
Constant	160.13*** [87.39, 232.86]	146.26*** [66.03, 226.49]	115.59** [31.46, 199.73]
<i>Adj. R² (n=)</i>	<i>-0.00 (n=310)</i>	<i>-0.00 (n=269)</i>	<i>-0.00 (n=245)</i>
<i>Age and gender adjusted model results</i>			
Self-esteem (W3)	-0.05 [-0.55, 0.44]	-0.02 [-0.58, 0.53]	0.08 [-0.50, 0.66]
Gender (RG: Male)	-1.34 [-31.40, 28.72]	-4.78 [-37.48, 27.93]	-6.40 [-41.16, 28.37]
Age (W3)	2.41** [0.83, 3.99]	1.74 [-0.04, 3.52]	2.03* [0.19, 3.88]
Constant	54.83 [-46.14, 155.80]	71.64 [-42.87, 186.15]	32.19 [-83.84, 148.22]
<i>Adj. R² (n=)</i>	<i>0.02 (n=310)</i>	<i>0.00 (n=269)</i>	<i>0.01 (n=245)</i>
<i>Fully adjusted model results</i>			
Self-esteem (W3)	-0.08 [-0.65,0.49]	0.14 [-0.51,0.79]	0.22 [-0.43,0.88]
Gender (RG: Male)	4.13 [-26.42,34.68]	-1.14 [-34.38,32.10]	-3.87 [-38.11,30.37]
Age (W3)	2.96*** [1.23,4.69]	2.21* [0.26,4.17]	2.91** [0.92,4.90]
Religion (RG: Not religious)	-20.53 [-54.08,13.01]	-26.56 [-64.87,11.75]	-32.49 [-70.07,5.09]
SES (RG: High)			
<i>Intermediate</i>	-7.58 [-40.63,25.48]	15.83 [-20.80,52.46]	-13.16 [-50.70,24.39]
<i>Low</i>	31.73 [-4.76,68.21]	43.17* [2.97,83.37]	11.25 [-29.29,51.79]
Marital status (RG: Married/Cohabiting)	3.15 [-26.61,32.90]	-4.69 [-37.83,28.45]	17.17 [-16.06,50.39]
Smoking (RG: Non smoker)	30.50* [1.13,59.88]	18.19 [-14.11,50.48]	57.55*** [24.25,90.86]
Drug use (RG: No drug use)	14.57 [-16.80,45.94]	12.12 [-21.84,46.07]	9.22 [-25.94,44.38]
Mental health	0.49 [-0.29,1.27]	0.01 [-0.85,0.88]	0.17 [-0.71,1.05]
Ethnicity (RG: White British)	-9.82 [-50.04,30.41]	-4.78 [-50.52,40.96]	2.29 [-43.01,47.59]
Constant	-15.06 [-141.08,110.97]	15.29 [-125.06,155.64]	-58.48 [-197.36,80.40]
<i>Adj. R² (n=)</i>	<i>0.05 (n=303)</i>	<i>0.01 (n=264)</i>	<i>0.06 (n=240)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.10
 Longitudinal regression results for total advantages of drinking

Predictor	Total advantages of drinking [95% CI]		
	W4	W5	W6
<i>Unadjusted model results</i>			
Self-esteem (W3)	-0.00 [-0.03, 0.02]	0.01 [-0.02, 0.04]	-0.01 [-0.04, 0.03]
Constant	13.03*** [9.42, 16.64]	9.45*** [5.09, 13.81]	11.71*** [7.33, 16.10]
Adj. R ² (n=)	-0.00 (n=309)	-0.00 (n=269)	-0.00 (n=245)
<i>Age and gender adjusted model results</i>			
Self-esteem (W3)	-0.00 [-0.03, 0.02]	0.00 [-0.03, 0.03]	-0.01 [-0.04, 0.02]
Gender (RG: Male)	0.14 [-1.37, 1.64]	-1.54 [-3.31, 0.23]	-1.10 [-2.92, 0.71]
Age (W3)	-0.08* [-0.16, -0.00]	-0.08 [-0.18, 0.01]	-0.09 [-0.19, 0.01]
Constant	16.51*** [11.46, 21.56]	13.89*** [7.69, 20.10]	15.99*** [9.94, 22.05]
Adj. R ² (n=)	0.00 (n=309)	0.01 (n=269)	0.01 (n=245)
<i>Fully adjusted model results</i>			
Self-esteem (W3)	-0.00 [-0.03,0.03]	0.02 [-0.02,0.05]	-0.01 [-0.04,0.03]
Gender (RG: Male)	0.12 [-1.44,1.67]	-1.74 [-3.53,0.04]	-0.87 [-2.71,0.97]
Age (W3)	-0.07 [-0.16,0.02]	-0.07 [-0.18,0.03]	-0.08 [-0.18,0.03]
Religion (RG: Not religious)	-0.90 [-2.60,0.81]	-1.11 [-3.17,0.95]	-1.62 [-3.64,0.41]
SES (RG: High)			
Intermediate	-1.22 [-2.89,0.46]	-0.69 [-2.65,1.28]	-0.84 [-2.87,1.18]
Low	-0.64 [-2.50,1.21]	-2.18* [-4.34,-0.02]	-0.43 [-2.61,1.75]
Marital status (RG: Married/ Cohabiting)	0.70 [-0.81,2.21]	0.62 [-1.16,2.40]	-0.18 [-1.97,1.61]
Smoking (RG: Non smoker)	-1.03 [-2.53,0.46]	-1.01 [-2.75,0.72]	-0.51 [-2.30,1.29]
Drug use (RG: No drug use)	1.05 [-0.55,2.64]	0.91 [-0.91,2.73]	0.70 [-1.19,2.60]
Mental health	-0.01 [-0.05,0.03]	-0.06* [-0.10,-0.01]	-0.00 [-0.05,0.05]
Ethnicity (RG: White British)	-1.21 [-3.27,0.84]	-1.02 [-3.48,1.43]	-1.17 [-3.61,1.27]
Constant	17.54*** [11.13,23.94]	16.95*** [9.42,24.49]	17.59*** [10.11,25.07]
Adj. R ² (n=)	0.01 (n=302)	0.04 (n=264)	-0.00 (n=240)

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.11
Longitudinal regression results for total disadvantages of drinking

Predictor	Total disadvantages of drinking [95% CI]		
	W4	W5	W6
<i>Unadjusted model results</i>			
Self-esteem (W3)	-0.06*** [-0.09, -0.03]	-0.04** [-0.07, -0.02]	-0.07*** [-0.10, -0.04]
Constant	17.75*** [13.49, 22.01]	12.21*** [8.57, 15.85]	16.67*** [12.37, 20.96]
<i>Adj. R² (n=)</i>	<i>0.05 (n=309)</i>	<i>0.03 (n=269)</i>	<i>0.07 (n=245)</i>
<i>Age and gender adjusted model results</i>			
Self-esteem (W3)	-0.06*** [-0.09, -0.04]	-0.04*** [-0.07, -0.02]	-0.07*** [-0.10, -0.04]
Gender (RG: Male)	-0.17 [-1.94, 1.60]	-0.26 [-1.74, 1.22]	-1.72 [-3.45, 0.02]
Age (W3)	-0.12* [-0.21, -0.02]	-0.10* [-0.18, -0.02]	-0.17*** [-0.26, -0.08]
Constant	22.99*** [17.06, 28.92]	16.59*** [11.42, 21.77]	24.53*** [18.73, 30.32]
<i>Adj. R² (n=)</i>	<i>0.06 (n=309)</i>	<i>0.05 (n=269)</i>	<i>0.12 (n=245)</i>
<i>Fully adjusted model results</i>			
Self-esteem (W3)	-0.04* [-0.07, 0.00]	-0.03 [-0.05, 0.00]	-0.05** [-0.08, -0.02]
Gender (RG: Male)	-0.85 [-2.63, 0.93]	-0.42 [-1.93, 1.08]	-1.85* [-3.49, -0.22]
Age (W3)	-0.06 [-0.16, 0.04]	-0.05 [-0.14, 0.04]	-0.09 [-0.19, 0.00]
Religion (RG: Not religious)	0.94 [-1.01, 2.89]	-0.88 [-2.61, 0.86]	-0.10 [-1.89, 1.70]
SES (RG: High)			
<i>Intermediate</i>	-1.70 [-3.62, 0.22]	0.19 [-1.47, 1.84]	1.34 [-0.46, 3.13]
<i>Low</i>	-0.12 [-2.25, 2.01]	0.13 [-1.68, 1.95]	3.73*** [1.79, 5.67]
Marital status (RG: Married/ Cohabiting)	0.72 [-1.01, 2.45]	0.76 [-0.74, 2.26]	-0.52 [-2.11, 1.07]
Smoking (RG: Non smoker)	0.44 [-1.28, 2.15]	-0.43 [-1.89, 1.04]	-1.04 [-2.63, 0.55]
Drug use (RG: No drug use)	2.45** [0.62, 4.28]	1.76* [0.23, 3.30]	1.94* [0.25, 3.62]
Mental health	-0.07** [-0.12, -0.03]	-0.04* [-0.08, -0.01]	-0.04 [-0.08, 0.01]
Ethnicity (RG: White British)	0.04 [-2.32, 2.40]	-0.10 [-2.17, 1.97]	2.36* [0.19, 4.52]
Constant	19.28*** [11.94, 26.62]	14.49*** [8.15, 20.84]	18.54*** [11.90, 25.18]
<i>Adj. R² (n=)</i>	<i>0.12 (n=302)</i>	<i>0.07 (n=264)</i>	<i>0.20 (n=240)</i>

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Table K.12
 Longitudinal regression results for level of alcohol dependency

Predictor	Level of alcohol dependency [95% CI]		
	W4	W5	W6
<i>Unadjusted model results</i>			
Self-esteem (W3)	-0.06*** [-0.07, -0.04]	-0.06*** [-0.08, -0.04]	-0.05*** [-0.08, -0.03]
Constant	12.86*** [10.20, 15.52]	13.86*** [10.98, 16.75]	12.34*** [9.34, 15.35]
Adj. R ² (n=)	0.10 (n=310)	0.12 (n=269)	0.09 (n=245)
<i>Age and gender adjusted model results</i>			
Self-esteem (W3)	-0.06*** [-0.07, -0.04]	-0.06*** [-0.08, -0.04]	-0.06*** [-0.08, -0.03]
Gender (RG: Male)	-0.83 [-1.94, 0.28]	-1.48* [-2.65, -0.31]	-1.25* [-2.49, -0.01]
Age (W3)	-0.03 [-0.08, 0.03]	-0.03 [-0.09, 0.04]	-0.04 [-0.10, 0.03]
Constant	14.40*** [10.67, 18.13]	15.84*** [11.74, 19.93]	14.38*** [10.24, 18.53]
Adj. R ² (n=)	0.10 (n=310)	0.13 (n=269)	0.11 (n=245)
<i>Fully adjusted model results</i>			
Self-esteem (W3)	-0.04*** [-0.06,-0.02]	-0.05*** [-0.07,-0.02]	-0.04** [-0.06,-0.01]
Gender (RG: Male)	-1.06 [-2.15,0.04]	-1.48* [-2.62,-0.33]	-1.36* [-2.60,-0.13]
Age (W3)	0.03 [-0.04,0.09]	0.01 [-0.06,0.08]	-0.01 [-0.08,0.06]
Religion (RG: Not religious)	-0.19 [-1.39,1.01]	0.22 [-1.10,1.54]	0.11 [-1.24,1.46]
SES (RG: High)			
Intermediate	-0.37 [-1.56,0.81]	0.48 [-0.78,1.74]	0.44 [-0.91,1.79]
Low	0.58 [-0.73,1.88]	0.26 [-1.12,1.65]	1.41 [-0.05,2.86]
Marital status (RG: Married/ Cohabiting)	0.53 [-0.54,1.59]	0.24 [-0.90,1.38]	0.13 [-1.07,1.32]
Smoking (RG: Non smoker)	0.34 [-0.71,1.39]	0.01 [-1.10,1.12]	0.04 [-1.16,1.24]
Drug use (RG: No drug use)	1.68** [0.56,2.81]	1.67** [0.51,2.84]	1.30* [0.03,2.56]
Mental health	-0.04** [-0.07,-0.01]	-0.04* [-0.07,-0.01]	-0.03* [-0.06,-0.00]
Ethnicity (RG: White British)	0.91 [-0.53,2.35]	-0.19 [-1.76,1.38]	-0.96 [-2.58,0.67]
Constant	10.48*** [5.97,14.99]	12.41*** [7.59,17.24]	11.24*** [6.25,16.23]
Adj. R ² (n=)	0.15 (n=303)	0.16 (n=264)	0.12 (n=240)

Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Unstandardised coefficients reported; SES= Socio-economic-status; RG= Reference Group; Adj. R² = Adjusted R²

Appendix L: Sensitivity Analyses

Table L.1

Comparison of means between samples who completed all waves of the study compared to those that did not for outcome total weekly units

Wave results taken from	Participants who completed all waves Mean	Participants who did not complete all waves Mean
W2	70.02	66.32
W3	69.03	59.28
W4	64.19	57.76
W5	60.20	53.89
W6	51.25	43.55

Table L.2

Comparison of means between samples who completed all waves of the study compared to those that did not for outcome no. of abstinent days in the past year

Wave results taken from	Participants who completed all waves Mean	Participants who did not complete all waves Mean
W2	83.60	96.03
W3	95.99	115.72
W4	105.00	127.02
W5	104.94	110.53
W6	115.20	102.83

Table L.3

Comparison of means between samples who completed all waves of the study compared to those that did not for outcome no. of days drank 7+/10+ units in the past year

Wave results taken from	Participants who completed all waves Mean	Participants who did not complete all waves Mean
W2	163.38	151.99
W3	172.49	151.84
W4	153.77	126.70
W5	146.93	103.29
W6	132.38	106.2

Table L.4

Comparison of means between samples who completed all waves of the study compared to those that did not for outcome total advantages of drinking

Wave results taken from	Participants who completed all waves Mean	Participants who did not complete all waves Mean
W2	14.78	13.68
W3	13.61	11.94
W4	13.31	11.65
W5	10.31	9.47
W6	11.09	9.43

Table L.5

Comparison of means between samples who completed all waves of the study compared to those that did not for outcome disadvantages of drinking

Wave results taken from	Participants who completed all waves Mean	Participants who did not complete all waves Mean
W2	9.50	9.76
W3	7.72	7.29
W4	8.58	9.41
W5	6.47	5.69
W6	7.10	6.23

Table L.6

Comparison of means between samples who completed all waves of the study compared to those that did not for outcome total level of alcohol dependency

Wave results taken from	Participants who completed all waves Mean	Participants who did not complete all waves Mean
W2	6.72	6.38
W3	6.30	5.13
W4	5.19	4.28
W5	5.39	4.17
W6	4.79	2.9

Table L.7

Longitudinal regression model results for total weekly units (sample taken from participants who completed all waves of data collection)

Predictors	Total weekly units outcome [95% CI]				
	W2	W3	W4	W5	W6
Self-esteem	0.19 [-0.11,0.48]	0.34* [0.05,0.64]	0.38** [0.10,0.66]	0.26 [-0.01,0.53]	0.20 [-0.06,0.46]
Gender (RG: Male)	-23.86** [-40.23,-7.48]	-30.76*** [-47.36,-14.16]	-31.73*** [-47.49,-15.98]	-22.94** [-38.00,-7.88]	-18.92* [-33.28,-4.56]
Age	1.14* [0.15,2.12]	1.02* [0.03,2.02]	1.28** [0.34,2.23]	1.40** [0.50,2.31]	0.67 [-0.19,1.54]
Religion (RG: Not religious)	-7.75 [-25.94,10.43]	-4.23 [-22.67,14.20]	-2.26 [-19.76,15.24]	-7.59 [-24.31,9.14]	-10.99 [-26.94,4.96]
SES (RG: High)					
<i>Intermediate</i>	5.12 [-12.99,23.23]	-1.87 [-20.23,16.49]	-0.25 [-17.67,17.18]	1.54 [-15.11,18.20]	9.67 [-6.21,25.55]
<i>Low</i>	5.82 [-13.71,25.34]	9.69 [-10.10,29.48]	22.82* [4.03,41.60]	7.03 [-10.92,24.99]	16.73 [-0.40,33.85]
Marital status (RG: Married/ Cohabiting)	6.31 [-9.80,22.42]	8.91 [-7.41,25.24]	3.42 [-12.08,18.92]	12.35 [-2.46,27.16]	11.31 [-2.81,25.44]
Smoking (RG: Non smoker)	12.59 [-3.40,28.59]	4.96 [-11.26,21.17]	1.76 [-13.63,17.15]	10.43 [-4.28,25.14]	12.91 [-1.12,26.93]
Drug use (RG: No drug use)	11.12 [-5.61,27.85]	14.79 [-2.17,31.75]	24.43** [8.33,40.53]	14.49 [-0.89,29.88]	11.78 [-2.90,26.45]
Mental health	-0.27 [-0.70,0.16]	-0.38 [-0.81,0.06]	-0.31 [- 0.73,0.10]	-0.09 [-0.48,0.31]	0.03 [-0.35,0.41]
Ethnicity (RG: White British)	-2.17 [-23.55,19.21]	4.71 [-16.97,26.38]	4.66 [-15.91,25.23]	4.95 [-14.71,24.61]	-10.25 [-29.00,8.50]
Constant	10.39 [-50.16,70.94]	-1.48 [-62.86,59.90]	-29.62 [-87.88,28.64]	-36.21 [-91.89,19.47]	-17.21 [-70.30,35.89]
<i>Adj. R² (n=)</i>	<i>0.05 (n=222)</i>	<i>0.07 (n=222)</i>	<i>0.12 (n=222)</i>	<i>0.08 (n=222)</i>	<i>0.09 (n=222)</i>

Table L.8

Longitudinal regression model results for no. of abstinent days in the past year (sample taken from participants who completed all waves of data collection)

Predictors	No. of abstinent days outcome <i>in the past year</i> outcome [95% CI]				
	W2	W3	W4	W5	W6
Self-esteem	-0.41 [-0.85,0.03]	-0.51* [-1.01,-0.01]	-0.44 [-0.98,0.10]	-0.38 [-0.95,0.18]	-0.43 [-1.03,0.18]
Gender (RG: Male)	-7.98 [-32.52,16.56]	8.74 [-19.16,36.64]	-12.03 [-42.29,18.23]	0.00 [-31.51,31.52]	14.10 [-19.74,47.95]
Age	-2.71*** [-4.18,-1.23]	-1.72* [-3.40,-0.04]	-2.54** [-4.36,-0.72]	-2.19* [-4.08,-0.29]	-2.34* [-4.38,-0.31]
Religion (RG: Not religious)	-4.44 [-31.69,22.82]	13.54 [-17.44,44.52]	10.89 [-22.71,44.50]	21.84 [-13.16,56.85]	11.54 [-26.05,49.12]
SES (RG: High)					
<i>Intermediate</i>	1.43 [-25.72,28.57]	9.37 [-21.48,40.22]	15.92 [-17.54,49.39]	9.14 [-25.72,44.00]	9.88 [-27.55,47.31]
<i>Low</i>	21.31 [-7.95,50.57]	36.93* [3.67,70.19]	18.67 [-17.41,54.75]	33.66 [-3.92,71.23]	27.98 [-12.38,68.33]
Marital status (RG: Married/ Cohabiting)	-14.17 [-38.31,9.97]	13.74 [-13.71,41.18]	3.64 [-26.13,33.40]	6.23 [-24.78,37.23]	-3.60 [-36.89,29.70]
Smoking (RG: Non smoker)	0.83 [-23.13,24.80]	-27.79* [-55.03,-0.54]	-5.34 [-34.89,24.21]	-17.49 [-48.27,13.29]	-13.65 [-46.71,19.40]
Drug use (RG: No drug use)	4.84 [-20.24,29.91]	-9.48 [-37.98,19.02]	-16.20 [-47.11,14.72]	-12.57 [-44.77,19.63]	-25.10 [-59.68,9.48]
Mental health	0.27 [-0.37,0.92]	0.60 [-0.14,1.33]	0.42 [-0.38,1.21]	0.45 [-0.38,1.28]	0.33 [-0.56,1.22]
Ethnicity (RG: White British)	1.62 [-30.43,33.66]	-21.33 [-57.75,15.10]	11.98 [-27.53,51.49]	-8.21 [-49.37,32.94]	17.69 [-26.50,61.88]
Constant	231.51*** [140.77,322.25]	179.31*** [76.16,282.46]	226.51*** [114.63,338.39]	194.27** [77.74,310.81]	236.25*** [111.11,361.40]
<i>Adj. R² (n=)</i>	<i>0.06 (n=222)</i>	<i>0.04 (n=222)</i>	<i>0.02 (n=222)</i>	<i>0.01 (n=222)</i>	<i>0.02 (n=222)</i>

Table L.9

Longitudinal regression model results for 7+/10+ units in the past year units (sample taken from participants who completed all waves of data collection)

Predictors	7+/10+ units in the past year outcome [95% CI]				
	W2	W3	W4	W5	W6
Self-esteem	0.25 [-0.38,0.87]	0.21 [-0.42,0.84]	0.11 [-0.50,0.72]	0.49 [-0.18,1.16]	0.81* [0.17,1.45]
Gender (RG: Male)	-12.63 [-47.52,22.26]	-20.87 [-56.09,14.34]	-5.82 [-39.80,28.15]	0.74 [-36.47,37.95]	-10.86 [-46.42,24.70]
Age	1.96 [-0.13,4.06]	3.10** [0.98,5.22]	3.65*** [1.60,5.69]	1.92 [-0.32,4.15]	2.19* [0.05,4.32]
Religion (RG: Not religious)	-3.32 [-42.07,35.43]	-17.04 [-56.15,22.06]	-6.69 [-44.42,31.04]	-20.33 [-61.65,21.00]	-35.32 [-74.81,4.17]
SES (RG: High)					
<i>Intermediate</i>	7.24 [-31.35,45.83]	6.38 [-32.56,45.33]	9.90 [-27.67,47.48]	20.36 [-20.79,61.52]	-9.05 [-48.38,30.28]
<i>Low</i>	35.55 [-6.05,77.15]	18.01 [-23.97,60.00]	48.93* [8.42,89.44]	41.24 [-3.12,85.61]	18.92 [-23.47,61.32]
Marital status (RG: Married/ Cohabiting)	-1.52 [-35.84,32.80]	21.63 [-13.01,56.26]	14.49 [-18.93,47.91]	6.51 [-30.09,43.11]	18.81 [-16.17,53.78]
Smoking (RG: Non smoker)	32.06 [-2.02,66.13]	33.92 [-0.47,68.31]	26.68 [-6.50,59.87]	19.56 [-16.78,55.90]	54.09** [19.37,88.82]
Drug use (RG: No drug use)	19.90 [-15.74,55.55]	17.51 [-18.47,53.48]	34.07 [-0.65,68.78]	11.04 [-26.98,49.05]	3.58 [-32.75,39.91]
Mental health	-0.16 [-1.08,0.75]	-0.30 [- 1.23,0.62]	0.41 [-0.48,1.30]	-0.30 [-1.27,0.68]	-0.17 [-1.10,0.77]
Ethnicity (RG: White British)	-18.05 [-63.61,27.50]	9.31 [-36.67,55.28]	-8.04 [-52.40,36.32]	-13.93 [-62.52,34.65]	-4.17 [-50.60,42.26]
Constant	31.51 [-97.50, 160.51]	12.28 [-117.91, 142.47]	-80.96 [-206.58, 44.66]	0.99 [136.59, 138.57]	-67.70 [-199.17, 63.78]
<i>Adj. R² (n=)</i>	<i>0.02 (n=222)</i>	<i>0.03 (n=222)</i>	<i>0.07 (n=222)</i>	<i>0.00 (n=222)</i>	<i>0.07 (n=222)</i>

Table L.10

Longitudinal regression model results for total advantages of drinking (sample taken from participants who completed all waves of data collection)

Predictors	Total advantages of drinking outcome [95% CI]				
	W2	W3	W4	W5	W6
Self-esteem	-0.01 [-0.04,0.02]	0.00 [-0.03,0.04]	0.01 [-0.03,0.04]	0.02 [-0.01,0.06]	0.01 [-0.02,0.04]
Gender (RG: Male)	-2.10* [-4.01,-0.19]	-1.37 [-3.40,0.66]	0.49 [-1.34,2.31]	-1.48 [-3.44,0.48]	-0.95 [-2.85,0.96]
Age	0.02 [-0.10,0.13]	0.02 [-0.10,0.14]	-0.08 [-0.19,0.03]	-0.08 [-0.20,0.03]	-0.10 [-0.21,0.01]
Religion (RG: Not religious)	-1.46 [-3.57,0.65]	0.72 [-1.54,2.97]	-0.26 [-2.28,1.77]	-0.45 [-2.62,1.73]	-1.60 [-3.71,0.52]
SES (RG: High)					
<i>Intermediate</i>	0.59 [-1.51,2.70]	0.99 [-1.26,3.24]	-1.76 [-3.77,0.26]	-0.79 [-2.96,1.37]	-0.59 [-2.69,1.52]
<i>Low</i>	0.27 [-2.00,2.54]	1.33 [-1.10,3.75]	-1.45 [-3.64,0.73]	-2.22 [-4.55,0.12]	0.15 [-2.12,2.42]
Marital status (RG: Married/ Cohabiting)	-0.22 [-2.09,1.66]	0.81 [-1.18,2.81]	0.98 [-0.81,2.78]	0.85 [-1.07,2.78]	-0.66 [-2.53,1.22]
Smoking (RG: Non smoker)	0.09 [-1.78,1.95]	-0.95 [-2.94,1.03]	-0.37 [-2.15,1.42]	-0.35 [-2.26,1.56]	-0.66 [-2.52,1.20]
Drug use (RG: No drug use)	0.16 [-1.79,2.11]	1.02 [-1.06,3.09]	0.61 [-1.25,2.48]	1.16 [-0.84,3.16]	1.09 [-0.86,3.03]
Mental health	-0.00 [-0.06,0.05]	-0.03 [-0.08,0.02]	-0.02 [-0.07,0.03]	-0.06* [-0.11,-0.01]	-0.01 [-0.06,0.04]
Ethnicity (RG: White British)	-0.54 [-3.03,1.95]	-0.23 [-2.88,2.43]	-2.56* [-4.96,-0.16]	-1.41 [-3.96,1.15]	-1.29 [-3.77,1.20]
Constant	17.42*** [10.39,24.45]	12.90*** [5.38,20.41]	17.63*** [10.89,24.37]	15.21*** [7.96,22.45]	16.16*** [9.12,23.20]
<i>Adj. R² (n=)</i>	<i>-0.01 (n=221)</i>	<i>-0.02 (n=222)</i>	<i>0.01 (n=221)</i>	<i>0.03 (n=222)</i>	<i>0.00 (n=222)</i>

Table L.11

Longitudinal regression model results for total disadvantages of drinking (sample taken from participants who completed all waves of data collection)

Predictors	Total disadvantages of drinking outcome [95% CI]				
	W2	W3	W4	W5	W6
Self-esteem	-0.04*	-0.04*	-0.02	-0.01	-0.01
	[-0.08,-0.01]	[-0.07,-0.00]	[-0.06,0.01]	[-0.04,0.02]	[-0.04,0.02]
Gender	-0.71	-1.90*	-0.23	-0.41	-1.85*
(RG: Male)	[-2.76,1.34]	[-3.75,-0.06]	[-2.23,1.76]	[-2.14,1.33]	[-3.52,-0.18]
	-0.02	-0.12*	-0.10	-0.07	-0.11*
Age	[-0.14,0.11]	[-0.23,-0.01]	[-0.22,0.02]	[-0.17,0.04]	[-0.21,-0.01]
Religion (RG:	0.17	0.62	0.48	-0.52	-0.19
Not religious)	[-2.11,2.44]	[-1.43,2.66]	[-1.74,2.69]	[-2.44,1.41]	[-2.04,1.66]
SES (RG: High)					
Intermediate	0.22	0.10	-2.49*	-0.10	1.70
	[-2.05,2.49]	[-1.94,2.14]	[-4.69,-0.28]	[-2.02,1.82]	[-0.14,3.54]
Low	1.82	2.42*	-0.80	-0.21	4.40***
	[-0.62,4.27]	[0.22,4.62]	[-3.19,1.58]	[-2.28,1.86]	[2.41,6.38]
Marital status					
(RG: Married/	1.91	0.15	1.20	1.30	-0.29
Cohabiting)	[-0.11,3.92]	[-1.66,1.96]	[-0.76,3.16]	[-0.40,3.01]	[-1.93,1.35]
Smoking (RG:	0.40	-1.44	0.96	0.22	-1.49
Non smoker)	[-1.60,2.40]	[-3.24,0.36]	[-0.99,2.92]	[-1.48,1.91]	[-3.12,0.14]
Drug use (RG:	0.88	1.98*	1.02	1.39	1.81*
No drug use)	[-1.21,2.98]	[0.09,3.86]	[-1.03,3.06]	[-0.38,3.16]	[0.11,3.52]
Mental health	-0.04	-0.09***	-0.08**	-0.05*	-0.06**
	[-0.10,0.01]	[-0.13,-0.04]	[-0.13,-0.03]	[-0.09,-0.00]	[-0.10,-0.02]
Ethnicity (RG:	-0.03	0.34	-0.39	-0.58	1.46
White British)	[-2.71,2.65]	[-2.07,2.75]	[-3.01,2.24]	[-2.84,1.69]	[-0.71,3.64]
Constant	16.32***	21.31***	19.67***	12.73***	14.54***
	[8.74,23.90]	[14.50,28.13]	[12.30,27.04]	[6.32,19.15]	[8.38,20.70]
<i>Adj. R² (n=)</i>	<i>0.08 (n=222)</i>	<i>0.18 (n=222)</i>	<i>0.11 (n=221)</i>	<i>0.05 (n=222)</i>	<i>0.17 (n=222)</i>

Table L.12

Longitudinal regression model results for total level of alcohol dependency (sample taken from participants who completed all waves of data collection)

Predictors	Total level of alcohol dependency outcome [95% CI]				
	W2	W3	W4	W5	W6
Self-esteem	-0.05*** [-0.07,-0.02]	-0.04** [-0.07,-0.01]	-0.03* [-0.05,-0.00]	-0.02 [-0.04,0.01]	-0.01 [-0.04,0.01]
Gender (RG: Male)	-0.96 [-2.38,0.45]	-1.57* [-3.09,-0.04]	-1.40* [-2.62,-0.17]	-1.58* [-2.94,-0.21]	-1.40* [-2.72,-0.07]
Age	0.03 [-0.05,0.12]	0.06 [-0.04,0.15]	0.03 [-0.04,0.10]	0.03 [-0.05,0.11]	-0.00 [-0.08,0.08]
Religion (RG: Not religious)	0.48 [-1.09,2.05]	0.28 [-1.41,1.97]	0.05 [-1.30,1.41]	0.40 [-1.11,1.91]	-0.06 [-1.53,1.41]
SES (RG: High)					
<i>Intermediate</i>	-0.12 [-1.68,1.45]	0.27 [-1.42,1.95]	0.35 [-1.00,1.70]	0.58 [-0.92,2.09]	0.61 [-0.86,2.07]
<i>Low</i>	1.70* [0.01,3.39]	0.61 [-1.20,2.43]	1.12 [-0.33,2.58]	0.00 [-1.62,1.63]	1.44 [-0.14,3.02]
Marital status (RG: Married/ Cohabiting)	0.99 [-0.40,2.38]	0.60 [-0.90,2.10]	0.44 [-0.77,1.64]	0.67 [-0.67,2.01]	0.17 [-1.14,1.47]
Smoking (RG: Non smoker)	0.16 [-1.22,1.54]	0.79 [-0.70,2.27]	0.40 [-0.79,1.59]	0.56 [-0.77,1.89]	0.01 [-1.29,1.30]
Drug use (RG: No drug use)	1.89* [0.44,3.34]	2.01* [0.45,3.57]	2.06** [0.82,3.31]	1.56* [0.17,2.95]	1.43* [0.07,2.78]
Mental health	-0.04* [-0.08,-0.00]	-0.05* [-0.09,-0.01]	-0.04* [-0.07,-0.00]	-0.05** [-0.09,-0.01]	-0.05** [-0.08,-0.01]
Ethnicity (RG: White British)	0.03 [-1.82,1.88]	0.53 [-1.46,2.52]	0.66 [-0.94,2.25]	-0.51 [-2.28,1.27]	-1.35 [-3.08,0.38]
Constant	12.01*** [6.77,17.24]	10.68*** [5.05,16.32]	7.96*** [3.44,12.47]	8.15** [3.11,13.18]	8.67*** [3.77,13.57]
<i>Adj. R² (n=)</i>	<i>0.18 (n=222)</i>	<i>0.14 (n=222)</i>	<i>0.14 (n=222)</i>	<i>0.09 (n=222)</i>	<i>0.08 (n=222)</i>