Investigating the health of non-drinkers

The sick quitter and sick non-starter hypotheses

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Declaration

I, Linda Ng Fat confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

Non-drinkers have been consistently found to have worse health outcomes than moderate drinkers in later life. Explanations for this include a protective effect of moderate alcohol consumption on health, or alternatively that some non-drinkers are ex-drinkers who may have had to stop drinking because of poor health hence suffering from a pre-existing poor health bias. Another factor, which has been unexplored in the literature, is the early life health and social circumstances of non-drinkers; this is the subject of investigation in this thesis

The Health Survey for England was used to explore the early life social, health and health behaviours of non-drinkers aged 18 to 34 years. The National Child Development Study and the 1970 British Cohort Study were used to investigate the childhood health characteristics of non-drinkers in early adulthood. Binary logistic regression was carried out to assess whether poor health from an early age and persistent poor health was associated with being a persistent non-drinker across time at different ages, adjusting for sex, highest qualification, mental health and marital and parental status.

Poor health from an early age and persistent poor health were associated with being a lifetime abstainer, consistently between two cohorts, which is an original contribution to knowledge. Non-drinkers from an early age had higher rates of emotional and behaviour problems than drinkers; this may contribute to greater risk of cognitive decline. Furthermore non-drinkers in early adulthood had higher rates of health conditions in adolescence, and had lower educational levels from early adulthood. This might increase the risk of mortality among non-drinkers in later life through persistent multiple disadvantage from an early age.

The health and social characteristics of non-drinkers in early life need to be considered when comparing health outcomes of non-drinkers with drinkers in later life. The worse health and lower social circumstances of non-drinkers from an early age may be why non-drinkers consistently have worse health outcomes than drinkers across a broad range of conditions.

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List of abbreviations

BCS70	The 1970 British Cohort Study
95% CI	95% confidence interval
Ex-drinker (non)	People who reduced consumption to non-drinking from drinking more in the previous wave
Ex-drinker (SO)	People who reduced consumption to special occasion drinking from drinking more in the previous wave
GOR	Government Office Regions
Eq-5D	A standard instrument used to provide a single index value for health status
HSE	The Health Survey for England
'Lifetime abstainers' (SI)	People who report 'never having an alcoholic drink' i.e. a self-identified current status measure of being a 'lifetime abstainer'.
LLSI	Limiting longstanding illness
LSI	Longstanding illness
MAR	Missing at random
MCAR	Missing completely at random
MID	Multiple Imputation then deletion
MNAR	Missing not at random
NCDS	The National Child Development Study
NHS	The National Health Service
OR	Odds Ratio

1. Introduction

Harms arising through alcohol consumption can contribute to a broad range of detrimental effects. This includes physical and social harms to the drinker, the drinker's immediate friends and family as well as wider problems created for society. Alcohol is estimated to cause 2.5 million deaths worldwide including 320,000 deaths to people aged between 15 to 29 years (1) and is considered the third leading risk factor for premature deaths and disabilities globally (2). Within the UK liver disease, which is associated with alcohol consumption, is the only major cause of death to still be rising annually, with numbers having doubled in 2008 from 1991, and is a greater cause of death than diabetes and road deaths combined (3). Among young people aged under 30 years serious liver problems have doubled in the last decade (4). As well as physical damage to the individual, alcohol related harm is estimated to cost the economy around £20 billion, this includes costs to the economy, social care and the criminal justice system (5).

Evidence suggests alcohol-related crime and anti-social behaviour has increased in the last 20 years (6). Furthermore, a rise in the number of young drunken people inhabiting the streets till early hours in the morning is thought to have led to segregation in towns with people aged 30 or over no longer going into the centre at night (7, 8) and developments of "no-go micro-districts" (9). Drinking levels have not always been so high, and in fact sobriety was advocated as a positive life style choice by members of the temperance movement from the late eighteenth century onwards (10-12). Today, whilst the public health message centres on sensible guidelines of drinking per day the option to not drink is often over looked (11), even though evidence shows that problem drinking is strongly correlated with average consumption (13, 14). This has come to be known as Population theory, which in the case of alcohol consumption, argues that a more effective measure to reduce problem drinking is to decrease average consumption as opposed to targeting problematic drinkers, which has been the focus of current policy (6).

One reason why abstinence as a health message may have been ignored could be in part down to findings from longitudinal observational studies which show that moderate drinkers have better health outcomes in later life than non-drinkers and heavy drinkers. This pattern has been found in various conditions such as coronary heart disease (15-17), all-cause mortality (18) and more recently in cognitive functioning (19-21), which is sometimes referred to as a U-shaped or J-shaped relationship. Since moderate drinkers have better health outcomes than non-drinkers consistently across studies, this has led some to suggest that the reason why moderate drinkers do better is that alcohol in moderation has a protective effect on health in later life. This however has not been without controversy and has called into question the nature of the people who do not drink alcohol.

The main aim of this thesis is to explore the hypothesis that some people may never take up drinking due to poor health from an early age. This has implications for studies which compare the health of moderate drinkers to non-drinkers and find that moderate drinkers have better health outcomes, as the latter may be subject to a pre-existing poor health bias even after excluding ex-drinkers. Indeed the consensus among some epidemiologists is that there are health benefits of moderate alcohol consumption (16, 17, 22-24), a message which the drinks industry often conveys (23, 25). This belief is also held among the general public (26-29). Whilst the J-curve has been explored for decades, the controversy that surrounds it is still relevant in the public health field today, for instance whilst writing this thesis a meta-analysis concluding that moderate alcohol is beneficial was published (16) and critiques of the J-curve later followed (23, 30). This shows that the controversy surrounding the J-curve still pertains and calls into question the health and social characteristics of those who do not drink alcohol throughout life. In this thesis the initial hypothesis was established using the Health Survey for England exploring demographic, social and health characteristics of young non-drinkers aged 18 to 34 years (31). Whether there exists a relationship between persistent poor health and continued non-drinking was explored further using two

nationally representative prospective cohort studies, The National Child Development Study (NCDS) and the 1970 British Cohort Study (BCS70).

Given that this thesis is an investigation of those who do not drink alcohol the first part of the literature review in Chapter 2 will review the characteristics of non-drinkers as understanding the reasons for not drinking is important in framing the analysis of this thesis, with a focus on non-drinking in early adulthood. The second section of the literature review will focus on non-drinkers in epidemiological studies and will provide a critique of the J/U-curve. Following from this review, gaps in the literature are established and finally how research in this thesis will answer these gaps is outlined in Chapter 3.

The rest of the thesis comprises of three different studies. Firstly cross-sectional analysis is conducted on broad characteristics of non-drinkers in early adulthood using The Health Survey for England (Chapter 4). This is then followed up with longitudinal analysis to explore specifically the effects of persistent poor health and remaining a persistent non-drinker from early adulthood (sick non-starters), or a worsening of health and becoming an ex-drinker (sick-quitters). This is done using the 1958 National Child Development Study (NCDS) and 1970 British Cohort study (BCS70). Data, methodology and results are presented in Chapter 5 to 12. This thesis closes with a general discussion in Chapter 13.

2. Literature Review

2.1 Characteristics of Non-drinkers

2.1.1 Trends

The total proportion of the population in Great Britain who classify themselves as a non-drinker has risen from around 10% in 1998 to 15% in 2009 (32) (Figure 2.1). A growing proportion of ethnic minorities in the population may have a role to play, since non drinking is higher among ethnic minorities (33) however the overall proportion of ethnic minorities is small. Furthermore evidence using trend data from the Health Survey for England shows increases in the number of white self-reported abstainers (34).

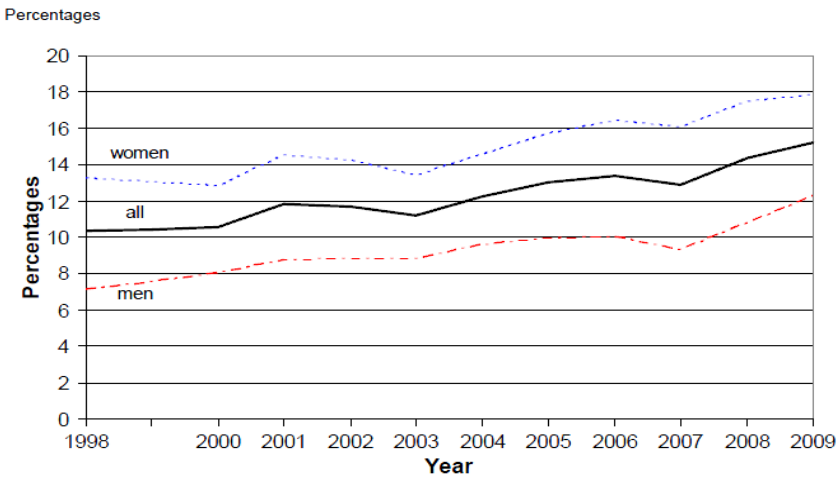


Figure 2.1 Percentage of adults who reported never drinking alcohol in Great Britain, ONS (32)

More recently non-drinking among young people is said to be on the increase. Around 48% of people aged 11 to 15 years have never had an alcoholic drink in 2008 compared with 39% in 2003 (35). This combined with young high profile celebrities claiming not to drink or smoke, has led to a newspaper naming this phenomenon as "The rise of the teetotal generation" (36). Other articles that have documented a decrease in the number of young people drinking alcohol in the

media this year include “Sobering” (37) “Meet the new puritans: young Britons cut back on drink and drugs” (38) and “Is the teen rebel a dying breed” (39).

The rise in the number of young people consuming less alcohol has been labelled a ‘cultural shift’ by Fiona Measham a criminologist who has studied alcohol and drug use for over two decades (37). In the same article she also suggests that “patterns of drink and drug use tend to go in 10- to 15-year cycles as generations react against those preceding them.” Whilst this may be a cyclical change in consumption patterns, other co-occurring factors may have also prompted the change including a rise in Internet use and social networking competing for leisure time.

2.1.2 Reasons and attitudes

Certain reasons for not drinking are well known such as abstaining for religious reasons, this is particularly the case among Muslims where drinking alcohol is condemned and abstinence is the general norm (40, 41), although some Muslims have been found to drink covertly (41). It has also been shown that being more religious in general, for example greater subjective religiousness, attending church and praying regularly is also associated with being an abstainer (33, 42, 43). Drinking is also shown to be lower among ethnic minorities compared with the white majority (33, 44). Religion is likely to be an influence in the higher rates of abstention among ethnic minorities, however social norms where drinking is lower among ethnic minorities may also be a factor. Indeed a protective ethnic density effect for current consumption has been shown, meaning those living in non-white areas were less likely to report being a current drinker than their counterparts (45). That ethnic density has a protective effect on current alcohol consumption compliments the idea that abstention rates are negatively correlated with problem drinking. A study conducted in Sweden found the scores on sociability among young male abstainers were higher in regions where there was a higher proportion of abstainers (46). It is possible in areas where there are more abstainers drinking heavily is less of a cultural and social norm or the presence of other abstainers

makes it easier for people to refrain from drinking. Indeed Sulkenen argues that individual-level pressure to abstain may reinforce societal reasons for abstaining (12).

Whilst it is well known that non-drinking is higher among religious and ethnic minority populations, a recent report on smoking and drinking in the UK found around 57% of those who reported never drinking stated they had always been a non-drinker, and among these people not liking the taste was the main reason (48%), whilst a smaller proportion (28%) stated it was for religious reasons (32). Furthermore, in a cross country comparison including eight diverse countries from different continents "I have no interest in drinking" was one of the top three reasons in each country for being a lifetime abstainer (47). This shows that non-ideological reasons as opposed to religious reasons are the most common reasons for not drinking alcohol. In the same study, a higher proportion of female lifetime abstainers stated "I have no interest in drinking" alongside the option of not liking the taste. The authors suggest that norms may be more restrictive of drinking for women, whereas for men reasons associated with experience with drinking such as "afraid of alcohol problems" were more popular. Non-drinking is found to be consistently greater among women (34, 48), with men drinking more alcohol and having more alcoholic related harms than women being one of the few consistent gender difference observed globally (49). This reflects the different drink related norms that exist among men and women.

Religion, ethnicity, norms and non-ideological reasons may be reasons why someone might abstain from alcohol. Attempts have been made to classify non-drinkers into categories. A study in the US found four classes of non-drinkers, those who abstained due to moral reasons, fear of the adverse consequences, inconsequential reasons or indifference, and family background (which was independent of religious, moral reasons or adverse consequences) (50). These typologies demonstrate that moral or religious reasons are not the only reasons for not drinking. The presence of an inconsequential group, people who do not drink

for non-ideological reasons, compliments the idea of an existence of a 'tolerant abstainer', a person who does not drink but does not impose their views on others. A different typology among non-drinkers was found by looking at the difference between abstaining groups with a drinking father and those without a drinking father in a study conducted on young male abstainers in Sweden (46). The latter group was defined as "Traditional abstainers", who were hypothesized to have a history of family temperance highlighting upbringing as an important pathway, whilst the former group were thought to abstain due to seeing the adverse effects of drinking from a parent.

2.2 Non-drinkers in Epidemiological Studies; The J-curve

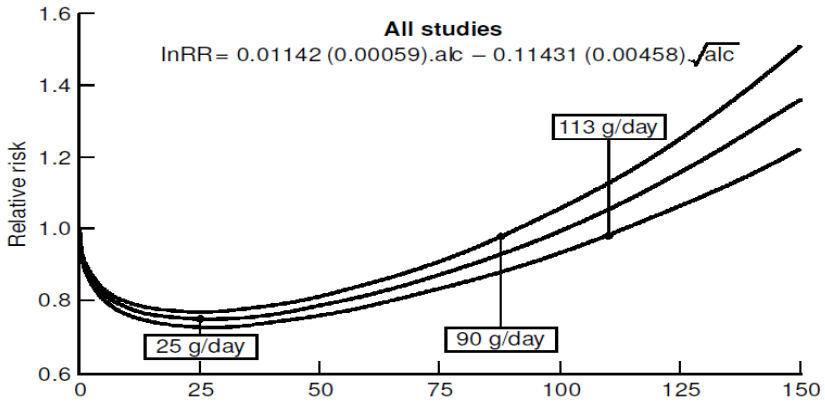


Figure 2.2 An example of a J-curve patterned association between alcohol consumption (measured in grams) and risk of coronary heart disease, a study by Corrao et al (15)

Outside of the sociological and qualitative work on non-drinkers, non-drinkers appear prominently in epidemiological literature where it is established that non-drinkers have worse health than light drinkers particularly in later life. This was first established by Pearl in 1926 on a study in Baltimore where it was found that moderate drinkers had lower mortality than non and heavy drinkers (51). This is often referred to as the J-shape or U-shape function because of the alcohol dose-response relationship, for example in Figure 2.2 those who drank around 25g of alcohol a day, which roughly amounts to two standard alcoholic drinks according to US measures, had the lowest risk of coronary heart disease (15).

This J-curve pattern has been replicated in numerous other studies particularly in the area of cardiovascular health where non-drinkers in comparison to moderate drinkers have a higher coronary heart disease risk (15-18). The relationship is robust, as well as existing through time this relationship has been found in diverse populations around the world for example among Puerto Ricans, and Japanese Americans in Hawaii (17), and in meta analyses (16, 18). Since moderate drinkers consistently do better than non-drinkers this has led some to suggest that the reason they live longer is due to a protective effect on health from moderate alcohol consumption. Indeed when assessing whether moderate alcohol consumption and reduced the risk of coronary heart disease are causally related, then the Bradford Hill eight point guidelines for assessing causality from findings from observational studies is often adopted (52), and the guideline of consistency of findings is strongly met.

Another Bradford Hill guideline for assessing whether a relationship is causal is for there to be a biological plausibility of a causal relationship. Moderate alcohol consumption may have a protective effect on health via increasing high-density lipoprotein cholesterol (HDL) also known as 'good cholesterol' which aid harmful cholesterol to be transported outside of the body. This has been suggested as the plausible mechanism as to why moderate drinkers consistently have better health outcomes. Whilst trials have analysed the effects of alcohol, findings have been mixed. Meta-analysis of experimental studies which focus on biomarkers concluded that there was evidence of a protective effect on coronary heart disease through changing lipids and haemostatic factors (53, 54), however there has also been evidence that alcohol raises triglycerides, a different type of fat which is actually a risk factor for coronary heart disease (55). Randomized controlled trials, the gold standard of studies to assess if associations are causal, however are limited particularly due to their small sample size and duration due to the high costs of conducting such studies. Furthermore none have assessed actual incidence of disease. Perhaps more importantly, there are ethical concerns with giving a treatment group alcohol, especially for long periods of time, as it may be misused

or participants may become dependent on it thus most of the research on this area has relied on findings from observational studies where causality can never be guaranteed. Therefore despite the consistency of findings whether non-drinkers have worse health outcomes than moderate drinkers because moderate alcohol consumption is protective still remains controversial.

2.2.1 Sick-quitter hypothesis

The most prominent criticism of claims of a beneficial effect of moderate alcohol consumption from a J-curve was proposed by Shaper and colleagues in 1988 (56, 57). This criticism is that some non-drinkers, especially in middle age consist of ex-drinkers who may have stopped drinking due to problems arising from alcohol itself or other health conditions, thus it is their pre-existing poor health which exaggerates their negative health outcomes relative to drinkers. This is sometimes referred to as the "sick-quitter" bias. It is well known that many problematic drinkers have to resort to stopping drinking altogether to deal with their addiction (58, 59), but whether non-problematic drinkers stop drinking in relation to a worsening of health is less well established. However since the development of the 'sick-quitter' hypothesis it has been shown that ex-drinkers have higher rates of doctor-diagnosed illnesses including heart disease (60) and have higher mortality rates than life time abstainers and light drinkers (61, 62). Furthermore a cross-sectional study conducted in Australia found having diabetes, hypertension or anxiety, was associated with increased probability of reduction or cessation of alcohol consumption, and this also increased with a decline in self-rated health (63). A more recent longitudinal study found having a diagnosis of chronic conditions was significantly associated with a reduction in excessive drinking as well as greater rates of drinking infrequently among participants aged between 50 to 85 years in the US (64). Conditions included diabetes, cancer, lung disease or heart disease and the decline to infrequent drinking was particularly more common among women with diabetes and cancer. Similarly in one longitudinal study conducted on middle aged women in Australia it was found that consistent

moderate drinkers had the best self-rated health after adjustment for chronic conditions, mental health and health behaviours (65).

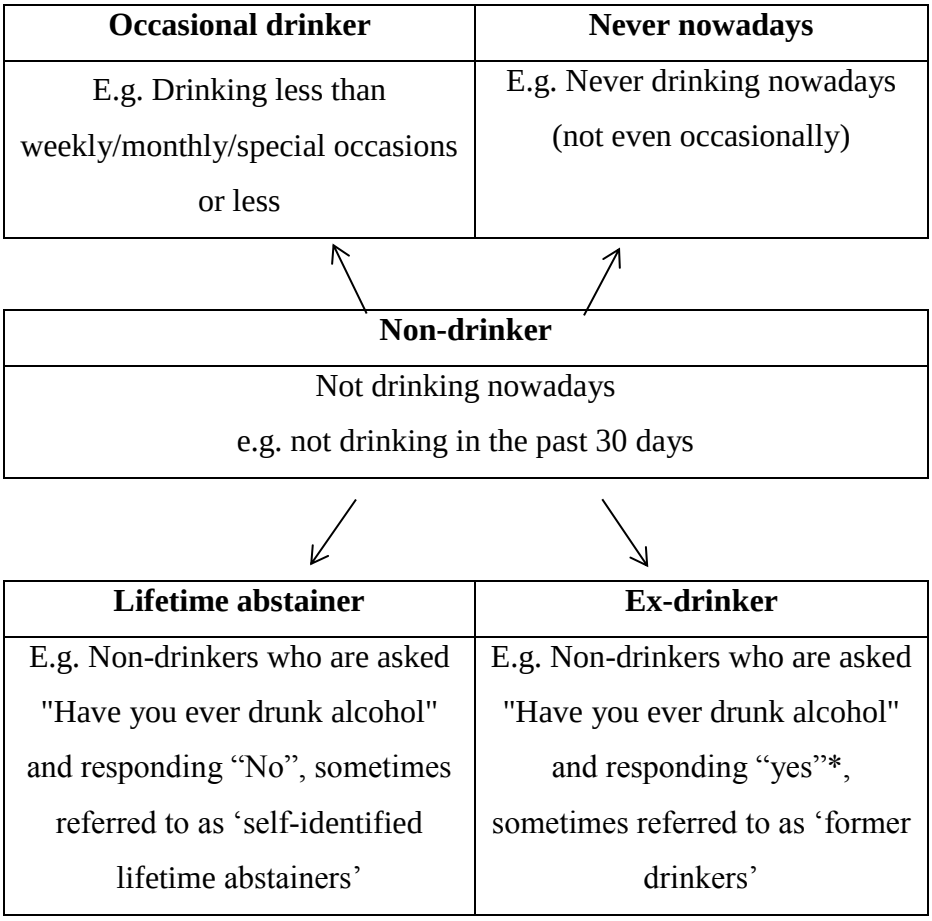


Figure 2.3 Types of non-drinkers

*This has also been extended to include only those who have drunk more often than once a month during their heaviest drinking period

These studies illustrate that non-drinking has a dynamic relationship with health and people may quit drinking because of health conditions which are not related to problems with alcohol itself. Furthermore since abstention increases with age (34, 66-68), it is often considered to be attributed to people quitting as they experience illness as they grow older. Whilst longitudinal studies have analysed the effects of health on declining consumption in later life it has not been shown what the effects of health on drinking are earlier on in adulthood.

Accounting for a pre-existing poor health bias among ex-drinkers, some studies have used lifetime abstainers as a reference group against drinkers which eliminates ex-drinkers from this category. Non-drinkers have been shown to be a heterogeneous group consisting of life time abstainers, ex-drinkers, and occasional drinkers (69). Figure 2.3 shows how the term; 'non-drinkers' is often used as an umbrella term to describe either 'occasional' or 'never nowadays' drinkers, whom may be lifetime abstainers or ex-drinkers. Sometimes groups are not mutually exclusive or do not have a strict definition.

Where ex-drinkers have been excluded from non-drinkers and lifetime abstainers used as the reference category against drinkers, findings have been mixed with some reporting reduced beneficial effects to moderate drinkers (15, 18) or no substantive change to the relative better health outcomes of moderate drinkers (16). A J-curve which separated ex-drinkers from lifetime abstainers showed that ex-drinkers had a risk of mortality that was more on a par with heavy drinkers, thus including them with non-drinkers may exaggerate their negative health outcomes relative to moderate drinkers (Figure 2.4) (70). Despite this the separation of ex-drinkers from lifetime abstainers is not always carried out. Furthermore it has been suggested that the non-drinker reference category may also include occasional drinkers, whom have been hypothesised to be prone to the sick-quitter bias, as some who are ill reduce their consumption to occasional drinking (71). In this review which examined studies that compared moderate drinkers with non-drinkers, it was found that only 9 out of 54 studies excluded occasional drinkers and ex-drinkers from the non-drinker reference category, and in such studies results were not significant (71). Indeed Shaper's et al study in 1988 which first established evidence for the sick-quitter bias, found prevalence of disease to be highest among non-drinkers followed by occasional drinkers (56). Failure to exclude ex-drinkers and occasional drinkers from the non-drinking category may be as a consequence of the study design where it is not possible to make the distinction due to the way the question was initially asked in the survey.

This review focuses on the comparison between drinkers and non-drinkers from observational data. This J-curve pattern has been found not only in the area of coronary heart disease, but on several other outcomes where the biological possibility is not as clear such as cognitive functioning (19-21, 72, 73), dementia (20), ageing (74), rheumatoid arthritis (75), all-cause mortality (18, 76), and even obesity (77) and the common cold (78). A list of 24 conditions where moderate alcohol consumption is thought to be protective was found in this critical review ranging from low birth weight to osteoporosis (30, 79, 80). If the criticisms that are about to be discussed are valid, then this would create inherent bias in all of these studies meaning that the better health outcomes of moderate drinkers may not be attributable to a protective effect of moderate alcohol consumption and may be why non-drinkers suffer from worse health outcomes across various conditions.

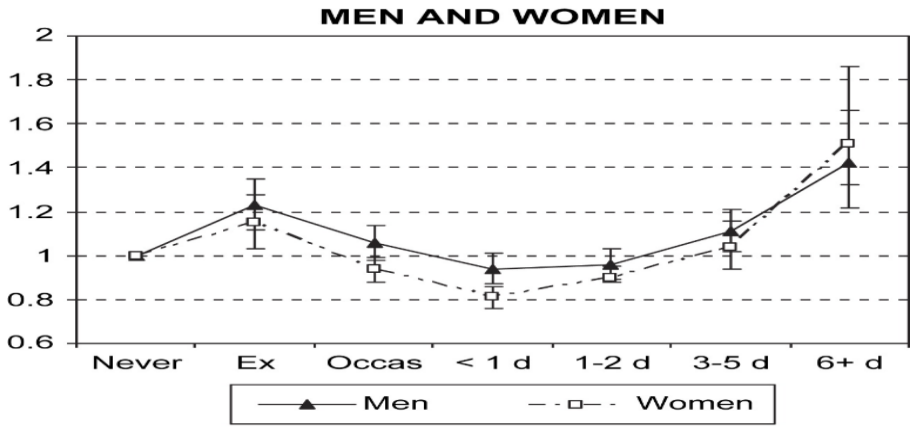


Figure 2.4 Frequency of drinking against relative risk of mortality, a study by Klatsky et al (70)

2.3 Further criticisms of the J-Curve

Outside the "sick quitter" hypothesis the precision of the J-shaped curve has been questioned further by recent research, which largely surrounds issues to do with non-drinkers being an inadequate reference group. This has revealed important information about non-drinkers and provides groundwork for research explored in this thesis. These criticisms are summarized from existing literature into three sections which are discussed in turn as follows:

2.3.1 There are potential uncontrolled factors that confound the relationship between non-drinking and mortality

2.3.2 There are methodological problems in the way lifetime abstainers are defined

2.3.3 Poor health at young age may be a reason for never drinking alcohol, thus lifetime abstainers may also be an inadequate reference group

2.3.1 Uncontrolled for confounders

Other factors may confound the relationship between increased risks of coronary heart disease among non-drinkers, specifically if non-drinkers had higher risk factors for mortality and coronary heart disease relative to drinkers. Non-drinkers have been shown to have worse health and health behaviours, including higher rates of diabetes and hypertension, poorer mental health, and are relatively inactive (63, 81), where in general good health behaviours have been found to cluster among moderate drinkers whom tend to be from higher social classes (82). Even when splitting ex drinkers from long-term abstainers in a sample of middle-aged men, both groups tend to have worse physical and mental health than light drinkers (57, 68) and were more likely to be on regular medical treatment (61). In addition whilst lifetime abstainers showed low cardiovascular mortality they had increased non-cardiovascular mortality in one study (57) and were also found to be less likely to use preventative care than light drinkers (68). The next two subsections will discuss the social and psychosocial aspect of non-drinking in greater detail.

2.3.1.1 Social Gradient in Non-drinking

Lower income and education has been found to be associated with non-drinking (31, 34, 48, 83-86) where mortality and morbidity has been shown to be higher among those in lower social positions (87, 88). In a longitudinal study using a British cohort born in 1958 men without qualifications at age 23 had almost three times the odds of non-drinking than those with qualifications, and this gradient did not change up to age 42 (83). In the same cohort lower cognitive ability in

childhood, which may affect educational attainment, increased the odds of being a non-drinker throughout adulthood (89). In another cross-sectional study conducted in Rotterdam a gradient of decreasing prevalence of abstinence along educational level was observed for both men and women aged 16 to 69 years. This gradient was larger for women where the least educated women had almost twice the rate of abstinence observed among the least educated males however at the highest educational level rates of abstinence between men and women were almost the same (84)

Why people with less education and income refrain from alcohol consumption has yet to be clarified. Alcohol is a commodity thus those with very low incomes who live within the poverty line may not be able to afford a lifestyle that includes drinking alcohol. Income is an important factor in abstaining from alcohol where it is relatively expensive (47) although alcohol has become increasingly cheaper in the UK. Drinking among university students is known to be higher than the general population (90-92), and some have referred to this transition as 'rite of passage' into certain drinking patterns (93). This may be a factor influencing greater levels of abstinence among those with no qualifications, having not experienced a university culture where many young people drink heavily. Another possible theory is that those from disadvantaged backgrounds may be socially excluded or have lower social capital that presents opportunities for people to drink. Alternatively social norms within lower socio-economic groups may be different with drinking being more of a norm among higher socio-economic groups.

2.3.1.2 Psychosocial health of non-drinkers

Many studies have reported a J or U-shaped relationship between poor mental health and alcohol consumption, with light to moderate drinkers having better mental health than non and heavy drinkers (94-96). Non-drinkers in a cross-sectional study in Australia aged between 40 to 42 years reported higher psychological distress than light to moderate drinkers and this was partially

explained through having poorer social relationships (97). In the same study former drinkers had higher levels of distress than lifetime abstainers or moderate drinkers. This was also the case in another cross-sectional study conducted in Finland looking at health utility, quality of life and mental distress, former drinkers had the highest scores which was more on a par with heavy drinkers among a cohort aged 30 to 64 years (95). However in a different prospective cohort study of women in Australia, risk of symptoms of depression or anxiety was the same between former drinkers and lifetime abstainers at 30 years (96). The sick-quitter effect may partially explain why we observe worse mental health among abstainers relative to light to moderate drinkers. Poorer mental health could be related to underlying issues that were associated with being a previous problematic drinker (98) or a consequence of a developing a health condition or having to give up alcohol itself.

However associations between poorer health and abstaining are not only found in later life but also among younger people. Male non-drinkers aged 18 to 19 in a Swedish cohort were the least socially integrated (46) and in a Norwegian study U-shaped associations were found between getting drunk for the first time and psychological problems from ages 19 to 28 (99). Similarly non-drinking males aged 20 to 24 years demonstrated higher levels of anxiety and depression, which was found to be related to lower extraversion and being less healthy (100). A U-shaped pattern found among 33 year olds for psychological distresses existed even after excluding past heavy drinkers which eliminated some of the effects of the sick-quitter bias (101). Given that the association between drinking and poor mental health is found even among 18 to 19 year olds (46) it is unlikely that the former drinker problem could be an issue at such a young age.

Studies have shown associations between poorer psychosocial health and abstinence for young males but not females (99, 100). The reason for this gender difference may be because abstinence is less of a ‘social deviance’ for females than males since drinking levels are universally lower among females. Males who do not drink alcohol may be much less like the average young male who drinks

alcohol. This was emphasized in a qualitative study of 12 undergraduate interviewees who found a greater negative attitude towards male non-drinkers than female non-drinkers (102). Similarly when comparing 17 to 18 year old abstaining males with drinking fathers to those with non-drinking fathers in Sweden, those with abstaining fathers did not suffer from poor psychosocial health which may reflect belonging to a 'dry' family where abstinence is more of a family tradition and less of a deviance from the drinking norm (46).

Despite the evidence that suggests a relationship between non-drinking and poorer mental health throughout life, suggesting that poorer health may be an antecedent to non-drinking, the causal direction is sometimes read in the other direction. For example in his review of the psychological benefits associated with moderate drinking, Stanton Peele, a psychologist who has researched addiction, argues that the benefits of moderate alcohol consumption should be considered more prominently in studies and even be included in cost-benefit economic analyses (103). The causal direction is also read in favour of moderate alcohol consumption in a different study which looked at the J-curve in relation to anxiety and depression which aimed to eliminate the bias from including ex-drinkers (96) p.645:

> *'If a consistent J-shaped association that is not due to confounding or sick quitters is found in other prospective studies, this would have important public health implications as it would suggest that mental health promotion should encourage light to moderate drinking, among the general population, in favour of abstinence or heavy drinking.'*

However these interpretations fail to consider that moderate drinking may be a marker for better psychosocial health and social integration and it is this that may be conferring the better health outcomes. The causal direction may actually be in the other direction in that people who are depressed or anxious feel less sociable or are socially isolated and hence abstain from alcohol, given the personality traits

correlates with abstinence (104) and the associations which are found in adolescence and young adulthood (46, 99-101) where the sick-quitter effects is likely to be minimal. Low sociability either as a consequence of personality traits or depression may be a barrier to drinking among abstainers and this difference between drinkers may be particularly emphasised in cultures where drinking is the social norm. Robin Room (1972), professor of Sociology and the director of the AER centre for Alcohol Policy and Research commented that (105) p.233:

> *"Drinking and sociability are often so intertwined in American life that it is hard to separate the two functions".*

If this is the case then we would expect to see non-drinkers farer better in populations where abstinence is more common, due to the buffering effect of having more *average* people among abstainers compared with populations where drinking is the norm and non-drinkers are deviating from the culture milieu. One example of a country where abstinence is more common is India, where the proportion of lifetime abstainers is 79.2% (106). Here the dose-response relationship between alcohol consumption and risk of CHD was not J-shaped but linear (107), confirming that where drinking is less common abstainers are not worse off than moderate drinkers, although a limitation of the study was that it was cross-sectional. Another example of a dry culture is the Mormon population. In a study analysing deaths among the Mormon population in Utah between 1967 to 1971, it was found that Mormons had 35% lower mortality from Ischemic heart disease than non-Mormons and they did not appear to be otherwise different from US Whites (108).

In light of this, poorer sociability and mental health may mediate the relationship between abstention and mortality since social integration has been found to be negatively related to mortality (109, 110). Could the poorer psychosocial health of abstainers which appear to precede non-drinking, be a confounder of the better health outcomes found in later life among moderate drinkers compared with non-drinkers? One study using extensive data on psychological and psychosocial

measures from the Whitehall II study of British Civil Servants explored whether there could be confounding from psychosocial measures, however it found that psychological measures contributed to only weak confounding and were not strong enough to explain the J-shaped relationship (111). However the authors admit that the study was unable to exhaust the range of possible measures, since there is difficulty in measuring psychosocial variants.

2.3.2 Validity of the 'lifetime abstainer' reference group

Studies have questioned the validity of the lifetime abstainer category as a reference group. For instance by looking at longitudinal data on adults in US households it was found that 52.9% of those who claimed to have been lifetime abstainers, reported drinking in previous studies (112). Furthermore in the same study, 11.4% of those who said they never drank at the baseline survey took up drinking in follow up studies. Similar results were found using data from a British cohort born in 1958 where only a third of those who reported to have never consumed alcohol at age 43, reported consistently being a lifetime abstainer from 16 years (113). Furthermore in the same study, around 25% of self-identified 'lifetime abstainers' were found to have drunk at least once a week in past surveys. The definition of non-drinker is not consistent. Some may include ex-drinkers, for example by including those who haven't drunk only in the past 12 months, whilst others also include occasional or infrequent drinkers whom are also thought to be subject to the 'sick-quitter' bias (71) (Figure 2.3). Thus if self-identified lifetime abstainers are an invalid group which includes ex-drinkers, then it is possible that the reference category may not be truly free from the sick-quitter bias. These important methodological considerations of the difference between those who abstain continually and those who drink and quit, will be taken into account when using lifetime abstainers and ex-drinkers in the analysis conducted in this thesis.

2.3.3 The U-shape exists even among young people

As well as existing in middle age, the J-shaped or U-shaped relationship has found to exist even among young people. As mentioned earlier a U-shaped relationship

was found in social integration amongst Swedish males aged 18 to 19 (46), and between intoxication debut and psychological problems among Norwegian males aged 19 to 28 years (99). However as well as psychological factors one study found non-drinkers and heavy drinkers to have higher rates of fair/poor self-rated health and limiting illness than light and moderate drinkers in early adulthood at age 33 (101). Concluding from this, the authors, Power et al 1998 suggested that (p. 877):

> *'Abstainers and heavy drinkers are…similar in several respects long before the emergence of higher mortality in both groups'.*

Since poor health exists in early adulthood among some non-drinkers, this suggests that non-drinkers may end up with worse health than light to moderate drinkers because they start off in a worse position. Whilst evidence has shown that ex-drinkers quit because of poor health (57, 63), poor health may be a cause for non-drinking even in young people. This suggests that poor health from an early age may be a reason why some people never take up drinking which may shape the characteristics of lifetime abstainers. This has implications for later life morbidity since evidence suggests that conditions experienced during childhood have an impact on health in later life. For instance studies have shown that worse health conditions and adversities experienced early on in life impacts on health in middle age (114-117) and this includes increased risk of cardiovascular and coronary heart disease (115, 117). As well as higher rates of ill health, lower childhood cognitive ability was also found to be associated with non-drinking from age 16 up to 40 years (89) where cognitive ability has been shown to predict adult morbidity (118). There has been little research on the early life circumstances of lifetime abstainers, and because of the implications of the J-shape relationship it calls into question the exact nature of those who do not drink alcohol throughout their life.

2.4 Implications of the J-curve

Studies which report better health outcomes for moderate drinkers result in a public health message that is confusing. Alongside the harms of alcohol consumption the

media frequently reports the benefits of moderate drinking (119), even though studies suggesting that there is a protective effect of alcohol would apply only to a middle-aged cohort. One study analysing systematic reviews and population data on the effects of alcohol consumption on various risk of deaths by age and sex found the U-shape to exist only among older age groups (120). Moreover in the same study, drinking zero units carried the lowest risk of mortality among men and women aged under 35 years. In a different study, whilst an association was found between risk of cardiovascular disease and current drinking status among a middle aged sample in the Netherlands, no association was found when past and lifetime drinking habits was taken into consideration (121). Despite this the blanket message of 'Wine in moderation' is used by the European wine sector to promote moderate and responsible wine drinking to the general public (25).

Furthermore not enough is known about how the benefits of drinking weigh against the harmful effects. Alcohol consumption has an exponential relationship and non j-curve relationship with liver disease, meaning heavier amounts of consumption carry much greater risks than lower amounts (122). Other studies have found a relationship between alcohol consumption and cancer (123), in particular breast cancer (122-124) . However a study conducted by market research company Mintel in 2004, found that 26% of people questioned drank because they believed alcohol had health benefits (28). Whilst another study conducted on outpatients from an urban medical centre in the US from 2002-04 found around a third of patients cited health benefits as a motivation for drinking whilst only 10% cited breast cancer as a risk (29). Similarly studies in Canada conducted in the early 2000's have shown that over half of participants believe that alcohol has health benefits (27) and these were more likely to be male and more frequent drinkers (26). This suggests how studies which document a J or U-shaped relationship between alcohol and risk of mortality might be interpreted by the general public. Furthermore this may be a factor why non-drinking as a lifestyle choice may have been relatively ignored.

Even in light of possible health benefits of alcohol to individuals, publicising this as a health message is ill advised (17), since Population theory shows that mean consumption is positively correlated with problematic drinking, thus increases in average consumption may increase levels of problematic drinking (13, 14). Furthermore causality can never be assumed from findings in observational studies. One famous example of this was when hormone replacement therapy was given to pre-menopausal women, since it was thought to protect against CHD, because of findings from observational studies. However this was later proved to be wrong following results from a randomised controlled trial that was conducted (125).

Since lifetime abstainers may differ from drinkers in important characteristics and usually account for a small proportion of the population, it has been suggested that an alternative reference group of 'occasional only' or even light drinkers be used (57). Furthermore since a worsening of health has been shown to be related to reduced or cessation of consumption, Liang and Chikritzhs (63) suggests that these candidates should be regrouped into the original drinking category they were assigned to just as bias is reduced in clinical trials. All of these problems may additionally contribute to overestimating the beneficial effects of alcohol consumption

2.5 Gaps in the literature

A U-shape or J-shape dose-response relationship has been found to exist in numerous studies and among diverse populations, where non-drinkers and heavy drinkers have higher mortality rates than light to moderate drinkers. Whether the better outcomes of moderate drinkers are attributable to alcohol consumption has been debated. Outside of the 'sick quitter' hypothesis, it has been questioned whether confounding factors remain unaccounted for, since non-drinkers have a lower social position, worse health behaviours and poorer psychosocial health than drinkers. Secondly using self-identified 'lifetime abstainers' may not be free from the 'sick-quitter' bias since a large proportion reported drinking in previous surveys.

A gap in the literature has also been identified. Since the U-shape exists in young people, illness may actually precede non-drinking and may be the reason why some never take up drinking. This is referred to as the 'sick non-starter' hypothesis in this thesis. It is unlikely that the worse health of non-drinkers relative to drinkers is the consequence of the non-consumption of alcohol at such a young age though this will be explored further. Whilst it has been shown that a decline in health status is associated with a reduction or cessation in alcohol consumption in older age groups (63) it may be a pathway as to some why young people do not drink alcohol in the first place, as suggested by the U-shape found in young adulthood (101). In addition whilst there is evidence that ex-drinkers have relatively poorer health than drinkers and lifetime abstainers, this has not yet been explored at different stages of the life course. This thesis also explores whether the effects of health on stopping drinking is present early on in the life course, and not just in later life. Furthermore the sick-quitter bias may also affect occasional drinkers, where it is hypothesised that as people's health worsen they reduce their consumption to occasional drinking and not just non-drinking (71). This thesis will explore whether a worsening of health is associated with a reduction to non or occasional drinking as there has been little research on the latter.

As well as exploring the relationship between illness and non-drinking, as mentioned earlier there may be other confounders including lower social position which has been found to be associated with non-drinking This thesis will add to the literature by exploring whether worse social and economic positions may be present in early adulthood. It has been frequently shown that circumstances early on in the life course impacts on later life-life health, and the question of what the early life circumstances of non-drinkers has not been largely explored. This has important implications since lifetime abstainers may not be free from the bias of having pre-existing poor health and social disadvantage. This would mean that the relative better health outcomes for moderate drinkers may not be causally related to moderate alcohol consumption. The separate components of early life social disadvantage, poor health behaviours and worse health may interrelate and jointly

impact on adult health as has been outlined in a life course framework (126). Indeed when the health outcomes of moderate drinkers were compared with non-drinkers in middle age, men who were moderate drinkers did not have better health outcomes than non-drinkers, after adjusting for a childhood measure in the form of father's social class (127).

3. Thesis overview

3.1 Aims and hypotheses

The aim of this thesis is to explore the health, mental health and social circumstances of non-drinkers, particularly in early adulthood. Much of the epidemiological literature on older non-drinkers have found them to have worse health outcomes than non-drinkers and a protective effect of moderate alcohol has been put forward as the reason behind this. This spans across a broad range of conditions (30) including cardiovascular health (15, 17, 54) , cognitive functioning (21, 128), dementia (20), ageing (74) and osteoporosis (79, 80) and all-cause mortality (18, 70, 129). However the early life circumstances of non-drinkers has not been directly investigated previously. This could influence the outcomes of non-drinkers in later life and may be a reason why non-drinkers are at a greater risk of a broad range of conditions than drinkers. A U-shape relationship between poorer health and non-drinking among young adults was found in one study (101) (Section 2.3.2), however whether this relationship exists after accounting for social, demographic, mental health and other health behaviours has not previously been investigated. This is the aim of Chapter 4 using the Health Survey for England, a cross-sectional nationally representative sample of the population of England.

As a follow up to this study the relationship between prior poor health from an early age and persistent poor health across the life course and never drinking is investigated using longitudinal datasets; the National Child Development Study (NCDS) and the 1970 British Cohort study (BCS70), two nationally representative prospective studies of the population of Great Britain. This is referred to as the 'sick non-starter' hypothesis to compliment the established 'sick-quitter' terminology. More formally this hypothesis is set out as below:

1. Poor health precedes non-drinking in early adulthood

2. On-going illnesses is associated persistent non-drinking from early adulthood

If the hypotheses are confirmed then it would mean, lifetime abstainers may not be free from a pre-existing poor health bias, which has implications for studies which use them as a reference category, which is an original contribution to knowledge.

Secondly, using the NCDS the 'sick-quitter' hypothesis is also investigated, early on in the life course to relate to the broader aim of investigating whether poor health has direct consequences on alcohol consumption at any stage of the life course, and not just in middle age or later life which current studies have focused on (57, 63, 64). This will illustrate the relationship between poor health and non-drinking throughout the life course and the direct effects of poor health on non-drinking. This will also demonstrate that the relationship between non-drinking and poor health not only co-occurs with ageing and a worsening of health, as current studies looking at the relationship between poor health and former drinking have used a middle-aged cohort only. This analysis is carried out on both drinkers who reduce consumption to non-drinking and occasional drinking. With regards to the latter, the examination of whether a worsening of health is associated with a reduction to occasional drinking has been hypothesised (71) (section 2.2.1) but to my knowledge not been directly investigated longitudinally before. This has implications for studies which use non-drinkers as a reference group but fail to remove occasional drinkers. More formally these hypotheses are set out as below.

3. A worsening of health is associated with a reduction in alcohol consumption to non-drinking at different stages of the life course

4. A worsening of health is associated with a reduction in alcohol consumption to occasional drinking at different stages of the life course

As well as examining the relationship between health and non-drinking this thesis will also examine the role of poorer psychosocial health, since non-drinkers have worse mental health than drinkers as outlined in the literature review section

2.3.1.2. Poorer mental health may be a contributory factor in the worse physical health outcomes of non-drinkers in later life therefore it is important for this to be examined independently of measures of self-reported health. If poorer psychosocial health is found to be associated with lifetime abstention and ex-drinking early on in life and consistently throughout the life course this may have implications for cognitive decline and dementia (section 2.2), which non-drinkers have been found to be at greater risk of than drinkers. More formally the hypothesis is set out below.

5. Poorer psychosocial health is associated with being a lifetime abstainer or ex-drinker, at different time points from early adulthood.

Secondly the effect of social factors will also be explored at separate stages of the life course including in early adulthood. As mentioned in the literature review section 2.3.1.1 lower education and income has found to be associated with non-drinking, where social factors are major determinants of health in later life (116, 131). Furthermore social position in early life has found to influence health later on in life, and the majority of studies among older age groups do not account for past disadvantage. More formally the hypothesis is set out below.

6. Lower educational qualifications will be associated with being a lifetime abstainer or ex-drinker, at different time points from early adulthood.

Since lower social position and worse physical and mental health are known to be related, analysis of social factors and mental health are conducted in separate chapters prior to including self-reported health into the model, to appreciate the individual effects that these factors may have towards non-drinking which may impact health in later life. Hypotheses 2-6 outlined above are investigated in reverse chronological order in separate chapters from Chapter 9 using regression models adding education (Chapter 9), mental health (Chapter 10) and then self-reported health to the model (Chapter 11 for ex-drinkers, Chapter 12 for lifetime

abstainers). Hypothesis 1 is investigated in Chapter 8 using bi-variate analysis. The aims of each chapter are described in more detail below.

3.2 Research design

The structure and specific aims of each chapter is outlined more formally below

Chapter 4: Characteristics of young non-drinkers; Cross-sectional secondary analysis

Whilst a U-shape between poor health and non-drinking among young adults has been found (101), whether this exists independently of social, demographic and other health related factors has not been investigated before. This is the aim of this study using The Health Survey for England, a cross-sectional nationally representative survey on the population of England. In addition this study will investigate the social, demographic, health and health behaviours that predict non-drinking between the ages of 18 to 34 years since the early life social and health behaviours and conditions of non-drinkers may have an influence on their relative worse health outcomes in later life. This is done using logistic regression on the odds of being a non-drinker versus drinker, and multinomial logistic regression on the odds of being a non-drinker/heavy drinker versus a moderate drinker.

Chapter 5-13: The relationship between poor health and lifetime abstention and ex-drinking; longitudinal secondary analysis

The aim of using longitudinal data is to extend work on the Health Survey for England by specific types of non-drinkers; lifetime abstainers and ex-drinkers. This study looked at the sick non-starter hypothesis by examining the adolescent health conditions of non-drinkers in early adulthood, establishing a temporal order between health and non-drinking in early adulthood, and whether poor health over time from early adulthood was associated with non-drinking over time using longitudinal data. This will be done using two measures of lifetime abstainers, one using consecutive non-drinking answers in successive waves of the study and another using self-identified ‘lifetime abstainers’ which is a current status measure

of being a lifetime abstainer. As outlined in section 2.3.2 self-identified 'lifetime abstainers' may be an invalid group as some have been found to report drinking in previous waves of study, therefore in this thesis lifetime abstainers are derived through taking consecutive 'non-drinker' statuses which may be a more valid measure. However whether poor health from an early age has an association with someone self-identifying as a 'lifetime abstainer' will also be investigated, since this is the common way it is derived in studies which use them as reference group.

Secondly whether a worsening of health is associated with a reduction in consumption to non or occasional drinking was also analysed adding to the broader literature on the 'sick-quitter' hypothesis by investigating whether this relationship exists among young adults and through the life course. Results from this analysis will demonstrate the strong relationship between poor health and non-drinking suggesting there to be direct effect of poor health on non-drinking across the life course. This is oppose to it co-occurring with ageing and a worsening of health since current studies showing a relationship between poor health and ex-drinking have done so using a middle-aged cohort only (61, 63, 64). Furthermore since this study is longitudinal it has the advantage of being able to assess health directly at an earlier time frame meaning the study will not suffer from retrospective recall.

In addition to assessing the effects of health, social and psychosocial factors are analysed in separate chapters in advance of the final model which combines measures of health. This is done to appreciate the individual effects these factors may have in predicting whether an individual becomes a lifetime abstainer or ex-drinker versus drinker, since these factors are important determinants of health in later life particular in certain conditions where non-drinkers are found to fare worse off in such as cognitive functioning (20, 21). This will also help sharpen the distinction between lifetime abstainers and ex-drinkers. Chapter 6-13 are outlined below with more specific aims and how these aims will be addressed.

Chapter 5: Longitudinal Survey Design and Methodology

The aim of Chapter 6 is to outline the longitudinal data used in this study; The National Child Development Study 1958 (NCDS) and The British Cohort Study 1970 (BCS70). These two cohorts are also compared to provide some background information on differences between the two cohorts. Following from this how the outcome groups in logistic regression will be derived; lifetime abstainers, self-identified 'lifetime abstainers', ex-drinkers who have reduced consumption to non-drinking, and ex-drinkers who have reduced consumption to occasional drinking, will be outlined. Secondly the derivation of main exposure variable, a change in limiting longstanding illness will also be outlined. Thirdly an explanation of why the variables; education, marital status and children in the household, will be adjusted for and not others such as smoking and physical activity will be provided. Binary logistic regression is the method employed in all subsequent results chapters and is carried out at separate time points. For example models examining the relationship between changes in health and ex-drinking are carried out in three separate models at age 33, 42 and 50 using the NCDS. This is described in more detail in this chapter.

Chapter 6: Sample sizes and Missing Data

This chapter gives an overview of the sample sizes and missing data in the two cohorts by assessing the proportion of participants who are excluded due to attrition and the number of participants who are not included due to item response. Despite data being missing not at random, complete case analysis is used for subsequent analysis due to item response being low (1-4.6%), this is discussed in greater detail in this chapter.

Chapter 7: Descriptive analysis of lifetime abstainers and ex-drinkers (NCDS and BCS70)

The aims of this chapter are to describe the social, health and demographic characteristics of lifetime abstainers and ex-drinkers at each time point assessed. Its main aims are to identify the size of the sick non-starter and sick-quitter groups,

compare sizes of lifetime abstainers between cohorts, verify the past drinking status of self-identified 'lifetime abstainers' and ex-drinkers and compare the early life and current social and health characteristics of ex-drinkers with lifetime abstainers and drinkers.

Chapter 8: Adolescent health status of non-drinkers in young adulthood

The aim of this chapter is to investigate the hypothesis that non-drinkers in early adulthood have higher rates of having worse health conditions in adolescence. In other words that childhood chronic conditions differ between drinking groups and are greater for non-drinkers. The method employed is by selecting conditions as assessed by a health visitor when participants were aged 16 and 11, and assessing how rates vary among drinking groups when participants were aged 23 and 26 in the NCDS and BCS70 respectively. This will present the temporal order between poor health and non-drinking from an early age.

Chapter 9: The effect of education on ex-drinking and lifetime abstention

The aim of this chapter is to investigate the hypothesis that lower educational qualifications are associated with being an ex-drinker or lifetime abstainer where a social gradient in non-drinking has been found (section 2.3.1.1) ahead of including psychosocial health and self-reported health in the model. The method employed is to use logistic regression to examine the odds of being a lifetime abstainer or ex-drinker dependent on education while adjusting for factors that have been hypothesised to influence non-drinking; sex, marital status and parental status. Poor health and low social position are related (116, 131) therefore this chapter focuses on the effects of education on non-drinking without adjusting for health at different stages of the life course from early adulthood. Social position from an early age may have an influence on health outcomes that J-curve studies may fail to account for. Justification for using education as a measure of social position,

because of having a substantive interest in the role of education, and the limitations of this measure are discussed in this chapter.

Chapter 10: The relationship between poor psychosocial health, ex-drinking and lifetime abstention

The aim of this chapter is to investigate the hypothesis that poor psychosocial health is associated with being an ex-drinker or lifetime abstainer, as non-drinkers have been found to have worse mental health than drinkers as outlined in section 2.3.1.2. This chapter examines items on the malaise inventory, a measure of psychosocial health, between drinking groups to examine how ex-drinkers and lifetime abstainers differ in terms of psychosocial health. In addition, logistic regression is carried out examining the odds of being an ex-drinker or lifetime abstainer dependent on poor psychosocial health adjusting for sex, education, marital and parental status. This is done ahead of including self-reported health in the model, as health and poor psychosocial health are known to be related (111) therefore this chapter examines the independent effects of poor psychosocial health. Poor psychosocial health of ex-drinkers and lifetime abstainers may be a contributory factor in their worse health outcomes in later life, including worse cognitive functioning and dementia.

Chapter 11: Sick-quitters; the effect of developing a limiting longstanding illness (final model)

The aim of this chapter is to explore the 'sick-quitter' hypothesis; that developing a limiting longstanding illness from the previous wave will be associated with being an ex-drinker who has reduced their consumption to non-drinking, or an ex-drinker who has reduced their consumption to occasional drinking. This will be done using logistic regression on the odds of being an ex-drinker (reducing consumption to non-drinking from being a drinker in the previous wave) dependent on changes in limiting longstanding illness adjusting for poor psychosocial health, education, marital status and children. The same is repeated for those who reduced

consumption to occasional drinking. This chapter will add to the broader literature on sick-quitters by observing whether the relationship between a worsening of health and stopping drinking is present at age 33 where most of the existing literature has focused only on people in middle age or later life. This provides stronger evidence for a direct relationship between poor health and non-drinking, rather than ex-drinking co-occurring with ageing and a worsening of health. Secondly this chapter also examines whether a worsening of health is also associated with a reduction to occasional drinking, where it has been hypothesised that drinkers are included with non-drinkers (71) but which has not been directly investigated before.

Chapter 12: Sick non-starters; the effect of persistent limiting longstanding illness (final model)

The aim of this chapter is to explore the 'sick non-starter' hypothesis: that having a persistent limiting longstanding illness or longstanding illness since early adulthood will be associated with being a lifetime abstainer. This will be carried out using logistic regression on the odds of being a lifetime abstainer dependent on changes in limiting longstanding illness (with a particular focus on the effects of having a persistent limiting longstanding illness from age 23) adjusting for poor psychosocial health, education, marital status and children in the household. The same analysis is repeated in the British Cohort Study using a similar derivation of lifetime abstainers, and also self-identified 'lifetime abstainers' which was derived through a current status measure of being a lifetime-abstainer, and changes in longstanding illness. If the hypothesis is confirmed this would provide evidence that poor health from an early age is a factor as to why someone never becomes a drinker. Therefore lifetime abstainers are not free from a pre-existing poor health bias and this would have implications for studies which use them as a comparison against drinkers particular with regards to certain conditions such as cognitive functioning.

Chapter 13: General discussion

The first section of the discussion will summarise the main findings. The second section will discuss the implications and relevance of findings with particular emphasis on the implication on conditions which exhibit a J or U-shaped dose-response relationship with alcohol. For example rates of emotional and behavioural problems are found to be higher among non-drinkers from an early age which may affect cognitive development. The third section will discuss further strengths and limitations of this analysis, followed by implications for future work. Implications for policy and public health recommendations is discussed in the fifth section. This chapter will close with a final conclusion.

4. Characteristics of young non-drinkers; Cross-sectional secondary analysis

4.1 Abstract

Aims: To investigate the early life social, demographic and health characteristics of non-drinkers aged 18 to 34 years.

Methods: Using the Health Survey for England 2006 and 2008, binary logistic regression on the odds of being a non-drinker versus drinker aged 18 to 34 years, dependent on age, ethnicity, region, income, highest qualification, marital status, limiting longstanding illness, anxiety or depression, smoking status and physical activity. Multinomial logistic regression with the same variables on the odds of being a non/heavy drinker versus moderate drinker is also carried out. Limiting longstanding illness was interchanged with longstanding illness and self-rated poor health in separate models. All models were stratified by sex.

Results: Young males with a limiting longstanding illness (OR1.74, 95% CI 1.17-2.58), lowest physical activity (1.48, 1.09-2.02), belonging in the lowest income quintile (1.89, 1.11-3.22), and no qualifications (2.15, 1.32-3.49) were more likely to be non-drinkers than drinkers in the fully adjusted model. Conversely current smokers had lower odds of being a non-drinker (0.63, 0.46-0.87). Associations were found in a similar direction among young females.

Conclusion: In early adulthood non-drinkers are worse off in terms of health, physical activity and have a lower social position than drinkers. This suggests that non-drinkers have poorer health than drinkers in later life because they begin with worse health than drinkers. Studies which show a J-shaped alcohol-dose relationship in later life should examine early life confounders where possible.

4.2 Introduction[1]

As discussed in the literature review non-drinkers have repeatedly been shown to have worse health than light drinkers. Several longitudinal observational studies using middle-age cohorts document a J-shaped or U-shaped relationship between alcohol consumption and mortality where incidence of coronary heart disease, cardiovascular disease and all-cause mortality is higher among non-drinkers and heavy drinkers than light drinkers (15-17). Some authors conclude from these findings that light to moderate drinking has a protective effect on health. Critics however argue that some non-drinkers, especially at middle age are ex-drinkers, who stopped because of poor health, thus it is pre-existing poor health which exaggerates their negative health outcomes relative to drinkers (56, 57). Indeed since abstention increases with age (34, 66-68), it is often considered to be attributed to people quitting as they experience illness as they grow older.

To account for this potential bias, studies have used lifetime abstainers as a reference group compared to drinkers which eliminates ex-drinkers from this category. Where ex-drinkers had been removed, findings have been mixed with some reporting no substantive change (16) or reduced beneficial effects (15). One study however found J or U-shaped relations between rates of poor health such as self-rated health, limiting illness, psychological distress among non-drinkers even in early adulthood (101), questioning the causal mechanism behind poor health and non-drinking even among those who do not drink alcohol from a young age. In other words poor health may predate non-drinking and may be a reason for life time abstention. This study was limited however as it looked at bi-variate associations only and did not take into account social and demographic factors. This study will address this limitation using regression analysis and measures of social, health and demographic factors.

[1] [1] This chapter has been published in the journal addiction 31. NG FAT L., SHELTON N. Associations between self-reported illness and non-drinking in young adults, Addiction 2012: 107: 1612-1620.10.1111/j.1360-0443.2012.03878.x Please see Appendix A for full paper.

Another criticism of the J-shaped relationship is that there are uncontrolled for confounders which may mediate the relationship between greater risk of mortality and non-drinking. Indeed, with the exception of smoking, non-drinkers have been found to have worse health behaviours (68, 81), whilst healthier behaviours have been found to cluster among moderate drinkers (82). There is also evidence of a social gradient in non-drinking, with those with low qualifications and low income being more likely not to drink (83, 85). More sophisticated study design in relation to the J or U-shape can control for measures such as body mass index, blood pressure and physical activity however these are usually done at two time points around middle age thus does not take into account circumstances earlier on in life. This study will add to the literature by investigating the social position and health behaviours of non-drinkers in early adulthood, where often later life studies are unable to assess early life factors

4.3 Aims and Objectives

Using the Health Survey for England the social position and health behaviours of young non-drinkers aged 18 to 34 years was explored, whilst also addressing whether illness has an independent association outside of these factors.

This was explored through the following analyses:

- Descriptive analysis of non-drinkers and white non-drinkers separately, since non-drinking is known to be higher among ethnic minorities (33) due to norms and religion, whilst the reasons for non-drinking among the white population is less well known
- Binary logistic regression on the odds of being a non-drinker aged 18 to 34 years and limiting longstanding illness adjusting for ethnicity, income, education, region, marital status, parental status, anxiety and depression, physical activity and smoking status. The same is repeated for self-rated poor health and longstanding illness
- Multinomial logistic regression to assess whether a U-shape is present between non, light to moderate and heavy drinking with limiting

longstanding illness adjusting for ethnicity, income, education, region, marital status, parental status, anxiety and depression, physical activity and smoking status. The same is repeated for self-rated poor health and longstanding illness.

4.4 Survey design

The Health Survey for England (HSE) is a cross-sectional nationally representative survey of the population of England conducted annually since 1991 and is currently commissioned and published by the NHS Information Centre (132). Its main aims are to monitor trends in the nations' health, establish risk factors associated with these conditions and monitor progress towards health targets. Using the Postcode Address File (PAF) a multi-stage stratified probability design is used to derive a representative sample of the population living in private households in England. Analysis was restricted to young adults aged 18 to 34 years. To boost sample size of this age group the HSE 2006 and HSE 2008 were merged to produce a sample of 6,483 adults aged 18 to 34 years. This was done to improve sample power and increase degrees of freedom in the model since the planned regression analysis adjusted for an extensive number of variables, and the primary group of interest was a minority of the population (non-drinkers) which was further stratified by gender. For a discussion on the recommended maximum of variables that can be included in a regression model given the sample size before running the risk of over-fitting please see section 5.5.3. These years were used as they included a mental health question, which was a component of the EQ-5D measure of quality of life (133), which is asked every alternate year. Given the associations between poor mental health and non-drinking it was necessary to adjust for a measure of mental health.

Data used in this study was collected by trained interviewers and nurses who carried out a face to face questionnaire in the participants' home using computer aided personal interview package (CAPI). Respondents were asked questions what they drunk in the past week through face to face interviews, whilst some

respondents aged 18 to 24 years provided this information though filling in a self-completion questionnaire, this is discussed in greater detail in the next section. Non-response weighting was applied to all data analysis which corresponded to non-response that occurred in the survey that year. The Health Survey for England dataset from 2006 (134) and 2008 (135) was downloaded from the UK Data service on 19/11/2011 subject to the End User Licence agreement (136) following user and project registration. The data and questionnaire documentation can be found online in the UK Data Service catalogue (137).

4.5 Variables

4.5.1 Alcohol consumption

Non-drinkers were established through answering no to the question "Do you ever drink alcohol nowadays including drinks you brew or make at home?" providing a binary variable of 1282 non-drinkers in a total sample of 6444 respondents aged 18 to 34 years who answered the question. Current drinkers were all those who responded positively to the same question. This broad derivation of non-drinkers includes those who may drink only very occasionally and those who never drink. An all-encompassing broad definition as outlined in Figure 2.3 was used to correspond to the majority of studies that use non-drinkers as a reference group were ex-drinkers and occasional drinkers are often grouped together (71), meaning implications from this study would apply to the majority of these studies.

A three category drinking group variable was also created based on total units respondents had drunk, which was derived by asking respondents what alcoholic drinks they had drunk on their last heaviest drinking day in the previous week. This sample size is slightly smaller than in the binary variable of non-drinker versus current drinker since 53 people who responded to the question about current drinking status did not go on to state what they had drunk in the past week (N=6391).

Heavy drinkers were defined as those exceeding the recommended daily allowance on their heaviest drinking day in the previous week. For men this included those who drank more than 4 units and for women more than 3 units on the heaviest drinking day in the previous week. Light to moderate drinkers included those who responded yes to ever drinking alcohol nowadays but did not drink in the previous week, and all those who drank up to 4 units for men, and 3 units for women on their heaviest drinking day in the previous week. This gave a sample of 1,235 non-drinkers (19%), 2,376 light to moderate drinkers (37%) and 2,780 heavy drinkers (43%).

Around 15.4% of those aged 18 to 24 year olds responded to drinking questions using a self-completion questionnaire (n=353), which equates to 5.4% of the total sample aged 18 to 34 years. Including a variable which indicated method of reporting, whether via a face-to-face interview or a self-completion booklet was not statistically significant and did not improve the fit of the model therefore was not included in regression analysis. This was tested using a Wald test for both men (χ^2 =0.38, p=0.5398) and women (χ^2 =0.30, p=0.5869).

4.5.2 Self-reported health

As well as establishing broad predictors of non-drinking in early adulthood whether self-reported illness was associated with non-drinking in young adulthood, adjusting for other factors which may influence non-drinking was explored. This was done with three different measures of self-reported health; self-rated poor health, longstanding illness and limiting longstanding illness which were interchanged in different models. Limiting longstanding was the main focus of the results and discussion with the results of this model with confounders being presented in full.

Self-reported health measures have been found to be a valid measure of morbidity and mortality and are used globally (138-140). As mentioned earlier this includes the 5-scale self-rated health, where respondents are asked to rate their health from excellent to poor and limiting longstanding illness, where individuals are asked

whether activities are limited due to having chronic conditions. The latter is established as a morbidity index being used in national health surveys across Europe and in international comparisons (139, 140) in light of the ageing population and growing disability and the need for resources to be allocated accordingly. Both have been found to have strong associations with serious conditions such as epilepsy and cancer, and weaker associations with less serious conditions such as eczema and hay fever even in early adulthood (141).

Limiting longstanding illness is the focus of this study rather than the 5 scale rating of general health, however results with self-rated poor health are shown in separate tables. Lifestyle factors such as smoking and diet (141) have been found to have stronger associations with the 5-scale measure than limiting longstanding illness. In particular people who have poor health behaviour such as those who drank heavily were more likely to rate their health as poor (141), thus there may be an overlap with self-rated health as an exposure variable and alcohol consumption. Self-rated health may also include ratings of mental health whilst LLSI has been found to have stronger associations with physical health than mental or social wellbeing (142), and childhood conditions (143).

Limiting longstanding illness was determined in the Health Survey for England by asking the question "Do you have any long-standing illness, disability or infirmity? By long-standing I mean anything that has troubled you over a period of time, or that is likely to affect you over a period of time?" Those that answered yes to this question were then asked "Does this illness or disability/do any of these illnesses or disabilities limit your activities in any way?" those who answered yes to this question were then coded as having a limiting longstanding illness. Self-rated general health was determined by asking respondents to rate their health on a five point scale with self-rated poor health being the sum of "bad" or "very bad" responses. These variables limiting longstanding illness, longstanding illness and self-rated poor health are included separately in each statistical model.

4.5.3 Social and demographic

Factors found to be associated with non-drinking in the literature review were adjusted for as these could be potential confounders between poor health and non-drinking. Ethnicity was adjusted for where non-drinking is known to be higher among ethnic groups (33, 44, 45), categorized as White, Asian or Asian British, Black or Black British, Chinese, mixed or other. Secondly components of social position were adjusted for since those in lower social position have been found to be more likely to be non-drinkers (83, 86), this was done by including income and education in the model (17, 46, 99, 100). Income was derived using the 5 quintile classification of equivalised household income, with the highest quintile earning over £40,373 and the lowest earning under £10,598. Educational qualifications were re-grouped into a smaller number of categories, degree or equivalent, higher education below degree, NVQ2/GCE O level/NVQ1/Foreign/Other/Unknown (labelled as 'other'), no qualifications and full-time student. In addition marital and parental status was also adjusted for since a reduction in consumption to non-drinking has been found to be associated with an uptake of marital or parental roles (144, 145). Categories for marital status were also reduced to single, married, cohabitees and separated/divorced/widowed. In addition whether respondents were natural parents, step parents or parents in law of a dependent living in their household was combined into an indicator of being a parent signified in a binary variable. Finally region was also adjusted for as abstinence has been found to vary along regions in England (130).

4.5.4 Health behaviours

To model health behaviours general activity and current smoking status were also included, where low physical activity and smoking are major contributors to higher mortality in later life. The early life health behaviours of non-drinkers who potentially are lifetime abstainers, may be a contributory factor behind higher rates of morbidity compared to drinkers in later life and therefore there is a substantive interest in looking at the relationship with these variables and non-drinking in early adulthood. General activity was derived from self-reported measures of activities

done in the past four weeks, based on the Allied Dunbar National Fitness Survey, a major national study of activity, carried out in 1990 (146). Activities included housework, manual/gardening/DIY activities, walking, sports and exercise which were then summarized into high (meets the government's minimum recommendation), medium (some activity) and low (low activity) levels. Current smokers were identified from asking respondents about current smoking status.

4.5.5 Mental Health

Non-drinkers have been found to have worse mental health even in adolescence (46, 99, 100), which could be a potential confounder between poor physical health and being a non-drinker, therefore a measure of this was also adjusted for. This was derived from a component of the Eq-5D measures of health from all those who answered "I have moderate anxiety and depression" and "I have extreme anxiety and depression". For income and anxiety and depression, missing values were coded into a separate 'missing' category since there was a relatively large number of missing responses. If missing values accounted for less than 1% of responses then these were included into the largest category of responses to incorporate the other information provided by other participants (e.g. physical activity). This is the method used in the Health Survey for England reports (147).

4.6 Statistical Analysis

4.6.1 Descriptive analysis

Descriptive analysis was carried out by observing the prevalence of the measures of illness, and other measures by comparing total non-drinkers with the total sample. Since ethnic minorities are known to have very different drinking patterns than the white population (33) results for white non-drinkers were also presented separately.

4.6.2 Binary Logistic Regression

Binary logistic regression was carried out to observe whether limiting longstanding illness was associated with being a non-drinker versus current drinker, independent

of ethnicity, income, education, region, marital status, parental status, anxiety and depression, physical activity and smoking status. The same was repeated interchanging limiting longstanding illness with longstanding illness and self-rated poor health in two separate models adjusting for the same factors. Models were stratified by sex.

4.6.3 Multinomial Logistic Regression

Using the same variables multi-nominal logistic regression was used to assess whether limiting illness, self-rated poor health or longstanding illness is associated with non-drinking versus light to moderate drinking in three separate models. Whether a U-shape is present among young people between poor health and drinking was assessed by simultaneously analysing the effects of illness on heavy drinkers compared with light to moderate drinkers. Each model was stratified by sex and adjusted for ethnicity, income, education, region, marital status, parental status, anxiety and depression, physical activity and smoking status, and the same variables were kept within the different log odds within the model.

4.7 Results

Table 4.1 presents the distributions of the study variables among 18 to 34 year olds by total non-drinkers, white non-drinkers, male non-drinkers, female non-drinkers and drinkers. Non-drinkers accounted for around a fifth of 18 to 34 years olds. Just under a quarter stated they had a longstanding illness, whilst a tenth stated they had a limiting longstanding illness. Among non-drinkers this proportion was higher, however white non-drinkers had the worst health, with a higher proportion reporting longstanding illness, limiting illness or self-rated poor health than total non-drinkers and the general average for their age group. Over a third of white non-drinkers had a longstanding illness. Around 21.3% of the sample had missing income data, and 6.4% has missing information on anxiety and depression.

Table 4.1 Characteristics of non-drinkers aged 18 to 34 years and all those aged 18 to 34 years (N=6444), Health Survey for England 2006 & 2008

	Non-drinkers	**White non-drinkers**	**Male non-drinkers**	**Female non-drinkers**	**Drinkers**
Base in numbers (% of total N=6,444)	1282 (19.9) %	657 (10.2) %	449 (15.8) %	833 (23.02) %	5162 (80.1) %
Sex					
Male	41.8	37.0	100		51.9
Female	58.2	63.0		100	48.1
Ethnicity					
White	48.5	100	42.1	51.5	91.2
Asian or Asian British	37.6	-	42.4	34.2	3.3
Black or Black British	9.6	-	10.0	9.3	2.3
Chinese, Mixed, Other	5.2	-	5.6	5.0	3.1
Income					
Highest quintile	10.7	15.1	10.5	10.9	21.4
2nd highest quintile	9.5	11.5	8.8	10.0	21.3
Middle quintile	12.9	16.5	11.3	14.1	14.0
2nd lowest quintile	14.0	15.0	12.8	14.9	11.6
Lowest quintile	22.0	24.2	18.2	24.7	12.7
Missing	30.8	17.7	38.3	25.4	19.0
Highest Qualification					
Degree or equivalent	23.0	17.8	24.3	22.0	26.0
Higher education below degree	6.6	6.5	7.5	5.9	8.2
Other	36.4	48.2	29.9	41.2	43.4
No qualifications	15.4	17.5	14.9	15.7	7.6
Full time Student	18.7	10.0	23.4	15.3	14.9
Marital Status					
Single	44.4	42.7	56.8	35.5	49.3
Married	38.4	28.2	29.5	44.8	23.5
Cohabitees	14.0	25.0	11.7	15.7	25.3
Sep/divorced/widowed	3.2	4.1	1.9	4.1	2.0
Is a Parent (yes)	41.6	44.3	24.8	53.6	27.1

Table continues on to the next page

	Non-drinkers	White non-drinkers	Male non-drinkers	Female non-drinkers	Drinkers
Health					
Longstanding illness	24.7	34.1	23.2	25.7	24.0
Limiting longstanding illness	12.9	19.1	10.3	14.7	10.2
Self-rated poor health	4.4	6.6	3.9	4.8	1.9
Anxiety or depression	16.3	22.1	11.9	17.7	14.1
Missing	10.7	7.9	12.1	9.6	5.4
Health Behaviours					
General Activity					
High	35.6	40.5	45.7	28.3	48.4
Medium	29.5	28.3	27.9	30.7	32.8
Low	34.9	31.2	26.3	41.1	18.9
Current smoker	19.6	30.5	23.4	16.9	31.9

Some proportions may not add up to 100 due to rounding

Table 4.2 presents binary logistic regression odds of being a non-drinker compared to a drinker aged 18 to 34 years. Limiting longstanding illness was significantly associated for both men (OR 1.74, 95% CI 1.17 to 2.58) and women (OR 1.45, 95% CI 1.11 to 1.89) with non-drinking in early adulthood whilst adjusting for all the listed factors. Anxiety or depression was also a significant predictor of being a non-drinker for men (OR 1.89, 95% CI 1.31 to 2.75), however this was not significant for women. In terms of health behaviours both men (OR 0.48, 95% CI 0.36 to 0.65) and women (OR 0.63, 95% CI 0.50 to 0.80) were less likely to be non-drinkers if they were current smokers and more likely to be non-drinkers if they belonged to the least active group (Men; OR 1.48, 95% CI 1.09 to 2.02, Women; OR 2.25, 95% CI 1.78 to 2.84). Also there was a social gradient, where having no qualifications (Men; OR 2.15, 95% CI 1.32 to 3.49, Women; OR 2.05, 95% CI 1.41 to 2.98) and belonging to the lowest income quintile (Men; OR 1.89, 95% CI 1.11 to 3.22, Women; OR 3.03, 95% CI 1.98 to 4.64) increased the odds of being a non-drinker. This was steeper for women than men. In addition being a parent increased the odds of being a non-drinker (Men; OR 1.62, 95% CI 1.10 to 2.38, Women; OR 1.40 95% CI 1.08 to 1.80). Gender differences however were

observed for marital status and non-drinking, with women having higher odds of being a non-drinker if they were married rather than single (OR 1.84, 95% CI 1.38 to 2.44) but this was not significant for men. Missing data on income was significantly associated with being a non-drinker for men (OR 2.05, 95% CI 1.33 to 3.18) and women (OR 1.83, 95% CI 1.25 to 2.66). Missing data on anxiety and depression was significantly associated with being a non-drinker for women (OR 1.62, 95% CI 1.06 to 2.48).

Table 4.2 Binary logistic regression results on the odds of being a non-drinker versus drinker, aged 18 to 34 years, Health Survey for England 2006 & 2008

	Men	**(n=2826)**		**Women**	**(n=3618)**	
	OR	**p-value**	**(95% CI)**	**OR**	**p-value**	**(95% CI)**
Age	0.95	0.004	(0.91 to 0.98)	1.02	0.210	(0.99 to 1.04)
Ethnicity						
White	1			1		
Asian or Asian British	**23.35**	**<0.001**	**(16.11 to 33.84)**	**16.68**	**<0.001**	**(12.09 to 23.03)**
Black or Black British	**7.86**	**<0.001**	**(4.83 to 12.80)**	**5.04**	**<0.001**	**(3.35 to 7.59)**
Chinese, Mixed, Other	**4.31**	**<0.001**	**(2.52 to 7.39)**	**2.27**	**<0.001**	**(1.49 to 3.47)**
Region						
London	1			1		
North East	**0.33**	**0.004**	**(0.15 to 0.71)**	**0.44**	**0.001**	**(0.28 to 0.71)**
North West	1.37	0.147	(0.89 to 2.11)	**0.66**	**0.017**	**(0.47 to 0.93)**
Yorkshire & Humb	0.73	0.222	(0.45 to 1.21)	**0.65**	**0.021**	**(0.45 to 0.94)**
East Midlands	1.06	0.838	(0.63 to 1.76)	**0.65**	**0.034**	**(0.43 to 0.97)**
West Midlands	0.68	0.131	(0.41 to 1.12)	**0.68**	**0.045**	**(0.47 to 0.99)**
East of England	1.09	0.726	(0.66 to 1.81)	0.85	0.373	(0.58 to 1.22)
South East	0.85	0.519	(0.52 to 1.40)	**0.67**	**0.024**	**(0.47 to 0.95)**
South West	1.26	0.353	(0.77 to 2.04)	**0.43**	**<0.001**	**(0.29 to 0.63)**
Income						
Highest quintile	1			1		
2nd highest quintile	0.67	0.132	(0.39 to 1.13)	0.88	0.507	(0.59 to 1.30)
Middle quintile	1.40	0.206	(0.83 to 2.35)	**1.76**	**0.005**	**(1.19 to 2.61)**
2nd lowest quintile	1.56	0.109	(0.91 to 2.69)	**2.02**	**0.001**	**(1.34 to 3.05)**
Lowest quintile	**1.89**	**0.019**	**(1.11 to 3.22)**	**3.03**	**<0.001**	**(1.98 to 4.64)**
Missing	**2.05**	**0.001**	**(1.33 to 3.18)**	**1.83**	**0.002**	**(1.25 to 2.66)**
Highest qualification						
Degree or equivalent	1			1		
Higher education	1.08	0.753	(0.65 to 1.80)	1.10	0.660	(0.72 to 1.69)
Other	1.13	0.539	(0.76 to 1.68)	1.30	0.070	(0.98 to 1.72)
No qualifications	**2.15**	**0.002**	**(1.32 to 3.49)**	**2.05**	**<0.001**	**(1.41 to 2.98)**
Full time Student	0.89	0.646	(0.56 to 1.44)	1.17	0.400	(0.81 to 1.71)
Marital status						
Single	1			1		
Married	1.04	0.862	(0.68 to 1.58)	**1.84**	**<0.001**	**(1.38 to 2.44)**
Cohabitee	0.89	0.561	(0.59 to 1.33)	1.31	0.061	(0.99 to 1.74)
Sep/divorced/widowed	2.80	0.080	(0.88 to 8.91)	1.16	0.585	(0.69 to 1.94)
Is a Parent (y)	**1.62**	**0.015**	**(1.10 to 2.38)**	**1.40**	**0.010**	**(1.08 to 1.80)**
Health						
Limiting longstanding illness	**1.74**	**0.006**	**(1.17 to 2.58)**	**1.45**	**0.006**	**(1.11 to 1.89)**
Anxiety or depression(y)	**1.89**	**0.001**	**(1.31 to 2.75)**	1.02	0.864	(0.80 to 1.31)
Missing	1.53	0.067	(0.97 to 2.41)	1.62	0.027	(1.06 to 2.48)
Health Behaviours						
Current Smoker	**0.48**	**<0.001**	**(0.36 to 0.65)**	**0.63**	**<0.001**	**(0.50 to 0.80)**
General activity High	1			1		
Medium	1.15	0.363	(0.85 to 1.57)	1.11	0.355	(0.89 to 1.40)
Low	**1.48**	**0.013**	**(1.09 to 2.02)**	**2.25**	**<0.001**	**(1.78 to 2.84)**

Table 4.3 Logistic regression results on the odds of being a non-drinker versus drinker with longstanding illness (model 2) and self-rated poor health (model 3) aged 18 to 34 years, fully adjusted, Health Survey for England 2006 & 2008

	Men	(n=2826)		Women	(n=3618)
	OR	p-value	(95% CI)	OR	p-value
Model 2					
Longstanding illness	**1.58**	**0.003**	**(1.18 to 2.15)**	1.15	0.191
Anxiety or depression	**1.94**	**<0.001**	**(1.34 to 2.79)**	1.07	0.598
Current Smoker	**0.48**	**<0.001**	**(0.36 to 0.65)**	**0.63**	**<0.001**
Low activity versus high	**1.48**	**0.014**	**(1.08 to 2.01)**	**2.25**	**<0.001**
Model 3					
Poor health	**2.65**	**0.003**	**(1.39 to 5.04)**	**1.77**	**0.021**
Anxiety or depression	**1.92**	**0.001**	**(1.33 to 2.79)**	1.05	0.664
Current Smoker	**0.49**	**<0.001**	**(0.36 to 0.66)**	**0.63**	**<0.001**
Low activity versus high	**1.45**	**0.021**	**(1.05 to 1.99)**	**2.23**	**<0.001**

Each model was adjusted for age, ethnicity, region, income, education, marital status, parental status, and predictors shown in table

In Table 4.3 the same binary logistic regression as in the previous table was carried out interchanging limiting longstanding illness with longstanding illness and self-rated poor health in models 2 and 3 respectively. Only associations between health and health behaviours and non-drinking are presented for simplicity. Poor self-rated health had an association with non-drinking for both men and women ($p<0.05$), whereas longstanding illness had an association with non-drinking for men ($p<0.01$) but not for women. Low activity versus high activity had a significant positive association for non-drinking for both men and women in all three binary logistic models ($p<0.05$).

Table 4.4 Multinomial logistic regression results on the odds of being a non-drinker/heavy drinker versus light to moderate drinker with limiting longstanding illness (model 1), longstanding illness (model 2) and self-rated poor health (model 3), fully adjusted, aged 18 to 34 years, HSE 2006 & 2008

	Men (n=2805)						Women (n=3586)					
	Non-drinkers			Heavy Drinkers			Non-drinkers			Heavy Drinkers		
Model 1	OR	p-value	(95% CI)	OR	p-value	(95% CI)	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Limiting longstanding illness	**1.32**	**0.185**	**(0.87 to 2.00)**	**0.55**	**<0.001**	**(0.41 to 0.74)**	**1.48**	**0.008**	**(1.11 to 1.98)**	1.07	0.599	(0.83 to 1.38)
Anxiety or depression	**1.85**	**0.002**	**(1.25 to 2.75)**	0.95	0.708	(0.71 to 1.26)	1.08	0.588	(0.82 to 1.41)	1.13	0.257	(0.91 to 1.41)
Current smoker	**0.63**	**<0.001**	**(0.46 to 0.87)**	**1.78**	**<0.001**	**(1.45 to 2.18)**	0.83	0.151	(0.64 to 1.07)	**1.72**	**<0.001**	**(1.42 to 2.08)**
Low activity versus high	**1.40**	**0.041**	**(1.01 to 1.95)**	0.89	0.361	(0.69 to 1.14)	**2.01**	**<0.001**	**(1.56 to 2.58)**	**0.77**	**0.016**	**(0.63 to 0.95)**
Model 2												
Long standing illness	**1.47**	**0.017**	**(1.07 to 2.01)**	0.85	0.134	(0.68 to 1.05)	1.08	0.489	(0.87 to 1.35)	0.92	0.314	(0.76 to 1.09)
Anxiety or depression	**1.83**	**0.002**	**(1.24 to 2.70)**	0.87	0.376	(0.66 to 1.17)	1.14	0.327	(0.87 to 1.49)	1.17	0.158	(0.94 to 1.45)
Current smoker	**0.63**	**0.004**	**(0.46 to 0.87)**	**1.75**	**<0.001**	**(1.43 to 2.14)**	0.84	0.169	(0.65 to 1.08)	**1.73**	**<0.001**	**(1.43 to 2.09)**
Low activity versus high	1.38	0.053	(1.00 to 1.92)	0.86	0.23	(0.67 to 1.10)	**2.02**	**<0.001**	**(1.57 to 2.59)**	**0.78**	**0.019**	**(0.63 to 0.96)**
Model 3												
Self-rated poor health	**3.05**	**0.003**	**(1.47 to 6.33)**	1.35	0.366	(0.71 to 2.56)	1.47	0.153	(0.87 to 2.47)	0.67	0.165	(0.37 to 1.18)
Anxiety or depression	**1.77**	**0.004**	**(1.19 to 2.62)**	0.84	0.225	(0.63 to 1.11)	1.12	0.387	(0.86 to 1.48)	1.17	0.160	(0.94 to 1.45)
Current smoker	**0.64**	**0.005**	**(0.47 to 0.87)**	**1.74**	**<0.001**	**(1.42 to 2.13)**	0.83	0.163	(0.65 to 1.08)	**1.73**	**<0.001**	**(1.43 to 2.09)**
Low activity versus high	1.35	0.078	(0.97 to 1.88)	0.84	0.177	(0.66 to 1.08)	**2.00**	**<0.001**	**(1.56 to 2.58)**	**0.78**	**0.021**	**(0.63 to 0.96)**

All odds ratios are adjusted for age, ethnicity, region, income, education, marital status, parental status, and predictors shown in the table

In Table 4.4 multinomial logistic regression analysis provides odds of being a non-drinker or a heavy drinker rather than a light to moderate drinker adjusting for age, ethnicity, region, income, education, marital status, parental status and predictors shown in the table. Limiting longstanding illness, self-rated poor health and longstanding illness were interchanged in model 1-3, respectively. A U-shape was observed for limiting longstanding illness for women, with those having a limiting longstanding illness being more likely to be a non-drinker or heavy drinker rather than a light to moderate drinker, whilst a U-shape was observed for self-reported poor health for males only. Rather than a U-shape, limiting longstanding illness or longstanding illness was associated with reduced consumption, increasing the odds of being a non-drinker and decreasing the odds of being a heavy drinker. The same was the case for self-rated poor health, and long standing illness for women. Individual significance tests for co-efficients were significant within the 5% level between one measure of drinking and the reference category but not both measures. For men longstanding illness and self-rated poor health increased the odds of being a non-drinker relative to a light to moderate drinker (OR 3.64, 95% CI 1.47 to 6.33), whilst limiting longstanding illness reduced the odds of being a heavy drinker rather than a light to moderate drinker (OR 0.55, 95% CI 0.41 to 0.74). For women limiting longstanding illness increased the odds of being a non-drinker (OR 1.48, 95% CI 1.11 to 1.98), however neither co-efficients for longstanding illness and self-rated poor health were significant. Individual associations between single coefficients had a statistically significant effect of reducing consumption rather than increasing consumption. Where poor-rated health increased the odds of heavy drinking relative to light to moderate consumption, the right tail of the U, this was not statistically significant. Heavy drinkers were more likely to be current smokers than moderate drinkers in every model, and among women were least likely to be highly active than moderate drinkers. Males with anxiety or depression were more likely to be non-drinkers than moderate drinkers in every model (e.g. in Model OR 1.85, 95% CI 0.87 to 2.00).

Table 4.5 Multinomial logistic regression results on the odds of being a non-drinker/heavy drinker versus light to moderate drinker, aged 18 to 34 years, Health Survey for England 2006 & 2008, (model 2 full results, 2 pages)

	Men (n=2,804)			Women (n=3,586)		
Non-drinker versus moderate drinker (Ref)	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Age	**0.95**	**0.012**	(0.91 to 0.99)	1.03	0.070	(1.00 to 1.05)
Ethnicity						
White	1			1		
Asian or Asian British	**13.57**	**<0.001**	**(9.01 to 20.46)**	**12.52**	**<0.001**	**(8.60 to 18.20)**
Black or Black British	**4.73**	**<0.001**	**(2.84 to 7.89)**	**3.18**	**<0.001**	**(2.06 to 4.89)**
Chinese, Mixed, Other	**2.75**	**0.001**	**(1.55 to 4.87)**	**1.63**	**0.033**	**(1.04 to 2.56)**
Region						
London	1			1		
North East	**0.43**	**0.036**	**(0.19 to 0.95)**	**0.49**	**0.006**	**(0.30 to 0.82)**
North West	**1.59**	**0.048**	**(1.00 to 2.50)**	**0.69**	**0.045**	**(0.47 to 0.99)**
Yorkshire and Humberside	0.84	0.534	(0.50 to 1.44)	0.67	0.052	(0.45 to 1.00)
East Midlands	1.25	0.435	(0.72 to 2.16)	**0.62**	**0.029**	**(0.40 to 0.95)**
West Midlands	0.66	0.119	(0.39 to 1.11)	**0.66**	**0.047**	**(0.44 to 0.99)**
East of England	0.99	0.985	(0.59 to 1.67)	0.93	0.723	(0.62 to 1.39)
South East	0.82	0.455	(0.49 to 1.38)	**0.66**	**0.031**	**(0.45 to 0.96)**
South West	1.15	0.578	(0.70 to 1.91)	**0.41**	**<0.001**	**(0.27 to 0.62)**
Income						
Highest quintile	1			1		
2nd highest quintile	0.70	0.195	(0.40 to 1.20)	0.80	0.274	(0.53 to 1.20)
Middle quintile	1.28	0.382	(0.74 to 2.21)	**1.53**	**0.042**	**(1.02 to 2.32)**
2nd lowest quintile	1.33	0.318	(0.76 to 2.34)	**1.91**	**0.004**	**(1.23 to 2.94)**
Lowest quintile	1.61	0.094	(0.92 to 2.82)	**2.82**	**<0.001**	**(1.79 to 4.46)**
Missing	**1.82**	**0.012**	**(1.14 to 2.89)**	**1.57**	**0.026**	**(1.06 to 2.34)**
Highest qualification						
Degree or equivalent	1			1		
Higher education	1.03	0.911	(0.61 to 1.75)	1.06	0.792	(0.68 to 1.65)
Other	1.10	0.660	(0.73 to 1.65)	1.25	0.138	(0.93 to 1.68)
No qualifications	**1.68**	**0.040**	**(1.02 to 2.75)**	**1.72**	**0.009**	**(1.15 to 2.56)**
Full time Student	0.92	0.770	(0.56 to 1.54)	1.39	0.113	(0.92 to 2.10)
Marital status						
Single	1			1		
Married	0.89	0.617	(0.58 to 1.39)	**1.53**	**0.006**	**(1.13 to 2.07)**
Cohabitee	0.78	0.245	(0.51 to 1.19)	1.14	0.408	(0.84 to 1.54)
Sep/divorced/widowed	2.32	0.186	(0.67 to 8.05)	1.29	0.400	(0.72 to 2.31)
Parent (yes)	1.41	0.09	(0.95 to 2.11)	1.23	0.134	(0.84 to 1.61)
Health						
Limiting longstanding illness	1.32	0.185	(0.87 to 2.00)	**1.48**	**0.008**	**(1.11 to 1.98)**
Anxiety or depression(yes)	**1.85**	**0.002**	**(1.25 to 2.75)**	1.08	0.588	(0.82 to 1.41)
-Missing	1.39	0.171	(0.87 to 2.22)	**1.62**	**0.043**	**(1.01 to 2.57)**
Health Behaviours						
Current Smoker	**0.63**	**0.004**	**(0.46 to 0.87)**	0.83	0.151	(0.64 to 1.07)
General activity - High	1			1		
Medium	1.15	0.394	(0.83 to 1.59)	1.10	0.461	(0.86 to 1.40)
Low	**1.40**	**0.041**	**(1.01 to 1.95)**	**2.01**	**<0.001**	**(1.56 to 2.58)**

Heavy drinker versus moderate drinker (Ref)	Men OR	p-value	(95% CI)	Women OR	p-value	(95% CI)
Age	1.02	0.152	(0.99 to 1.04)	**1.02**	**0.015**	**(1.01 to 1.05)**
Ethnicity						
White	1			1		
Asian or Asian British	**0.29**	**<0.001**	**(0.17 to 0.48)**	**0.49**	**0.009**	**(0.28 to 0.83)**
Black or Black British	**0.29**	**<0.001**	**(0.15 to 0.57)**	**0.24**	**<0.001**	**(0.12 to 0.46)**
Chinese, Mixed, Other	**0.38**	**0.001**	**(0.22 to 0.66)**	**0.44**	**<0.001**	**(0.28 to 0.70)**
Region						
London	1			1		
North East	**1.63**	**0.023**	**(1.07 to 2.50)**	1.27	0.225	(0.86 to 1.88)
North West	1.32	0.111	(0.94 to 1.87)	1.08	0.648	(0.78 to 1.49)
Yorkshire and Humberside	1.31	0.140	(0.91 to 1.89)	1.08	0.672	(0.77 to 1.51)
East Midlands	1.39	0.102	(0.94 to 2.07)	0.87	0.470	(0.61 to 1.26)
West Midlands	0.94	0.739	(0.65 to 1.36)	0.95	0.784	(0.67 to 1.35)
East of England	0.83	0.297	(0.58 to 1.18)	1.23	0.238	(0.87 to 1.73)
South East	0.90	0.538	(0.63 to 1.27)	1.01	0.966	(0.72 to 1.41)
South West	0.84	0.330	(0.58 to 1.20)	0.92	0.642	(0.67 to 1.29)
Income						
Highest quintile	1			1		
2nd highest quintile	1.10	0.502	(0.84 to 1.43)	0.81	0.103	(0.63 to 1.04)
Middle quintile	0.84	0.275	(0.61 to 1.15)	**0.72**	**0.022**	**(0.54 to 0.95)**
2nd lowest quintile	0.74	0.090	(0.52 to 1.05)	0.82	0.216	(0.60 to 1.12)
Lowest quintile	0.72	0.066	(0.50 to 1.02)	0.80	0.182	(0.58 to 1.11)
Missing	0.77	0.084	(0.57 to 1.04)	**0.71**	**0.018**	**(0.53 to 0.94)**
Highest qualification						
Degree or equivalent	1			1		
Higher education	0.89	0.502	(0.64 to 1.25)	0.84	0.329	(0.60 to 1.19)
Other	0.89	0.351	(0.70 to 1.13)	0.85	0.651	(0.77 to 1.18)
No qualifications	**0.56**	**0.003**	**(0.38 to 0.82)**	**0.66**	**0.024**	**(0.46 to 0.95)**
Full time Student	1.08	0.658	(0.76 to 1.55)	**1.45**	**0.021**	**(1.06 to 1.98)**
Marital status						
Single	1			1		
Married	**0.69**	**0.016**	**(0.51 to 0.93)**	**0.63**	**0.000**	**(0.49 to 0.80)**
Cohabitee	**0.77**	**0.033**	**(0.60 to 0.98)**	**0.74**	**0.006**	**(0.60 to 0.92)**
Sep/divorced/widowed	0.69	0.311	(0.33 to 1.42)	1.18	0.453	(0.76 to 1.84)
Is a Parent (yes)	**0.74**	**0.027**	**(0.56 to 0.97)**	**0.75**	**0.006**	**(0.61 to 0.92)**
Health						
Limiting longstanding illness	**0.55**	**<0.001**	**(0.41 to 0.74)**	1.08	0.599	(0.83 to 1.38)
Anxiety or depression(yes)	0.95	0.708	(0.71 to 1.26)	1.13	0.257	(0.91 to 1.41)
-Missing	0.81	0.243	(0.56 to 1.16)	0.97	0.908	(0.62 to 1.52)
Health Behaviours						
Current Smoker	**1.78**	**<0.001**	**(1.45 to 2.18)**	**1.72**	**<0.001**	**(1.42 to 2.08)**
General activity - High						
Medium	1.00	0.997	(0.81 to 1.23)	0.98	0.794	(0.82 to 1.17)
Low	0.89	0.361	(0.69 to 1.14)	0.77	0.016	(0.63 to 0.95)

Table 4.5 presents the full multinomial logistic regression model with limiting longstanding illness as the exposure, comparing the odds of being a non-drinker versus moderate drinker, and a heavy drinker versus moderate drinker. Comparing the odds of being a non-drinker with a moderate drinker, results for social and demographic factors were largely similar to the binary logistic regression results on odds of being a non-drinker versus a current drinker in Table 4.2. Demographic factors had an influence on heavy versus moderate drinking. Married people had lower odds of being a heavy drinker than a moderate drinker (Men; OR 0.69, 95% CI 0.51 to 0.93, Women; OR 0.63, 95% CI 0.50 to 0.80), and the same applied to cohabitees (Men; OR 0.76, 95% CI 0.60 to 0.97, Women; OR 0.75, 95% CI 0.60 to 0.93), and parents (Men; 0.73, 95% CI 0.56 to 0.96, Women; 0.74, 95% CI 0.61 to 0.91). Women in the lowest income quintile were least likely to be a heavy drinker than a moderate drinker (OR 0.71, 95% CI 0.55 to 0.94). There was no association between income quintiles and heavy and moderate drinking among males.

4.8 Discussion

This study shows that self-reported illness is associated with non-drinking among 18 to 34 year olds, controlling for ethnicity, income, education, marital status, presence of children in the household, anxiety and depression, smoking and activity levels. Limiting longstanding illness was associated with a significant increase in the odds of being a non-drinker for men, and to a lesser extent for women. Whilst one study showed rates of self-reported health were higher among non-drinkers than moderate drinkers in young adulthood (101), to my knowledge this is the first study to do so whilst adjusting for social, demographic, mental health and health behaviour factors. Younger adults with no qualifications had double the odds than those with a degree of being a non-drinker and being in the lowest income quintile was also associated with increased odds of non-drinking. Consistent with the literature for the general population (83-85) a social gradient in non-drinking was also observed. This was steeper for women than men (Table 4.2), which is also consistent with another cross-sectional study (84). This study

shows that the social gradient in non-drinking begins in early adulthood and that poor health is an independent predictor of non-drinking outside of these factors.

Declining health as a reason for not drinking has been explored in great detail by Shaper and colleagues and has come to be known as the 'sick-quitter' hypothesis. It is often thought the reason why the proportion of non-drinkers increases with age is due to declining health with age. A cross-sectional study specifically addressing whether health was associated with a change in alcohol consumption by asking respondents whether they had reduced their consumption in the past 12 months found having diabetes, hypertension or anxiety, was associated with increased probability of reduction or cessation of alcohol consumption, and this also increased with a decline in self-rated health (63). Consistent with this study, poor health was not only associated with non-drinking but with a reduction in the odds of heavy drinking on the heaviest drinking day in the previous week, as shown by the statistically significant associations in the multi-nominal logistic model. Since illness is present in early adulthood among non-drinkers, it is not only illness related to ageing that is a predictor of non-drinking, illness may be a reason why people do not drink in the first place.

Young white non-drinkers have different characteristics from the general population of young total non-drinkers, having higher rates of poor health and lower educational attainment (Table 4.1), thus failing to account for ethnicity may mask important differences in drinking outcomes. Ethnic minorities, who account for over half of young non-drinkers, are known to abstain due to cultural reasons, such as religion or simply because it is more of a norm not to drink; by adjusting for this factor the independent effect of poor health as a predictor may be highlighted particularly when rates of poor health was shown to be higher among white non-drinkers (Table 4.1). This was the case for males when not adjusting for ethnicity in the full model in exploratory analysis, limiting longstanding illness no longer had an association (OR=1.28, 95% CI 0.88 to 1.86, p=0.197). Poor health may be a reason why some young white people do not drink when it is the social

norm to do so. Since a significant proportion of non-drinkers are ethnic minorities ethnicity should be considered in studies which use non-drinkers as a reference group.

Numerous risk factors for increased mortality were found to be associated with non-drinkers in this study, including lower education, lower income, lower physical activity, anxiety amongst men, and self-reported illness. This is consistent with numerous other studies which investigate the health and health behaviours of non-drinkers (61, 68); however what this study shows that this begins in early adulthood. Whilst ex-drinkers may be removed from the non-drinker category, pre-existing poor health and disadvantage may be present even in lifetime abstainers. If non-drinkers are to be used as a reference category against drinkers more sophisticated controls should be used which account for circumstances in early adulthood or even younger. Indeed, where childhood measures could be adjusted for such as father's social class, middle aged men who were moderate drinkers did not have better health outcomes than non-drinkers in a Scottish Prospective Cohort Study (127). Early social disadvantage and the presence of illness which may be factors influencing the non-consumption of alcohol in the first place however would require further longitudinal analysis to confirm this

4.8.1 Limitations

A limitation of this study is the way in which the drinking groups are defined. To facilitate recall, adults were asked what alcohol they had drunk in the heaviest drinking day in the previous week rather than average consumption. This means that the subsample is limited to only recent drinkers, and thus does not exclude the possibility that a person may have drank heavily in the weeks before, but abstained in the previous week, or vice versa. It may also measure single heavy episodic drinking rather than be a reflection of regular consumption. However, approximately 48.6% of male heavy drinkers and approximately 34.5% of female heavy drinkers claimed to have drank on at least 3 or 4 days a week in the previous year, compared with 18.2% and 10.7% of light to moderate drinkers, respectively.

This implies that heavy drinkers in the way that are defined here are both more frequent drinkers as well as drinking more in a particular episode. These classifications do not affect the non-drinker category which was based on asking whether respondents drank nowadays.

Another limitation is that the broad definition of 'non-drinkers' included very occasional drinkers, where approximately 47 very occasional drinkers went on to record drinking levels in the previous week. This implies that there may be a validity issue in the way in which non-drinkers are defined. Indeed, definitions of non-drinkers are ambiguous, often including ex-drinkers or occasional drinkers [10]. Potentially, more research is required to highlight distinctions between very occasional drinkers and never drinkers. As mentioned in the methodology section a broad definition of non-drinkers was used to keep in line with definitions in other studies however further analysis in this thesis using longitudinal data will aim to distinguish between these types of drinkers.

Complex survey design was not accounted for as the stratification variables from two separate years could not be merged due to the inability to match primary sampling units across pooled data. Due to the large sample sizes this should have minimal impact on the results; however caution should be taken when reading borderline significant variables at the 5% level. There was also a statistically significant association with missing data particularly on income. This was adjusted for by including missing data as a category; however the data on this particular variable might be skewed and biases may arise from uniformly grouping together missing data (148). Finally, this study uses cross-sectional data therefore the temporal order of events cannot be confirmed. Despite being conducted on young adults where non-drinking is unlikely to be a cause of poor health at a young age, the temporal order between poor health and non-drinking is not clearly established, which will be the subject of investigation in the next chapters using longitudinal datasets.

4.9 Summary and Conclusion

- Having a limiting longstanding illness, longstanding illness or rating your health as poor in early adulthood, were predictors of being a non-drinker independent of social, demographic, mental health and health behaviours.
- Self-rated poor health was associated with non-drinking and also with a reduction in the likelihood of heavy drinking on the heaviest drinking day in the previous week.
- Young white non-drinkers have different characteristics than the general population of non-drinkers having higher rates of illness, fewer educational qualifications and lower income than young non-drinkers generally.
- A social gradient in non-drinking exists among young adults aged 18 to 34 years

In conclusion self-reported limiting illness, longstanding illness and self-rated poor health among 18 to 34 year olds is associated with increased probability of being a non-drinker and reduced odds of heavy drinking, and this is independent of lower income and education also associated with non-drinking among young adults. Observational studies which conclude drinkers have better health than non-drinkers from a J-shape relationship and attribute it to alcohol consumption should account for pre-existing poor health and disadvantage from an early age. Excluding ex-drinkers from non-drinkers may not be enough, since pre-existing poor health may be the reason why even lifetime abstainers choose not to drink alcohol. However since this is a cross sectional study the relationship between persistent poor health and non-drinking requires further analysis with a longitudinal dataset. With this analysis there are grounds to believe that poor health and persistent poor health may be a reason why some people never take up drinking which is the subject of investigation in the next chapter using the National Child Development Study and the 1970 British Cohort Study.

5. Longitudinal Survey design and Methodology

5.1 Introduction and Study outline

The previous chapter established that there was an association between having a limiting longstanding illness in young adulthood and being a non-drinker using cross-sectional data which motivated the hypothesis that some people may never take up drinking because of poor health from an early age. This is explored using two national representative prospective cohort studies, the National Child Development Study (NCDS) and the 1970 British Cohort Study (BCS70). The established sick-quitter hypothesis, that some people stop drinking due to poor health, will also be explored using the NCDS. This is a development of work in the previous chapter since using a longitudinal dataset enables the possibility to assess the temporal order between poor health and non-drinking and analyse the effects of health over time on persistent non-drinking over time. Furthermore this study distinguishes between types of non-drinkers, lifetime abstainers, ex-drinkers and occasional drinkers.

Methodology, including survey design and variables used in this study is first outlined in this chapter. Chapter 6 discusses missing data in the cohort studies. Following from this basic descriptive analysis is carried out to provide information on the characteristics of the sample in Chapter 7. Chapter 8 explores the early life health status of drinkers and non-drinkers in young adulthood. Ahead of regression analysis between health and lifetime abstention and ex-drinking, the effect of education and demographic factors is explore14d using regression analysis in Chapter9. Following from this the effect of poor psychosocial health on lifetime abstention and being an ex-drinker, a potential confounder between physical health and non-drinking is investigated in Chapter 10. The final two chapters 11 and 12 include limiting longstanding illness into the final model and investigates effects on ex-drinking and lifetime abstention in line with sick-quitter and sick non-starter hypothesis respectively.

5.2 Survey Design

5.2.1 The National Child Development Study (NCDS)

The National Child Development Study (NCDS) is an on-going longitudinal study which follows the lives of 17,414 babies born in one week of March 1958, in Great Britain (149). It began as the Perinatal Mortality Survey sponsored by the National Birthday Trust fund which aimed to investigate factors associated with stillbirth and death in early infancy. Since the first wave in 1958, data has been collected eight times covering extensive physical, educational, social and economic information from the original sample. These studies were conducted by Social Statistics Research in 1965, 1969, 1974 and 1981, the National Children's Bureau Unit, and City University in 1991 and by the Centre for Longitudinal Studies, Institute of Education, in 2000, 2004 and 2008 (150). Data has been collected from a variety of sources including parents, health visitors and schools, and a range of topics covered, including employment, education, marriage and cohabitation, family income, leisure, voluntary activities and health. This study focuses on data from medical records at age 16 as assessed by a health visitor, drinking status and social, demographic and health factors collected through face to face interviews at ages 23 (1981), 33 (1991), 42 (2000) and 50 (2008).

The National Child Development dataset 1981 (151), 1991(152), 2000(153) and 2008 (154) was downloaded from the UK Data service on 31/08/2011, 05/10/2011 and 26/06/2012. This was subject to the End User Licence agreement (136) following user and project registration and the condition of not identifying the individuals within the study sample. The data and questionnaire documentation can be found online in the UK Data Service catalogue (155).

5.2.2 The 1970 British Cohort Study (BCS70)

The 1970 British Cohort study (BCS70) began with a cohort of approximately 17,200 babies born in 1970 in Great Britain (156). Since then data has been collected at age 5 (1975), 11 (1980-81), 16 (1986), 26 (1996), 30 (1999/2000), 34 (2004/5) and 38 (2008) and from a variety of sources including from parents,

health visitors, school and individuals themselves. Drinking status questions, collected through a postal questionnaire at age 26 (1996) and through face to face interviews at age 30 (2000) and 34 (2004) were used to supplement analyses with the NCDS on the sick nonstarter hypothesis. In addition health conditions at age 10 (1980-81) were used to assess whether conditions in childhood have an effect of drinking status in young adulthood. Availability of drinking status records motivates this selection of BCS70 waves, as drinking status questions were not asked at 38 years.

The 1970 British Cohort Study (BCS70) was used to supplement exploratory work with health conditions and those who abstain from alcohol continually through life, since the sick nonstarter hypothesis has never been directly explored before. The aim of this thesis is to explore whether the association between early life poor health and lifetime abstention exists in two different cohorts and thereby persists over time, rather than comparing the effects between two cohorts. The different time points and measurements used in each cohort would make it difficult to make a direct comparison, however consistent findings between two cohorts would strengthen conclusions drawn from results.

The 1970 British Cohort Study datasets 1991 (157) 2000 (158), and 2008 (159) and were downloaded from the UK Data service on 14/01/2013 and 1981 (160) on 26/06/2012. This was subject to the End User Licence agreement (136) following user and project registration and the condition of not identifying the individuals within the study sample. The data and questionnaire documentation can be found online in the UK Data Service catalogue (155).

5.2.3 Cohort comparison between the NCDS at age 33 (1991) and BCS70 at age 34 (2004)

Table 5.1 presents the raw sample at age 33 (1991) in the NCDS (1958 cohort) and age 34 (2004) in the BCS70 (1970 cohort) to compare social, drinking and health characteristics of each cohort. The complete case sample used in regression analysis is detailed in Chapter 7 is also provided. The 1970 cohort is slightly more

educated than the 1958 cohort, with a higher proportion having a degree in the 1970 cohort. This rise reflects an on-going trend, where rates have increased for the whole population, but have been greater for women (161). No large differences were found in the proportions without qualifications. There has been a substantial decrease in the proportion without qualifications in the last half of the century. In the 1946 British Birth Cohort, the proportion of those with no qualifications was around 42%, however the proportion of people with no qualifications has 'stalled' at 11-14% between the younger 1958 and 1970 cohorts (161). Rises in wages and living standards has been found in the younger 1970 cohort, however wage inequality has also increased (162).

In the 1970 Cohort at age 34 a greater percentage of adultswere drinking at least once a week compared with the 1958 Cohort. An increase in the proportion of women who drink more than 14 units from 1984 to 1996 is likely to be a contributory factor (88) as well increases in the mean number of alcohol units consumed between the cohorts in general (163). Rates of lifetime abstainers cannot be compared between cohorts at this age point due to differences in the way the question was asked. In the BCS70 it is possible to distinguish self-identified 'lifetime abstainers' from the option 'never had an alcoholic drink' which accounted for 2.2% of the population, this option was not provided in the NCDS. However using a different measure of deriving lifetime abstainers by taking consecutive non-drinking statuses across waves found a similar proportion between the cohorts (1.9%). This is discussed in more detail in 6.2.1.1.

There was an increase in the proportion reporting a longstanding illness in the 1970 cohort compared with the 1958 cohort when respondents where in their thirties; this could be related to increases in the rates of asthma, anxiety and hearing problems between the two cohorts (164). There was also in an increase in the proportions with poor psychosocial health, which is consistent with studies in the US where prevalence of depression has been increasing in younger populations (164).

Both cohorts are predominately white and each 'does not have the ethnic diversity of today's population' (149, 156). Among those with ethnicity recorded in the cohorts, British White accounted for 96.4% of the population at age 33 in the NCDS, and 94.8% of the population at age 34 in the BCS70. This is much higher than the total population as recorded in the census in 2011 (87.1%) (165), and among 18 to 34 year olds in the Health Survey for England 2006 and 2008 (82.6%) (Table 4.1). Missing data on ethnicity in the NCDS and BCS70 was high accounting for 14.0% and 7.1% in each cohort respectively. The cohorts may also differ in their representativeness. The NCDS suffers from less attrition and therefore is likely to be more representative of the population. The BCS70 suffered from greater non-response due to an industrial strike by teachers at age 16 who were requested to collect information on education. Furthermore a postal questionnaire was sent out at age 26 to cohort members, which was the first time that cohort members were asked to provide information themselves, rather than the parents or teachers. This has been suggested as a reason why attrition was particularly high at age 26 (166).

Table 5.1 Demographic, social, drinking and health characteristics of NCDS at age 33 (1991) and BCS70 at age 34 (2004), raw and complete case samples

	Raw Sample				Complete Case			
	NCDS (1991)		BCS70 (2004)		NCDS (1991)		BCS70 (2004)	
	Age 33		**Age 34**		**Age 33**		**Age 34**	
	%	N	%	N	%	N	%	N
Total	100	11469	100	9665	100	9290	100	5960
Sex								
Male	49.1	5634	47.9	4626	48.0	4461	43.1	2571
Female	50.9	5835	52.1	5039	52.0	4829	56.9	3389
Fathers social class at birth								
Higher	16.7	1911	18.5	1784	17.2	1600	19.7	1174
Middle	55.4	6349	54.9	5307	55.8	5185	56.5	3366
Lower	18.6	2131	18.5	1785	18.3	1703	16.6	988
No Father/Sick	4.4	508	0.5	44	4.2	387	0.4	25
Missing	5.0	570	7.7	745	4.5	415	6.8	407
Highest qualification								
Degree	12.2	1402	23.0	2219	12.9	1200	26.7	1589
Other	72.7	8337	66.2	6401	71.4	6637	63.9	3807
No qualification	12.2	1403	10.8	1045	15.6	1453	9.5	564
Missing	2.9	327	-	-	-	-	-	-
Drinking								
Most days	12.2	1400	16.7	1616	12.1	1124	16.8	1000
1-3 times a week	46.4	5322	51.4	4972	47.5	4412	52.4	3121
1-3 times a month	19.4	2221	12.2	1179	19.8	1841	12.7	756
Less often	16.7	1911	12.9	1248	16.4	1521	12.3	735
Never drink	4.5	513	4.2	405	4.2	392	4.0	239
Never had an alcoholic drink	-	-	2.2	215	-	-	1.8	109
Not answered	0.9	102	0.3	30	-	-	-	-
Malaise inventory score								
Normal	6.9	797	14.9	1441	6.5	604	86.2	5138
Poor Psychosocial health (High score)	91.8	10532	84.0	8115	93.5	8686	13.8	822
Missing	1.2	140	1.1	107	-	-	-	-
Longstanding illness								
Yes	15.5	1773	28.2	2722	15.2	1408	27.1	1613
No	83.5	9582	71.7	6930	84.8	7882	72.9	4347
Missing	1.0	114	0.1	13	-	-	-	-

5.3 Outcome Variables

5.3.1 Alcohol consumption

In the NCDS at ages 23, 33 and 42 respondents were asked a drinking status question such as "How often do you usually have an alcoholic drink of any kind?" Response options differed slightly in each wave ranging from "Most days" to "less often (than once or twice a week)" at age 23, and "one to three times a month" at age 33 and "two to three times a month" at age 42, but each had a "less often"/"only on special occasion" option and "Never/Never nowadays" following on. In some waves in addition to a 'never/never nowadays option' there was an additional option 'Never had an alcoholic drink'. This occurred in the NCDS at 42 years and in the BCS70 at 30 and 34 years. This additional option is to distinguish ex-drinkers from those who report not drinking alcohol throughout their lives i.e. lifetime abstainers. To avoid confusion those who answered 'never/never nowadays' are referred to as non-drinkers and the latter as self-identified 'lifetime abstainers'.

Table 5.2 Example of a drinking status question (NCDS. 2000 42 years)

Example of a drinking status question	**Terminology used in this thesis**
How often do you have an alcoholic drink of any kind? Would you say you had a drink ...	
On Most days	
2 to 3 days a week	
Once a week	
2 to 3 times a month	
Less often/only on special occasions	Special Occasion drinker
Never nowadays	Non-drinker
Never had an alcoholic drink	Self-identified 'lifetime abstainer'

In the literature lifetime abstainers are commonly derived through a single self-report answer for example from reporting 'I have never ever had an alcoholic drink'. However two studies have found that over half of participants who claimed to have never drank alcohol reported drinking in the previous waves of the surveys (112, 113) as mentioned in section 2.3.2. Therefore two derivations of lifetime abstainers are used in this thesis. Firstly by using a bottom up approach taking consecutive 'never nowadays' or 'never had an alcoholic drink answers' from consecutive waves to get around validity issues of those who claim to be lifetime abstainers reporting drinking in past waves. These people are referred to as *lifetime abstainers*. Secondly those who state 'I have never ever had an alcoholic drink', information provided in a single wave of the survey, are classified as self-identified 'lifetime abstainers', or 'lifetime abstainers' (SI) for short. The latter group is also analysed to explore whether persistent poor health is also associated with those who claim to be lifetime abstainers in a single wave of the survey, despite there being potential methodological issues with this method. If there is evidence of a relationship then this would have implications for the majority of studies that classify lifetime abstainers this way.

5.3.1.1 Lifetime abstainer derivation in the NCDS

The bottom-up approach groups together all those who said "Never nowadays" or "Never had an alcoholic drink" in consecutive waves starting from age 23 to 33 to create a variable 'lifetime abstainers at 33 years', and then up to age 42 creating 'lifetime abstainers at 42 years'. Lifetime abstainers derived through taking consecutive records from age 23 to 50 years consisted of fewer than 100 participants, therefore analysis is limited to 42 years. This is likely to do with attrition since the derivation requires cohort members to have participated in all four waves. Despite being referred to as 'lifetime abstainers' it should be read as being a lifetime abstainer up to the age of the model in other words reporting not drinking consistently from early adulthood up to the most recent survey being analysed. For example lifetime abstainers at 33 years are lifetime abstainers up to 33 years (having responded 'Never nowadays' to drinking status questions

consecutively at 23 and 33 years), whilst lifetime abstainers at 42 years have reported 'Never nowadays' or 'Never had an alcoholic drink' drinking status questions consecutively at 23, 33 and 42 years, thus are lifetime abstainers up to 42 years. The option 'Never had an alcoholic drink' was asked only at 42 years and therefore analysis on self-identified 'lifetime abstainers' is carried out in the BCS70 only ,where results are analysed consistently with the same time points as lifetime abstainers derived using consistent 'never nowadays' answers. Furthermore as mentioned earlier in the literature review a study using the NCDS found over half of self-identified 'lifetime abstainers' at age 45 reported drinking in past surveys and therefore this measure may be invalid (113)

5.3.1.2 Lifetime abstainer and self-identified 'lifetime abstainer' derivation in the BCS70

In the BCS70 lifetime abstainers were derived in the same way as in the NCDS by taking all those who consecutively responded 'Never nowadays' or 'Never had an alcoholic drink' to drinking status questions from age 26 to 30 years creating 'lifetime abstainers at 30 years' and then up to 34 years creating 'lifetime abstainers at 34 years' as two separate derivations of lifetime abstainers at two separate time points. As mentioned earlier these waves were used since they were the ones in which drinking frequency questions were asked. In addition findings were also compared with those who reported "Never had an alcoholic drink" using the BCS70 at 30 and 34 years as a different self-identified measure of being a lifetime abstainer at the same time points. These people are referred to as 'lifetime abstainers' (SI). However there may be validity issues with this group as some may have actually been drinkers in the past which is why lifetime abstainers derived from taking consecutive waves of non-drinking answers are the main area of investigation in this thesis. 'Lifetime abstainers' (SI) were analysed only in the BCS70 as this option to drinking status questions was not provided at 33 years in the NCDS.

5.3.1.3 Ex-drinker derivation in the NCDS

Ex-drinkers were classified into two types; those who reported being a non-drinker, but had stated they had drank in the previous wave, and those who reported drinking on special occasions only, but had stated they drank more than on special occasions in the previous wave. These types of non-drinkers are referred to as ex-drinker (non) and ex-drinker (SO) respectively. Unlike derivations of lifetime abstainers that depended on data from consecutive waves from age 23, this derivation depended on two consecutive waves of data only. For example an ex-drinker (non) at 33 years was someone who stated 'Never nowadays' to drinking status questions at 33 years but stated they drank at 23 years. Whilst an ex-drinker (SO) at 42 years was someone who stated 'Only on special occasions' to drinking status questions at 42 years but stated they drank more than on special occasions only at 33 years. Since this analysis is done to test the hypothesis that a worsening of health is associated with a change in drinking status to a non-drinker or special occasion drinker, drinking status from two decades earlier is irrelevant to answering this specific research question. Furthermore the sample would be reduced due to attrition from using participants with more than two consecutive waves of data. However this means that the sample sizes are different at the different time points, thus attention was drawn to assessing whether associations existed rather than comparing absolute values across models. For a flow diagram of the samples used to derive lifetime abstainers and ex-drinkers please see Figure 6.1 and Figure 6.2. Certain groups from the binary derivation of ex-drinkers were excluded to ensure a better comparison. Ex-drinkers (non) exclude lifetime abstainers, thus comparing those who reduced consumption to non-drinking with those who have always been drinkers. Ex-drinkers (SO) exclude those who reported 'never nowadays' drinking in the current wave thus comparing with current drinkers.

Definitions are presented in Table 5.3

Table 5.3 Summary definitions of lifetime abstainers and ex-drinkers used in statistical models in the NCDS and BCS70

		'Lifetime abstainers' (SI)	**Lifetime abstainers**		**Ex-drinkers (non)**	**Ex-drinkers (SO)**
Dataset		**BCS70**	**NCDS**	**BCS70**	**NCDS**	**NCDS**
Definition		Those who reported ' I've never had an alcoholic drink' i.e. Self-identified lifetime abstainers	Those who reported 'never nowadays' and 'never had an alcoholic drink' to drinking status questions in consecutive waves		Those who reduced drinking to 'never nowadays' whilst drinking in the previous wave	Those who reduced drinking to 'only on special occasions' (SO) drinking whilst drinking more frequently in the previous wave
Waves used		Current status	Consecutive waves from 23y (NCDS), 26 y(BCS)		Two consecutive waves	Two consecutive waves
Derivation	Model 1	Current status response at 30 years	Non-drinker (23y)-> Non-drinker (33y)	Non-drinker (26y)-> Non-drinker (30y)	Drinker (23y) -> Non-drinker (33y)	Drinking more than SO (33y) -> SO drinker (42y)
	Model 2	Current status response at 34 years	Non-drinker at (23y)-> Non-drinker (33y)->Non-drinker (42 y)	Non-drinker at (26y)-> Non-drinker (30y)->Non-drinker (34y)	Drinker (33y) -> Non-drinker (42y)	Drinking more than SO(33y) -> SO drinker (42y)
	Model 3				Drinker (42y) -> Non-drinker (50 y)	Drinking more than on SO (42y) -> SO drinker (50y)
Limitations		Participants reported drinking in previous waves	Participants may have been drinkers in between waves			
Excludes					Non-drinkers across two waves	Non-drinkers in current wave

5.4 Main Exposure variables

5.4.1 Adolescent Health

5.4.1.1 The National Child Development Study (NCDS)

In the NCDS a local authority health visitor carried out a full medical examination on each member of the cohort at age 16 (149). This included carrying out tests on vision, hearing, speech and motor co-ordination. In addition a systematic examination was carried out on details of skin conditions, respiratory tract infections, defects in the cardiovascular system, the alimentary tract, the urogenital system, hernias, bones and joints and the neuromuscular system (167). Variables used for health at age 16 are based on the summary of conditions recorded following the medical assessment. Health visitors were asked to state whether condition was present, and if so whether the condition ranged from "No disability, slight, moderate, severe or degree unknown". In addition whether the member had no condition or insufficient information was also recorded. Each condition is converted into a binary variable representing whether the condition was present (no disability to degree unknown) or not. Another binary variable was included in the model; whether a participant had at least one slight to severe disability or not. Where rates were low conditions were grouped into categories such as 'physical disability'. This breakdown can be found in Table 8.1, for a full list of how conditions were recorded please refer to Appendix B.

5.4.1.2 The 1970 British Cohort Study (BCS70)

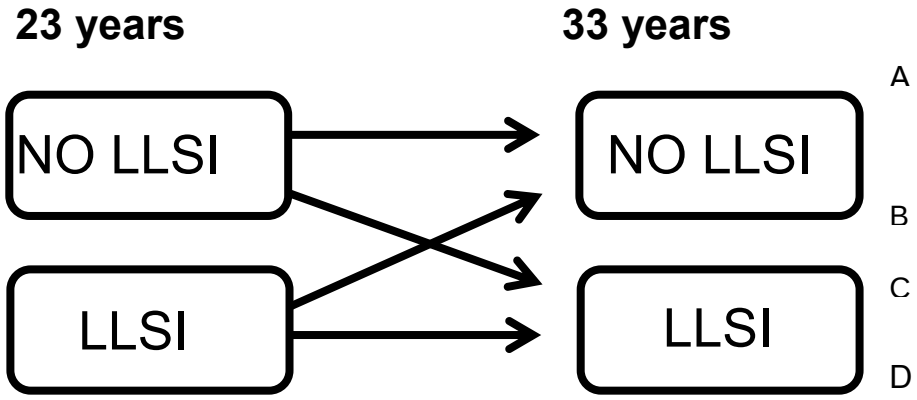
A similar medical examination was carried out at age 16 in the BCS, however data collection that year was low due to poor school attendance following a teacher trade union strike (156, 168). Only around half the sample had medical examination records at age 16. For that reason medical conditions at age 10 are investigated where response rates were not as low (see Appendix C for how health conditions were recorded). Alongside this retrospective self-report measures at age 26, where respondents were given a list of ailments and asked to state whether they have suffered from the condition since they were 16 were also analysed. These results were provided through sending back a postal

questionnaire in line with general data collection at age 26. These subjective measures involve an alternative breakdown of conditions therefore provides further detail on the relationship between adolescent health and early adulthood drinking status. This breakdown can be found in Table 8.2.

5.4.2 Changes in longstanding illness across successive waves

5.4.2.1 Limiting longstanding illness in The National Child Development Study (NCDS)

For a discussion on the use of self-reported health please refer to section 4.5.2



A. Never had a LLSI
B. No longer has a LLSI
C. Developed LLSI
D. Persistent LLSI

Figure 5.1Change in limiting longstanding illness across two waves as a single four categorical variable

Binary variables derived from yes/no answers to the question "Do you have any longstanding illness, disability or infirmity which limits your activities in any way compared with people of your own age?" were used to measure health status across different time waves by creating a four categorical variable as has done with self-rated poor health in another longitudinal study (169). At age 33 this included all those who did not have a limiting longstanding illness (LLSI) at age 23 and 33 as the reference category. The other three categories included those who had a LLSI at age 23 but not at 33, those who had a LLSI at age 33 but not at age 23, and finally all those who had a LLSI in both waves as illustrated in Figure 5.1.

To combine LLSI information from age 23, 33 and 42 the three binary variables were reduced to four categories rather than create an eight category variable where cases within categories would have been small and to keep degrees of freedom within the model. This includes two categories, one with participants who did not have a LLSI at age 42 but had a LLSI at age 23 or 33, and the other with participants who had a LLSI at age 42 who may or may not have had a LLSI at age 23 or 33. The reference and the final category were those who did not have a LLSI and had a LLSI in successive waves respectively. This is illustrated in Figure 5.2. Referring to Figure 5.1 and 5.2 the sick non-starter hypothesis is interested in assessing whether D. having a persistent LLSI from age 23 years is associated with a being a lifetime abstainer from age 23. The sick quitter hypothesis on the other hand is interested in observing whether an association exists between C, developing a LLSI from the previous wave and becoming an ex-drinker (non) or ex-drinker (SO). This refers only to Figure 5.1 where only two waves of data on LLSI were used for models using ex-drinkers.

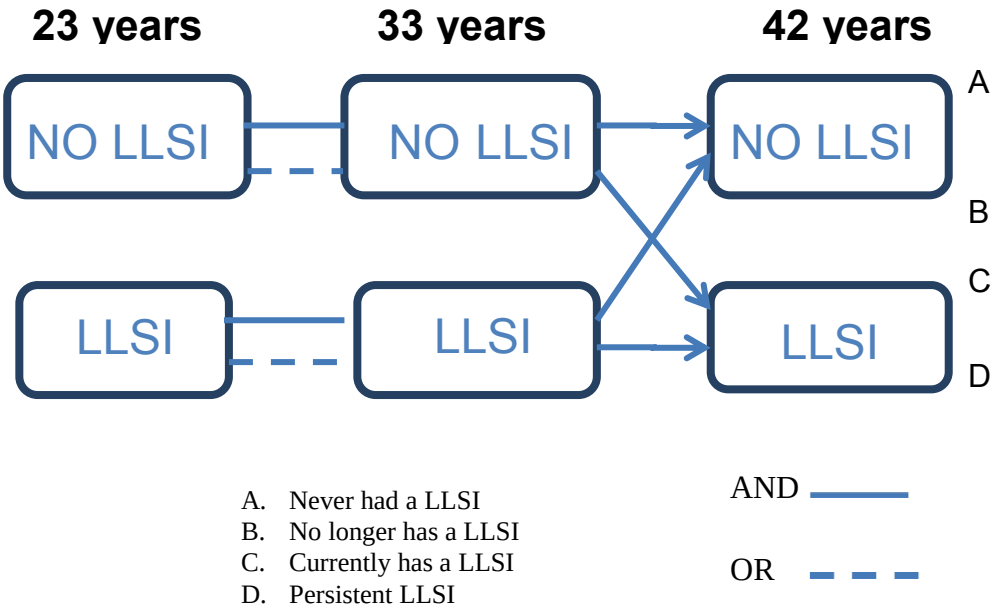


Figure 5.2 Change in limiting longstanding illness across three waves created into a four categorical variable

5.4.2.2 Longstanding illness in the 1970 British Cohort Study (BCS70)

A similar method of variable creation was applied to the BCS70 at age 26, 30 and 34. However only longstanding illness (LSI) was asked consistently in each wave through the question "Do you have any long-standing illness, disability or infirmity? By long-standing I mean anything that has troubled you over a period of time, or that is likely to affect you over a period of time?" (Similarly in the NCDS only LLSI was asked consistently). Thus the same variable creation used with limiting longstanding illness in the NCDS was used with longstanding illness in the BCS. Rather than being a limitation this is seen as a strength of the study as if the association is present in both cohorts then it would also apply to two different measures of health. This analysis is also interested in whether having a persistent longstanding illness from age 26 is associated with being a persistent non-drinker from age 26, in line with the sick non-starter hypothesis.

5.5 Confounders

5.5.1 Psychosocial health as a confounder

Given that non-drinkers have been found to have poorer psychosocial health than drinkers (95, 97, 170) and these associations have been found to exist in early adulthood (46, 94, 99-101) mental health will be adjusted for in the final models to explore associations between physical health in the form of limiting longstanding illness and drinking status in both the NCDS and BCS70. Poorer mental health may confound the relationship existing prior to the limiting longstanding illness; alternatively it could mediate the relationship where poorer mental health may be a consequence of limited activity. Poorer psychosocial health may prevent one from carrying out daily activities representing the limiting longstanding illness, providing another justification for adjusting for psychosocial health.

The Malaise Inventory is a set of 24 self-completion yes or no questions, developed by Rutter et al (171) from the Cornell Medical Index. It was designed to measure psychiatric morbidity, with those answering yes to 8 or more questions being at a high risk of depression (172). The scale has been found to have internal consistency and external validity being applicable to men

and women and different socio-economic groups when referencing to external criteria such as service use and recent or current psychiatric morbidity (172). It has been used among general populations (172, 173) and a large body of work has focused on groups particularly at risk such as those caring for a dependent (174, 175).

Whilst the Malaise Inventory has been shown to capture one underlying dimension of poor psychosocial health (172), a recent study recommends a two dimensional approach to the inventory, one concerning psychological stress and the other the physical effects of stress, sometimes referred to as the somatic dimension (174). The somatic dimension can be thought to be made up of items 1, 4, 11, 17, 18, 22 and 23 (see Table 10.1 for the full list of items), and includes questions such as "Do you often have back-ache?" The psychological and somatic dimensions of the malaise inventory was explored in a later study which found no support for a two dimensional treatment (172). The study acknowledged however that the somatic questions might have greater effects at older ages where there is greater physical morbidity

In the NCDS the 24 item self-completion questionnaire was asked at ages 23, 33 and 42 and the results were summed and converted into a two category variable with those scoring 8 or more being classified as having poor psychosocial health, which is referred to as 'malaise score (high)' or 'high malaise score'. At age 50, only 9 of the original 24 items were asked resulting in a 4+ cut off for poorer psychosocial health (176). An 8 item questionnaire has been found to be less reliable than the full 24 item questionnaire thus caution must be taken when comparing results (172). However the 8 item questionnaire does not include any items on the somatic scale where at older ages physical symptoms are likely to be more of an issue, so it may be more accurate in capturing psychosocial health rather than measuring physical health (172). In the BCS70 a 24 item self-completion questionnaire was asked at 30, resulting in an 8+ cut off for poor psychosocial health. At age 34 only 9 of the original 24 items were asked, also resulting in a 4+ cut off for poor psychosocial health. These cut-off points are also referred to as 'malaise inventory score (high)' or 'high malaise score' in regression models.

5.5.2 Other covariates

Models were also adjusted for sex, highest education, marital status and children in the household aged under 16 years. Justifications for using these variables only are explained in this section. The number of covariates in regression analysis was limited due to the risk of over-fitting where the sample of lifetime abstainers and ex-drinkers were small as explained in the next section. In addition because sample sizes were small models were adjusted for sex rather than stratified by male and female. Modelling an interaction effect between sex and changes in limiting longstanding illness was unfeasible due it creating an 8 category variable meaning numbers within categories were too small. Therefore it was not possible to examine whether there were real differences between males and females, furthermore when stratified, the number of participants of interest would be fewer than 100 in some models.

Highest qualification (Degree or higher/Other/No qualifications) obtained was used to model a component of social economic position. Poor health (116, 131) and non-drinking (31, 83, 84) is socially patterned across the life course, and therefore it was necessary to adjust for a measure of social position, to adjust for a possible confounder. In addition the effects of education is also examined independently of health in Chapter 9, as low social position is an important determinant of health in later life, therefore the effect of education on ex-drinking and lifetime abstention required discussion ahead of including health in the model, as this factor may have an influence on health outcomes later on in life. Furthermore early life social position may be a factor influencing morbidity later on in lifer, which J-curve studies in later life do not account for. Highest qualification obtained was used to measure a component of social position as there is a substantive interest in assessing how educational attainment may affect if someone becomes a drinker. As mentioned in section 2.3.1.1 of the literature review drinking among university students is known to be higher than non-university students which may represent an important ‘rite of passage’ into drinking. This motivates the decision to adjust for education to analyse, whether people with no qualifications are more likely to be non-drinkers, having not attended university. Secondly, highest qualification

obtained was a more efficient variable to use to measure social position as missing data from income and social class was greater, resulting in a larger sample to use in regression analysis. For example the number of lifetime abstainers with social class recorded at age 42 was 95 only compared with 119 of lifetime abstainers who had highest qualification data (Table 7.8). Another possible confounder considered was the early life social position, which cannot often be adjusted for in studies which show a J-shaped relationship. However father's social class at birth appeared to be similar between lifetime abstainers and drinkers at age 42 (Table 7.8), unlike education where a higher proportion of lifetime abstainers had no qualifications compared with drinkers (Table 7.8). This is discussed in more detail in Chapter 7.

Social role theory which suggests that drinking patterns change with the acquisition of different roles such as a spouse or parent role (144, 145) motivates the decision to adjust for marital status and whether the respondent has a child aged 16 years of under in the household. This was additionally influenced by findings from the Health Survey for England in Chapter 4 where marital status and having a child were significantly associated with being a non-drinker. This may occur via a number of plausible mechanisms such as less time spent in contexts that encourage drinking due to the additional responsibility of being a parent or lower psychological need to drink alcohol due to the additional social support from being in a marital relationship. Since this analysis focuses on time points when these demographic transitions are likely to happen (for example in the NCDS at age 33 and BCS at age 30 and age 34) these measures were adjusted for, since they might have a particular influence on the decision to stop drinking.

Unlike the previous analysis with the Health Survey for England which was interested in assessing the broad characteristics of non-drinkers in young adulthood this study focuses on exploring the hypothesis that poor health from an early age and persistent poor health is associated with being a persistent non-drinker from an early age. Whilst varying health behaviours such as smoking and physical activity among non-drinkers and drinkers may contribute to their

verifying health outcomes in later life, smoking status is unlikely to be a confounder in the relationship between chronic childhood conditions and non-drinking at such an early age which is the focus of this study, therefore it was not adjusted for in this analysis. There has also been studies which have shown non-drinkers to have lower rates of smoking ((31, 68)) (Chapter 4) and lower levels of activity (31, 68, 81, 82). Since non-drinkers have lower rates of smoking a major risk factor for mortality, compared with drinkers smoking is unlikely to be a contributor to their worse health in later life compared with drinkers. Whilst physical activity is lower among non-drinkers compared with drinkers which could contribute to their worse health later in life, and may be a by-product of having poor health, physical activity was not adjusted for as it was not central to the hypotheses of chronic health from an early age being related to persistent non-drinking. This is confirmed in sensitivity analysis which showed little changes to the association between the main exposure variable and lifetime abstention and ex-drinking at age 33 when including exercise at age 23 into the model. However simple descriptive analysis of smoking and physical activity rates between lifetime abstainers and ex-drinkers at age 42 has been shown and discussed in Chapter 7. Due to each cohort being predominately white (149, 156) and there being missing information on ethnicity (section 5.2.3), ethnicity was also not adjusted for in this analysis which is addressed as a limitation in the final general discussion.

All data from covariates was collected solely though self-report where members were interviewed by a professional survey research interviewer with the exception of data recorded at age 26 in the BCS70 which was collected via a self-completion questionnaire. The most recent responses at the corresponding age of the model in both cohorts were used as variables within models, for example in the model using lifetime abstainers at age 33 as an outcome, highest qualification as recorded at age 33 was adjusted for.

5.5.3 Number of variables in model and risk over-fitting

If there are too many parameters in the model relative to the number of observations there is the possibility that the significant estimates are modelling random noise rather than true findings that appear in the actual population. An

extreme case would be where the number of estimates is equal to or greater than the number of observations, or in other words where all the degrees of freedom in the model are used up. Such a scenario would produce a perfectly fitted model however it would be modelling noise in the sample rather than true relationships that can be replicated in other samples (177). This problem is also known as over-fitting.

A minimum number of events per variable (EPV) have been suggested to reduce risk of over-fitting. Peduzzi et al (178) recommends a minimum of 10 to 15 EPV in logistic regression models as his simulation study showed that there was a significant bias in estimates when including less than 10 EPV. Even if the total sample size is large as in with the NCDS and BCS70 it is the 'limiting sample size' that is important, in other words in a binary outcome it is the smallest sample out of events versus non-events (177), so in these analyses the limiting sample size is the number of lifetime abstainers.

The smallest number of lifetime abstainers occurred at age 42 in the NCDS (n=119), with six variables (sex, highest qualification, change in limiting longstanding illness, malaise score, marital status and presence of children under 16 in the household), this gives an EPV of 119/6= 19.8 which is over the minimum of 10 to 15 EPV recommended by Peduzzi et al (178). In the BCS70 the smallest event size occurred with self-identified 'lifetime abstainers' at age 30 (n=108), with the same number of variables this gives an EPV of 18. Adding more variables to the model may run the risk of over-fitting thus producing biased estimates, where the estimates would be less likely to be replicated in other samples. It has been suggested that an EPV lower than 20 significantly reduces power and the problem will be greater where variables are correlated (179). Therefore since the sample size of lifetime abstainers is small the number of confounders adjusted for is kept to a minimum.

5.6 Statistical Analyses

5.6.1 Adolescent health status of non-drinkers and drinkers in young adulthood

Aims: To explore the preceding health status of non-drinkers in early adulthood

In the NCDS rates of medical conditions as assessed by a health visitor at age 16 among drinking groups at age 23 was analysed in Chapter 8. A similar analysis in the BCS70 was carried out, where rates of medical conditions as assessed by a health visitor at age 10 and drinking status at age 26 were analysed. In addition rates of retrospective self-report conditions suffered since age 16 asked at age 26 was analysed with drinking status at age 26.

Findings from the NCDS and BCS70 were compared and chi-squared tests carried out to observe whether there was a bi-variate association between adolescent conditions and varying drinking status. This also provided greater detail on the conditions that might influence non-drinking in early adulthood.

5.6.2 Binary logistic regression analysis

5.6.2.1 Lifetime abstainers

Aims: To investigate whether persistent LLSI/LLI is associated with remaining a non-drinker

Using the NCDS binary logistic regression on the odds of being a lifetime abstainer was used to explore the effects of a change in limiting longstanding illness, whilst adjusting for sex, malaise inventory score, highest qualification, marital status and presence of children under age 16 in the household. This was done at 33 and 42 years in separate models. The same method was used in the BCS70 on the odds of being a lifetime abstainer, except change in longstanding illness was used; this was carried out at 30 and 34 years. The method was replicated for 'lifetime abstainer' (SI), at the same time points. In line with the sick non-starter hypothesis, the effect of persistent LLSI/LSI from early adulthood on persistent non-drinking was assessed.

The reasons for using two cohorts is to validate the hypothesis that persistent self-reported illness is associated with persistent non-drinking since this hypothesis has not been explored before rather than compare absolute effects between two cohorts. The different time points and measurements used in each cohort would also make it difficult to make a direct comparison.

5.6.2.2 Ex-drinkers

Aims: To investigate whether developing a LLSI is associated with becoming an ex-drinker

Using the NCDS binary logistic regression analysis was used to explore the effects of changes in limiting longstanding illness on the odds of being an ex-drinker (non), whilst adjusting for sex, malaise inventory score, highest qualification, marital status and presence of children under age 16 in the household. This was done at age 33, 42 and 50 years in separate models. The same method was repeated for those who reduced consumption to drinking only on special occasions from drinking more than this in the previous wave, whom are referred to as ex-drinkers (SO). Since the hypothesis that a worsening of health is associated with a reduction in consumption was tested a particular focus on whether developing a LLSI was associated with being an ex-drinker (non) or an ex-drinker (SO) was investigated.

5.6.2.3 Model building and chapter outline

Whilst the relationship between poor health and non-drinking is the main area of investigation in this thesis, the effect of education, demographic factors and mental health on being a lifetime abstainer or ex-drinker excluding the effects of LLSI or LSI, was also analysed ahead of building the final model. Justification for this analysis based on existing literature was written at the start of each chapter including specific hypotheses that were tested. Unadjusted models for lifetime abstainers and ex-drinker models are shown in separate chapters as discussed in Chapter 3 Thesis overview, in the following way:

Chapter 6: Sample sizes and Missing data in the NCDS and BCS9.

Chapter 7: Descriptive analysis of lifetime abstainers in the NCDS and BCS70, and ex-drinkers in the NCDS36

Chapter 8: Adolescent health status of drinkers in young adulthood

Hypothesis: Non-drinkers in early adulthood will have higher rates of having worse health conditions in adolescence.

Methods: Bi-variate analysis of rates of conditions experienced during adolescence with drinking rates in young adulthood.

Chapter 9: The relationship between education and demographic factors with ex-drinking and lifetime abstention

Hypothesis: Lower educational qualifications will be associated with being a lifetime abstainer, ex-drinker (non) or ex-drinker (SO).

Hypothesis: Being married or having children (an acquisition of a role) will be associated with a being an ex-drinker (non) or ex-drinker (SO).

Method: Regression analysis on the odds of being an ex-drinker (non), ex-drinkers (SO), or lifetime abstainer with the following variables;

Model A: Sex, Highest qualification

Model B: Sex, Marital Status and Children in Household

Model C: Sex, Highest Qualifications, Marital Status and Children in Household

Chapter 10: The relationship between poor psychosocial health and lifetime abstention and ex-drinking

Hypothesis: Poor psychosocial health will be associated with being a lifetime abstainer, ex-drinker (non) or ex-drinker (SO).

Method: Regression analysis on the odds of being an ex-drinker (non), ex-drinkers (SO),

Model A: Sex, Malaise Score

Model B: Sex, Malaise Score, Highest Qualifications, Marital Status, and Children in Household

Chapter 11: Sick-quitters, the effect of developing a limiting longstanding illness (Final model)

Hypothesis: Developing a LLSI from the previous wave will be associated with being an ex-drinker (non) or ex-drinker (SO)

Method: Regression analysis on the odds of being an ex-drinker (non), ex-drinkers (SO) in the NCDS with the following variables:

Model A: Sex, Change in limiting longstanding illness, Malaise Score, Highest Qualifications, Marital Status, and Children in Household

Chapter 12: Sick non-starters, the effect of persistent limiting longstanding illness (Final Model)

Hypothesis: Having a persistent LLSI or LSI since early adulthood will be associated with being a lifetime abstainer.

Method: Regression analysis on the odds a lifetime abstainer in the NCDS and BCS70 or lifetime abstainer (SI) in the BCS70 with the following variables:

Model A: Sex, Change in limiting longstanding illness, Malaise Score, Highest Qualifications, Marital Status, and Children in Household

6. Sample sizes and Missing data (NCDS, BCS70)

This chapter discusses issues to do with missing data particularly in longitudinal studies. Firstly an overview is provided of the problems of handling missing data. Secondly the samples sizes used in regression analysis using complete case analysis are outlined. Thirdly missing data within the data being analysed in the National Child Development Study (NCDS) is investigated, firstly through using cross-sectional analysis to observe the characteristics of those who are lost to attrition, and then assessing the number of participants lost to item non-response. The same analysis is repeated using the 1970 British Cohort Study (BCS70). Finally the implications of these findings are discussed, including justification for using listwise deletion as the method of handling missing data in this thesis.

6.1 A brief overview of missing data analysis

Missing data arises from participants who have not responded to questions, which is often referred to as item non-response, and includes 'Don't know' answers. It may also occur in longitudinal studies due to attrition, where some who answered questions in one wave do not go on to participate in the next. This chapter will discuss the different types of missing data and the methods used to address them.

Missing data patterns have been classified into three types of mechanisms, missing completely at random (MCAR), missing at random (MAR) or missing not at random (MNAR) (180). MCAR describes missing data which are completely independent from the observed variables or unobserved data, whilst MAR describes missing data which can be explained by the observed variables. However if missing data depends on the missing observations in question, for example if missing responses in income was due to lower participation among lower income groups then the mechanism underlying missing data is described as MNAR. This is sometimes referred to as 'informative missingness' and means missing values cannot simply be ignored. These classifications have important implications for biases that may arise and the appropriate method used in dealing with missing data.

The most common and simplest method for handling missing data is listwise deletion which involves removing participants who have missing values on any of the variables being analysed, or in other words using only participants who have complete cases. This is sometimes referred to as complete case analysis. If missing data is MCAR then this will produce unbiased estimates. Unbiased estimates will also be produced if missing data in predictor variables, X_1, X_2, X_3 etc., is unrelated to the outcome variable Y (181). However due to the reduced sample size from excluding cases with missing values standard errors will be larger and there will be a loss of precision. This will particularly be the case where there are missing values in several variables including in the outcome and predictors. Furthermore if missing data is MAR or MNAR then this may create biased estimates as the sample may not be representative of the general population.

In order to deal with these limitations a number of ad-hoc methods have been developed. These include simple mean imputation of the missing values so that it is replaced by the average of the variable; however this would underestimate the variance within the variable and also does not take into account information from the other variables already observed. Another method is to create a missing category which includes all the missing data for that particular variable. An advantage of this approach is that statistical analysis can then be performed on all the available data, however biases can arise as the category uniformly groups all missing data as being similar when actually they may be dissimilar therefore may not correctly adjust for the confounder (148). In a longitudinal data set the last observation may be carried forward (LOCF) to account for the missing value, however this may give rise to means and variances that are wrong as it makes a strong assumption that participants' responses stay the same in each survey.

A more sophisticated method however uses maximum likelihood estimation to impute several estimates of missing data rather than relying on one single imputation. This includes producing several copies of the data set, where missing values are imputed using standard statistical methods such as regression imputation ensuring each imputation has its own variation (182).

These are then combined and averaged to give an overall estimate. Standard errors can then take into account between-imputation variations hence accounting for the uncertainty of predicting missing values. An advantage of this approach is that once multiple imputations are carried out there are no missing values, the sample size has increased, and analysis can be carried out just as before. Since analysis can be performed on a completed dataset this method is also useful in handling missing data in covariates. However an issue of circularity may arise if using predictors in multiple imputations to provide an estimate of missing values in outcome variable (Y) and then using the same predictors to predict the outcome (Y) in final logistic regression analysis. Therefore it has been suggested that MID (multiple imputation, then deletion), deleting the imputed outcome variables after imputation, provides better estimates as it reduces noise around the estimates (183).

In general for multiple imputations to produce valid estimates, data must be MAR since it relies on observed variables in the dataset to predict missing values. Unfortunately it is impossible to be certain whether data is MAR and not MNAR from the observed data, therefore MAR is often assumed. However sensitivity analysis can be carried out to give a better idea of missing data patterns in the dataset. This was carried out in the next sections using the NCDS and BCS70 by looking at missing data lost to attrition and then item non-response separately. It was decided after analysis that listwise deletion be used for regression analysis, as item non-response was low and therefore multiple imputations would be imputing a relatively small number of values after deleting the imputed Y's (MIDs). Furthermore missing data may be MNAR which would violate the assumption needed when using multiple imputations for the data to be MAR. This is explained in greater detail in the discussion of this chapter.

6.2 Sample sizes in The National Child Development Study (NCDS)

6.2.1 Adolescent health status of drinkers in young adulthood

Figure 6.1 shows the sample based used in cross-cohort analysis. Around 82.2% of cohort members with drinking records at age 23 had health conditions recorded by a health visitor at age 16. Chi-squared tests showed no association between missing data on health conditions at age 16 and drinking status at age 23, p=0.646 (Table 8.1).

6.2.2 Lifetime abstainers models

Figure 6.1 shows the sample base used in the lifetime abstainer models. In the NCDS of those with drinking records at 23 years (n=9,733), 85% went on to answer drinking status questions at 33 years (n=9,290), of this sample 95% had complete cases on all the variables included in the models. Sixty-eight per cent of those with drinking records at 23 years went on to answer drinking status questions at both 33 and 42 years (n=8,537), and around 99% of this sample had complete cases in all the variables included in the model (n=8,488).

6.2.3 Ex-drinker models

In the ex-drinker models data from two consecutive waves was used unlike the lifetime abstainer models which relied on data of up to three consecutive waves since 23 years, meaning there was less loss due to attrition (Figure 6.2). Around 84% of participants with drinking records at 33 years had drinking records at 42 years (n=9,562), 99% had complete cases on all variables included in the model. At 42 years around 77% had drinking records at 42 and 50 years (n=8,798), 99% of this sample had complete cases on all the variables included in the model.

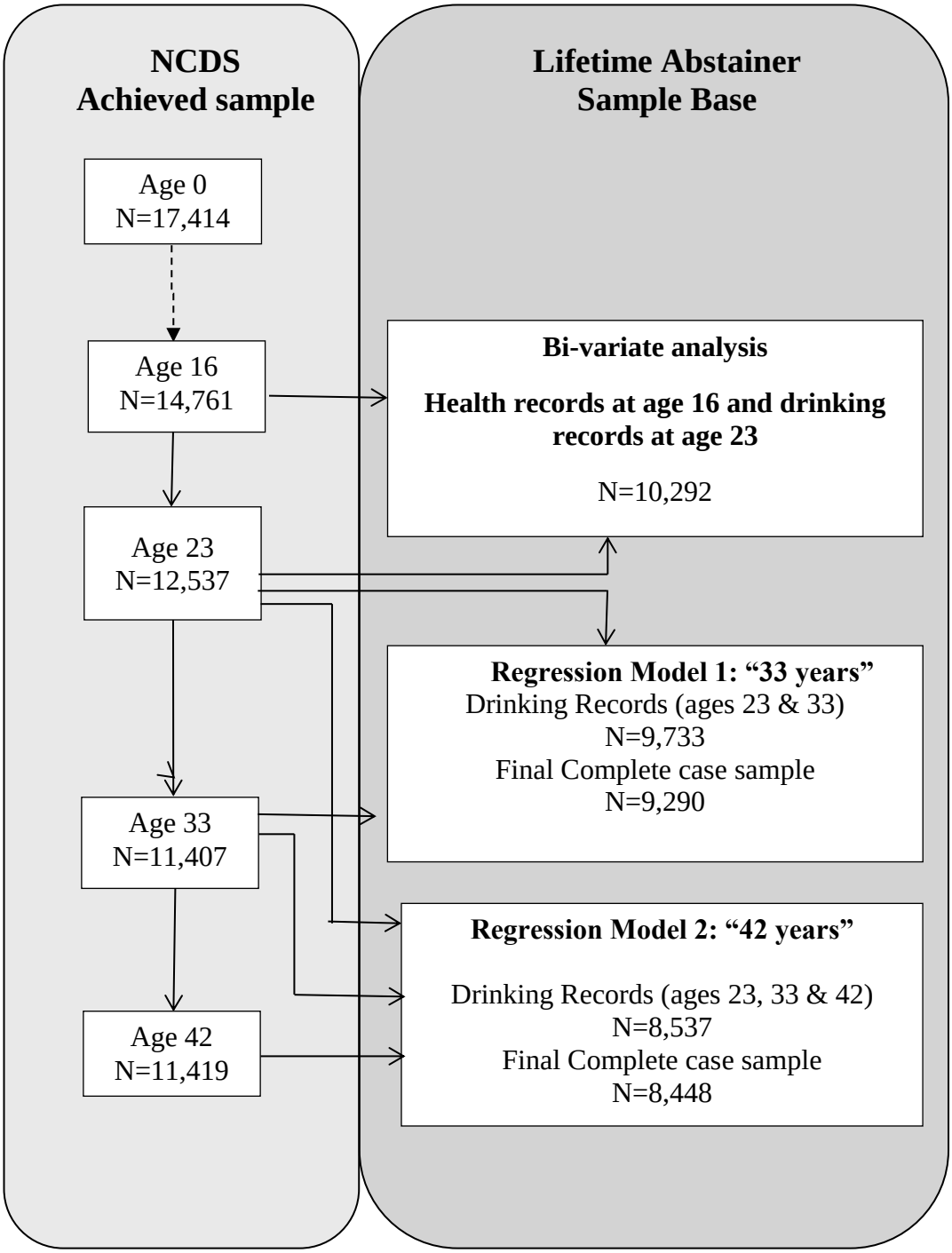


Figure 6.1 Flow diagram of samples used in analysis with lifetime abstainers, NCDS[2]

[2] Model n "X years", refers to the title of the column on the logistic regression tables in the next chapters

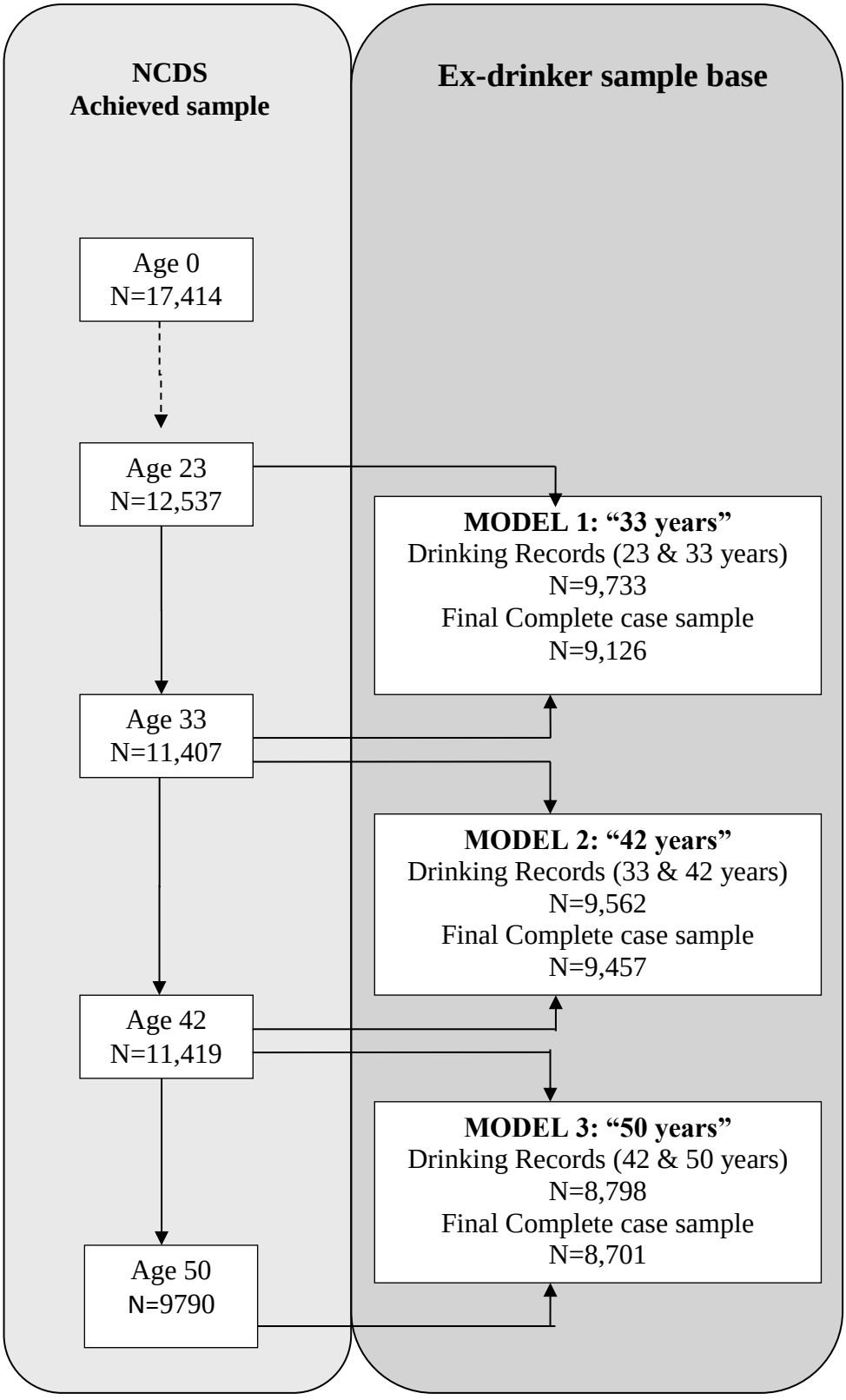


Figure 6.2 Flow diagram of samples used in logistic regression models with ex-drinkers, NCDS

6.3 Missing lost to attrition in the National Child Development study (NCDS)

The following analysis refers to the sample that would be lost to attrition in logistic regression models after creating a lifetime abstainer variable that depended on participants having successive waves of data from age 23 in the National Child Development Study (NCDS). For the models using ex-drinkers as an outcome variable, attrition refers to data lost from using only participants who had drinking records in two consecutive waves.

6.3.1 Lifetime abstainer models

Table 6.1 show cross-sectional analysis of the excluded sample[3] that was not included in the lifetime abstainer models due to attrition from 23 to 33 years (n=2,792, 22.3%) and at 42 years (n=3,988, 31.8%) compared with the observed sample of those with drinking records at 23. Chi-squared tests were carried out to observe whether characteristics of the sample that did not go on to participate in the next waves from 23 years were different from the observed sample at 23 years.

There was statistically significant difference between characteristics of the observed and excluded sample. Drinking status, the main outcome variable, was different between the observed and excluded sample at 33 and 42 years. ($p<0.001$), specifically attrition was greater for non-drinkers in each wave. In addition there was also a statistically significant difference between exposure variables such as sex ($p<0.01$), highest qualification ($p<0.001$), malaise inventory (<0.001), marital status ($p<0.001$) and children in the household ($p<0.001$) excluded at 33 and 42 years. A higher proportion of the excluded participants at 33 and 42 years were male, had a high malaise score, were single or had children at age 23. In addition the excluded sample at age 42 appeared to have higher rates of limiting longstanding illness than the sample observed at 23 ($p<0.05$).

[3] People lost to attrition are referred to as the 'excluded sample'

6.3.2 Ex-drinker (non) and ex-drinker (SO) models

Table 6.2 and Table 6.3 shows excluded sample due to attrition at age 42 (n=1,569, 13.8%) and 50 (n=2,314, 20.3%) in regression models involving ex-drinkers. Table 6.2 shows cross-sectional analysis at age 33 of the excluded sample at age 42 due to participants with drinking records at age 33 who did not go on to participate in the next wave. Similarly Table 6.3 shows cross-sectional analysis at age 42 of the excluded sample at age 50 due to participants with drinking records at age 42 who did not go on to participate in drinking status questions in the next wave. Again there was a statistically significant difference between drinking status between the observed and excluded sample at age 42 and 50 ($p<0.05$). Attrition appears to be skewed towards less frequent drinkers; in other words drop out appears to be greater for special occasion drinkers and greatest for non-drinkers in both tables.

There was a statistical difference in all other exposure variables between the excluded sample and observed sample at ages 42 and 50 including sex ($p<0.01$), limiting longstanding illness ($p<0.05$), highest qualification ($p<0.001$), malaise inventory ($p<0.001$), marital status ($p<0.001$) and parental status ($p<0.001$). Participants who did not go on to take part in the next wave from age 33 to 42 (Table 6.2) and 42 to 50 (Table 6.3) were largely similar having higher proportion of males, limiting longstanding illness, no qualifications, a high malaise score and lower rates of being married and having children.

Table 6.1 Characteristics at age 23 of observed and excluded sample at age 33 42, cross-sectional analysis, NCDS

	Observed		**Excluded cases at 33 years**			**Excluded cases at 42 years**		
N		12525	22.3	2792		31.8	3988	
Characteristics at age 23	%	n	%	n	p-value	%	n	p-value
Sex								
Male	50	6258	55.5	1549		55.2	2200	
Female	50	6267	44.5	1243	p<0.001	44.8	1788	p<0.001
Drinking frequency								
Most Days	20.5	2564	20.7	579		20.3	811	
1-2 times a day	47.7	5974	47.1	1316		47.2	1881	
Less often	12.7	1590	11.4	318		12.1	481	
Special Occasion	14.3	1788	14	391		14.3	569	
Never drink	4.9	609	6.7	188	p<0.001	6.2	246	p<0.001
Liming longstanding illness								
LLSI	4.6	574	5.1	142		5.3	210	
No LLSI	95.4	11948	94.9	2650		94.7	3776	
Missing	0	3	-	-	0.231	0	1	p=0.035
Highest qualification								
Degree	6.8	-	0	1		2.1	83	
Other	56.6	7091	0.2	5		20.3	808	
No qualifications	9.6	1208	0	1		6.3	250	
Missing	27	3376	99.7	2785	p<0.001	71.4	2847	p<0.001
Malaise inventory score								
Normal	92	11529	90.4	2524		90.2	3599	
High	7.6	947	9	250		9	357	
Missing	0.4	49	0.6	18	p<0.001	0.8	32	p<0.001
Marital status								
Single	51.7	6477	53.7	1498		53.3	2125	
Married	44.6	5587	41.6	1162		40.8	1627	
Widowed/separated/ divorced	3.7	460	4.7	132		4.8	190	
Missing	0	1	-	-	p<0.001	0	1	p<0.001
Children in household								
No	74.4	9318	71.5	1995		71.7	2858	
Yes	25.6	3207	28.5	797	p<0.001	28.3	1130	p<0.001

Table 6.2 Characteristics at age 33 of observed and excluded sample at age 42, cross-sectional analysis, NCDS

	Observed cases at 33 years		Excluded cases at age 42		p-value
N	11367		1569	13.8	
Characteristics at age 33	%	n	%	n	
Sex					
Male	49.1	5583	55.1	865	
Female	50.9	5784	44.9	704	p<0.001
Drinking frequency					
Most days	12.3	1400	13.1	205	
1,2 or 3 times/week	46.8	5322	45.6	715	
1,2 or 3 times/month	19.5	2221	17.7	277	
Less often	16.8	1911	18.4	288	
Never	4.5	513	5.4	84	p=0.038
Liming longstanding illness					
LLSI	5.4	611	7.3	115	
No LLSI	94.5	10738	92.6	1453	
Missing	0.2	18	0.1	1	p=0.001
Highest qualification					
Degree	12.3	1400	9.9	155	
Other	73.3	8330	66.5	1043	
No qualifications	12.3	1401	21.2	332	
Missing	2.1	236	2.5	39	p<0.001
Malaise inventory score					
Normal	92.6	10527	87.6	1375	
High	7	797	11.2	175	
Missing	0.4	43	1.2	19	p<0.001
Marital Status					
Single	17.2	1958	22	345	
Married	68.3	7759	56.2	882	
Widowed/Sep/divorced	11.1	1267	15.6	244	
Missing	3.4	383	6.2	98	p<0.001
Children in household					
No	31.3	3554	38.2	600	
Yes	68.7	7813	61.8	969	p<0.001

Table 6.3 Characteristics at age 42 of observed and excluded sample at 50 years, cross-sectional analysis, NCDS

	Observed cases at 42 years		**Excluded cases at age 50**		**p-value**
N	11375		2314		
Characteristics at age 42	%	n	%	n	
Sex					
Male	49.2	5602	52.1	1206	
Female	50.8	5773	47.9	1108	0.020
Drink frequency					
On most days	19.7	2245	19.1	441	
2 to 3 days a week	32.3	3679	30.8	712	
Once a week	18.8	2134	17.5	405	
2 to 3 times a month	10.6	1211	9.9	230	
less often/only on special occasions	13.2	1497	15.1	349	
Never nowadays	3.9	449	5.8	134	
Never had an alcoholic drink	1.4	160	1.9	43	p<0.001
Liming longstanding illness 33					
LLSI	13.4	1519	17.1	395	
No LLSI	86.6	9854	82.9	1919	
Missing	0.0	2	-	-	p<0.001
Highest qualification					
Degree	16.5	1878	11.5	266	
Other	63.9	7274	58.7	1359	
No qualifications	19.5	2222	29.8	689	
Missing	0.0	1	-	-	p<0.001
Malaise Inventory Score					
Normal	86	9779	82.5	1908	
High	13.2	1498	16	371	
Missing	0.9	98	1.5	35	p<0.001
Marital Status					
Single	12.7	1441	14.3	330	
Married	70.6	8032	63.7	1473	
Widowed/separated/divorced	16.7	1899	22	509	
Missing	0.0	3	0.1	2	p<0.001
Children in household					
Yes	74.9	8520	69.2	1602	
No	24.9	2830	30.3	700	
Missing	0.2	25	0.5	12	p<0.001

6.3.3 Missing participants with LLSI and non-drinkers

Are non-drinkers who have a limiting longstanding illness more likely to be lost to attrition?

Around 14.9% of non-drinkers at 23 years who were lost to attrition at 33 years had a limiting longstanding illness at 23 years, of those who were lost at age 42 years this percentage was 17.1% (Table 6.4), compared with 4.4% and 4.5% of drinkers who were lost to attrition at age 23. Furthermore Chi^2 tests showed a statistical difference between excluded drinkers and non-drinkers with a limiting longstanding illness ($p<0.001$).

Table 6.4 Drinkers and non-drinkers lost to attrition from age 23 and rates of limiting longstanding illness, NCDS

	Drinkers		**Non-drinkers**		**Missing Total**		**p-value**
Participants lost to attrition from age 23							
	%	n	%	n	%	n	
At age 33		2604		188		2792	
LLSI at age 23	4.4	114	14.9	28	5.1	142	p<0.001
At age 42		3742		246		3988	
LLSI at age 23	4.5	169	17.1	42	5.3	211	p<0.001

6.4 Missing due to item non-response in the National Child Development Study (NCDS)

Table 6.6 and Table 6.7 show missing responses to each exposure variable by lifetime abstainers, participants who reduced consumption to non-drinking, ex-drinkers (non), and participants who reduced consumption to occasional drinking, ex-drinkers (SO), at 33 and 42 years respectively after filtering on the corresponding outcome variable. Item non-response is largest at 33 years (n=443, 4.6% of observed sample). Missing records on marital status at age 33 (n=295), and missing educational qualifications (n=116)[4] accounted for most of the item non-response.

Item non-response for changes in limiting longstanding illness, the main exposure variable of interest, is small. At 33 years only one person had missing limiting longstanding illness information in the lifetime abstainer and ex-drinker (non) models. No missing item response for limiting longstanding illness derived using three consecutive waves at age 42 was found. Missing data using the derivation of limiting longstanding illness that depended on three successive waves was comparatively large in the ex-drinker (non) models, 12.6% and 13.0% of the sample respectively. However missing responses from limiting longstanding illness derived using only two consecutive waves, corresponding to the same waves used to derive the ex-drinker models was small, only 0.2% for each model, providing another justification to limit analyses to two consecutive waves only for analysis on ex-drinkers. This is the variable that will be used in the final regression model. Similarly Table 6.8 shows item non-response at age 50, missing data in changes in limiting longstanding illness using records from 42 and 50 years was small accounting for 0.1% in the ex-drinker (non) and (SO), models.

In summary, item non-response was low in each model ranging from 1.0% to 4.6% (Table 6.5). Item non-response was largest in the models at 33 years where there was a relatively large proportion of missing marital status and educational records. Item non-response for the main exposure variable of

[4] Base refers to missing respondents for lifetime abstainers as this is the largest total sample

interest, changes in limiting longstanding illness was lower than one per cent in all models in all waves.

Table 6.5 Filtered sample on consecutive drinking records and complete case sample, NCDS

	Filtered Sample (n)	**Complete cases (n)**	**Item non-response (%)**
At age 33			
Lifetime abstainer	9733	9290	4.6
Ex-drinker (non)	9556	9126	4.5
Ex-drinker (SO)	9311	8898	4.4
At age 42			
Lifetime abstainer	8537	8448	1.0
Ex-drinker (non)	9562	9457	1.1
Ex-drinker (SO)	9306	9208	1.1
At age 50			
Ex-drinker (non)	8798	8701	1.1
Ex-drinker (SO)	8517	8429	1.0

Table 6.6 Missing items on exposure variables by outcome variables at age 33, based on drinking records at age 23 and 33, NCDS

	Drinking records at age 23 and 33											
	Lifetime Abstainer		**Total**		**Ex-drinkers (non)**		**Total**		**Ex-drinkers (SO)**		**Total**	
	%	n	%	N	%	n	%	N	%	n	%	N
		177		9733		245		9556		934		9311
Limiting longstanding illness at age 23 & 33												
NO LLSI 23 & 33	80.2	142	91.5	8902	80.4	197	91.1	8705	89.6	837	92.0	8563
LLSI 23, NO LLSI 33	8.5	15	3.2	315	5.7	14	3.1	301	3.5	33	3.1	286
NO LLSI 23, LLSI 33	5.1	9	4.0	388	9.0	22	3.8	366	4.7	44	3.8	357
LLSI 23 & 32	5.6	10	1.2	114	4.5	11	1.1	103	2.1	20	1.0	93
Missing	0.6	1	0.1	14	0.4	1	0.1	13	-	0	0.1	12
Malaise Inventory Score												
Normal	91.0	161	93.1	9059	85.7	210	93.1	8898	69.4	648	93.3	8688
High	8.5	15	6.6	643	13.5	33	6.6	628	8.9	83	6.4	595
Missing	0.6	1	0.3	31	0.8	2	0.3	30	0.3	3	0.3	28
Highest Qualification												
Degree	9.6	17	12.6	1230	9.4	23	12.7	1213	6.4	60	12.8	1190
Other	70.1	124	70.3	6840	66.9	164	70.4	6723	75.4	704	70.6	6570
No Qualifications	19.2	34	15.9	1547	22.4	55	15.8	1506	15.2	142	15.5	1440
Missing	1.1	2	1.2	116	1.2	3	1.2	114	3.0	28	1.2	111
Marital Status												
Single	19.2	34	17.2	1672	18.8	46	17.1	1638	14.9	139	17.1	1592
Married	68.9	122	68.9	6705	65.3	160	68.9	6583	73.2	684	69.0	6423
Separated/Divorced/Widowed	6.2	11	10.9	1061	11.0	27	11.0	1050	9.5	89	11.0	1023
Missing	5.6	10	3.0	295	4.9	12	3.0	285	2.4	22	2.9	273
Child												
No	31.1	55	31.3	3051	31.8	78	31.4	2996	21.8	204	31.3	2918
Yes	68.9	122	68.7	6682	68.2	167	68.6	6560	78.2	730	68.7	6393
Missing	-	-	-	-	-	-	-	-	-	-	-	-

Table 6.7 Missing items on exposure variables by outcome variables at age 42, NCDS

	Life time Abstainer				Ex-drinkers (non)				Ex-drinkers (SO)			
	%	n	%	N	%	n	%	N	%	n	%	N
Limiting longstanding illness age 23,33 and 42		119		8537		258		9562		1146		9304
No LLSI (23, 33 & 42)	63.9	76	82.7	7061	53.9	139	71.1	6800	63.4	726	69.5	6470
LLSI (23 or 33) NO LLSI 42	10.9	13	4.6	393	4.7	12	3.8	363	5.1	58	3.5	326
NO LLSI (23 or 33), LLSI 42	21.8	26	11.9	1013	27.5	71	9.3	893	15.3	175	8.7	808
LLSI 23, 33 & 42	3.4	4	0.6	55	0.8	2	0.5	45	0.6	7	0.5	44
Missing	-	-	0.2	15	13.2	34	12.6	1203	15.7	180	12.1	1127
Limiting longstanding illness at age 33 and 42												
No LLSI 33 & 42	71.4	85	85.0	7258	62.4	161	83.5	7982	77.4	887	81.4	7578
LLSI 33 No LLSI 42	3.4	4	2.3	198	3.5	9	2.3	216	3.2	37	2.1	195
NO LLSI 33 LLSI 42	18.5	22	10	852	23.3	60	9.2	880	15.7	180	8.2	759
LLSI 33 & 42	6.7	8	2.5	216	10.1	26	3.2	309	3.5	40	2.0	190
Missing	-	-	0.2	13	0.8	2	0.2	17	0.2	2	0.2	17
Malaise Inventory Score												
Normal	80.7	96	87.1	7436	67.8	175	85.3	8153	81.8	938	83.0	7721
High	19.3	23	12.2	1039	29.5	76	11.4	1090	17.5	200	10.7	999
Missing	-	-	0.7	62	2.7	7	0.6	61	0.7	8	0.6	55
Highest qualification at age 42												
Degree or higher	10.9	13	16.7	1428	11.2	29	16.4	1569	9.0	103	16.3	1513
Other	69.7	83	68.2	5826	63.2	163	66.1	6316	68.2	781	64.0	5952
No qualifications	19.3	23	15	1282	25.6	66	14.8	1418	22.9	262	14.1	1309
Missing	-	-	-	1	-	-	-	1	-	-	-	1

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Marital status											
Single	14.3	17	11.9	1019	19.4	50	11.3	1082	12.8	147	10.9	1012
Married	76.5	91	72.2	6164	56.2	145	70.4	6732	70.3	806	68.4	6365
Separated/divorced/widowed	9.2	11	15.9	1354	24.0	62	15.6	1489	16.8	193	15	1397
Missing	-	-	-	-	0.4	1	-	1	-	-	-	1
Child												
Yes	76.5	91	76.3	6510	69.4	179	74.5	7126	78.8	903	21.9	2038
No	23.5	28	23.6	2013	30.6	79	22.6	2161	21.2	243	72.2	6720
Missing	-	-	0.2	14	-	-	0.2	17	-	-	0.2	17

Table 6.8 Missing items on exposure variables by outcome variables at age 50, NCDS

	Drinking records at age 42 and 50 (N=8,798)							
	Ex-drinkers (non)		Total		Ex-drinkers (SO)		Total	
	%	n	%	N	%	n	%	N
LLSI at age 33 and 42		281		8798		371		8517
No LLSI 33 & 42	49.5	139	68.8	6052	63.1	234	69.4	5913
LLSI 33 No LLSI 42	9.3	26	5.5	483	5.1	19	5.4	457
NO LLSI 33 LLSI 42	17.8	50	8.5	752	14.6	54	8.2	702
LLSI 33 & 42	15.7	44	5.9	517	8.9	33	5.6	473
Missing	7.8	22	11.3	994	8.4	31	11.4	972
Malaise Inventory Score								
Normal	69.0	194	85.6	7534	76.3	283	86.2	7340
High	28.1	79	13.6	1193	21.8	81	13.1	1114
Missing	2.8	8	0.8	71	1.9	7	0.7	63
Highest qualification at age 42								
Degree or higher	10.7	30	20.1	1764	14.3	53	20.4	1734
Other	59.1	166	63.1	5552	61.2	227	63.2	5386
No qualifications	30.2	85	16.8	1482	24.5	91	16.4	1397
Missing	-	-	-	-	-	-	-	-
Marital status								
Single	13.9	39	9.9	869	11.1	41	9.7	830
Married	59.1	166	70.3	6188	69.8	259	70.7	6022
Separated/divorced/widowed	26.7	75	19.6	1726	19.1	71	19.4	1651
Missing	0.4	1	0.2	15	-	-	0.2	14
Child								
Yes	82.9	233	77.7	6836	79.2	294	77.5	6603
No	16.7	47	22.1	1948	20.8	77	22.3	1901
Missing	0.4	1	0.2	14	-	-	0.2	13

6.5 Sample sizes and missing data in the 1970 British Cohort Study (BCS70)

6.5.1 Sample sizes

6.5.1.1 Adolescent health status of drinkers in young adulthood

Figure 6.3 shows the sample based used in cross-cohort analysis. Around 81% of cohort members with drinking records at age 26 had health conditions recorded by a health visitor at age 10. Chi-squared tests showed a bi-variate association between missing data on health conditions at age 10 and drinking status at age 26, p=0.018, (Table 8.3) this was documented as a limitation in chapter 7.

6.5.1.2 Lifetime abstainers

Figure 6.3 shows the sample base used in the lifetime abstainer models in the 1970 British Cohort Study. Around 83.4% of the sample at 26 years had drinking records at 30 years (n=7,507). Removing item non-response and using complete cases only amounted to 90.7% (6,809) of the observed sample of those with consecutive drinking records at 26 and 30 years. Around 70.5% of respondents at 26 years had drinking records at 30 and 34 years (n=6,348), 93.9% of this sample is used in complete case analysis (n=5,960) when item non-response removed.

6.5.2 Missing due to attrition

Table 6.9 shows characteristics of the excluded sample that was not included in the lifetime abstainer models due to attrition from age 26, at age 30 (n=1,370) and age 34 (n=2,529) compared with the observed sample at age 26. Chi^2 squared tests were carried out to observe whether the characteristics of the sample that did not go on to participate in the waves following age 26 were different from the observed sample at age 26.

There was a statistically significant difference between the characteristics of the observed and excluded sample. Drinking status, the main outcome variable, was different between the observed and excluded sample at age 30 and 34 ($p<0.010$). This appeared to be skewed towards those who responded ‘never nowadays’ and

‘never had an alcoholic drink’ where there was a higher proportion in the excluded sample compared with the observed sample (e.g. 14.8% of non-drinkers in the excluded sample at age 30 compared with 12.7% in the observed sample). There were also statistical difference in sex, malaise inventory, highest qualification and marital status between the observed and excluded sample at both 30 and 34 years. The excluded sample had a higher proportion of males, those with high malaise inventory score, and higher rates of no qualifications or missing educational data. There was a statistically significant difference in rates of limiting longstanding illness at age 30 only, where there was a slightly higher rate of those with a LLSI or missing data.

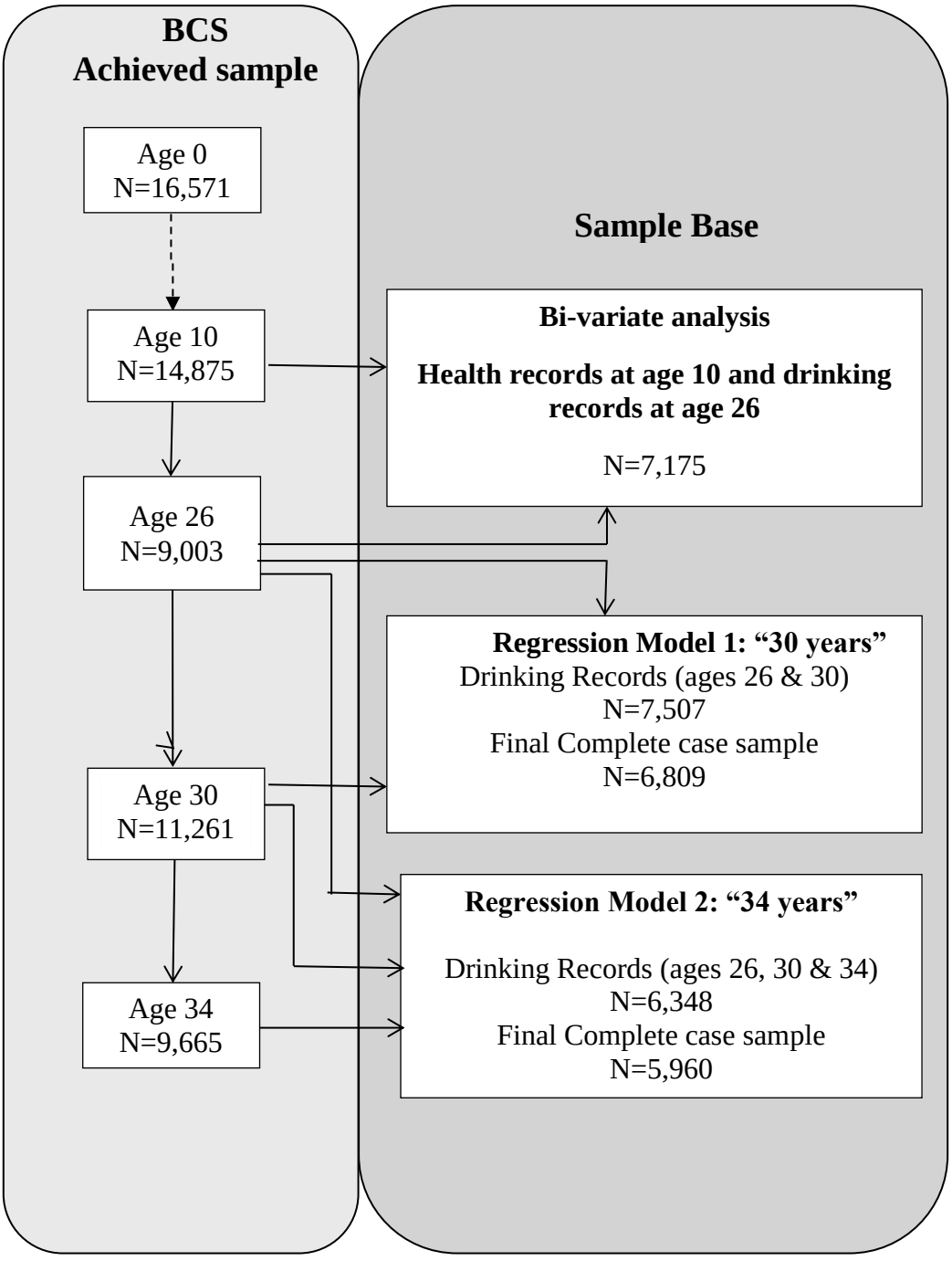

Figure 6.3 Flow diagram of samples used in logistic regression models with lifetime abstainers, BCS70

Table 6.9 Characteristics at age 26 of observed and excluded sample at 30 and 34 years, cross-sectional analysis, BCS70

	Observed		**Excluded at 30 years**		**Excluded at 34 years**	
		8877[5]		1370		2529
Baseline characteristics at age 26	%	n	%	n	%	n
Sex				p<0.001		p<0.001
Male	45.6	4044	51.2	702	50.5	1277
Female	54.4	4833	48.8	668	49.5	1252
Drinking status				P<0.007		p=0.008
On most days	9.1	805	10.1	138	9.9	250
2 to 3 days a week	18.7	1661	19.1	262	18.9	477
Once a week	36.4	3232	33.6	460	34.6	875
2 to 3 times a month	23.1	2052	22.4	307	22.9	578
less often/ only on special occasions	8.7	771	9.3	127	8.7	221
never now a days	4.0	356	5.5	76	5.1	128
Limiting longstanding illness				p<0.037		p=0.149
Yes	15.6	1381	16.1	220	15.5	392
No	79.4	7044	77.5	1062	78.7	1990
Missing	5.1	452	6.4	88	10.2	258
Malaise Inventory Score				p<0.001		p<0.001
Normal	72.2	6409	67.6	926	69.5	1757
High	13.5	1200	17.3	237	16.6	420
Missing	14.3	1268	15.1	207	13.9	352
Highest qualification				p<0.001		p<0.001
Degree	19.4	1722	19.0	260	17.9	453
Other	68.7	6099	61.2	839	64.5	1631
No qualifications	5.4	477	9.4	129	8.2	207
Missing	6.5	579	10.4	142	9.4	238
Marital Status				p<0.001		p<0.001
Single	64.5	5722	69.3	949	68.3	1728
Married	29.8	2643	23.9	328	25.1	635
Separated/widowed/divorced	3.5	314	4.0	55	3.8	97
Missing	0.0	1	0.0	0	0.0	0
Children in household				p<0.032		p=0.067
Yes	24.0	2133	69.8	956	24.4	616
No	70.2	6234	22.8	313	69.0	1746
Missing	5.7	510	7.4	101	6.6	167

[5] Sample is based on those with drinking records at age 26

6.5.3 Missing due to item non-response

Table 6.10 Rate of item non-response BCS70

	Filtered Sample (n)	Complete cases (n)	Item non-response (%)
At age 30	7507	6809	10.3
At age 34	6348	5960	6.5
'lifetime abstainers' (SI)			
At age 30	11205	6834	64.0
At age 34	9635	5986	61.0

6.5.3.1 Lifetime abstainers

Missing due to item response was higher in the BCS70 than in the NCDS among lifetime abstainers. This is likely due to the data at age 26 being collected through a postal questionnaire rather than through face to face interviews. At age 30 missing due to item non-response accounted for 10.3% of the sample and there was a relatively large number of missing LLSI records (n=366) presented in Table 6.11. Around 281 participants of the postal questionnaire did not answer LLSI questions at age 26. At age 34 missing due to item response was lower at 6.5%.

6.5.3.2 'Lifetime abstainers' (SI)

Self-identified 'lifetime abstainers' are identified through a current status measure and so does not depend on participation in previous waves because of this item non-response is higher and is actually representative of participants who were present at that current wave but not in previous waves. This is because change in limiting longstanding illness, a key exposure variable, depends on participation in successive waves, therefore participants who took part in the current wave but do not have LLSI data in consecutive waves are excluded in the analysis. Change in LLSI is used for consistency between models and comparison. Furthermore whether past health is associated with later self-identified 'lifetime abstention' is the subject of investigation therefore it is necessary to use health data from previous waves to answer the research question asked in this thesis. Around 64% who answered drinking status questions at age 30 could not be used in the analysis, and 61% at age 34.

Table 6.11 Missing items on exposure variables by lifetime abstainers at 30 and 34 years, BCS

	Lifetime abstainer at 30 years		**Total**		**Lifetime abstainer at 34 years**		**Total**	
	152	174	6809	7507	115	125	5960	6348
	%	n	%	n	%	n	%	n
Sex								
Male	44.3	77	44.5	3342	46.4	58	43.6	2767
Female	55.7	97	55.5	4165	53.6	67	56.4	3581
Limiting longstanding illness								
No LLSI	56.3	98	68.2	5118	44.8	56	58.1	3691
No longer LLSI	5.2	9	5.8	432	14.4	18	11.1	702
Developed LLSI	7.5	13	11.5	863	14.4	18	18.4	1169
Still LLSI	21.8	38	9.7	728	18.4	23	7.5	479
Missing	9.2	16	4.9	366	8.0	10	4.8	307
Malaise Inventory Score								
Normal	82.8	144	87.9	6595	84.0	105	85.5	5426
High	17.2	30	11.5	867	15.2	19	13.9	881
Missing	-	-	0.6	45	0.8	1	0.6	40
Top qualification								
Degree	21.8	38	20.3	1521	25.6	32	26.6	1688
Other	48.3	84	53.1	3987	48.8	61	52.5	3331
No qualifications	27.0	47	23.0	1728	25.6	32	20.9	1329
Missing	2.9	5	3.6	271	-	-	-	
Marital Status								
Single	41.4	72	47.5	3564	28.8	36	26.6	1689
Married	53.4	93	46.1	3458	67.2	84	68.6	4352
Separated/widowed/divorced	5.2	9	6.5	485	4	5	4.2	264
Missing	-	-	-	-	-	-	0.7	43
Children under age 16 in household								
Yes	50.6	88	43.8	3288	64.8	81	62.2	3950
No	48.3	84	55.7	4183	35.2	44	37.6	2390
Missing	1.1	2	0.5	36	-	-	0.1	8

6.6 Discussion

Higher attrition was found among non-drinkers, males, those with no qualifications, those who are single, and those with no children at baseline compared with the observed sample. This is not surprising given that missing respondents in the NCDS were found to have lower education and were more socially disadvantaged (172). These factors have been found to be associated with non-drinkers, with those with lower incomes and less education being more likely to be non-drinkers (31, 83). Similar characteristics were found for participants who dropped out in the BCS, where higher proportions were male, had higher malaise scores and higher rates of no qualifications or missing highest qualification data.

Given the statistical difference between the observed and excluded sample it is evident that missing data is clearly not MCAR however it is impossible to be certain whether data is MAR or MNAR. A higher proportion of missing non-drinkers may be MAR which depends on the missing social and demographic records, since attrition was related to lower income and education. However there may be an element of MNAR when concerning limiting longstanding illness, which had a statistically significant association with excluded participants at baseline, as some may have been too ill to participate in the next wave. Furthermore Chi-squared tests revealed that there was a statistical significant difference between excluded drinkers and non-drinkers with a limiting longstanding illness at baseline in the NCDS. Around 17.1% of non-drinkers aged 23 years who were lost to attrition in the lifetime abstainer models, had a limiting longstanding illness at 23 years compared with 5.3% of the total lost to attrition. Whilst it is impossible to verify from the data whether illness was a reason why those with a limiting longstanding illness did not take part in the next wave, if this was the case it would appear to affect non-drinkers more. If the hypothesis that non-drinking is a consequence of poor health is true then MNAR, due to being too ill to participate in the next wave could potentially mean a reduced sample of non-drinkers who are ill. This would underestimate the associations due to a reduced

sample of non-drinkers who were very ill however again this is impossible to verify.

Item non-response was found to be small accounting for just 1.0-1.1% at age 42 and 50 and was largest at age 33 accounting for 4.4%-4.6% of the sample in the NCDS. A possible reason why item non-response is low is that, given that the sample is already reduced to participants who continue to participate in successive waves these are perhaps the types of people who are more likely to answer all the items on the questionnaire. As mentioned in the introduction to this chapter an issue of circularity may arise if using predictors in logistic regression models to predict missing values using multiple imputations and then using them again in final regression to predict the estimates. Thus it has been suggested that MID, multiple imputation then deletion of the imputed Y's, provides better estimates as it reduces noise around the estimates by deleting the influence of imputed values (183). Since item response is low using multiple imputation to address missing values would be imputing a relatively small number of values that could be used in the model, after deleting participants with the imputed Y's (i.e. those lost to attrition as the Y depended on data from at least two consecutive waves). Furthermore item non-response on the main exposure variable accounted for just 0.6% and 0.4% at age 33 and 42 in the lifetime abstainers' models in the NCDS. Where a small number of imputed data is required then complete case analysis is likely to give similar estimates to multiple imputations (184). Furthermore as mentioned in the previous paragraph, data may be MNAR as some may be too ill to participate in the next wave, which would violate the assumption of MAR needed for multiple imputation.

Missing due to attrition was greater among non-drinkers at age 23 years. This will create a reduced sample of lifetime abstainers since the derivation depends on being a non-drinker at baseline. This could affect the size of the outcome variable of lifetime abstainers, however the proportion of lifetime abstainers of the total population remained similar at 33 (1.8%) and 42 years (1.4%), even after

considering that some lifetime abstainers at 33 years may have taken up drinking between 33 and 42 years. Therefore the number of lifetime abstainers was not greatly reduced. In the ex-drinker models lifetime abstainers are not included in the sample, since the comparison is made between those who have reduced consumption to never or occasional drinking and existing drinkers, therefore a higher proportion of missing non-drinkers that go on to participate in the next wave is not as problematic.

6.7 Summary and Conclusion

- Attrition was influenced by social and demographic characteristics (e.g. male, no qualifications, single)
- Item non-response was relatively small particularly on the main exposure value, therefore if using MID, the cases being imputed would be relatively small
- Complete case analysis will be used in the rest of the thesis.

Higher drop out is found among non-drinkers, males, those with no qualifications, those who are single, and with no children at baseline compared with the observed sample. On an already filtered sample of those with drinking records in consecutive waves (Y), item non-response is small accounting for 1% to 4.6% of the sample. Since the imputed Y's would be deleted after multiple imputations to reduce bias, multiple imputations would predict relatively few variables, the few that are missing to item-response in the final model. Therefore complete case analysis is used in all regression models, bearing in mind that the sample is reduced to a higher educated, wealthier and slightly healthier sample throughout the thesis. Furthermore there may be an element of MNAR when concerning limiting longstanding illness, as some may be too ill to participate in the next wave, however if the hypothesis that poor health is associated with lifetime abstention is true, this would underestimate the associations due to a reduced sample. The next chapters will use complete case samples only which corresponds to the sample outlined in Table 6.5 in the NCDS and Table 6.10 in the BCS70.

7. Descriptive analyses of lifetime abstainers and ex-drinkers (NCDS and BCS70)

7.1 Abstract

Aims: This chapter presents the characteristics of the sample used in this thesis. Its main aims are to identify the size of the sick non-starter and sick-quitter groups, compare size of lifetime abstainer groups between cohorts, verify the past drinking status of lifetime abstainers and ex-drinkers and compare the social and health characteristics of ex-drinkers with lifetime abstainers and drinkers.

Methods: Descriptive analysis of the sample at all-time point assessed using a complete-case sample. Chi-squared tests are carried out to test for bi-variate associations between variables and lifetime abstainers or ex-drinkers.

Results: Around a third of lifetime abstainers at age 34 had a previous or persistent longstanding illness. Lifetime abstainers account for a small proportion of the total proportion (around 1.4-2.2% of the total sample). Around 38% of self-identified lifetime abstainers reported drinking in the previous wave and the highest proportion of these were previous special occasion drinkers. Ex-drinkers exhibit worse health behaviours (smoking and lower physical activity), have a lower social position and worse mental than drinkers and lifetime abstainers and drinkers. Lifetime abstainers suffer from higher rates of limiting longstanding illnesses (LLSI) from early adulthood compared with drinkers and ex-drinkers, and constantly across waves compared with drinkers. Ex-drinkers appear to suffer from higher rates of LLSI closer to the time point of non-drinking.

Conclusion: Lifetime abstainers with a previous illness comprise of a substantial proportion of lifetime abstainers (around a third). While ex-drinkers suffer from worse health than lifetime abstainers, both suffer from worse health than drinkers and lifetime abstainers appear to have the worst health in early adulthood.

7.2 Aims and objectives

The aim of this chapter is to describe characteristics of the sample ahead of regression analysis. Table 6.1 showed basic differences between the cohorts, this chapter provides more detail on the characteristics of the variables of interest. Firstly the characteristics sex, education, marital status, children in the household, psychosocial health and limiting longstanding illness, among lifetime abstainers will be assessed in the NCDS at age 33 and 42. The same will be repeated for lifetime abstainers and self-identified 'lifetime abstainers' the BCS70 at age 30 and 34. Of particular interest is the number of lifetime abstainers in the National Child Development Study (NCDS) at age 33 and 42 and in the 1970 British Cohort Study (BCS70) at age 30 and 34. Furthermore a comparison is made between the two methods of deriving lifetime abstainers; the bottom-up derivation by taking consecutive 'never nowadays' answers and self-identified 'lifetime abstainers' in the BCS70. The past drinking frequency of self-identified 'lifetime abstainers' is also analysed to investigate the validity of this measure, as over half of self-identified 'lifetime abstainers' reported drinking in past surveys in two other cohorts including in the NCDS (112, 113).

Secondly the same characteristic among ex-drinkers; those who reduced their consumption to non-drinking, and those who reduced their consumption to occasional drinking at age 33, 42 and 50 will be assessed in the NCDS. This section will explore the past drinking frequency of those who reduced their consumption to non-drinking, ex-drinkers (non) and those who reduced their consumption to occasional drinking, ex-drinkers (SO). Alongside this, rates of ex-drinkers (non) and (SO) were assessed at ages 33, 42 and 50. A final table showing social and early life health and current health and health behaviour characteristics of lifetime abstainers, ex-drinkers and drinkers at age 42 is presented for comparison purposes. This includes additional characteristics such as father's social class at birth, smoking status and physical activity in early adulthood. All results are presented based on the complete case sample used in regression analysis.

Findings from these results will be discussed in the following order in the Discussion:

7.5.1 Size of the sick non-starter and sick quitter groups

7.5.2 Size of lifetime abstainers and non-drinkers compared to other surveys

7.5.3 Past drinking of 'lifetime abstainers' and ex-drinkers

7.5.4 The social and health characterises of lifetime abstainers and ex-drinkers compared with drinkers

7.3 General Trends[6]

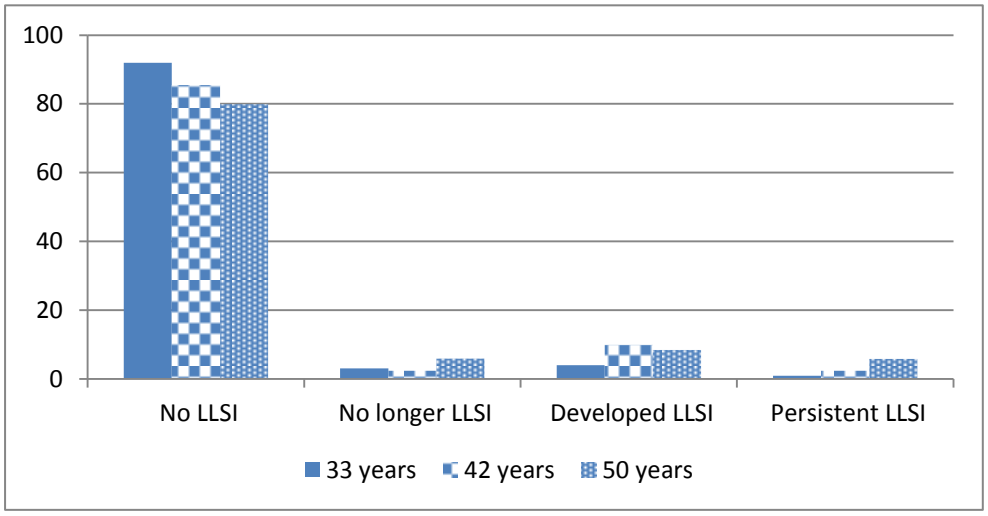

Figure 7.1 Percentage rates of changes in LLSI across three decades, NCDS

In the NCDS, the number of people with no limiting longstanding illness declined with age at 33, 42 and 50 years, as you would expect with declining health and increasing age. Rates of persistent longstanding illness between two consecutive waves were small 1% at age 33, but increased with age to 5% at age 50. In Table 7.6 rates of people with poorer psychosocial health also increased with age, 6.5% at

[6] Rates in section 7.1 here refer to ex-drinker (non) sample base (Table 7.6)

age 33 years, 12.2% at age 42 and 12.7% at age 50. Rates of those who were separated, widowed or divorced increased with age from 11% at 33 years to 18.8% at 42 years; in addition there was a small increase in the number of people with children under 16 in the household, 68.7% at 33 years and 77.7% years at 42 years.

7.4 Lifetime abstainers

7.4.1 The National Child Development study

Table 7.1 shows social and demographic characteristics of lifetime abstainers at age 33 and 42 compared with the total complete case sample used in the models. Lifetime abstainers from age 23 to 33 accounted for 1.8% (n=164) of the sample and up to 42 years 1.4% (n=119) of the sample. There was a 0.4% decline in lifetime abstainers from age 33 to 42 representing a small but stable base of the population. Characteristics were similar in each wave within lifetime abstainers, with there being a higher proportion of females (at age 33, 67.7%), having higher rates of no qualifications (22.6%), and having a high score on the malaise inventory (9.1%) and persistent limiting longstanding illness (4.3%). All these variables were statistically significant at the 5% level using Chi-squared tests in at least one wave, sex and change in liming longstanding illness was significant in both waves. There was no bi-variate association between marital status and children under age 16 years in the household and lifetime abstention in each time point.

Table 7.1 Characteristics of lifetime abstainers, NCDS

	33 Years				42 Years			
	Lifetime abstainer		Drinkers		Lifetime abstainer		Drinkers	
	%	n	%	N	%	n	%	N
	1.8	164	98.2	9126	1.4	119	98.6	8329
Sex		p<0.001				p<0.001		
Male	32.3	53	48.3	4408	31.9	38	47.6	3965
Female	67.7	111	51.7	4718	68.1	81	52.4	4364
Limiting longstanding illness		p<0.001				p<0.001		
No LLSI	82.3	135	92.0	8395	63.9	76	83.3	6934
No longer LLSI	7.9	13	3.1	283	10.9	13	4.5	374
Developed LLSI	5.5	9	3.9	359	21.8	26	11.7	974
Persistent LLSI	4.3	7	1.0	89	3.4	4	0.6	48
Malaise Inventory		p=0.166				p<0.050		
Normal	90.9	149	93.5	8537	80.7	96	87.9	7319
High	9.1	15	6.5	589	19.3	23	12.1	1010
Top qualification		p<0.050				p=0.125		
Degree	9.8	16	13.0	1184	10.9	13	16.9	1406
Other	67.7	111	71.5	6526	69.7	83	68.4	5693
No qualifications	22.6	37	15.5	1416	19.3	23	14.8	1230
Marital Status		p=0.173				p=0.122		
Single	19.5	32	17.7	1612	14.3	17	11.8	984
Married	73.8	121	71.0	6483	76.5	91	72.3	6018
Separated/widowed/divorced	6.7	11	11.3	1031	9.2	11	15.9	1327
Children under in the household		p=0.577				p=0.995		
Yes	70.7	116	68.7	6269	76.5	91	76.4	6367
No	29.3	48	31.3	2857	23.5	28	23.6	1962

7.4.2 The 1970 British Cohort Study

7.4.2.1 Lifetime abstainers

Table 7.2 shows social and demographic characteristics of lifetime abstainers, derived by taking consecutive 'never nowadays' or 'never have drank alcohol' responses to drinking status questions in the 1970 British Cohort Study, from age 26 to age 30 and 34. Lifetime abstainers accounted for 2.2% (n=152) of the sample

at age 30 and 1.9% (n=115) at age 34, this is similar to percentage rates in the NCDS (1.8% at age 33 and 1.4% at age 42 years). There was a statistically significant association with fewer variables than in the NCDS. Change in limiting longstanding illness was significant in both waves ($p<0.001$), with lifetime abstainers having double the rate of having a persistent limiting longstanding illness than the average across two waves (24.2% at age 30 and 20% at age 34). The only other significant variable was malaise inventory score at age 30. Lifetime abstainers had higher rates of having a high score (16.4%) than the average (11.3%). Unlike the NCDS where gender was significant in each wave and a higher proportion of lifetime abstainers were female, gender was not significant in either wave.

7.4.2.2 'Lifetime abstainers' (SI): Those who reported 'never having had an alcoholic drink'

Those who reported 'never having had an alcoholic drink' to drinking status questions were used as an alternative self-identified measure of being a lifetime abstainer. In the raw sample they accounted for 2.1% of the sample at age 30 and 2.2% at age 34. Around 27.4% of those who reported never having had an alcoholic drink or 'lifetime abstainers' (SI) at age 30 reported drinking at 26 years. Similarly around 27.2% of 'lifetime abstainers' (SI) at age 34 reported drinking at 30 years and 21.3% at 26 years (Table 7.3). Of 'lifetime abstainers' (SI) who did report drinking in the previous wave a large proportion drank on special occasions previously (e.g. 60% of 'lifetime abstainers' (SI) at age 30 who reported drinking previously were special occasion drinkers). Lifetime abstainers derived through consecutive 'never nowadays' drinking answers accounted for 62% of self-identified 'lifetime abstainers' at 34 years meaning substantial overlap between the two measures. This also signifies that 38% of lifetime abstainers (SI) reported drinking at age 30 or 26 years.

Table 7.2 Characteristics of lifetime abstainers, BCS70

	30 years				34 years			
	Lifetime abstainer		Drinkers		Lifetime abstainer		Drinkers	
	%	n	%	N	%	n	%	N
	2.2	152	97.8	6657	1.9	115	98.1	5845
Sex		p=0.835				p=0.519		
Male	42.8	65	43.6	2903	46.1	53	43.1	2518
Female	57.2	87	56.4	3754	53.9	62	56.9	3327
Longstanding illness		p<0.001				p<0.001		
No LSI	61.2	93	71.7	4772	48.7	56	61.6	3598
No longer LSI	5.9	9	6.1	406	15.7	18	11.5	675
Developed LSI	8.6	13	12.3	819	15.7	18	19.3	1130
Persistent LSI	24.3	37	9.9	660	20	23	7.6	442
Malaise Inventory		p<0.05				p=0.391		
Normal	83.6	127	88.8	5912	83.5	96	86.3	5042
High	16.4	25	11.2	745	16.5	19	13.7	803
Highest qualification		p=0.215				p=0.776		
Degree	23.7	36	22.0	1564	27.0	31	26.7	1558
Other	64.8	94	66.7	4538	61.7	71	63.9	3736
No qualifications	14.5	22	10.4	707	11.3	13	9.4	551
Marital Status		p=0.110				p=0.901		
Single	40.1	61	46.7	3106	27.8	32	26.3	1538
Married	55.3	84	46.9	3119	68.7	79	69.6	4069
Separated/widowed/divorced	4.6	7	6.5	432	3.5	4	4.1	238
Children in household		p=0.054				p=0.563		
Yes	52.6	80	44.8	2981	65.2	75	62.6	3658
No	47.4	72	55.2	3676	34.8	40	37.4	2187

After filtering the sample to replicate the complete case sample used in logistic regression models in Table 7.4 'lifetime abstainers' (SI) accounted for 1.6% at age 30 and 1.8% at age 34. Characteristics were largely similar with lifetime abstainers derived using the bottom up approach. Only limiting longstanding illness was significant in both waves with 'lifetime abstainers' (SI) have higher rates of having a persistent limiting longstanding illness, (17.6% at 30 years and 17.3% at 34 years). Having a child in the household was also significant at age 30 (59.3%).

Table 7.3 Previous drinking status of 'lifetime abstainers' (SI) (those who report 'never having an alcoholic drink') at 30 and 34 years, BCS70

Self-identified 'lifetime abstainer' age 30 years			**Self-identified 'lifetime abstainers age 34 years**		
	%	n		%	n
		106			110
Drinking status 26 years			**Drinking status 30 years**		
Most days		-	On most days	-	-
3 or 4 times a week		-	2 to 3 days a week	3.6	4
Once or twice a week	5.7	6	Once a week	2.7	3
Less often	10.4	11	2 to 3 times a month	4.5	5
Special occasions	11.3	12	Less often/only on special occasions	16.4	18
Never drink alcohol	72.6	77	Never nowadays	25.5	28
			Never had an alcoholic drink	47.3	52
			Not answered	-	-
					109
			Drinking status 26 years		
			Most days	-	-
			3 or 4 times a week	1.8	2
			Once or twice a week	8.3	9
			Less often	11	12
			Special occasions	8.3	9
			Never drink alcohol	70.6	77

Table 7.4 Characteristics of 'lifetime abstainers' (SI) at 30 and 34 years, BCS70

	30 years				**34 years**			
	'Lifetime abstainers' (SI)		Drinkers		'Lifetime abstainers' (SI)		Drinkers	
	%	n	%	N	%	n	%	N
	1.6	108	98.4	6726	1.8	110	98.2	5876
Sex		p=0.555				p=0.153		
Male	40.7	44	43.6	2931	36.4	40	43.2	2537
Female	59.3	64	56.4	3795	63.6	70	56.8	3390
Longstanding illness		p=0.010				p<0.001		
No LSI	59.3	64	71.6	4817	47.3	52	61.6	3618
No longer LSI	10.2	11	6.1	407	18.2	20	11.5	678
Developed LSI	13	14	12.2	821	17.3	19	26.1	1533
Still LSI	17.6	19	10.1	681	17.3	19	7.6	4470
Malaise Inventory		p=0.256				p=0.106		
Normal	85.2	92	88.7	5965	80.9	89	86.3	5070
High	14.8	16	11.3	761	19.1	21	13.7	8060
Highest qualification		p=0.103				p=0.966		
Degree	25.9	26	22.9	1540	27.3	30	26.6	1562
Other	58.3	63	66.8	4492	62.7	69	63.9	3082
No qualifications	15.7	17	10.3	696	10	11	9.5	1232
Marital Status		p=0.259				p=0.671		
Single	40.7	44	46.6	3132	30	33	26.3	1543
Married	54.6	59	46.9	3156	66.4	73	69.6	4092
Separated/widowed/divorced	4.6	5	6.5	438	3.6	4	4.1	241
Children under age 16 in household		p=0.003				p=0.856		
Yes	59.3	64	44.7	3008	61.8	68	62.7	3682
No	40.7	44	55.3	3718	38.2	42	37.3	2194

Ex-drinkers (non)Table 7.5 presents results for those who reduced consumption to non-drinking from being a drinker in the previous wave, (ex-drinkers (non)) and those who reduced consumption to special occasional drinking from drinking more than this in the previous wave, (ex-drinkers (SO)) at age 33, 42 and 50 by the previous wave drinking frequency. Around a third of ex-drinkers (non) previously drunk alcohol at least once a week, 33.9% at age 33, 36.9% at 42 years and 36.3%

at 50 years. The largest proportion of ex-drinkers (non) however were special occasion drinkers and this increased with age 37.3% at 33 years, 46.6% at 42 years, 51.1% at 50 years. Ex-drinkers (non) also consisted of previous frequent drinkers and this proportion was greatest at 33 years. Around 11% of ex-drinkers (non) at 33 years reported drinking most days at 23 years. Table 7.6 presents the social and demographic characteristics of ex-drinkers (non) at age 33, 42 and 50 compared with the total complete case sample used in the logistic regression models. Ex-drinkers (non) accounted for 2.5% of the sample at age 33, 2.6% at 42 years and 3.1% at 50 years representing a small and steady increase of the proportion with age.

Trends were largely similar in each wave. A higher proportion of ex-drinkers (non) were female (at age 33 71.5%), had higher rates of developing a LLSI from the previous wave (8.8%), a higher score on the malaise inventory (11.8%) and no qualifications (26.3%). Incidentally rates of developing a LLSI was over twice as high at age 42 (23.7%) and 50 (17.6%) then at age 33 (8.8%). These results are also conveyed in a declining proportion of people not having a LLSI in consecutive waves among ex-drinkers (non), 82.5%, 62.7% and 57.7% at age 33, 42 and 50 years respectively. Marital and parental status was significant at the 5% level at age 42 and 50 only. Ex-drinkers (non) had higher rates of being separated/widowed/divorced whilst having lower rates of having children at age 42, but higher rates of having children than the average at age 50.

Table 7.5 Ex-drinkers' drinking status in the previous waves, NCDS

	Ex-drinkers (non)		**Drinkers**		**Ex-drinkers (SO)**		**Drinkers**	
			33 years (1991)					
	%	n	%	N	%	n	%	N
		228		8898		897		8001
Drinking frequency age 23								
Most days	11	25	21.1	1874	8.6	77	22.5	1797
1-2 times a week	32.9	75	49.3	4383	57.3	514	48.4	3869
Less often	18.9	43	13.3	1181	34.1	306	10.9	875
Special Occasion	37.3	85	13.9	1236	-	-	15.4	1236
Never drink	-	-	2.5	224	-	-	2.8	224
			42 years (2000)					
	%	n	%	N	%	n	%	N
		249		9208		523		8686
Drinking frequency age 33								
Most days	6.4	16	13.1	1167	3.1	16	14.4	1151
1,2 or 3 times a week	30.5	76	50.4	4482	37.1	194	53.6	4289
1,2 or 3 times a month	16.5	41	21.2	1884	59.8	313	19.6	1571
Less often	46.6	116	16.7	1486	-	-	18.6	1486
Never	-	-	2.1	189	-	-	2.4	189
			50 years (2008)					
	%	n	%	N	%	n	%	N
		272		8426		363		8066
Drinking frequency at 42 years								
Most days	5.5	15	19.8	1762	5.8	21	21.8	1741
2 to 3 days a week	15.4	42	32.6	2899	14.6	53	35.6	2846
Once a week	15.4	42	18.8	1670	32.8	119	19.4	1551
2 to 3 times a month	12.5	34	10.5	938	46.8	170	9.6	768
Only on special occasions	51.1	139	11.2	995	-	-	12.4	995
Never nowadays	-	-	1.6	143	-	-	1.8	143
Never had an alcoholic drink	-	-	0.2	22	-	-	0.3	22

Table 7.6 Characteristics of ex-drinkers (non), NCDS

	Age 33				Age 42				Age 50			
	Ex-drinker (non)		Drinkers		Ex-drinker (non)		Drinkers		Ex-drinker (non)		Drinkers	
	%	n	%	N	%	n	%	N	%	n	%	N
	2.5	228		8898	2.6	249		9209	3.1	272		8429
Sex		p<0.001				p<0.001				p<0.001		
Male	28.5	65	48.8	4343	36.1	90	48.6	4480	33.5	91	49.2	4148
Female	71.5	163	51.2	4555	63.9	159	51.4	4729	66.5	181	50.8	4281
Limiting longstanding illness		p<0.001				p<0.001				p<0.001		
No LLSI	82.5	188	92.2	8207	62.7	156	86.1	7925	57.0	155	80.6	6796
No longer LLSI	5.3	12	3.0	271	3.6	9	2.3	213	10.3	28	5.8	486
Developed LLSI	8.8	20	3.9	348	23.7	59	9.5	872	17.6	48	8.1	686
Persistent LLSI	3.5	8	0.9	81	10	25	2.2	199	15.1	41	5.5	461
Malaise inventory score		p<0.010				p<0.001				p<0.001		
Normal	88.2	201	93.7	8336	70.3	175	88.3	8127	71.0	193	84.6	7127
High	11.8	27	6.3	562	29.7	74	11.7	1082	29.0	79	12.2	1030
Highest qualification		p<0.001				p<0.001				p<0.001		
Degree	10.1	23	13.0	1161	11.6	29	16.9	1560	11.0	30	20.5	1726
Other	63.6	145	71.7	6381	63.5	158	68.0	6260	59.2	161	63.4	5345
No qualifications	26.3	60	15.2	1356	24.9	62	15.1	1388	29.8	81	16.1	1358
Marital Status		p=0.806				p<0.001				p<0.050		
Single	19.3	44	17.6	1568	19.3	48	11.5	1063	13.6	37	9.2	775
Married	69.7	159	71.1	6324	56.6	141	72.5	6674	59.6	162	69.0	5818
Separated/widowed/divorced	11	25	11.3	1006	24.1	60	16.0	1472	26.8	73	18.6	1564
Children in household		p=0.842				p<0.01				p<0.001		
Yes	69.3	158	68.7	6111	69.9	174	76.8	7074	83.5	227	77.5	6536
No	30.7	70	31.3	2787	30.1	75	23.2	2135	16.5	45	22.5	1893

7.5 Ex-drinkers (SO)

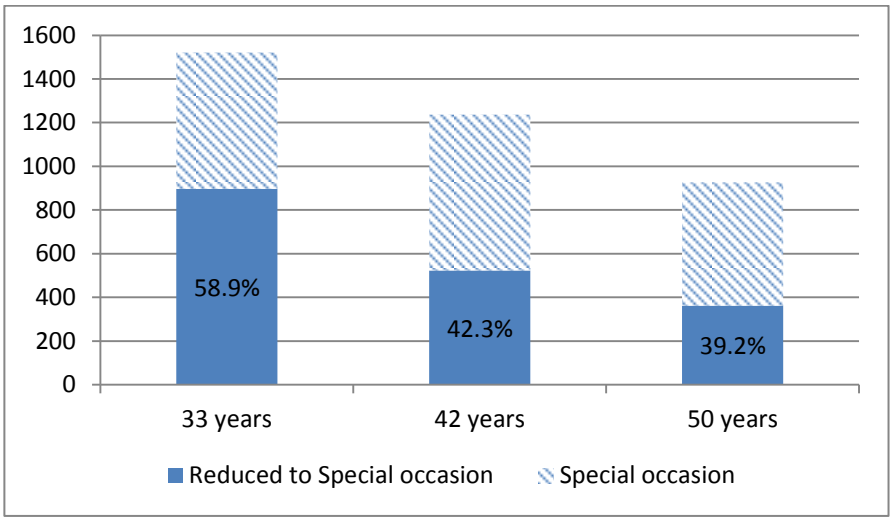

Figure 7.2 Number of ex-drinkers (SO), reducing to special occasion drinking from the previous wave among total special occasion drinkers, NCDS

Around two thirds of ex-drinkers (SO) drank at least once a week in the previous waves at 33 years (65.9%), 18.5% at 42 years and 53.2% at 50 years (Table 7.5).

Table 7.3 shows the total number of special occasion drinkers and the number that reduced their consumption to special occasion drinking from the previous waves, which accounted for 59.0%, 42.3% and 39.2% of special occasion drinkers at 33, 42 and 50 years respectively (Figure 7.2).

Table 7.7 presents social and demographic characteristics of ex-drinkers (SO) at ages 33, 42 and 50 compared with the total complete case sample used in the logistic regression models. The proportion of people who reduced their consumption to special occasion drinking was highest at age 33 (10.1%), whilst a smaller proportion of drinkers reduced their consumption to special occasion drinking at age 42 (5.7%), and at age 50 (4.3%).

There was a bi-variate association between sex, change in LLSI, malaise inventory score and highest qualification and ex-drinkers (SO) at each time

point. A higher proportion of ex-drinkers (SO) were female (at age 33 65.3%), and had lower rates of having a degree (6.6%). The proportion of ex-drinkers (SO) having no LLSI across waves declined with age, 90.2%, 76.2% and 70.1% at 33, 42 and 50 years respectively. Rates of developing a LLSI from the previous wave increased at older ages, from 4.6% at 33 years to 16.3% at 42 years and 14.3% at 50 years. Marital status and parental status was statistically significant at 33 years only with ex-drinkers (SO) having higher rates of being married (75%) and having children (78.7%) unlike ex-drinkers (non) where marital and parental status was significant only at 42 years and 50 years.

Table 7.7 Characteristics of ex-drinkers (SO), NCDS

	Age 33				Age 42				Age 50			
	Ex-drinker (SO)			Drinkers	Ex-drinker (SO)			Drinkers	Ex-drinker (SO)			Drinkers
	%	n	%	N	%	n	%	N	%	N	%	N
Ex-drinkers	10.1	897		8001	5.7	523		8686	4.3	363		8066
Sex		p<0.001				p<0.001				p<0.001		
Male	34.7	311	50.4	4032	35.8	187	49.4	4293	35.5	129	49.8	4019
Female	65.3	586	49.6	3969	64.2	336	50.6	4393	64.5	234	50.2	4047
Limiting longstanding illness		p<0.001				p<0.001				p<0.001		
No LLSI	90.2	809	92.5	7398	76.1	398	86.7	7527	70.8	257	83.3	6719
No longer LLSI	3.5	31	3	240	4	21	2.2	192	6.1	22	5.8	464
Developed LLSI	4.6	41	3.7	298	16.3	85	9.1	787	14.3	52	7.9	634
Persistent LLSI	1.8	16	0.8	65	3.6	19	2.1	180	8.8	32	5.3	429
Malaise inventory score		p<0.001				p<0.001				p<0.001		
Normal	91.2	818	94	7518	82.6	432	7.5	650	74.7	271	87.4	7049
High	8.8	79	6	483	17.4	91	92.5	8036	25.3	92	12.6	1017
Highest qualification		p=0.02				p<0.001				p<0.001		
Degree	6.6	59	13.8	1102	10.7	56	17.3	1504	14.6	53	20.7	1673
Other	73.5	659	71.5	5722	69	361	67.9	5899	61.4	223	63.5	5122
No qualifications	20	179	14.7	1177	20.3	107	14.7	1281	24	87	15.8	1271
Marital Status		p<0.001				p=0.317				p=0.762		
Single	15.3	137	17.9	1431	12.8	67	11.5	996	10.7	39	9.6	773
Married	75	673	70.6	5651	69.6	364	72.6	6310	70.2	255	71	5725
Separated/widowed/divorced	9.7	87	11.5	919	17.6	92	15.9	1380	19	69	19.4	1568
Children in household		p<0.001				p=0.894				p=0.478		
Yes	21.3	191	32.4	2596	22.9	120	23.2	2015	79.1	287	77.5	6249

7.6 Comparison of lifetime abstainers, ex-drinkers and drinkers at age 42 in the NCDS

Table 7.8 presents health and social characteristics of lifetime abstainers, ex-drinkers, and drinkers, at age 42 in the NCDS. To understand the earlier health, mental health and social circumstances of lifetime abstainers and ex-drinkers versus drinkers at age 42 prior health and mental health status from age 23 and father's social class at birth was also analysed. This table also contains further information on exercise and whether participants have never smoked at age 42.

Lifetime abstainers had the most persistent poor health through the life course, having statistically significant higher rates of having a limiting longstanding illness at age 23 (14.3%), 33 (10.1%) and 42 (25.2%) than drinkers (age 23 4.0%, age 33 4.7%, age 42 12.3%). A high proportion of ex-drinkers (non) had a limiting longstanding illness close to the time point of recording non-consumption at age 42 (33.7%). In addition ex-drinkers (SO) at age 42 had worse health than drinkers having higher rates of LLSI at age 23 (5.5%), 33 (7.6%) and 42 (19.2%), however rates were lower than lifetime abstainers and ex-drinkers (non).

36.1% of lifetime abstainers at age 42 had a limiting longstanding illness (LLSI) in previous waves of the survey. 10.9% no longer had a LLSI at age 42, 21.8% developed a LLSI by age 42 and 3.4% having had a persistent LLSI across the three waves of the survey. Among ex-drinkers (non) at age 42 around 33.7% had developed a LLSI or had a persistent LLSI from the previous wave. Among ex-drinkers (SO) at age 42 18.9% had developed a LLSI or had a persistent LLSI from the previous wave.

Ex-drinkers (non) had the worst psychosocial health, having higher rates of scoring high on the malaise inventory at age 23 (15.3%), age 33 (12.9%) and age 42 (29.7%) than drinkers (age 23 6.7%, age 33 6.0%, age 42 12.1%). Lifetime abstainers had worse psychosocial health than drinkers at age 23 only (10.1%). Ex-drinkers (SO) had poorer mental health than drinkers at age 33 (9.8%) and age 42 (17.4%) only.

Ex-drinkers came from more disadvantaged backgrounds with a greater proportion than drinkers having fathers in the lowest social class, belonging to the lowest social class and having the lowest educational qualifications at age 42. This was similar between ex-drinkers (non) and (SO) and was statistically significant. Father's social class was similar between lifetime abstainers and drinkers, however a slightly higher proportion of lifetime abstainers than drinkers belonged to the lowest social group at age 42 (21.1%, drinkers=15.1%) and had no qualifications (19.3%, drinkers=14.8%). However none of these findings were statistically significant.

A higher proportion of lifetime abstainers than drinkers had never smoked (65.5%, drinkers=46.0%), whilst a lower proportion of ex-drinkers (non) and (SO) had never smoked (36.9% and 38.8% respectively). Exercise at age 23 or 42 had no statistically significant association with lifetime abstention at age 42. However a higher proportion of ex-drinkers (non) and ex-drinkers (SO) than drinkers did not do exercise in the past 4 weeks at age 23 (62.4% and 65.7% respectively compared with 51.5% of drinkers).

Table 7.8 Comparison of lifetime abstainers, ex-drinkers and persistent drinkers at age 42, NCDS

	Lifetime abstainers			**Ex-drinkers (non)**			**Ex-drinkers (SO)**			**Persistent drinkers[1]**	
	%	n		%	n		%	n		%	n
		119			249			523			8329
Sex (Male)	31.9	38	0.001	36.1	90	<0.001	35.8	187		47.6	3965
Limiting longstanding illness											
LLIS age 23	**14.3**	17	**0.001**	4.8	12	0.510	**5.5**	29	**0.013**	4.0	334
LLSI age 33	**10.1**	12	**0.006**	**13.7**	34	**<0.001**	**7.6**	40	**<0.001**	4.7	390
LLSI age 42	**25.2**	30	**<0.001**	**33.7**	84	**<0.001**	**19.9**	104	**<0.001**	12.3	1022
Change in limiting longstanding illness at age 42 (derived variable)[2]											
No LLSI	**63.9**	76		**62.7**	156		**76.1**	398		**84.0**	6993
No longer LLSI	**10.9**	13		**3.6**	9		**4.0**	21		**4.5**	374
Developed LLSI	**21.8**	26		**23.7**	59		**16.3**	85		**11.8**	984
Persistent LLSI	**3.4**	4	**<0.001**	**10.0**	25	**<0.001**	**3.6**	19	**<0.001**	**0.6**	48
Malaise inventory score											
Malaise score (high) age 23	**10.1**	12	**<0.001**	**15.3**	38	**<0.001**	7.1	37	0.152	6.8	566
Malaise score (high) age 33	9.2	11	0.308	**12.9**	32	**<0.001**	**9.8**	51	**0.001**	6.0	502
Malaise score (high) age 42	**19.3**	23	**0.017**	**29.7**	74	**<0.001**	**17.4**	91	**<0.001**	12.1	1010
Father's Social Class[3]											
Higher	17.9	17		10.7	25		12.7	63		18.4	1466
Middle	58.9	56		57.7	135		59.4	295		58.2	4651
Lower	18.9	18		**26.1**	61		**22.3**	111		19.1	1527
No Father/Sick/Other	4.2	4	0.999	5.6	13	**0.002**	5.6	28	**0.002**	4.3	342

	Lifetime abstainers			Ex-drinkers			Ex-drinkers			Persistent drinkers[1]	
	%	n		%	n		%	n		%	n
Social class at age 42[3]											
Higher	34.7	33		31.8	48		31.3	130		43.8	3152
Middle	44.2	42		43.0	65		43.5	181		41.0	2948
Lower	21.1	20		**25.2**	**38**		**25.0**	**104**		15.1	1089
Other	-	-	0.191	-	-	**0.001**	0.2	1	**<0.001**	0.1	10
Education at age 42											
Degree or higher	10.9	13		11.6	29		10.7	56		16.9	1406
Other	69.7	83		63.5	158		69.0	361		71.6	5963
No Qualifications	19.3	23	0.125	**24.9**	**62**	**<0.001**	**20.3**	106	**<0.001**	14.8	1230
Never smoked at age 42	**65.5**	78	**<0.001**	**36.9**	92	**<0.001**	**38.8**	203	**<0.001**	46.0	3830
Exercise in past 4 weeks at age 23[3]		119			218			449			8322
5 times a week	5.9	7		5.5	12		4.5	20		6.0	497
3-4 times a week	5.0	6		4.6	10		4.9	22		7.5	623
1-2 times a week	14.3	17		14.2	31		12.3	55		18.2	1518
2-3 times last 4 weeks	8.4	10		7.3	16		7.4	33		9.8	819
Once in last 4 weeks	7.6	9		6.0	13		5.4	24		6.9	576
Not done in last 4 weeks	58.8	70	0.627	62.4	136	**0.037**	65.7	295	**<0.001**	51.5	4289

[1]*Persistent drinkers are defined are those who consistently reported drinking at age 23, 33 and 42*

[2]*For lifetime abstainers this derivation depended on three consecutive waves, for ex-drinkers it depends on two consecutive waves*

[3]*Sample sizes are smaller within these variables due to missing data*

7.7 Comparison of lifetime abstainers and drinkers in the BCS70

Table 7.9 presents health, social and demographic characteristics of lifetime abstainers (derived through taking consecutive non-drinking statuses from age 26, 30 and 34) and self-identified 'lifetime abstainers' (a current status measure at age 34) compared with drinkers at age 34 in the BCS70.

Lifetime abstainers had higher rates of having a longstanding illness than drinkers at age 26 (31.3%, drinkers=17.0%), age 30 (32.2%, drinkers=23.2%) and age 34 (35.7%, drinkers=28.7%). Self-identified 'lifetime abstainers' had higher rates of having a longstanding illness than drinkers at age 26 (27.3%) and age 30 (30.0%) only. No statistically significant association was found between poor psychosocial health among lifetime abstainers compared with drinkers. Furthermore no statistically significant difference was found between highest qualification or social class between lifetime abstainers and drinkers. However a higher proportion of self-identified 'lifetime abstainers' belonged to the lowest father's social class (29.6%) compared with drinkers (17.6%).

Changes in longstanding illness across age 26, 30 and 34 was statistically significantly associated with both types of lifetime abstainers. Around 20.0% of lifetime abstainers and 17.3% of self-identified 'lifetime abstainers' had a persistent longstanding illness from age 26, compared with 8.1% of drinkers. In addition 15.7% of lifetime abstainers and 18.2 of self-identified 'lifetime abstainers' had a longstanding illness previously from age 26 compared with 12.3% of drinkers.

A higher proportion of Lifetime abstainers and self-identified 'lifetime abstainers' than drinkers had never smoked cigarettes at age 42 (73.9% and 76.4% respectively) compared with drinkers (51.2%). No statistically significant association was found with exercise at age 30 or 34 and lifetime abstention.

Table 7.9 Comparison of lifetime abstainers and drinkers at age 34, BCS70

	Lifetime abstainers			**Lifetime abstainers' (SI)**			**Drinkers**	
	%	n	p-value	%	n	p-value	%	n
		115			110			5485
Sex (Male)	46.1	53	0.519	36.4	40	0.153	45.9	2518
Longstanding illness								
LSI at age 26	**31.3**	36	**<0.001**	**27.3**	30	**0.001**	17.0	934
LSI at age 30	**32.2**	37	**0.008**	**30.0**	33	**0.042**	23.2	1275
LSI at age 34	**35.7**	41	**0.036**	26.4	29	0.225	28.7	1572
Changes in longstanding illness								
No LSI	48.7	56		47.3	52		65.6	3598
No longer LSI	**15.7**	18		**18.2**	20		12.3	675
Developed LSI	15.7	18		17.3	19		20.6	1130
Persistent LSI	**20.0**	23	**<0.001**	**17.3**	19	**<0.001**	8.1	442
Malaise inventory								
High age 26	14.0	13	0.903	18.3	17	0.305	13.5	675
High age 30	12.2	14	0.549	14.8	16	0.256	10.1	588
High age 34	16.5	19	0.391	13.5	12	0.202	13.7	803
Education								
Degree or higher	27.0	31		27.3	30		26.7	1588
Other	61.7	71		62.7	69		63.9	3736
No Qualifications	11.3	13	0.776	10.0	11	0.966	9.4	551
Social class at age 42[1]								
Higher	58.7	54		55.6	45		49.1	2405
Middle	30.4	28		33.3	27		38.9	1909
Lower	10.9	10		11.1	9		11.7	572
Other	-	-	0.289	-	-	0.656	0.4	17
Father's social class[1]								
Higher	18.81	19		15.3	15		21.2	1155
Middle	55.5	56		55.1	54		60.7	3310
Lower	25.7	26		**29.6**	**29**		17.6	962
Other	-	-	0.184	-	-	**0.016**	0.5	25

Continued….

	Lifetime abstainers			Lifetime abstainers' (SI)			Drinkers	
	%	n	p-value	%	n	p-value	%	n
		115			110			5485
Never smoked cigarettes at age 42	**73.9**	85	**<0.001**	**76.4**	84	**<0.001**	51.2	2809
Exercise at age 30[1]								
Every day	32.0	27		33.3	25		19.6	916
4-5 days a week	9.5	8		6.7	5		13.7	639
2-3 days a week	28.6	24		34.7	26		32.5	1517
Once a week	17.9	15		17.3	13		24.1	1124
2-3 times a month	9.5	8		5.3	4		7.3	342
Less often	2.4	2	0.127	2.7	2	0.072	2.9	135
Exercise at age 34[1]								
Every day	22.0	20		25.9	22		20.8	976
4-5 days a week	17.6	16		15.3	13		14.5	681
2-3 days a week	26.4	24		29.4	25		34.0	1592
Once a week	23.1	21		22.4	19		21.3	998
2-3 times a month	7.7	7		5.9	5		7.2	338
Less often	3.3	3	0.716	1.2	1	0.817	2.1	99

[1]*Sample sizes are smaller within these variables due to missing data*

7.8 Size of the sick non-starter and sick quitter groups

Rates of limiting longstanding illness and longstanding illness among lifetime abstainers and ex-drinkers in the NCDS and BCS70 in tables 7.6, 7.7, 7.8 and 7.9, respectively is summarised separately in this section to put into context the size of the sick non-starter and sick quitter groups. At age 42 around 33.7% of ex-drinkers (non), and around 19.9% of ex-drinkers (SO) can be considered sick-quitters (having a pre-existing limiting longstanding illness) compared with 13.4% of drinkers. In the NCDS around 14.3% of lifetime abstainers can be considered sick non-starters (having a limiting longstanding illness in early adulthood or persistent limiting longstanding illness since age 23) compared with 5.1% of drinkers. In the BCS around a 35.7% of lifetime abstainers and 35.5% of self-identified 'lifetime abstainers' at age 34 can be considered sick non-starters based on similar categories using longstanding illness since age 26, compared with 20.4% of drinkers. These results are summarised in Table 7.10

Table 7.10 Size of the sick-quitter and sick non-starter groups in the NCDS and BCS70

The National Child Development study at 42 years

	Lifetime abstainer		Ex-drinker (Non)		Ex-drinkers (SO)		Persistent drinkers	
	%	n	%	n	%	n		8329
N		119		249		523		
Sick non-starter[a]	14.3	17					5.1	422
Sick quitter[b]			33.7	84	19.9	104	13.4	1032

The British Cohort Study 1970 at age 34 years

	Lifetime abstainer		Self-identified 'lifetime abstainer'		Drinkers	
	%	n	%	n	%	n
		115		110		
Sick non-starter[c]	35.7	31	35.5	38	20.4	1572

[a] Previously had a limiting longstanding illness (LLSI) in early adulthood or had a persistent LLSI from early adulthood

[b] Developed a LLSI, or had a persistent LLSI from the previous wave

[c] Previously had a longstanding illness (LSI) in early adulthood or had a persistent LSI from early adulthood

7.9 Discussion

7.9.1 Size of the Sick non-starter and Sick Quitter groups

The sick non-starter and sick-quitter groups equated to a substantial proportion of lifetime abstainers and ex-drinkers. Around 14% of lifetime abstainers aged 42 in the NCDS previously had a limiting longstanding illness or had a persistent longstanding from age 23, compared with 5% of drinkers. Additionally around 36% of lifetime abstainers, and self-identified 'lifetime abstainers' at age 34 previously had a longstanding illness or persistent

longstanding illness from age 26, compared with 20% of drinkers in the BCS70. This demonstrates that lifetime abstainers have poorer past health than drinker in two cohorts. Furthermore rates were similar to results from the Health Survey for England where 34% of White non-drinkers aged 18 to 34 years had a longstanding illness (compared with 24% of drinkers), and 19% had a limiting longstanding illness, compared with 10% of drinkers (Table 4.1). This similarity across three different cohorts would be consistent with the hypothesis that poor health has a direct relationship with non-drinking even early on in the life course rather than being an artefact of the sample.

Similarly supporting the sick-quitter hypothesis, around 33% of ex-drinkers who reduced their consumption to non-drinking at age 42 had developed a limiting longstanding illness or had a persistent limiting longstanding illness from the previous wave, among ex-drinkers who reduced their consumption to occasional drinking this proportion was slightly lower (19%). In line with the hypothesis that ex-drinkers stop drinking because of poor health, ex-drinkers have worse health than drinkers closer to the time of non-consumption, whilst lifetime abstainers exhibited worse health than drinkers throughout the time of being a lifetime abstainer, consistent with the sick non-starter hypothesis.

7.9.2 Size of lifetime abstainers and non-drinkers compared to other surveys

Lifetime abstainers at age 33 (1991) accounted for 1.9% in the NCDS, and 2.2% in the BCS70 at 30 years (2000). The similarity of percentage rates of lifetime abstainers using two methods of derivation and between two cohorts suggests that whilst the percentage is small, they are a stable group among the population. Furthermore percentage rates where similar to another paper looking at lifetime abstainers using the Health Survey for England from 1994-2003 (34). In this study, white lifetime abstainers aged 30 to 54 years accounted for 2.0% of the population. Despite the NCDS and BCS70 being a prospective study which suffers from attrition from wave to wave, rates of lifetime abstainers were similar to the Health Survey for England, a cross-sectional study. Similarities in proportions between studies were also found for non-drinkers, which include occasional drinkers, ex-drinkers and lifetime

abstainers. Among adults aged 18 to 34 years in the Health Survey for England 2006 and 2008, non-drinkers accounted for 19.9% of the population (Table 4.1). This was similar to 21.3% in the NCDS at age 33 (1991) and 18.0% in the BCS at age 34 (2004).

7.9.3 Past drinking of 'lifetime abstainers' and ex-drinkers

Lifetime abstainers derived through taking consecutive 'never nowadays' drinking answers accounted for 62% of self-identified 'lifetime abstainers' at 34 years in the BCS70 indicating substantial overlap between the two different measures. 'Lifetime abstainers' (SI) had greater validity in the BCS70 than in other prospective studies. Over half who reported being a 'lifetime abstainer' were found to have drunk alcohol in previous waves in the NCDS (113) and a different prospective cohort study in the US (112). In the BCS70, around 38% of 'lifetime abstainers' (SI) at age 34 reported drinking in previous waves, and the highest proportion of these past drinkers were special occasion drinkers. This may reflect ambiguity between being a non-drinker and special occasion drinker when reporting past drinking status. Indeed 'drinking occasionally' is vague and for example could signify drinking only once a year at Christmas or every month for birthday celebrations. However whilst the percentage reporting drinking previously was relatively low compared to other studies (112, 113), this measure was taken in their thirties where perhaps at older ages the chance of finding previous drinking being reported is greater. Indeed, the duration of being a non-drinker may influence whether someone reports themselves as 'never having drank alcohol', even if they may have drank several decades ago.

Ex-drinkers (non) and (SO) consisted of both past frequent and less frequent drinkers. Around 11% of ex-drinkers (non) at 33 years drank on most days in the previous waves, and this may represent past heavy drinkers who have had to quit due to problems related to drink itself or health, although volume of consumption cannot be assumed from frequency questions. The largest proportion of ex-drinkers (non) however were previously special occasion drinkers and this increased with age: 37.3% at 33 years, 46.6% at 42 years, 51.1% at age 50 years. This demonstrates that the majority of ex-drinkers in

this classification were not past heavy drinkers and the increasing shift to non-drinking from special occasional drinkers may reflect a gradual reduction in alcohol consumption with age over time. The proportion of people reducing drinking to 'only on special occasions' was highest at 33 years (10.1%) and was a half lower at 42 years (5.7%). Perhaps the thirties are an important time when people reduce their consumption due to life changes such as changes in marital or parental status; however this will be explored in more detail using regression in the next chapters.

7.9.4 Comparison of the social and health characterises of lifetime abstainers, ex-drinkers and drinkers

Distinctions between ex-drinkers are lifetime abstainers at age 42 in the NCDS were also found. Consistent with the literature on non-drinking and smoking (31, 68, 81), lifetime abstainers were less likely than drinkers to be smokers in the NCDS and BCS70. Conversely both types of ex-drinkers were more likely to have been smokers than drinkers who also had higher rates of doing the lowest amount of exercise. This appears to suggest that ex-drinkers have worse health behaviours than lifetime abstainers, which may be related to a proportion of ex-drinkers being past heavy drinkers, where heavy drinkers are also more likely to be smokers (31, 82).

Ex-drinkers also had the worse psychosocial health in each wave whereas lifetime abstainers had worse psychosocial health than drinkers at age 23 only. A higher proportion of ex-drinkers had a lower social position than drinkers in terms of education, social class and father's social class. Higher proportions of lifetime abstainers had no qualifications and belong to the lowest social class. However the relationship between highest qualification and lifetime abstention did not have a bi-variate association.

Ex-drinkers had poorer health behaviours and lower social position than lifetime abstainers; however lifetime abstainers had higher rates of poor health early on in the life course compared with ex-drinkers and drinkers, and throughout life compared with drinkers. Although the association between poor health and lifetime abstainers was consistent between cohorts, some

inconsistency was found in terms of social and demographic factors. For example a higher proportion of lifetime abstainers were women in the NCDS but not the BCS70. Drinking levels among women are thought to have risen in the past decades (88, 185), which may be reflected in a growing number of alcohol related deaths among women in their thirties and forties (186) alternatively this may be an issue with missing data. This will be discussed more greatly in Chapter 10 which looks more closely at the effect of social and demographic characteristics on lifetime abstention and ex-drinking using regression analysis.

7.9.5 Limitations

Results of the sample are presented using complete cases only therefore there is a some missing data particularly due to attrition (Chapter 6). Sample sizes are different between waves and therefore caution must be heeded when analysing trends. As mentioned in Chapter 6 attrition was greater for non-drinkers, males and those with no qualifications and therefore the sample is limited to a wealthier, more affluent and female sample. This may be why we observe inconsistent findings in terms of sex and lifetime abstention between the two cohorts, as attrition was greater in the BCS70 than NCDS. In the BCS70 at age 26, information was collected through a postal questionnaire in the first instance of collecting data from the cohort members themselves, and this is thought to have influenced a greater amount of non-response. This is discussed in more detail in Chapter 9 where differences are observed between cohorts following regression analysis.

7.10 Summary and conclusion

- Sick non-starters comprise of a substantial proportion of lifetime abstainers (e.g. around a third of lifetime abstainers at age 34 had a previous or persistent longstanding illness)
- Lifetime abstainers suffer from higher rates of LLSI and LSI from early adulthood consistently across waves compared with drinkers in both studies. While ex-drinkers appear to suffer from higher rates of LLSI than drinkers closer to the time point of non-drinking.

- Ex-drinkers exhibit worse health behaviours (smoking and lower exercise), worst mental health and lower social position than drinkers and lifetime abstainers.
- Lifetime abstainers account for a small proportion of the total proportion (around 1.4-2.2% of the total sample) and this applied to both lifetime abstainers and 'lifetime abstainers' (SI) which is a similar rate to a cross-sectional nationally representative cross-sectional study.
- In the BCS70 lifetime abstainers derived using consecutive waves accounted for 62% of self-identified 'lifetime abstainers' at 34 years.
- Around 38% of 'lifetime abstainers' (SI) reported drinking in the previous wave, and the highest proportion of these were previous special occasion drinkers
- Ex-drinkers (non) consisted of past frequent and non-frequent drinkers. E.g. 11% of ex-drinkers (non) at 33 years drank on most days, whilst 33.9% drank at least once a week in the previous wave
- The rate of people reducing to special occasion drinking was highest at 33 years (10.1%) and lower at 42 years (5.7%)

Sick non-starters comprise of a substantial proportion of lifetime abstainers. While ex-drinkers suffer from worse health than lifetime abstainers, both suffer from worse health than drinkers. Lifetime abstainers have the worst health in early adulthood and consistently have poorer health than drinkers at later stages of the life course. Further analysis is needed into whether these associations remain whilst adjusting for other factors. In addition the adolescent health status among drinkers and non-drinkers has not been explored. This is the subject of investigation using bi-variate analysis in the next chapter.

8. Adolescent health status of non-drinkers in young adulthood

8.1 Abstract

Aims: To examine whether poor health precedes non-drinking from an early age by investigating how health conditions experienced during childhood vary among drinkers and non-drinkers in young adulthood.

Methods: Using the NCDS, objectively recorded medical conditions assessed by a health visitor at age 16, are compared between drinking groups and non-drinkers at age 23. Similarly in the BCS70 objectively recorded medical conditions assessed by a health visitor at age 10, are compared between drinking groups and non-drinkers at age 26. In addition a further measure of self-reported retrospective health conditions suffered since age 16, asked at age 26 is compared between drinking groups and non-drinkers at age 26 in the BCS70. Chi-squared tests are carried to observe whether there is a bi-variate associations.

Results: In the NCDS, non-drinkers at age 23 had highest rates of having at least one condition (45.7%) and at least one slight or severe disability (18.7%) at age 16. Furthermore they had higher rates of having a mental health condition (12.8%), emotional and behavioral problems (6.5%), epilepsy (2.4%), physical disability (9.5%) and a heart condition (3.1%). Similarly non-drinkers at age 26 in the BCS had higher rates of having depression (20.5%), epilepsy (6.7%), persistent joint or back pain (25.0%), or other health problem (16.9%) since age 16.

Conclusion: Conditions non-drinkers experience during young adulthood may put them at greater risk of certain conditions in later life than drinkers. Mental difficulties early in life may increase risk of cognitive decline. Non-drinkers have worst prior health conditions early on in life than drinkers and this may put them at greater risk of morbidity and mortality in later life.

8.2 Introduction

Ex-drinkers have been found to have worse health than moderate drinkers in later life. For example they had higher rates of diabetes, coronary heart disease (57) and hypertension (63) than drinkers. This is often the argument as to why ex-drinkers should be excluded from the non-drinker reference category when comparing their health with moderate drinkers, since a pre-existing poor health bias may arise. However associations have been found with limiting longstanding illness and self-rated poor health with non-drinkers in early adulthood even after adjusting for extensive social and demographic factors (31) (Chapter 4). This raises the question as to what specific conditions non-drinkers in early adulthood may suffer from. Furthermore since this study was cross-sectional it is not possible to know the temporal order of events. This chapter looks at rates of condition in adolescence among non-drinkers and drinkers in young adulthood, to assess the temporal order between poor health and non-drinking and provide further detail on actual conditions which may vary by frequency of drinking. This corresponds to the first component of the sick non-starter hypothesis that poor health precedes non-drinking from an early age (Chapter 3).

8.3 Objectives

The following hypothesis is investigated by exploring the preceding health status of drinkers in early adulthood, in line with the first component of the sick non-starter hypothesis (Chapter 3 Thesis Overview):

Hypothesis: Poor health preceeds non-drinking in early adulthood

The following analysis was carried out and chi-squared tests conducted to compare health conditions among people with different drinking status in early adulthood:

- In the NCDS, rates of medical conditions at age 16 as assessed by a health officer by drinking status at 23 years (See Appendix B and Appendix C for how data was recorded)

- In the BCS70 rates of self-reported retrospective conditions suffered since age 16 asked at 26, by drinking status at 26 years. In the BCS70 rates of medical conditions at 10 years as assessed by a health officer by drinking status at 26 years. *(*See section 5.4.1)

8.4 Results

8.4.1 The National Child Development Study

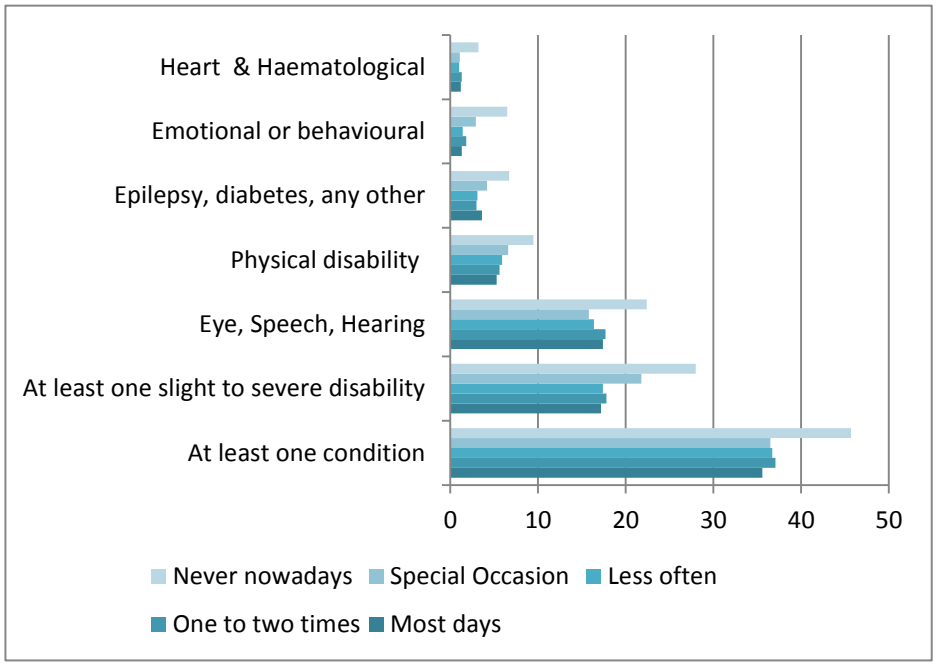

Figure 8.1 Percentage rates of statistically significant conditions (p<0.05) at 16 years by drinking status at 23 years, NCDS

Table 8.1 Non-drinkers[7] at age 23 have higher rates of abnormalities than other drinkers, and there is statistical difference between drinking status and rates of abnormalities (p<0.01). In particular non-drinkers have higher rates of speech, mental disability, emotional and behavioural problems, physical disability, epilepsy, heart, haematological and other central nervous system conditions than drinkers (p<0.05)

[7] Those who answered 'never nowadays'

Table 8.1 Medical conditions at age 16 by drinking status at age 23, NCDS

	Most days	**One to two times**	**Less often**	**Special Occasion**	**Non-drinkers**	**Total**	**p-value**
N	2,136	4,910	1,305	1,433	508	10,292	
	%	%	%	%	%	%	
At least one condition	**35.6**	**37.1**	**36.7**	**36.5**	**45.7**	**37.1**	**<0.001**
At least one slight to severe disability	**17.2**	**17.8**	**17.4**	**21.8**	**28.0**	**18.7**	**<0.001**
Eye, Speech, Hearing	17.4	17.7	16.4	15.8	22.4	17.5	0.013
-Eye	13.8	14	12.9	12.4	15.9	13.7	0.256
-Hearing	3.0	3.4	2.8	3.1	5.3	3.3	0.093
-Speech	**1.8**	**1.5**	**1.6**	**2.2**	**5.7**	**1.9**	**<0.001**
Skin	14.2	14.4	15.9	15.3	15.0	14.7	0.547
Physical disability	**5.3**	**5.6**	**5.9**	**6.6**	**9.5**	**5.9**	**0.005**
Internal system	4.4	4.4	4.5	3.8	4.9	4.4	0.833
- Respiratory system	3.7	3.5	3.2	2.6	3.1	3.4	0.483
- Alimentary System	0.3	0.5	0.8	0.4	0.5	0.5	0.474
- Urogenital System	1.0	1.3	1.3	1.6	2.0	1.3	0.441
Epilepsy, diabetes, any other	**3.6**	**3.0**	**3.1**	**4.2**	**6.7**	**3.5**	**<0.001**
- Epilepsy	**0.2**	**0.2**	**0.5**	**0.6**	**2.4**	**0.4**	**<0.001**
- Diabetes	0.2	0.2	0.1	0.2	0.2	0.2	0.950
- Other CNS system	**0.4**	**0.4**	**0.6**	**0.6**	**2.1**	**0.5**	**<0.001**
- Any other	2.8	2.4	2.2	0.3	3.0	2.5	0.160
Mental	**1.9**	**2.7**	**2.2**	**4.9**	**12.8**	**3.3**	**<0.001**
-Mental disability	**0.7**	**1.2**	**0.8**	**2.9**	**9.8**	**1.7**	**<0.001**
-Emotional Behavioural	**1.3**	**1.8**	**1.4**	**2.9**	**6.5**	**2.0**	**<0.001**
Heart & Hematological	**1.2**	**1.3**	**1.0**	**1.1**	**3.2**	**1.3**	**<0.001**
- Heart	**1.1**	**1.2**	**1.0**	**0.8**	**3.1**	**1.2**	**<0.001**
- Haematological	0.3	0.4	0.2	0.5	0.5	0.4	0.790
% of sample at age 23 who had medical records at age 10 (n=12,531)	83.3	82.2	82.1	80.1	83.4	82.2	0.646

8.4.2 British Cohort Study

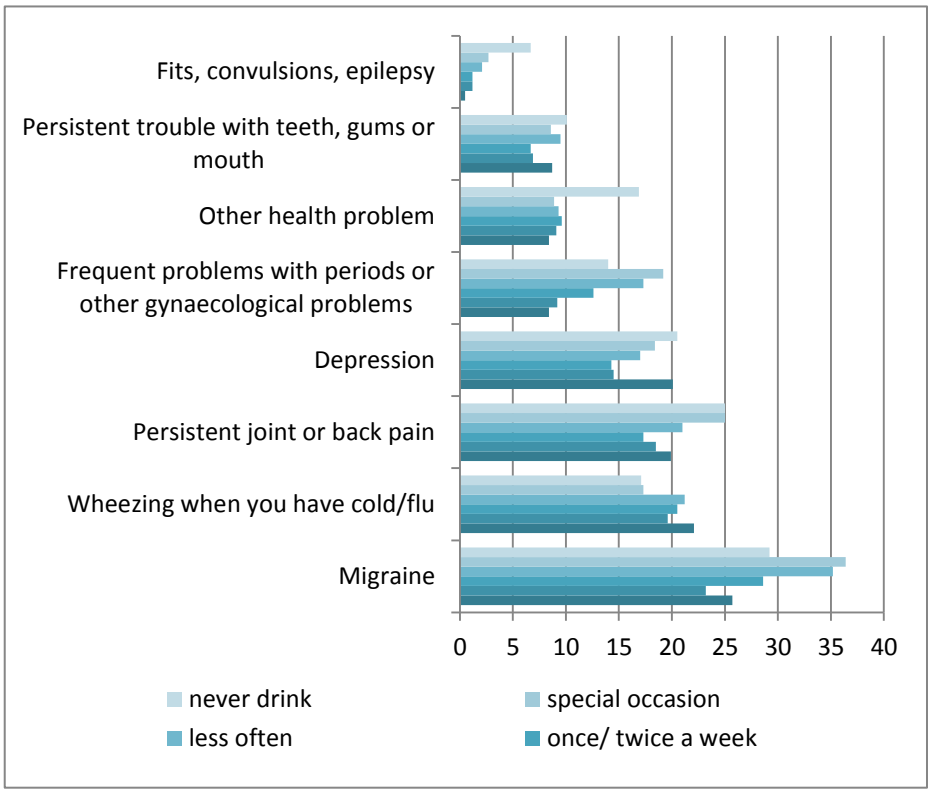

Figure 8.2 Percentage rates of statistically significant self-report conditions ($p<0.05$) suffered since age 16 reported at age 26, by drinking status at age 26

Using retrospective self-report conditions suffered since age 16 reported at 26 years, non-drinkers had the greatest rates of fits, convulsions, epilepsy (6.7%) and had higher rates of persistent joint or back pain (25%) and there was a statistically significant difference between drinking groups (Table 8.2). Rates of reported depression were highest among frequent drinkers and those who never drank ($p<0.001$). Other conditions which showed a statistically significant difference between drinking groups include trouble with teeth, gums or mouth (10.1%) and 16.9% of non-drinkers reported having a condition not provided in the list by selecting 'other health problem'. Suffering from migraines also appeared to affect drinking status however this rate was greatest among special occasion drinkers (36.4%). Other conditions that were higher among special occasion drinkers included persistent joint and back pain (25.0%) and gynaecological problems (19.2%).

Table 8.2 Self-report conditions suffered since 16 years reported at age 26 by drinking status at 26 years, BCS70

	Most days	**3/4 times a week**	**Once/ twice a week**	**Less often**	**Special occasion**	**Non-drinkers**	**Total (N)**	**p-value**
Number in figures	805	1661	3232	2052	771	356	8877	
(% of N)	(9.1) %	(18.7) %	(36.4) %	(23.1) %	(8.7) %	(4.0) %	%	
Suffered since age 16								
Migraine	**25.7**	**23.2**	**28.6**	**35.2**	**36.4**	**29.2**	**29.6**	**<0.001**
Hay fever	31.6	29.7	30.5	27.7	28.4	27.2	29.5	0.177
Asthma	11.6	11.4	12.6	12.6	11.5	12.4	12.2	0.790
Bronchitis	5.3	6.6	5.6	6.2	6.6	5.9	6.0	0.650
Wheezing when you have cold/flu	22.1	19.6	20.5	21.2	17.3	17.1	20.2	0.076
Eczema	17.8	15.0	15.1	16.7	17.3	14.3	15.8	0.193
Skin problems	16.6	17.1	16.7	16.5	15.0	16.3	16.6	0.889
Fits, convulsions, epilepsy	**0.5**	**1.2**	**1.2**	**2.1**	**2.7**	**6.7**	**1.7**	**<0.001**
Persistent joint or back pain	**19.9**	**18.5**	**17.3**	**21**	**25.0**	**25.0**	**19.6**	**<0.001**
Diabetes	1.0	0.2	0.7	0.9	0.8	1.1	0.7	0.135
Persistent trouble with teeth, gums or mouth	**8.7**	**6.9**	**6.7**	**9.5**	**8.6**	**10.1**	**7.9**	**0.002**
Cancer	0.6	0.5	0.3	0.6	0.6	0.3	0.5	0.491
Digestive problems	11.8	12.2	10.6	11.1	12.2	14.6	11.4	0.209
Bladder or Kidney problems	4.0	5.1	5.4	6.4	5.4	5.6	5.5	0.195
Depression	**20.1**	**14.5**	**14.3**	**17**	**18.4**	**20.5**	**16.1**	**<0.001**
Hearing difficulties	4.2	3.4	2.7	2.9	3.6	3.4	3.1	0.253
Other problems with your ears	5.5	5.8	5.8	5.4	6.2	7.0	5.8	0.856
Gynecological problems[8]	**8.4**	**9.2**	**12.6**	**17.3**	**19.2**	**14.0**	**13.3**	**<0.001**
Other health problem	**8.4**	**9.1**	**9.6**	**9.3**	**8.9**	**16.9**	**9.6**	**<0.001**

[8] Refers to frequent problems with periods or other gynaecological problems

Table 8.3 Medical conditions at age 10 by drinking status at age 26, BCS70

	Most days	**3/4 times a week**	**Once/ twice a week**	**Less often**	**Special occasion**	**Non-drinkers**	**P-value**
N	644	1362	2651	1636	613	269	
	%	%	%	%	%	%	
Facial and general appearance	**1.7**	**2.6**	**2.6**	**2.4**	**2.8**	**6.7**	**0.001**
Skin condition	9.8	11.2	10.3	9.0	10.4	13.8	0.182
Ear, nose or throat condition	11.3	9.3	9.1	9.9	8.6	13.4	0.127
Upper respiratory condition	3.3	2.7	3.3	4.0	2.4	3.7	0.375
Lower respiratory condition	1.1	1.4	2.2	1.4	1.1	1.1	0.153
Cardiovascular condition	0.8	1.8	1.8	1.5	2.4	1.9	0.289
Gastrointestinal condition	0.8	1	0.9	0.9	1.8	1.1	0.421
Other abdominal condition	0.5	1.5	1.1	1.3	1.5	1.5	0.485
Urogenital tract condition	3.1	1.9	2.3	1.9	3.8	3.3	0.057
Neurological condition	**0.6**	**0.9**	**1.1**	**1.0**	**1.8**	**3.0**	**0.021**
Muscular-skeletal condition	2.2	2.7	3.2	3.2	2.4	4.5	0.393
Endocrine condition	0.5	0.7	0.8	0.8	0.8	0.7	0.963
Blood or lymphatic condition	1.1	1.5	1.0	0.9	2.0	1.1	0.243
Mental disability	**0.3**	**0.4**	**0.6**	**0.9**	**2.8**	**6.7**	**<0.001**
Behavioural or emotional problem	**2.2**	**1.5**	**2.3**	**2.8**	**2.8**	**5.9**	**0.001**
Other abnormal condition(s)	6.2	6.1	5.7	5.8	6.4	7.1	0.937
% of sample at age 26 who had medical records at age 10 (n=8877)	80	82	82	80	80	76	0.018

Table 8.3 shows that among those who had a medical examination at age 10 and drinking records at age 26, non-drinkers had higher rates of abnormalities in facial and general appearance (6.7%), neurological conditions (3.0%), mental disability (6.7%) and behavioural and emotional problems (5.9%), there was a statistically significant difference between drinking status and these conditions ($p<0.05$). There was a statistically significant difference between rates of missing data between drinking frequency ($p<0.05$), unlike in the NCDS. This was greatest for non-drinkers where 76% of non-drinkers aged 26 had medical records at age 10 compared with 81% of the total sample.

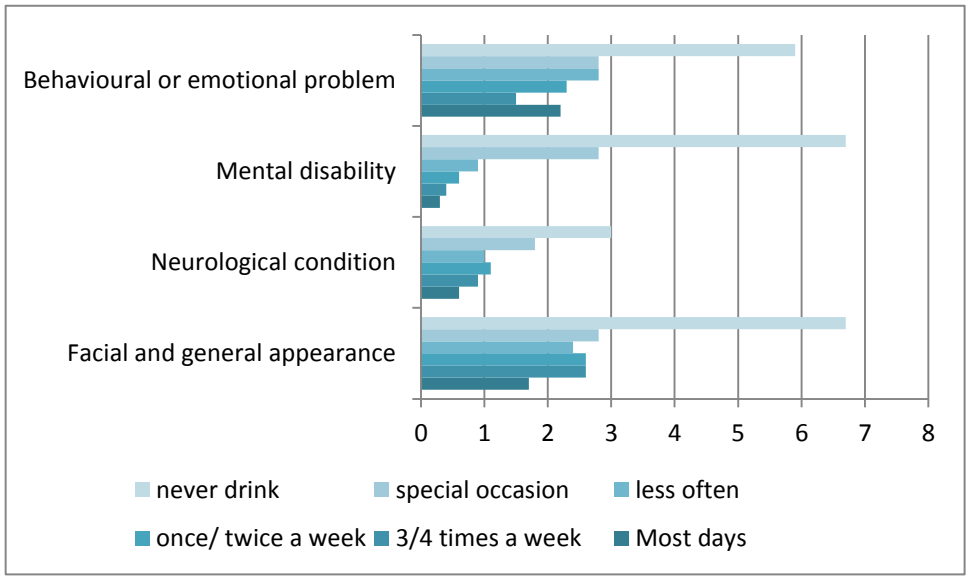

Figure 8.3 Percentage rates of statistically significant conditions ($p<0.05$) at age 10 by drinking status at age 26, (Table 8.3) BCS70

8.5 Discussion

There was a statistically significant difference between drinking status and medical conditions or retrospectively self-reported conditions in both cohorts and rates were more prevalent among non-drinkers. Similar conditions that were higher among non-drinkers in both cohorts included having epilepsy (NCDS) or epilepsy, fits and convulsions (BCS70 26 years) or neurological conditions (BCS70 10 years) and physical disability (NCDS) and persistent joint and back pain (BCS70 26 years), and emotional and behavioural problems (NCDS and BCS70 10 years). In the NCDS non-drinkers at 23 years also had

higher rates of having a heart condition, unfortunately fewer conditions were asked in the BCS70 at 26 years, which may explain the large proportion of non-drinkers selecting other (16.9%).

Poor health may have a direct impact on drinking for example many medications interact harmfully with the consumption of alcohol prohibiting the use of alcohol, including medication for epilepsy, muscular pain, depression, ADHD (which is an emotional and behavioural problem) (187). Furthermore binge drinking or withdrawal from alcohol can increase the chances of having an epileptic seizure, whilst medication taken for seizures may lower someone's tolerance for alcohol (188). These direct reasons for epilepsy sufferers to not drink alcohol may be why consistent findings are observed between cohorts and with different measures. Physical disability or physical pain may hinder mobility and alcohol can increase risk of injury which may be why a relatively high proportion of those with physical disability or pain may not drink alcohol. Alternatively severe disability may contribute to social exclusion where it may not be the norm to drink.

Emotional and behavioural problems may be a sign of mental difficulties which could affect health in later life; this may explain why non-drinkers consistently have worse cognitive functioning and higher rates of dementia than drinkers (19, 128) later on in life. J-curve studies which examine the relationship between alcohol and cognitive decline are based on middle-aged cohorts and therefore are unable to account for mental health early on in life. Similarly, problems with mobility early on in life among non-drinkers may influence a sedentary lifetime which could contribute to their higher rates of osteoporosis found in later life compared with drinkers (30, 75) which was not accounted for in this study. Having a heart condition was also more common among non-drinkers in early adulthood which may contribute to their worse cardiovascular health in later, although the percentage of non-drinkers at age 23 in the NCDS with heart conditions was small (3.2%). While the other conditions presented here do not have a clear causal pathway as to how they may contribute to the conditions in which a J-curve have been found, childhood chronic conditions may affect morbidity and mortality later on in life through social disadvantage.

Studies have found that conditions and adversities experienced early on in life impacts on health in middle age (115, 126, 131) and this includes increased risk of cardiovascular and coronary heart disease (115, 126), Some of these conditions may contribute to social exclusion which may have an adverse impact on health later on in life, for example problems with speech, facial and general appearance and mental disability were higher among non-drinkers in the NCDS (Table 8.1) and BCS70 (Table 8.2 and Table 8.3 9.3) which may be a barrier to socialising or taking part in the workforce. The lack of social relationships has been found to increase the risk of mortality, on a par with smoking and excessive alcohol consumption (110).

46% of non-drinkers at age 23 in the NCDS had at least one condition compared with 36% of those who drank on most days, and 28% of non-drinkers had at least one slight to server disability compared with 17% of those who drank on most days. This shows that non-drinkers have worst health than drinkers even in early adulthood, and the number of non-drinkers with childhood conditions at age 23 is over two fifths. This is similar to findings using the Health Survey for England where around 34% of white non-drinkers aged 18 to 34 years had a longstanding illness compared with 24% of drinkers (Chapter 4).

In the BCS70 it was also found that a higher proportion of special occasion drinkers and non-drinkers self-reported at age 26 that they suffered from specific conditions since they were aged 16. This included suffering from migraines, persistent joint and back pain (25.0%) and gynaecological problems (19.2%). This highlights that poor health may be a reason for drinking only on special occasions as well as abstention. Indeed poor health is known to increase the likelihood of reducing consumption (63) and not just stopping altogether. This has important implications for studies which fail to exclude occasional drinkers from the reference category of non-drinkers (71) as these people, as well as potentially consisting of ex-drinkers, may also contain people who only drink occasionally throughout their life due to health reasons. Consistent with other studies which show a U-shape between rates of poor mental health and drinking (94-96), in the BCS70 the most frequent drinkers and non-drinkers had

the highest rates of depression at 26 years. For a further discussion on the effects of psychosocial health on drinking please refer to section 2.3.1.2

8.5.1 Limitations

Rates cannot be directly compared between the two cohorts due to the different methods of data collection. In the NCDS a medical assessment was carried out by a health visitor at 16 years, whilst in the BCS70 respondents were asked to state whether they had suffered the condition at 26 since 16 years, therefore conditions may vary in length of duration as well as accuracy from retrospective recall. However this shows that ill health in a variety of representations are more prevalent among non-drinkers in young adulthood. Furthermore the fact that similar findings are found in both cohorts which are 12 years apart strengthens the existing findings and the argument that poor health has a direct effect on the non-consumption of alcohol, which if true would be observed regardless of age and time.

Another limitation is missing data. Around 81% of those who had drinking records at age 26 had medical examination data at age 10 however there was a statistical significant difference between rates of missing data and drinking groups ($p<0.05$) with 76% of non-drinkers aged 26, the lowest proportion, having medical examination records at age 10. This was also mentioned in section 6.5.1. Therefore results may be slightly biased due to the lower proportion of non-drinkers, in the BCS70 only. There appeared to be no statistically significant difference between missing medical data in the NCDS however and results are also presented through a retrospective self-report measure in the BCS70 which relied on only one wave of data collection.

This descriptive analysis looks at rates and does not take into account social and demographic factors nor co-occurring conditions hence there may be correlations or underlying confounders. A regression model was attempted with each of these conditions in separate models. However given the small sample size and likelihood of overlap this was abandoned in favour of using limiting longstanding illness in the next chapters. The advantages of using

limiting longstanding illness is that was asked consistently in successive waves and thus changes in health status over time can be assessed.

8.6 Summary and Conclusion

- Bi-variate associations suggest that drinking status in early adulthood varies by health conditions from an early age, and rates were higher among non-drinkers. This was the case for both objectively assessed conditions and self-reported conditions in two cohorts.
- Non-drinkers had higher rates of epilepsy, physical disability and emotional and behavioural problems, and this was consistent between two cohorts.
- In the BCS70 special occasion drinkers also had higher rates of reporting certain conditions such as suffering from migraines, and persistent joint and back pain

There was a statistically significant difference between the effects of health at an earlier age and drinking status in adulthood. In particular non-drinkers had higher rates of epilepsy, physical disability and emotional and behavioural problems. Higher rates of physical disability may contribute to higher rates of osteoporosis in later life where a J-curve has been found, while mental difficulties may contribute to worse cognitive functioning and higher rates of dementia found among non-drinkers. While the other conditions presented here may not have not directly impact on some of the conditions which find a J-curve in later life, they may contribute to increase morbidity indirectly via social disadvantage. For example problems with speech, facial appearance and disability which were higher among non-drinkers than drinkers which could contribute to social exclusion. In conclusion non-drinkers in young adulthood appear to suffer from worse health in adolescence which may influence their health outcomes in later life

9. The effect of education on ex-drinking and lifetime abstention

9.1 Abstract

Aims: The aim of this chapter is to examine the relationship between being an ex-drinker and lifetime abstainer and education, since social position is a major determinant of health in later life. While chapter 4 showed a social gradient in non-drinking among young people this chapter investigates the effect of education on lifetime abstainers and ex-drinkers separately at different points in the life course, ahead of including psychosocial health and health in the final model.

Methods: Separate binary logistic regression models on the odds of being an ex-drinker at age 33, 42 and 50 and lifetime abstainer at age 33 and 42 in the NCDS, dependent on highest educational qualification obtained along the same time points. Models are adjusted for sex (model A) and then marital status and children in the household (model B). The same analysis is repeated using the BCS70 on the odds being a lifetime abstainer and self-identified 'lifetime abstainer' in separate models at age 30 and 34.

Results: Having no qualifications was associated with being an ex-drinker (non) at each stage of the life course (ORs range 2.33-3.42), and ex-drinkers (SO) (OR 2.20-2.60) and lifetime abstainers (OR 2.03-2.13) after adjusting for demographic factors at age 23, 42 and 50 the NCDS. Highest qualification obtained had no association with being a lifetime abstainer in the BCS70...

Conclusion: Early life social position may influence poor health in later life, which later life measures of SEP may fail to capture, therefore studies which use non-drinkers as a reference group against drinkers in later life should account for early life social position.

9.2 Background

A social gradient in non-drinking exists consistently across studies, where a higher proportion of people with lower education and income are more likely to be non-drinkers than those with higher levels of education (31, 34, 83, 85, 86, 189) as outlined in the literature review (section 2.3.1.1). Furthermore this gradient exists along income and education even among young non-drinkers aged 18 to 34 years, after adjusting for extensive health and demographic factors, using the Health Survey for England 2006 and 2008 in Chapter 4.

This chapter focuses on the effect of education on the odds of being a lifetime abstainer and ex-drinker using binary logistic regression analysis, ahead of including psychosocial health in the model in Chapter 10, and limiting longstanding illness in Chapters 11 and 12. Poor health and low social position are related (116, 131) therefore this chapter focuses on the effects of education on non-drinking without adjusting for health. Since social factors are strong determinants of health in later life it is important to assess the effects on their own which may contribute to the poorer health of non-drinkers later on in life. Furthermore many studies in later life do not have the data to consider social position of non-drinkers at an early age, which may be a confounding factor in the worse health outcomes of non-drinkers found in later life. In addition this chapter will analyse whether there are distinctions between lifetime abstainers and ex-drinkers. Differences between lifetime abstainers and ex-drinkers using the NCDS were found in Chapter 7, for example ex-drinkers tended to have worse health behaviours and were from lower social positions. This chapter examines whether these relationships exist after adjusting for sex, and demographic factors.

9.3 Methods

Although the main objective of using the National Child Development Study (NCDS) is to look at relationships between health and non-drinking, this section of the thesis will observe the effects of highest educational qualifications, on lifetime abstention and ex-drinking. Educational qualifications were used to measure social position due to having a substantive interest in looking at how

educational attainment has an influence on non-drinking, in particular whether having a degree and thus going to university decreases your chances of being a non-drinker. Drinking among university students is known to be higher than the general population (90-92), and some have referred to this transition as 'rite of passage' into certain drinking patterns (93). This may be a factor influencing greater levels of abstinence among those with no qualifications, having not experienced a university culture where many young people drink heavily.

Of more substantive interest to this thesis is whether lower education is associated with being a lifetime abstainer or ex-drinker, this extends work with the Health Survey for England in Chapter 4, which showed that the social gradient exists among non-drinkers, however did not analyse the effects of education with ex-drinkers and lifetime abstainers separately. More specifically the following hypotheses were investigated:

> *Consistent with the social gradient in non-drinking, those with lower qualifications will be more likely to be ex-drinkers and lifetime abstainers*

This hypothesis was investigated through the following analyses:

Binary logistic regression on the odds of being an ex-drinker in separate models at age 33, 42 and 50 and lifetime abstainer at age 33 and 42 in the NCDS dependent on highest educational qualification obtained along the same time points. Binary logistic regression on the odds of being a lifetime abstainer or self-identified 'lifetime abstainer' in separate models at age 30 and 34 dependent on highest educational qualification obtained along the same time points using the BCS70. Models are adjusted for sex (model A) and then marital status and children in the household (Model B).

9.4 Results

The following tables present results from logistic regression on the odds of being an ex-drinker (non), an ex-drinker (SO) and a lifetime abstainer.

> Model A shows the effect of highest education adjusting for sex;

Model B shows the effect of highest education adjusting for sex; effects of marital status and children in the household

9.4.1 Ex-drinkers (NCDS)

9.4.1.1 Ex-drinkers (non)

Including marital status and children in the household made little difference to the odd ratios in Model A so only Model B is presented for simplicity for ex-drinkers (non) and ex-drinkers (SO) (Table 9.1 and Table 9.2).

Table 9.1 shows odds of being an ex-drinker (non). Having no qualifications was consistent in predicting odds of being an ex-drinker (non) at age 33 (OR 2.33, 95% CI 1.42 to 3.83), 42 (OR 2.34, 95% CI 1.49 to 3.67) and 50 (OR 3.42, 95% CI 2.20 to 5.33) showing an increase in odds with age. People who were married were least likely to have reduced their consumption to non-drinking compared with single people at age 42 (OR 0.49, 95% CI 0.33 to 0.73) and age 50 (OR 0.61, 95% CI 0.41 to 0.91) adjusting for sex, highest qualification and presence of children in the household. Women had higher odds of being an ex-drinker (non) in every model at age 33, 42 and 50.

9.4.1.2 Ex-drinkers (SO)

Table 9.2 shows odds of being an ex-drinker (SO). People with less than a degree or no qualifications were more likely to be ex-drinkers (SO) in model C than those with a degree qualification, adjusting for marital status and children in the household. People with no qualifications had the highest odds at age 33 (OR 2.60, 95% CI 1.90 to 3.54), 42 (OR 2.22, 95% CI 1.59 to 3.10) and 50 (OR 2.42, 95% CI 1.67 to 3.50) to be ex-drinkers (SO). The odds ratio for those with qualifications below a degree was also statistically significant at age 33, 42 and 50 ranging from 1.39 to 1.96. In model C separated, widowed or divorced people were least likely to be ex-drinkers (SO), (OR 0.67, 95% CI 1.32 to 1.99) and those with children in the household had higher odds of being an ex-drinker (SO) at age 33 only (OR 1.62, 95% CI 1.33 to 1.99). Females had higher odds of being an ex-drinker (SO) in every model at age 33, 42 and 50.

Table 9.1 Odds ratios of being an ex-drinker (non) by education and demographic factors, NCDS

	1981			**2000**			**2008**		
	Age 33 (N=9126)			**Age 42 (N=9457)**			**Age 50 (N=8701)**		
Model B									
	OR	p-value	(95% CI)	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Sex (Female)	**2.52**	**<0.001**	**(1.47 to 2.88)**	**1.72**	**<0.001**	**(1.32 to 2.26)**	**1.83**	**<0.001**	**(1.40 to 2.39)**
Highest qualification									
Degree	1			1			1		
Other	1.13	0.608	(0.72 to 1.76)	1.35	0.14	(0.91 to 2.02)	**1.67**	**0.015**	**(1.11 to 2.52)**
No qualifications	**2.33**	**0.001**	**(1.42 to 3.83)**	**2.34**	**<0.001**	**(1.49 to 3.67)**	**3.42**	**<0.001**	**(2.20 to 5.33)**
Marital Status									
Single	1			1			1		
Married	0.90	0.607	(0.60 to 1.35)	**0.49**	**<0.001**	**(0.33 to 0.73)**	**0.61**	**0.015**	**(0.41 to 0.91)**
Separated/widowed/ divorced	0.76	0.306	(0.45 to 1.28)	0.86	0.455	(0.57 to 1.29)	0.93	0.741	(0.60 to 1.43)
Children in the household	0.86	0.414	(0.61 to 1.23)	0.88	0.437	(0.64 to 1.22)	0.82	0.258	(0.58 to 1.20)

Table 9.2 Odds ratios of being an ex-drinker (SO) by education and demographic factors, NCDS

	1981 Age 33 (N=8898)			2000 Age 42 (N=9208)			2008 Age 50 (N=8429)		
Model B									
	OR	p-value	(95% CI)	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Sex (Female)	**1.83**	**<0.001**	**(1.58 to 2.12)**	**1.76**	**<0.001**	**(1.46 to 2.12)**	**1.91**	**<0.001**	**(1.51 to 2.41)**
Highest qualification									
Degree	1			1			1		
Other	**1.96**	**<0.001**	**(1.49 to 2.58)**	**1.61**	**0.001**	**(1.21 to 2.15)**	**1.39**	**0.045**	**(1.01 to 1.92)**
No qualifications	**2.60**	**<0.001**	**(1.90 to 3.54)**	**2.22**	**<0.001**	**(1.59 to 3.10)**	**2.42**	**<0.001**	**(1.67 to 3.50)**
Marital Status									
Single	1			1			1		
Married	0.82	0.1	(0.65 to 1.04)	0.81	0.185	(0.60 to 1.10)	0.85	0.402	(0.59 to 1.23)
Separated/ widowed/ divorced	**0.67**	**0.008**	**(1.32 to 1.99)**	0.88	0.452	(0.63 to 1.23)	0.75	0.179	(0.49 to 1.14)
Children in the household	**1.62**	**<0.001**	**(1.33 to 1.99)**	1.01	0.965	(0.79 to 1.28)	1.03	0.851	(0.78 to 1.34)

9.4.2 Lifetime abstainers

9.4.2.1 Lifetime abstainers (NCDS)

Table 9.3 presents odds of being a lifetime abstainer by education and demographic factors. Having no qualifications was consistent in predicting the odds of being a lifetime abstainer and odds were attenuated when adjusting for sex, marital status and children in the household at age 33 (OR 2.03, 95% CI 1.11 to 3.71), and at age 42 (OR 2.13, 95% CI 1.07 to 4.24). In model B people who were separated, widowed or divorced were least likely to be lifetime abstainers than single people at 33 years (OR 0.45, 95% CI 0.23 to 0.94), and 42 years (OR 2.13, 95% CI 1.07 to 4.24). Being separated, widowed or divorced was the only significant marital status category included in the final model controlling for education and presence of children. In model B, the most adjusted model, women had double the odds of men of being a lifetime abstainer at 33 and 42 years (OR 0.43, 95% CI 0.20 to 0.95). Women had higher odds of being a lifetime abstainer and this was statistically significant in every model.

Table 9.3 Odds of being a lifetime abstainer by education and demographic factors in the NCDS

	1991			**2000**		
	Age 33 (N=9290)			**Age 42 (N=8448)**		
Model A						
	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Sex (Female)	**1.97**	**<0.001**	**(1.42 to 2.74)**	**1.93**	**0.001**	**(1.31 to 2.85)**
Highest qualification						
Degree	1			1		
Other	1.19	0.512	(0.70 to 2.02)	1.52	0.162	(0.85 to 2.74)
No qualifications	**1.90**	**0.034**	**(1.05 to 3.43)**	**2.02**	**0.045**	**(1.02 to 4.00)**
Model B						
Sex (Female)	**2.04**	**<0.001**	**(1.36 to 2.97)**	**2.01**	**<0.001**	**(1.36 to 2.97)**
Highest qualification						
Degree	1			1		
Other	1.25	0.405	(0.74 to 2.14)	1.59	0.123	(0.88 to 2.87)
No qualifications	**2.03**	**0.021**	**(1.11 to 3.71)**	**2.13**	**0.030**	**(1.07 to 4.24)**
Marital Status						
Single	1			1		
Married	0.89	0.648	(0.55 to 1.44)	0.87	0.647	(0.47 to 1.59)
Separated/widowed/ divorced	**0.45**	**0.320**	**(0.23 to 0.94)**	**0.43**	**0.037**	**(0.20 to 0.95)**
Children in the household	0.95	0.814	(0.62 to 1.45)	0.90	0.684	(0.55 to 1.49)

9.4.2.2 Lifetime abstainers (BCS70)

Table 9.4 shows odds of being a lifetime abstainer in the BCS70 at 30 and 34 years. There were no statistically significant associations between sex, highest qualifications, marital status or children in the household in any of the unadjusted and adjusted models. Table 9.5 shows odds of being a self-identified 'lifetime abstainer' in the BCS70 at 30 and 34 years. Children under 16 years in the household was the only statistically significant variable adjusting for sex and marital status (OR 1.77, 95% CI 1.15 to 2.72) and highest qualification (OR 1.86, 95% CI 1.04 to 0.71).

Table 9.4 Odds of being a lifetime abstainer by education and demographic factors in the BCS70

	2000			2004		
	Age 30 (n=6809)			**Age 42 (n=5960)**		
	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Model A						
Sex (Female)	1.04	0.800	(0.75 to 1.44)	0.89	0.540	(0.61 to 1.29)
Highest qualification						
Degree	1			1		
Other	0.81	0.304	(0.54 to 1.21)	0.93	0.758	(0.60 to 1.45)
No qualifications	0.97	0.912	(0.62 to 1.54)	1.12	0.674	(0.66 to 1.66)
Model B						
Sex (Female)	0.99	0.995	(0.71 to 1.38)	0.87	0.485	(0.60 to 1.27)
Top qualification						
Degree	1			1		
Other	0.75	0.181	(0.50 to 1.14)	0.92	0.712	(0.59 to 1.44)
No qualifications	0.90	0.674	(0.56 to 1.45)	1.09	0.747	(0.64 to 1.84)
Marital Status						
Single	1			1		
Married	1.24	0.259	(0.85 to 1.79)	0.85	0.513	(0.53 to 1.37)
Separated/widowed/ divorced	0.79	0.570	(0.36 to 1.76)	0.77	0.627	(0.26 to 2.22)
Children in the household	1.31	0.156	(0.90 to 1.89)	1.23	0.373	(0.78 to 1.93)

Table 9.5 Odds of being a 'lifetime abstainer' (SI) by education and demographic factors in the BCS70

	2000			**2004**		
	Age 30 (n=6834)			**Age 34 (n=5986)**		
	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Model A						
Sex (Female)	1.14	0.496	(0.78 to 1.69)	1.33	0.153	(0.90 to 1.97)
Top qualification						
Degree	1			1		
Other	0.71	0.161	(0.44 to 1.15)	0.95	0.835	(0.61 to 1.49)
No qualifications	1.14	0.616	(0.68 to 1.92)	0.99	0.971	(0.57 to 1.71)
Model C						
Sex (Female)	1.05	0.806	(0.71 to 1.56)	1.36	0.134	(0.91 to 2.02)
Top qualification						
Degree	1			1		
Other	0.61	0.047	(0.37 to 0.99)	0.97	0.901	(0.62 to 1.53)
No qualifications	0.95	0.845	(0.55 to 1.63)	1.00	0.986	(0.58 to 1.75)
Marital Status						
Single	1			1		
Married	1.04	0.869	(0.67 to 1.61)	0.81	0.375	(0.50 to 1.30)
	0.71	0.473	(0.28 to 1.82)	0.73	0.568	(0.25 to 2.12)
Separated/widowed/ divorced						
Children under 16 in the household	**1.86**	**0.006**	**(1.19 to 2.91)**	1.01	0.966	(0.64 to 1.59)

9.5 Discussion

Consistent with findings that suggest a social gradient in non-drinking (31, 34, 83, 85, 86, 189), those with no educational qualifications were also most likely to be ex-drinkers (non) and ex-drinkers (SO) at 33, 42 and 50 years consistently in every model using the NCDS. It has already been shown that people who do not drink in early adulthood are more likely to have no qualifications (31) and by separating ex-drinkers and lifetime abstainers this has shown that lower education qualifications is additionally associated with these specific types of non-drinkers. This was not unexpected given the higher rates of having no qualifications and belonging to the lowest social class among ex-drinkers found in Chapter 7.

In addition having no qualifications was also associated with being a lifetime abstainer at age 33 and 42, despite highest qualifications having no bi-variate association with lifetime abstention at age 42. Among male lifetime abstainers at age 42, 26.3% had no qualifications compared with 16.0% of female lifetime abstainers, by adjusting for sex the relationship between no qualifications and lifetime abstention was emphasised since male lifetime abstainers have much higher rates of having no qualification than drinkers, compared with females. This relationship was found for both ex-drinkers and lifetime abstainers at age 33 again complimenting findings from the Health Survey for England which showed that the social gradient in non-drinking was present in early adulthood. Although we already know that a social gradient exists among non-drinkers, this analysis shows that this also applies to lifetime abstainers and ex-drinkers separately at different stages in life, which may contribute to health disadvantage relative to drinkers in older ages. Early life social position has been found a strong determinant of health in later life and since lifetime abstainers and ex-drinkers has lower social position than drinkers (131) across the life course this could be why non-drinkers consistently have worse health outcomes than drinkers across a broad range of conditions, since they are consistently more disadvantaged.

Studies using a life course framework has shown that early life social position has an impact on health later on in life (116, 131), and this chapter shows that

both ex-drinking and lifetime abstention appears to be socially patterned early on in life, where often middle age cohorts which show a J-shaped pattern do not have information on early life social position to adjust for. Furthermore social position in later life has been found to be difficult to measure due to changes in occupational status and income among those in retirement (190) and therefore adjusting for social position later in life may not correctly account for social disadvantage throughout the life course. In light of this how father's social class at birth, one of the earliest measures of social position, varied among ex-drinkers or lifetime abstainers compared with drinkers was assessed in Chapter 7. Here differences were found for ex-drinkers only, where a higher proportion had a father who was in the lowest social class; no clear difference for lifetime abstainers compared with drinkers were found in this cohort (although there was an bi-variate association found with lifetime abstainers and father's social class in the BCS70). Further research is needed as to why non-drinking is socially patterned in early adulthood and across the life course, which may be a factor related to lower incomes or different social norms among people from lower social groups. Early life social disadvantage among non-drinkers may increase the risk of early life mortality, cognitive decline and risk of coronary heart disease which may contribute to their worse outcomes compared with drinkers found in later life. It may also be why non-drinkers consistently have worse outcomes than drinkers across a broad range of conditions.

Associations were also found among those with less than a degree and those with no qualifications and those who reduced consumption to occasional drinking at 33, 42 and 50 years even after adjusting for sex, marital status and children in the household. This implies that it is those with a degree are more likely to sustain drinking over three decades from early adulthood; whether this is heavy or moderate drinking requires further analysis. As outlined in the literature review section 2.3.1.1, it is possible that going to university is a rite of passage to drinking with many establishing drinking habits among peers which continues among graduates in the work environment, being more likely to sustain alcohol consumption through the life course. It could also be the case that higher disposable incomes among graduates makes drinking and activities

which involve drinking more affordable, unfortunately income is not adjusted for in this analysis due to the limited degrees of freedom within the model to adjust for income where there are also methodological differences in the way it is derived each year and large number of missing values. The level of drinking that is sustained among different educational levels, whether it is graduates who sustain moderate or heavy drinking, is an area of further analysis which is beyond the scope of this thesis. Alternatively people who quit drinking or never started drinking may have done so because of poor health or problems related to alcohol, and these people may be more likely to have lower qualifications. The fully adjusted model in Chapters 11 and 12 will adjust for health to see whether education still has an independent association outside of health.

No other social or demographic variable was significant for lifetime abstainers or 'lifetime abstainers' (SI) in the BCS70. This inconsistency between the BCS70 and NCDS may be a factor of the smaller sample size of the BCS70, where data at 26 years was recorded through a postal questionnaire or alternatively a reflection of a change between the cohorts. In light of this descriptive analysis was carried out the raw sample of self-identified 'lifetime abstainers' at age 34 which did not depend on data using consecutive waves and so suffered from fewer issues to do with attrition (Appendix D). Unlike the models in this chapter, the difference between males and females in the raw sample was statistically significant (p=0.003) where a slightly lower proportion of males were self-identified 'lifetime abstainers' (37.8% compared with 36.4% in Table 7.8). These differences between findings from the raw sample at age 34 (N=9,635) compared with using consecutive waves of data (N=5,960), show that the non-significant finding between sex and lifetime abstention in models here are likely to be due to a loss of sample power due to attrition which is a major limitation of this analysis. However the same difference between the raw sample and the sample used in regression models was not found with measures of social position. Although attrition within the BCS70 has been found to be greater for males who are more disadvantaged (166), no significant association between highest qualification and social class and self-identified 'lifetime

abstainers' at age 34 was found in the raw sample (Appendix D), or the sample used in regression analysis. This means the non-significant finding for sex in regression models may be due to attrition, the same cannot be said with highest educational qualification since the non-significant relationship with highest educational qualification was the same using both cohorts.

Although having said this, results are inconsistent with the NCDS where there was an association with having no qualifications and lifetime abstention which requires further investigation. One factor behind this may be the use of education and the higher number of people with degrees in the latter cohort (Table 5.1, section 5.2.3) since a different measure of social position; father's social class at birth did have a bi-variate association with self-identified 'lifetime abstention' in the BCS70 (Table 7.9 and Appendix D). Another factor is the small sample size of lifetime abstainers which reduces power to detect differences in the population. The anomaly did not apply to non-drinkers as a whole in the BCS70 where having no qualifications was associated with being a non-drinker in the raw sample, a consistent finding with the NCDS (Appendix D) and other studies which show a social gradient in non-drinking (31, 83, 84, 86).

9.5.1 Limitations

As mentioned in the previous paragraph a major limitation of this analysis particularly with the BCS70 is missing data, which meant that the sample could not detect difference between male and females and lifetime abstention. The use of education to measure social position may also have been an issue in the differences found between the NCDS and BCS70, since a greater number of people had a degree in the latter cohort than the NCDS, and each suffered greater attrition from people who were more socially disadvantaged. Consistently between the two cohorts, having no qualifications was associated with being a non-drinker as a whole (ex-drinkers and lifetime abstainers), thus the inconsistency with lifetime abstainers may be an issue to do with their small sample size, although having the lowest father's social class at birth was significant in the BCS70 indicating that lifetime abstainers were more

disadvantaged than drinkers in childhood along this measure making it essential to adjust for a measure of social position.

This also highlights another limitation of using education as a measure of lower social position in preference of other measures such as social class, social class at birth, or income. Furthermore the small sample size of lifetime abstainers and ex-drinkers made it difficult to include more than one measure of socio-economic position. As mentioned in section 5.5.2, a substantive interest in the role of education (in particular attending particular institutions) motivated the decision to adjust for education, as well as this variable suffering less from missing data. However other studies may wish to use different measures such as father's social class at birth which was associated with ex-drinking in the NCDS and self-identified 'lifetime abstainers' in the BCS70, which may account for some of the higher risk of morbidity found in later life. In the BCS70 when replacing education with father's social class at birth in regression models, this was not significant, and made no difference to the association between persistent longstanding illness and persistent non-drinking, the hypothesis central to this thesis in all models (Appendix E). Therefore the use of education as oppose to father's social class in the final model did not affect findings.

Although analysis in Appendix E shows that those with poor health from an *early age* are more likely to be lifetime abstainers even after accounting for father's social class at birth; this does not rule out that father's social class at birth may influence worse morbidity in *later life* via a more disadvantaged early life enviornment, and may be greater if combined with early life poor health and persistent poor health.

9.6 Summary and conclusion

- Having no qualifications was associated with being a lifetime abstainer, ex-drinker (non) and ex-drinker (SO) after adjusting for demographic factors at each time point assessed in the NCDS

- Having qualifications below degree level was also associated with reducing consumption to occasional drinking at 33 and 42 years in the NCDS
- Education was not significant with the BCS70 however father's social class at birth had a bi-variate association with self-identified 'lifetime abstainers' at age 34.

Consistent with the social gradient in non-drinking those with no educational qualifications were more likely to be lifetime abstainers or ex-drinkers. This finding was robust and existed in every model even after adjusting for demographic factors using the NCDS It was also found that those with less than a degree were more likely to have reduced their consumption to occasional drinking at 33, 42 and 50 years after adjusting for demographic factors suggesting that those with a degree are more likely to sustain drinking across the life course. Education was not significantly associated with lifetime abstention in the BCS, which may be a limitation of the smaller size and attrition from those who were more disadvantaged. However father's social class at birth did have a bi-variate association with lifetime abstainers indicating that this group were more disadvantaged and that care should be taken in assessing the past social circumstances of non-drinkers in later life, using a range of different measures. In conclusion lifetime abstainers and ex-drinkers appear to have lower education than drinkers in early adulthood and across the lifecourse. Early life social position may influence poor health in later life, therefore studies which use non-drinkers as a reference group in later life may need to take into account early life social position, since accounting for social position in later life may not fully capture disadvantage across the life course.

10. The relationship between poor psychosocial health, ex-drinking and lifetime abstention

10.1 Abstract

Aims: The aim of this chapter is to examine the relationship poor psychosocial health and being an ex-drinker and lifetime abstainer.

Methods: Descriptive analysis is carried out on items on the malaise inventory comparing ex-drinkers, lifetime abstainers and drinkers. Secondly separate binary logistic regression models are produced on the odds of being a lifetime abstainer at age 33 and 42, and ex-drinker at age 33, 42 and 50 using the NCDS dependent on poor psychosocial health as measured by the malaise inventory, adjusting for sex, education, marital status and children in the household. The same analysis is repeated for lifetime abstainers and self-identified 'lifetime abstainers' in the BCS70 at age 30 and 34.

Results: Poorer psychosocial health increased the odds of being an ex-drinker (non) at age 33 (OR 1.56, 95% CI 1.02-2.38), age 42 (2.66, 1.22-2.09) and age 50 (2.18, 1.64-2.89) and an ex-drinker (SO) at age 42 (1.43, 1.12-1.82) and 50 (1.75, 1.34-2.28). Poor psychosocial health was associated with being a lifetime abstainers at age 30 in the BCS70 only (1.64, 1.05-2.56). However lifetime abstainers scored greater on items related to low sociability compared with drinkers. 10.4% of lifetime abstainers reported being 'frightened of going out alone or of meeting people' compared with 4.6% of drinkers.

Conclusion: Ex-drinkers suffer have worse psychosocial health than drinkers across the life course. Lifetime abstainers did not have worse psychosocial health, however scored higher on traits related to social anxiety compared with drinkers. Poorer psychosocial health may contribute to the worse health status of non-drinkers in later life.

10.2 Background

Non-drinkers have been found to have poorer psychosocial health than drinkers (95, 97, 170) and these associations have been found to exist in early adulthood (46, 94, 99-101) (see section 2.3.1.2 for a more in-depth discussion). Chapter 4 showed an association between anxiety and depression among male non-drinkers aged 18 to 34 years. Chapter 7 showed that ex-drinkers at age 42, had higher rates of having a high score on the malaise inventory than drinkers at age 23, 33 and 42, whilst for lifetime abstainers this was significant at age 23 only (Table 7.8). This chapter will investigate whether there is an association between poor, psychosocial health in the form of the malaise inventory score, and being an ex-drinker or lifetime abstainer.

Crude descriptive findings on individual items of the malaise inventory score is carried out to provide further detail on the understanding of how psychosocial health may vary among these different types of non-drinkers. The same analysis is carried out on lifetime abstainers at age 33 and 42 in the National Child Development Study (NCDS), and age 30 and 34 in the 1970 British Cohort Study (BCS70). This is done prior to including self-reported health in the model, as self-reported health and poor psychosocial health are known to be related (111) therefore this chapter examines the independent effects of poor psychosocial health. Poor psychosocial health of ex-drinkers and lifetime abstainers may be a contributory factor in their worse health outcomes in later life for example poor mental health may contribute to worse cognitive functioning in later life, which has been found to be worse for non-drinkers compared with drinkers (20, 21). Since psychosocial health and physical health are potentially related the effect of psychosocial health on its own is examined ahead of including limiting longstanding illness into the model.

10.3 Methods

Given the literature on non-drinkers the following hypotheses was investigated:

Poor psychosocial health is associated with being a lifetime abstainer

Poor psychosocial health is associated with being an ex-drinker

Following from this a higher percentage of ex-drinkers and lifetime abstainers than drinkers will answer yes to items on the malaise inventory

This hypothesis will be tested through the following analyses:

- Descriptive analysis on items of the malaise inventory score will be provided for ex-drinkers (non), ex-drinkers (SO) and lifetime abstainers at age 33 in the NCDS. Chi-squared tests will be conducted to observe whether there is a bi-variate association between the item and type of non-drinker compared with drinkers
- Logistic regression to examine associations between poor psychosocial health as measured by a high score on the malaise inventory, on ex-drinking and lifetime abstention adjusted for sex only (Model A), and then adjusted for social and demographic factors (Model B). (See section 5.5.1 for a detailed explanation of the malaise inventory score)
- This analysis is performed using ex-drinkers in separate models at ages 33, 42 and 50 using the NCDS.
- For lifetime abstainers analysis is carried out in separate models at ages 33 and 42 in the NCDS, and age 30 and 34 in the BCS70

10.4 Results

10.4.1 Individual items on the Malaise inventory score

Table 10.1 presents items on the malaise inventory score for ex-drinkers and lifetime abstainers and drinkers. Ex-drinkers (non), at 33 years have higher levels of poorer psychosocial health, having a statistically significant difference to drinkers on 19 of the 24 items. This includes getting into a violent rage, finding people annoying and twitching in the face, head or shoulders.

Symptoms of anxiety and depression were evident among this group with 39.0% claiming they often get worried about things and 15.4% often feeling miserable or depressed, compared with 32.1% and 10.9% of all 33 year olds with drinking records at age 23.

Ex-drinkers (SO), those who reduced their consumption to special occasion drinking, whilst drinking more in the previous wave, had statistically different associations from the drinkers son 10 of the 24 items. These included items that indicated psychological difficulties for example more worried about things (37.3%, (drinkers)=32.1%), feeling miserable or depressed (14.0%, drinkers=10.9%), or being easily upset or irritated (18.3%, drinkers=15.6%), and fewer items on the measures of physical symptoms of depression, in other words the somatic scale (items 1, 4, 11, 17, 18, 22 and 23) (172), with the exception of often having back-ache (27.5%, drinkers=24%) and bad headaches (20.2%, drinkers=14.4%).

Lifetime abstainers had lower rates on items on the malaise inventory being only statistically different from drinkers on five out of the 24 items. These included often getting bad headaches (23.8%, drinkers=14.4%), being scared to be alone when no friends near (6.7%, drinkers=3.0%), being frightened of meeting new people (10.4%, drinkers=4.8%), being constantly keyed up and jittery (6.7%, drinkers=3.4%) and having a heart that often races like mad (9.1%, drinkers=5.4%). Unlike ex-drinkers they did not score higher than the average on feeling miserable or depressed or being worried about things.

Table 10.1 Items on the malaise score by types of non-drinkers at 33 years and chi-sqaured test, NCDS

		Ex-drinkers (Non)			Ex-drinkers (SO)			Lifetime abstainers			Drinkers	
		%	n	p-value	%	n	p-value	%	n	p-value	%	N
			228			897			164			9126
	Items on the malaise inventory											
1	**Do you often have backache?**	**33.8**	**77**	**p<0.001**	**27.5**	**247**	**0.005**	23.8	39	0.954	24.0	2188
2	**Do you feel tired most of the time?**	**28.9**	**66**	**p<0.001**	**25.5**	**229**	**p<0.001**	21.3	35	0.309	18.2	1663
3	**Do you often feel miserable or depressed?**	**15.4**	**35**	**0.025**	**14**	**126**	**0.001**	10.4	17	0.812	10.9	997
4	**Do you often have bad headaches?**	**25.9**	**59**	**p<0.001**	**20.2**	**181**	**p<0.001**	23.8	39	0.001	14.3	1301
5	**Do you often get worried about things?**	39.0	89	0.02	**37.3**	**335**	**p<0.001**	32.9	54	0.816	32.0	2924
6	Do you usually have great difficulty in falling or staying asleep?	**15.4**	**35**	**0.048**	11.3	101	0.954	11.6	19	0.911	11.3	1031
7	Do you usually wake unnecessarily early in the morning?	20.6	47	0.056	18.1	162	0.06.0	14.6	24	0.628	16.0	1462
8	**Do you wear yourself out worrying about your health?**	**6.6**	**15**	**p<0.001**	3.2	29	0.275	4.3	7	0.243	2.8	253
9	Do you often get into a violent rage?	5.7	13	0.278	5.4	48	0.085	3.7	6	0.894	4.3	391
10	Do people often annoy and irritate you?	24.6	56	0.144	22.9	205	0.071	25.6	42	0.124	20.6	1884

Continued…

		Ex-drinkers (Non)			Ex-drinkers (SO)			Lifetime abstainers			Drinkers	
		%	n	p-value	%	n	p-value	%	n	p-value	%	N
11	Have you at times had a twitching of the face, head of shoulders?	9.6	22	0.104	7.6	68	0.42	7.9	13	0.633	7.0	639
12	**Do you often suddenly become scared for no good reason?**	**8.8**	**20**	**0.002**	5.0	45	0.358	6.7	11	0.291	4.5	413
13	**Are you scared to be alone when there are no friends near you**?	4.8	11	0.084	**4.3**	**39**	**0.006**	**6.7**	**11**	**0.005**	**2.9**	269
14	**Are you easily upset or irritated?**	**21.5**	**49**	**0.009**	**18.3**	**164**	**0.009**	20.7	34	0.066	15.5	1412
15	**Are you frightened of going out alone or of meeting people?**	**13.2**	**30**	**p<0.001**	**6.4**	**57**	**0.005**	**10.4**	**17**	**0.001**	4.7	425
16	**Are you constantly keyed up and jittery?**	**7.5**	**17**	**0.002**	3.9	35	0.512	**6.7**	**11**	**0.037**	3.3	303
17	**Do you suffer from indigestion?**	**17.5**	**40**	**0.025**	12.7	114	0.908	15.2	25	0.338	12.7	1161
18	**Do you suffer from an upset stomach?**	**14**	**32**	**0.014**	8.4	75	0.295	11	18	0.510	9.4	862
19	**Is your appetite poor?**	**7**	**16**	**0.002**	2.7	24	0.301	4.9	8	0.285	3.4	306
20	**Does every little thing get on your nerves and wear you out?**	**5.7**	**13**	**0.002**	3.3	30	0.081	3	5	0.689	2.6	234
21	**Does your heart often race like mad?**	**8.3**	**19**	**0.038**	5.4	48	0.921	**9.1**	**15**	**0.032**	5.4	489
22	**Do you often have bad pains in your eyes?**	**7.5**	**17**	**0.002**	4.3	39	0.218	5.5	9	0.236	3.7	339
23	**Are you troubled with rheumatism or fibrosis?**	**7**	**16**	**0.015**	**5.1**	**46**	**0.040**	4.9	8	0.550	4.0	361
24	**Have you ever had a nervous breakdown?**	**6.6**	**15**	**p<0.001**	**3.2**	**29**	**0.027**	4.3	7	0.101	2.3	211

-p-value corresponds to bi-variate chi2 tests using complete case sample in logistic regression models

10.4.2 Logistic regression

The following tables present results from logistic regression on the odds of being a lifetime abstainer, ex-drinker (non) and an ex-drinker (SO)

Model A shows the effect of scores on the malaise inventory adjusted for sex only

Model B shows the effect of scores on the malaise inventory adjusted for sex, education, marital status and children in the household

10.4.2.1 Ex-drinkers

Table 10.2 shows the odds of being an ex-drinker (non) and poor psychosocial health, adjusted for sex only, and then adjusted for education and demographic factors respectively. Being recorded as having poor psychosocial health (having a score of 8 or more on the malaise inventory) was associated with more than double the odds of being an ex-drinker at age 33 (OR 1.75, 95% CI 1.16 to 2.65), 42 (OR 3.02, 95% CI 2.28 to 4.01) and 50 (OR 2.51, 95% CI 1.90 to 3.31) adjusting for sex only. The association remained significant after adjusting for highest qualification, marital status and children under 16 years in the household at age 33 (OR 1.56 95% CI 1.02 to 2.38), 42 (OR 2.66, 95% CI 2.00 to 3.54) and 50 (OR 2.18, 95% CI 1.64 to 2.89) although the magnitude of the effect was reduced.

Table 10.2 Logistic regression model on the odds of being an ex-drinker (non) and poor psychosocial health, NCDS

	1991			**2000**			**2008**		
	33 Years (N=9126)			**42 Years (N=9457)**			**50 Years (N=8701)**		
	OR	p-value	(95% CI)	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Model A									
Sex (Female)	**2.32**	**<0.001**	**(1.73 to 3.11)**	**1.55**	**0.001**	**(1.19 to 2.01)**	**1.66**	**<0.001**	**(1.27 to 2.17)**
High malaise score	**1.75**	**0.008**	**(1.16 to 2.65)**	**3.02**	**<0.001**	**(2.28 to 4.01)**	**2.51**	**<0.001**	**(1.90 to 3.31)**
Model B									
Sex (Female)	**2.46**	**<0.001**	**(1.83 to 3.31)**	**1.60**	**0.001**	**(1.22 to 2.09)**	**1.69**	**<0.001**	**(1.29 to 2.21)**
Malaise score (High)	**1.56**	**0.039**	**(1.02 to 2.38)**	**2.66**	**<0.001**	**(2.00 to 3.54)**	**2.18**	**<0.001**	**(1.64 to 2.89)**
Highest qualification									
Degree	1			1			1		
Other	1.11	0.649	(0.71 to 1.74)	1.28	0.233	(0.85 to 1.91)	**1.59**	**0.027**	**(1.06 to 2.41)**
No qualifications	**2.20**	**0.002**	**(1.33 to 3.64)**	**1.96**	**0.004**	**(1.24 to 3.09)**	**3.05**	**<0.001**	**(1.95 to 4.77)**
Marital Status									
Single	1			1			1		
Married	0.91	0.637	(0.60 to 1.36)	**0.51**	**0.001**	**(0.35 to 0.76)**	**0.65**	**0.033**	**(0.44 to 0.97)**
Separated/Widowed/Divorced	0.74	0.252	(0.77 to 1.24)	0.83	0.362	(0.55 to 1.25)	0.93	0.736	(0.60 to 1.43)
Children in household	0.86	0.391	(0.60 to 1.22)	0.88	0.428	(0.63 to 1.21)	0.82	0.266	(0.58 to 1.16)

Table 10.3 Logistic regression model on the odds of being an ex-drinker (SO) and poor psychosocial health, NCDS

	1991			**2000**			**2008**		
	33 Years (N=8898)			**42 Years (N=9208)**			**50 Years (N=8429)**		
	OR	p-value	(95% CI)	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Model A									
Sex (Female)	**1.88**	**<0.001**	**(1.63 to 2.18)**	**1.72**	**<0.001**	**(1.43 to 2.06)**	**1.75**	**<0.001**	**(1.39 to 2.21)**
Malaise score (High)	**1.36**	**0.017**	**(1.06 to 1.74)**	**1.54**	**<0.001**	**(1.21 to 1.95)**	**1.86**	**<0.001**	**(1.43 to 2.41)**
Model B									
Sex (Female)	**1.81**	**<0.001**	**(1.56 to 2.09)**	**1.72**	**<0.001**	**(1.43 to 2.07)**	**1.82**	**<0.001**	**(1.44 to 2.30)**
Malaise score (High)	1.27	0.067	0.98 to 1.64)	**1.43**	**0.040**	**(1.12 to 1.82)**	**1.75**	**<0.001**	**(1.34 to 2.28)**
Highest qualification									
Degree	1			1			1		
Other	**1.95**	**<0.001**	**(1.48 to 2.57)**	**1.59**	**0.020**	**(1.19 to 2.12)**	1.35	0.071	(0.98 to 1.86)
No qualifications	**2.53**	**<0.001**	**(1.85 to 3.46)**	**2.11**	**<0.001**	**(1.50 to 2.95)**	**2.26**	**<0.001**	**(1.55 to 3.27)**
Marital Status									
Single	1			1			1		
Married	0.83	0.108	(0.65 to 1.04)	0.82	0.210	(0.60 to 1.12)	0.89	0.524	(0.61 to 1.28)
Separated/Widowed/divorced	**0.66**	**0.006**	**(0.49 to 0.89)**	0.87	0.410	(0.62 to 1.22)	0.74	0.177	(0.49 to 1.14)
Children in household	**1.62**	**<0.001**	**(1.32 to 1.98)**	1.00	0.960	(0.79 to 1.28)	1.03	0.858	(0.78 to 1.35)

Table 10.3 shows the odds of being an ex-drinker (SO) and malaise score, adjusted for sex in model A, and then adjusted for education and demographic factors, respectively in Model B. Similarly statistical significant associations were found between having poor psychosocial health and reducing to occasional drinking at age 33 (OR 1.36, 95% CI 1.06 to 1.74), 42 (OR 1.54, 95% CI 1.21 to 1.95) and 50 years (OR 1.86, 95% CI 1.43 to 2.41) although the effect was smaller than for those who reduced their consumption to non-drinking at each wave. Associations between poor psychosocial health and reducing consumption to occasional drinking was significant at age 42 (OR 1.43, 95% CI 1.12 to 1.82) and 50 (OR 1.75, 95% CI 1.34 to 2.28) when adjusting for sex, highest qualification, marital status, marital and children under 16 in the household. However no association between having a high malaise score and reducing to occasional drinking was found at age 33.

1.1.1.1 Lifetime abstainers

Table 10.4 shows the odds of being lifetime abstainer in the NCDS. A high malaise score was associated with being a lifetime abstainer at 42 years only adjusting for sex (OR 1.62 95% CI 1.02 to 2.58); however this was no longer significant when adjusting for highest qualification, marital status and children under 16 in the household.

Table 10.4 Odds ratio of being of being a lifetime abstainer and psychosocial health, NCDS

	1991			**2000**		
	33 Years (N=9290)			**42 Years (N=8448)**		
	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Model A						
Sex (Female)	**1.93**	**<0.001**	**(1.38 to 2.69)**	**1.88**	**0.001**	**(1.28 to 2.78)**
Malaise score (High)	1.31	0.322	(0.77 to 2.25)	**1.62**	**0.039**	**(1.02 to 2.58)**
Model B						
Sex (Female)	**2.02**	**<0.001**	**(1.44 to 2.83)**	**1.95**	**0.001**	**(1.32 to 2.89)**
Malaise score (High)	1.27	0.396	(0.72 to 2.20)	1.59	0.053	(0.99 to 2.53)
Highest qualification						
Degree	1			1		
Other	1.25	0.420	(0.73 to 2.12)	1.56	0.142	(0.86 to 2.81)
No qualifications	**1.98**	**0.027**	**(1.08 to 3.62)**	1.97	0.054	(0.99 to 3.95)
Marital Status						
Single	1			1		
Married	0.89	0.658	(0.55 to 1.45)	0.88	0.678	(0.48 to 1.62)
Separated/ Widowed/ Divorced	**0.45**	**0.029**	**(0.22 to 0.92)**	**0.42**	**0.033**	**(0.19 to 0.94)**
Children in household	0.95	0.803	(0.62 to 1.44)	0.90	0.693	(0.55 to 1.49)

Table 10.5 shows the odds of being a lifetime abstainer in the BCS70. Having poor psychosocial health measured by answering yes to more than 8 items on the malaise inventory, was significantly associated with being a lifetime abstainers at 30 years adjusting for sex only (OR 1.56, 95% CI 1.01 to 2.42) and then adjusting for highest qualification, marital status and presence of children in household (OR 1.64, 95% CI 1.05 to 2.56). There were no statistically significant associations at 34 years.

Table 10.5 Logistic regression on the odds being a lifetime abstainer and poor psychosocial health, BCS70

	2000			**2004**		
	30 years (N=6809)			**34 years (N=5960)**		
	OR	p-value	(95% CI)	OR	p-value	(95% CI)
Model A						
Sex (Female)	1.01	0.944	(0.73 to 1.40)	0.87	0.469	(0.60 to 1.26)
Malaise score (High)	**1.56**	**0.046**	**(1.01 to 2.42)**	1.27	0.357	(0.77 to 2.09)
Model B						
Sex (Female)	0.96	0.831	(0.69 to 1.34)	0.86	0.435	(0.59 to 1.26)
Malaise score (High)	**1.64**	**0.028**	**(1.05 to 2.56)**	1.26	0.363	(0.76 to 2.09)
Highest qualification						
Degree	1			1		
Other	0.74	0.151	(0.49 to 1.12)	0.91	0.679	(0.58 to 1.42)
No qualifications	0.86	0.528	(0.53 to 1.38)	1.07	0.798	(0.63 to 1.82)
Marital Status						
Single	1			1		
Married	1.28	0.193	(1.05 to 2.56)	0.86	0.526	(0.53 to 1.38)
Separated/ Widowed/ Divorced	0.77	0.533	(0.35 to 1.72)	0.76	0.618	(0.26 to 2.21)
Children in household	1.30	0.170	(0.89 to 1.88)	1.23	0.368	(0.78 to 1.93)

Table 10.6 shows the odds of being a lifetime abstainer (SI) in the BCS70 and malaise score adjusted for sex in model A, and then adjusted for education and demographic factors in model B using the BCS70. No statistically significant associations were found between having a high malaise score at 30 or 34 years. Only having a child in the household was statistically significantly associated with reporting being a self-identified lifetime abstainer at 30 years (OR 1.85, 95% CI 1.18 to 2.90).

Table 10.6 Logistic regression on the odds being a lifetime abstainer (SI) and psychosocial health, BCS70

	2000			**2004**		
	30 years (N=6834)			**34 years (N=5986)**		
	Odds Ratio	p-value	(95% CI)	Odds Ratio	p-value	(95% CI)
Model A						
Sex (Female)	1.11	0.608	(0.75 to 1.63)	1.30	0.196	(0.88 to 1.97)
High Malaise score	1.34	0.276	(0.79 to 2.31)	1.44	0.141	(0.89 to 2.33)
Model B						
Sex (Female)	1.03	0.866	(0.70 to 1.53)	1.32	0.174	(0.88 to 1.97)
High Malaise score	1.36	0.273	(0.79 to 2.34)	1.44	0.145	(0.88 to 2.33)
Highest qualification						
Degree	1			1		
Other	**0.60**	**0.042**	**(0.36 to 0.98)**	0.96	0.843	(0.61 to 1.50)
No qualifications	0.92	0.759	(0.53 to 1.58)	0.97	0.928	(0.56 to 1.70)
Marital Status						
Single	1			1		
Married	1.06	0.801	(0.68 to 1.64)	0.81	0.394	(0.51 to 1.31)
Separated/ Widowed/ Divorced	0.70	0.455	(0.27 to 1.79)	0.73	0.557	(0.25 to 2.11)
Children in household	**1.85**	**0.007**	**(1.18 to 2.90)**	1.01	0.954	(0.64 to 1.59)

10.5 Discussion

Poor psychosocial health as measured by the malaise inventory score is associated with reducing consumption to non-drinking at 33, 42 and 50 years whilst adjusting for social and demographic factors among adults born in Great Britain in 1958. To a lesser extent associations were found between reducing

consumption to occasional drinking and depression at 42 and 50 years adjusting for the same factors. Contrary to what was hypothesised there was no association between having poor psychosocial health and lifetime abstention in the NCDS, or reporting being a 'lifetime abstainer' (SI) in the BCS70 in any of the fully adjusted models. In the BCS70 however having a high malaise score was associated with being a lifetime abstainer at 30 years only among adults born in 1970, whilst adjusting for education and demographic factors.

Results were consistent with other studies which show that ex-drinkers suffer from poorer mental health than drinkers and even heavy drinkers (95) and lifetime abstainers (95, 97). Poorer mental health may have a direct effect on stopping consumption via medication since prescribed medication for depression has side effects when combined with alcohol such as drowsiness, dizziness and may even exaggerate the feeling of depression among young people, also alcohol may inhibit or exacerbate the effects of medication and therefore is to be avoided (99, 187). Alternatively poorer mental health may occur as an effect of stopping drinking, this may be particularly the case for those who use alcohol to relieve stress. Whilst this may be the case for a few cases such a finding should not be read in favour of drinking alcohol to cope with stress, as drinking in relation to chronic stress and stressful life events has been found to be associated with heavy and problematic drinking (189, 191). Furthermore a high proportion of problematic drinkers, whom are known to give up alcohol consumption in order to deal with their addiction, have a dual diagnosis of a mental illness (98) therefore the association may be related to existing underlying mental health issues that prompted the problematic drinking in the first place.

Lifetime abstainers had higher than average on only 5 out of the 24 items on the malaise inventory in the NCDS so as expected there was a minimal association in the regression models. However the items that were significantly different to the average appear to relate to sociability such as 'being frightened of meeting new people' and 'being scared to be alone with no friends near' which is consistent with other studies which find abstainers to be less sociable and have lower confidence and are more dependent on others (99, 104)

In addition almost a quarter of lifetime abstainers up to 33 years (23.8%) claimed they suffer from bad headaches, an item on the malaise inventory, compared to 14.4% of the sample's average. This was also high among those who reduced consumption to non-drinking (25.9%) and occasional drinking (20.2%). This is consistent with descriptive findings in Chapter 8 were 36.4% of special occasion drinkers reported suffering from migraines since they were aged 16, at age 26, compared with 29.6% of the average (Table 8.2). Suffering from frequent severe headaches or migraines may be a plausible reason why someone chooses not to drink alcohol due to the side effects such as hangovers which are likely to exacerbate headaches. Caution must be heeded when interpreting descriptive results and there could be correlation with other items, but perhaps this is an area for future investigation.

This Chapter finds that high scores on the malaise inventory were associated with stopping drinking after adjusting for education, marital and parental status, and this was stronger for those who reduced their consumption to non-drinking than occasional drinking. As mentioned earlier medication for depression may also be a direct factor in the decision not to drink alcohol, alternatively people who develop problematic drinking and have to stop drinking may have had underlying mental health issues that influenced problematic drinking to begin with. No association was found with lifetime abstention in similar models. Upon further inspection statistically significant different scores for lifetime abstainers were found on the malaise inventory with items related to low sociability. Low sociability may be a cause of why someone never takes up drinking in the first place and this may be an established personality trait in adolescence whilst poorer psychosocial health may come and go and develop later on in life which may be a reason for its association with stopping drinking and prompting a lifestyle behaviour change. This draws out a distinction between ex-drinkers and lifetime abstainers; ex-drinkers have worse mental health overall which may include depression, while lifetime abstainers have traits related to social anxiety. This might be why associations were found with the composite measure 'anxiety and depression' and non-drinkers in young adulthood using the Health Survey for England in Chapter 4.

The worse mental health of non-drinkers may be a factor contributing to their worse health outcomes relative to drinkers in later life. A study comparing cardiovascular outcomes of drinkers compared with non-drinkers attempted to account for psychosocial factors by adjusting for them in their models; however concluded that psychosocial health was not enough to explain the better cardiovascular outcomes among moderate drinkers (111). However studies have found that early life poorer mental health and cumulative poorer mental health has been related to increased risks of cognitive decline and dementia (192, 193) which could account for the greater risk found among non-drinkers in later life compared with drinkers (20, 21)which these studies do not adjust for.

Poor physical health as hypothesised in this thesis as being a pathway to never starting drinking and stopping may result in worse mental health therefore may be acting as a confounder. The next chapter explores the role of limiting longstanding illness in relation to mental health, education and demographic and social factors on lifetime abstention and ex-drinking. While poor psychosocial health at the time of the model had no relationship with lifetime abstention in the NCDS, there was a bi-variate association found with lifetime abstainers at age 42 and previous psychosocial health at age 23 (Table 7.8), which may have co-occurred with the early life health condition that prevented drinking in the first place. To investigate this further research is needed on more complex pathways between mental health and health and non-drinking, taking into account lower social position, which is beyond the scope of this thesis

11.4.1 Limitations

A limitation of this analysis is the lower number of question asked at age 50 in the NCDS. Only 9 questions were asked at age 50 in the NCDS resulting in a lower cut off of four ‘yes’ items for poor psychological health. The 8 item questionnaire has been found to be less reliable than the full 24 item questionnaire (172) thus findings cannot be directly compared with preceding years However these do not include any items on the somatic scale where at older ages physical symptoms are likely to be more of an issue therefore may be

a more valid measure of mental health at older ages (172). Also a limitation of this measure is the inability to separate anxiety and depression from the psychosocial health measure and this should be done in future analysis that aimed to sharpen the distinction between the mental health of ex-drinkers and lifetime abstainers. Analysis of missing data in Chapter 6 also found higher drop out from people with a high score on the malaise inventory which may reduce power to detect associations.

10.6 Summary and Conclusion

- Poor psychosocial health increased the odds of being an ex-drinker (non) at all-time points
- To a lesser extent poor psychosocial health was also associated with being an ex-drinker (SO) at 42 and 50 years only
- An association between poor psychosocial health was found with lifetime abstention in the BCS70 at 30 years only after adjusting for sex and demographic factors.

Ex-drinkers (non) had the worst psychosocial health at all time points, followed by ex-drinkers (so) at age 42 and 50 while contrary to what was hypothesised poor psychosocial health had no effect on lifetime abstention. Upon inspection lifetime abstainers had higher rates than average on only 5 items of the malaise inventory only, and these items appeared to relate to social anxiety. Ex-drinkers may suffer from worse psychosocial health in general while lifetime abstainers may suffer from worse psychosocial health related to anxiety, as demonstrated by their higher response to items on the malaise inventory related to problems with sociability. Studies that compare the health outcomes between drinkers and non-drinkers need to account for psychosocial health, particular in conditions where early life poor psychosocial health is likely to have an influence such as cognitive decline and dementia.

11. Sick-quitters; the effect of developing a limiting longstanding illness (final model)

11.1 Abstract

Aims: Ex-drinkers are known to suffer from worse health than drinkers however whether a simultaneous change in health is associated with a change in drinking status to non or occasional drinking from early adulthood has not been directly investigated before.

Methods: Binary logistic regression was used to assess whether a change in limiting longstanding illness (LLSI) across two waves was associated with a simultaneous reduction in consumption to non-drinking in separate models at age 33, 42 and 50, adjusting for sex, poor psychosocial health, education, marital and parental status. The same analysis was repeated for drinkers who reduced their consumption to occasional drinking.

Results: Developing a LLSI from the previous wave was associated with reducing consumption to non-drinking at age 33 (OR 2.20, 95% CI 1.35-3.58), age 42 (2.56, 1.84-3.56) and age 50 (2.34, 1.65-3.31), and occasional drinking at age 42 (1.79, 1.38-2.31) and age 50 (1.75, 1.27-2.41). Having a persistent LLSI across two waves had higher odds with reducing consumption to non-drinking at age 33 (3.58, 1.66-.7.70), age 42 (4.30, 2.68-6.89) and age 50 (2.63, 1.80-3.85), and occasional drinking at age 33 (2.29, 1.30-4.04) and age 42 (1.70, 1.03-2.78). Poor psychosocial health also had independent associations with reducing consumption to non-drinking at age 42 and age 50 (and occasional drinking at age 50). Those with no qualifications were the most likely to have reduced consumption to non or occasional drinking a ages t 33, 42 and 50.

Conclusion: Developing a LLSI was associated with a reduction to non or occasional consumption across adulthood, suggested there to be direct effects of poor health on non-drinking regardless of age. Care should be taken when verifying the past health status of ex and occasional drinkers.

11.2 Background

Shaper and colleagues first proposed the idea that the comparison of health outcomes between moderate drinkers and non-drinkers may be subject to bias, since many non-drinkers consist of ex-drinkers who have stopped drinking due to poor health, or problems related to drink itself (56, 57) thus may suffer from pre-existing poor health. Since then it has been shown that ex-drinkers have higher rates of doctor-diagnosed illnesses including heart disease (60) and a reduction in alcohol consumption was found to be associated with a diagnosis of diabetes, hypertension or anxiety using cross-sectional data (63). In another study using longitudinal data consistent moderate drinkers had the best overall self-rated health among a cohort of middle-aged women (65), and another found associations between diagnoses of chronic conditions and a reduction in excessive drinking among participants aged between 50 to 85 years (64). This study adds to this literature by assessing whether a worsening of health is associated with being an ex-drinker at different stages of the life course including in early adulthood. Furthermore this study also explored whether there was an association with a worsening of health and a reduction to occasional drinking. In a meta-analysis assessing the methodology used in studies which find a J-shaped relationship, it is hypothesized that occasional drinkers and not just non-drinkers are also subject to the sick quitter bias (71), however this has not been directly investigated before.

This builds upon previous findings in the thesis. In Chapter 9 having no qualifications was associated with being an ex-drinker (non) and (SO) at ages 33, 42 and 50 years. Chapter 9 included psychosocial health in the model and found similar associations between poor psychosocial health and being an ex-drinker, which was stronger for those who reduced consumption to non-drinking at each time point, than occasional drinking which was significant at ages 42 and 50 years only. This chapter introduces changes in limiting longstanding illness to the model.

For a more detailed literature review please see section 2.2.1

11.3 Methods

This section addresses whether changes in limiting longstanding illness are simultaneously associated with a change in drinking status to 'never nowadays' or 'occasional' drinking at different stages of the life course at ages 33, 42 and 50. Based on the literature the following hypothesis will be investigated:

> *Developing a limiting longstanding illness is associated being an ex-drinker (non); reducing consumption to non-drinking from the previous wave*
>
> *Developing a limiting longstanding illness is associated with being an ex-drinker (SO); reducing consumption to special occasion drinking from the previous wave*

These hypotheses were investigated through the following analyses:

- Logistic regression on the odds of being an ex-drinker (non), with main exposure being a change in limiting longstanding illness from the previous wave.
- The same is repeated for ex-drinkers (SO), those who reduced to occasional drinking from drinking more than previously in the previous wave.
- Models are adjusted for sex, highest qualification, malaise inventory score, marital status and presence of children in the household at the time point of the model, (Chapter 5 discussed methodology and variable selection in more detail.)

Recap of definitions:

Ex-drinkers (non) are participants who responded 'never nowadays' to drinking status where they responded more often than 'never nowadays' in the previous wave.

Ex-drinkers (SO) are participants who responded 'special occasions'/'less often' where they responded more often than 'special occasions'/'less often' in the previous wave to drinking status questions.

11.4 Results

Table 11.1 presents the odds of being an ex-drinker (non); reducing consumption to non- drinking from the previous wave at ages 33, 42 and 50 years compared with drinkers. Those who developed a limiting longstanding illness from the previous wave had over double the odds of being an ex-drinker (non) at age 33 (OR 2.20, 95% CI 1.35 to 3.58), age 42 (OR 2.56, 95% CI 1.84 to 3.56) and age 50 (OR 2.34, 95% CI 1.65 to 3.31) than those who did not have a limiting longstanding illness after adjusting for sex, highest qualification, marital status, children under 16 in the household and malaise inventory score. In addition those who had a limiting longstanding illness in both waves had higher odds of being an ex-drinker at age 33 (OR 3.58, 95% CI 1.66 to 7.70), age 42 (OR 4.30, 95% CI 2.68 to 6.89) and age 50 (OR 2.63, 95% CI 1.80 to 3.85) whilst no longer having a limiting longstanding illness was significant at age 33 (OR 1.84, 95% CI 1.01 to 3.37) and age 50 (OR 2.16, 95% CI 1.42 to 3.28). Adults with no qualifications were more likely to be an ex-drinker (non) than those with a degree at each time point ($p<0.05$) after adjusting for health, education and demographic factors. Having a high score on the malaise inventory score was also positively associated with being an ex-drinker (non) at age 42 (OR 1.89, 95% CI 1.39 to 2.58,) and age 50 (OR 1.68, 95% CI 1.25 to 2.24,) in the adjusted models.

Table 11.2 presents the odds of being an ex-drinker (SO); reducing consumption to special occasion drinking from drinking more in the previous wave. Adults who developed a limiting longstanding illness from the previous wave had higher odds of being an ex-drinker (SO) at age 42 (OR 1.79, 95% CI 1.38 to 2.31) and age 50 (OR 1.75, 95% CI 1.27 to 2.41) respectively, in the fully adjusted models. This association was not significant at age 33. As in the previous table having no qualifications was positively associated with reducing to occasional drinking in each model ($p<0.05$), whilst adjusting for health and demographic factors. Having a qualification lower than a degree was also associated with higher odds of being an ex-drinker (SO) at 33 years (OR 1.93, 95% CI 1.46 to 2.54) and 42 years (OR 1.56, 95% CI 1.17 to 2.08). Having poor psychosocial health as measured by the malaise inventory was positively

associated with reducing to occasional drinking at 50 years only in the adjusted models (OR 1.53, 95% CI 1.16 to 2.00). Children in the household increased the odds of being an ex-drinker (SO) at 33 years only (OR 1.64, 95% CI 1.33 to 2.00). Those who were separated, widowed or divorced had lower odds than single people of being an ex-drinker (SO) at 33 years only (0.49 to 0.90, $p<0.001$).

Table 11.1 Odds ratio of being an ex-drinker (non) (n) and changes in limiting longstanding illness (fully adjusted), NCDS

	1991				**2000**				**2008**			
	Age 33 (N=9126)				**Age 42 (N=9457)**				**Age 50 (N=8701)**			
	n=228	OR	p-value	(95 % CI)	n=249	OR	p-value	(95 % CI)	n=272	OR	p-value	(95 % CI)
Sex (Female)	163	**2.48**	**<0.001**	**(1.85 to 3.34)**	159	**1.58**	**0.001**	**(1.21 to 2.07)**	181	**1.78**	**<0.001**	**(1.37 to 2.32)**
Limiting longstanding illness since previous wave												
No LLSI	188	1			156	1			155	1		
No longer LLSI	12	**1.84**	**0.047**	**(1.01 to 3.37)**	9	1.89	0.070	(0.95 to 3.88)	28	**2.16**	**<0.001**	**(1.42 to 3.28)**
Developed LLSI	20	**2.20**	**0.002**	**(1.35 to 3.58)**	59	**2.56**	**<0.001**	**(1.84 to 3.56)**	48	**2.34**	**<0.001**	**(1.65 to 3.31)**
Persistent LLSI	8	**3.58**	**0.001**	**(1.66 to 7.70)**	25	**4.30**	**<0.001**	**(2.68 to 6.89)**	41	**2.63**	**<0.001**	**(1.80 to 3.85)**
Malaise inventory score (High)	27	1.31	0.213	(0.85 to 2.04)	74	**1.89**	**<0.001**	**(1.39 to 2.58)**	79	**1.68**	**0.010**	**(1.25 to 2.24)**
Highest qualification												
Degree	23	1			29	1			30	1		
Other	145	1.08	0.750	(0.69 to 1.69)	158	1.19	0.407	(0.79 to 1.78)	161	**1.56**	**0.030**	**(1.04 to 2.32)**
No qualifications	60	**2.01**	**0.006**	**(1.22 to 3.33)**	62	1.64	0.035	(1.04 to 2.61)	81	**2.62**	**<0.001**	**(1.69 to 4.06)**
Marital Status												
Single	44	1			48	1			37	1		
Married	159	0.95	0.795	(0.63 to 1.43)	141	**0.53**	**0.002**	**(0.36 to 0.78)**	162	**0.64**	**0.021**	**(0.44 to 0.94)**
Separated/widowed/divorced	25	0.77	0.327	(0.46 to 1.30)	60	0.85	0.452	(0.56 to 1.29)	73	0.85	0.446	(0.56 to 1.29)
Children under age 16 in household	158	0.89	0.511	(0.63 to 1.26)	174	1.07	0.669	(0.77 to 1.49)	45	0.88	0.458	(0.63 to 1.23)

Table 11.2 Odds ratio of being an ex-drinker (SO) (n) and changes in limiting longstanding illness (fully adjusted), NCDS

	1991				**2000**				**2008**			
	Age 33 (N=8898)				**Age 42 (N=9208)**				**Age 50 (N=8429)**			
	n=897	OR	p-value	(95 % CI)	n=523	OR	p-value	(95 % CI)	n=363	OR	p-value	(95 % CI)
Sex (Female)	586	**1.82**	**<0.001**	**(1.57 to 2.10)**	336	**1.71**	**<0.001**	**(1.42 to 2.06)**	234	**1.76**	**<0.001**	**(1.41 to 2.20)**
Limiting longstanding illness since previous wave												
No LLSI	809	1			398	1			257	1		
No longer LLSI	31	1.18	0.411	(0.80 to 1.73)	21	**1.99**	**0.004**	**(1.25 to 3.17)**	22	1.11	0.663	(0.71 to 1.73)
Developed LLSI	41	1.15	0.438	(0.81 to 1.61)	85	**1.79**	**<0.001**	**(1.38 to 2.31)**	52	**1.75**	**0.001**	**(1.27 to 2.41)**
Persistent LLSI	16	**2.29**	**0.040**	**(1.30 to 4.04)**	19	**1.70**	**0.037**	**(1.03 to 2.78)**	32	1.45	0.067	(0.97 to 2.16)
High Malaise inventory score	79	1.22	0.141	(0.94 to 1.58)	91	1.22	0.128	(0.95 to 1.56)	81	**1.53**	**0.002**	**(1.16 to 2.00)**
Highest qualification												
Degree	59	1			56	1			53	1		
Other	659	**1.93**	**<0.001**	**(1.46 to 2.54)**	361	**1.56**	**0.003**	**(1.17 to 2.08)**	223	1.31	0.082	(0.97 to 1.79)
No qualifications	179	**2.47**	**<0.001**	**(1.81 to 3.38)**	106	**1.98**	**<0.001**	**(1.41 to 2.78)**	87	**2.01**	**<0.001**	**(1.40 to 2.87)**
Marital Status												
Single	137	1			67	1			39			
Married	673	0.84	0.133	(0.66 to 1.06)	364	0.82	0.217	(0.61 to 1.12)	255	0.89	0.509	(0.63 to 1.26)
Separated/widowed/divorced	87	**0.67**	**0.008**	**(0.49 to 0.90)**	92	0.87	0.408	(0.62 to 1.22)	69	0.77	0.198	(0.51 to 1.15)
Children under age 16 in household	706	**1.64**	**<0.001**	**(1.33 to 2.00)**	403	1.03	0.820	(0.81 to 1.31)	76	1.05	0.729	(0.80 to 1.36)

11.5 Discussion

Associations were found between developing a limiting longstanding illness and reducing consumption to non-drinking at 23, 33 and 42 years. Results are consistent with other studies which show that ex-drinkers have worse health (57, 68) and have higher probability of ceasing consumption with a medical diagnosis (63, 64). This relationship was present at age 33 meaning the sick quitter phenomenon exists even in early adulthood, and is not a phenomenon that co-occurs with ageing and a worsening of health. Similar albeit smaller associations were also found between developing a LLSI and reducing consumption to occasional drinking at ages 42 and 50. This implies that the sick-quitter bias may also relate to occasional drinkers in middle age where often these people are grouped together with non-drinkers (71). For those who reduced consumption to occasional drinking the effects of health on reducing consumption may be greater at older ages, whilst demographic factors such as having children, which was significant at 33 years may be more important in early adulthood. It is thought that a reason why abstention increases with age (34) is due to development of ill health as people get older, and ill health has been found to be associated with not only cessation of alcohol use but a general reduction (63) particularly excessive drinking (64). Among middle-aged women in Australia followed longitudinally it was found that moderate drinkers with more stable consumption patterns had the best self-rated health (65) whilst a reduction in alcohol consumption including an increase in abstinence after diagnosis of chronic conditions was found among a cohort aged between 50 to 85 years (64).

The relationship between changes in limiting longstanding illness and non-drinking was found to be complex. In the ex-drinker models having a limiting longstanding illness across two consecutive waves had a stronger association with a reduction in consumption to non-drinking than developing a limiting longstanding illness from the previous waves which was contrary to what was hypothesised. Perhaps those who had a limiting longstanding illness across two decades have worse health than those who had it only in the current wave, which may have a greater influence on

quitting drinking. Alternatively this may reflect a gradual reduction in alcohol consumption to non-drinking with a longstanding illness over the time span, particularly as associations are found with development of limiting longstanding illness and reducing consumption to occasional drinking. The extent of health conditions effect on drinking and how it might affect a general reduction in alcohol consumption over time requires further analysis.

The development of LLSI and a reduction in consumption to non-drinking was significant at 33, 42 and 50 years. These changes were assessed at simultaneous time points meaning that it is not certain whether the reduction in consumption came before the development of a LLSI particularly over a decade time span. However since there was an association between having a persistent LLSI across the decade and reducing consumption to non or occasional drinking, this highlights that in these cases poor health existed before the change in alcohol consumption. Furthermore associations were found between development of LLSI and reduction to non-drinking at 33 years where at such an early age it is less plausible that non-drinking could be the cause of developing a limiting longstanding illness. Given this finding and findings from Chapter 8, where non-drinkers in their twenties had higher medical conditions in adolescence, it seems much more convincing that the development of a limiting longstanding illness came before the reduction in drinking status. However as with all observational studies there may be selection effects where it cannot be ruled out that the type of person who stops drinking alcohol may also be the type of people to develop illnesses and the association may not be causal. Adjusting for education, mental health and demographic factors was used to account for this, however regression cannot adjust for all possible confounders.

Non-drinkers have been found to have poorer psychosocial health than drinkers (97, 170) including in early adulthood (46, 99-101). The analysis here provides a possible explanation of physical health as being a confounder between poor mental health and non-drinking. Chapter 10 showed that poorer psychological health

measured by a high malaise inventory score was associated with reducing consumption to non-drinking at each time point, without adjusting for limiting longstanding illness. In the fully adjusted models with LLSI, the association with poor psychosocial health was significant at ages 42 and 50 years only, and the magnitude of the effect was reduced. Indeed poorer psychological health is likely to be related to having a limiting longstanding illness either being a consequence or the actual limiting longstanding illness. Considering that there are independent associations of both it is unlikely that poorer mental health explains all the association between LLSI and reducing consumption to non-drinking however there is likely to be substantial overlap and teasing out the effects would require more complex models.

Independent associations were also found with education. The social gradient in non-drinking where people with lower incomes and less education are more likely to be non-drinkers is established (31, 34, 48, 83). Here it was also found that those with no qualifications were more likely to have reduced to non-drinking at ages 33, 42 and 50 years even when adjusting for limiting longstanding illness. It was also found people with a highest qualification lower than a degree at 33 and 42 years were more likely to have reduced consumption to occasional drinking than those with a degree. This suggests that is those with a degree who are more likely to sustain drinking through the life course as mentioned in Chapter 9. It is important to consider that low social economic status, poor health and mental health may all interrelate and contribute to disadvantage and deprivation resulting in higher morbidity and may suggest indirect effects of each on non-drinking through social exclusion. This will be discussed in greater detail in the general discussion.

11.5.1 Limitations

Models have not been stratified by sex, this is to keep it consistent with models predicting the odds of being lifetime abstainer' where the sample size of lifetime abstainers is relatively small. This is also the case for ex-drinkers (non), where there were only 65 male ex-drinkers (non) at 33 years, thus conducting analysis on

a smaller sample would reduce statistical power. There does not seem to be large differences in models stratified by sex (Appendix D.) in that changes in limiting longstanding illness were significant for both males and females at different time points, however stronger odds ratios were observed for females. This is consistent with another longitudinal study which found that a reduction to infrequent drinking with a diagnosis of a chronic condition was more common among women (64)

Some studies suggest that it is mainly past heavy drinkers contributing to the sick-quitter effect, having health characteristics more on a par with heavy drinkers (56, 57, 95). Due to the use of frequency questions information on the volume of drank was not analysed in this thesis. However in Table 7.5, it was shown that around a third of ex-drinkers (non) drank at least once a week in the prior wave whilst the largest proportions were special occasion drinkers, meaning a fairly even split between frequent and less frequent drinkers. Further research should assess whether the effects of health on a change in consumption are greater for heavier drinkers, and whether these changes are maintained later on in life.

Whilst it has been shown here that a development of a limiting longstanding illness was associated with a reduction in consumption to special occasion drinking, health may have an effect of reducing consumption along a scale for example from heavy to moderate consumption as has been found with a diagnosis of a condition (63, 64). Consistent with this, results in Chapter 4 showed that self-rated poor health increased the odds of being a moderate drinker rather than a heavy drinker, suggesting that poor health has a negative effect on consumption. Analysing the continuous effect of health on consumption is out of the scope of the binary variables used in this analysis.

It has been previously found that long-term ex-drinkers (more than 5 years) had higher characteristics of morbidity than recent ex-drinkers among British middle aged men in a study conducted by Wannamethee and colleagues (57). However due to the binary derivations of ex-drinkers, using two time points across a decade in this study, it is not possible to know when, within the decade time span, the

decision to stop drinking occurred, this is a limitation of a long time lag between waves of the survey. Also the analysis here uses two time points only, therefore it is quite possible that ex-drinkers may go on to take up drinking later on in life. However to my knowledge this is the first study to address whether changes in drinking and health are associated simultaneously, through the use of longitudinal data from early adulthood.

11.6 Summary and conclusion

- Developing a limiting longstanding illness from the previous wave was associated with being an ex-drinker (non) at 33, 42 and 50 years, and an ex-drinker (SO) at 42 and 50 years
- Stronger associations were found between having a persistent LLSI and being an ex-drinker (non) and (SO) than developing a LLSI from the previous wave
- Poor psychosocial health remained significant at some waves with the inclusion of LLSI in the model, for example at 42 years and 50 years for ex-drinkers (non), and 50 years for ex-drinkers (SO) albeit the magnitude of the effect was reduced
- Associations between no qualifications between being an ex-drinker (non) and (SO) remained significant after adjusting for limiting longstanding illness

Developing a limiting longstanding illness was associated with a reduction in alcohol consumption to non-drinking at ages 33, 42 and 50 years and a reduction to special occasion drinking at ages 42 and 50 years whilst adjusting for social and demographic factors as hypothesised. This provides evidence of the sick-quitter bias across the life course, suggesting there to be a direct effect of poor health on non-consumption of alcohol across the life course and not just as people age. Findings here also suggest that the sick-quitter bias may also apply to occasional drinkers, where often occasional drinkers are grouped together with non-drinkers. This further supports the argument that studies comparing moderate drinkers and

non-drinkers should exclude ex-drinkers who have reduced to non or occasional drinking.

Having a limiting longstanding illness at two waves of the survey had a stronger effect on a reducing consumption to non-drinking in all waves, which may indicate a complex relationship between health and drinking in which there may exist a time lag between worsening of health and when the behaviour change occurs. This chapter has expanded existing knowledge on sick-quitter by showing that bias exists across the life course and not just as people age. Secondly the sick-quitter bias also applied to people who have reduced consumption to occasional drinking, with the latter being hypothesised but never directly tested before. In the next chapter whether pre-existing poor health is associated with lifetime abstention is explored which is a new concept.

12. Sick non-starters; the effect of persistent limiting longstanding illness (final model)[9]

12.1 Abstract

Aims: To examine whether poor health in early adulthood and persistent poor health across the life course is associated with being a lifetime abstainer from early adulthood.

Methods: Binary logistic regression was used to assess whether having a persistent limiting longstanding illness (LLSI) from age 23 was associated with being a lifetime abstainer from age 23 to 33, and 42, adjusting for sex, poor psychosocial health, education, marital and parental status. The same analysis was repeated using longstanding illness (LSI) for lifetime abstainers and self-identified 'lifetime abstainers' in the BCS70 from age 26 to age 30 and 34.

Results: Having a persistent LLSI from age 23 was associated with being a lifetime abstainer at age 33 (OR 4.50, 95%CI 1.99-10.18), and age 42 (7.02, 2.39=20.66). Similar findings were also found for LSI and lifetime abstainers at age 30 (2.80, 1.88-4.18) and age 34 (3.33, 2.01-5.53) in the BCS70. Having previously had a LLSI/LSI but not currently was also associated with being a lifetime abstainer in the NCDS at age 33 (2.82, 1.57-5.08) and age 42 (3.16, 1.73-5.77) and self-identified 'lifetime abstainers' in the BCS70 at age 30 (2.07, 1.08-3.98) and age 34 (2.02, 1.20-3.42).

Conclusion: Poor health from early adulthood and persistent poor health is associated with persistent non-drinking from early adulthood. Therefore lifetime abstainers may also not be free from a pre-existing poor health bias which may be a factor influencing the worse health outcomes of lifetime asbastiners compared with drinkers in older ages..

[9] Results here have been published: 194. NG FAT L., CABLE N., MARMOT M., SHELTON N. Persistent long-standing illness and non-drinking over time, implications for the use of lifetime abstainers as a control group, Journal of Epidemiology and Community Health 2013.10.1136/jech-2013-202576 Doi: 10.1136/jech-2013-202576. Please see Appendix E for full paper.

12.2 Background

Chapter 4 found associations between self-reported poor health and non-drinking for men and women aged 18 to 34 years provided basis to explore the sick non-starter hypothesis; that some may never take up drinking due to poor health from an early age or persistent poor health, however this study was limited as it was cross-sectional. Following from this two prospective cohort studies were used the National Child Development Study (NCDS) and the 1970 British Cohort Study (BCS70), where in Chapter 8 it was found that non-drinkers in young adulthood had higher rates of medical conditions in adolescence than drinkers such as epilepsy or having an emotional and behavioural problem. Chapter 9 showed that being female and having no qualifications was predictive of being a lifetime abstainer in the NCDS only. Contrary to what was hypothesised no association was found between poor psychosocial health and lifetime abstention in the NCDS and at age 30 years only in the BCS70 in Chapter 10. This chapter adds to these models by including the effects of persistent poor health on remaining a non-drinker across successive waves of the study adjusting for education, demographic factors and psychosocial health. This is to investigate the hypothesis that persistent poor health from an early age is associated with being a persistent non-drinker.

12.3 Methods

This section assesses whether having a persistent limiting longstanding illness across waves is simultaneously associated with remaining a non-drinker from early adulthood, and subsequent waves using NCDS and BCS70. The following hypothesis was investigated:

Having a persistent limiting longstanding illness (LLSI) or longstanding illness (LSI) from early adulthood is associated with being a persistent non-drinker in successive waves or being a self-identified lifetime abstainer.

This hypothesis will be explored through the following analyses:

- Logistic regression on the odds of being a lifetime abstainer with the main exposure being a change in limiting longstanding illness from age 23 and 26 in the NCDS and BCS70 respectively. Analysis will be carried out on lifetime abstainers at 33 and 42 years in the NCDS and 30 and 34 years in the BCS70.
- The same is repeated for 'lifetime abstainers' (SI) at 30 and 34 years in the BCS70
- Models are adjusted for sex, highest qualification, marital status and presence of children in the household at the time point of the model (See Chapter 5 for methodology and variable selection in more detail).

Definitions:

Lifetime abstainers are defined as those who consistently said 'never nowadays' or 'never had an alcoholic drink' to drinking status questions in successive waves from age 23 in the NCDS and age 26 in the BCS.

'Lifetime time abstainers' (SI) refer to self-identified 'lifetime abstainers'; people who responded 'never had an alcoholic drink' to drinking status questions in the BCS70 at 30 and 34 years and are coded based on their current status answer to that question (See section 5.3.1 for detailed variable coding methodology).

12.4 Results

In Table 12.1 using the NCDS, those who had a persistent limiting longstanding illness in successive waves from age 23 had 4.50 times the odds (95% CI 1.99 to 10.18) of being a lifetime abstainer at age 33 and 7.02 times the odds (95% CI 2.39 to 20.66) at age 42 after adjustment for sex, highest qualification, marital status, children under 16 years in the household and malaise inventory score at the corresponding time point of the model. In addition having a limiting longstanding illness in at least one wave before the age of the model since age 23 years was positively associated with being a lifetime abstainer at age 33 (OR 2.82, 95% CI 1.57 to 5.08, $p<0.001$) and 42 (OR 3.16, 95% CI 1.73 to 5.77) whilst currently

having a limiting longstanding illness whether the respondent had one previously or not, was associated with being a lifetime abstainer at age 42 only (OR 2.13, 95% CI 1.33 to 3.45, $p<0.01$). People who were separated and divorced at age 33 were less likely than those who were single to have been a lifetime abstainer (OR 0.48, 95% CI 0.23 to 0.99), apart from sex and limiting longstanding illness this was the only significant association in either model after adjustment for education and other demographic factors. Women were statistically significantly more likely to be lifetime abstainers in every model ($p<0.001$).

In Table 12.2, using the BCS70, adults who had a persistent longstanding illness in all time sweeps since age 26 had 2.80 times (95% CI 1.88 to 4.18) the odds of someone who never had a longstanding illness of being a lifetime abstainer at age 30, and 3.33 times the odds (95% CI 2.01 to 5.23) at age 34, whilst adjusting for sex, highest qualification, marital status, children under 16 years in the household and malaise score. None of the other variables had a significant association with lifetime abstention.

Similarly for self-identified 'lifetime abstainers', those who reported "never having an alcoholic drink" in Table 12.3, those who had a LSI in all time sweeps had 2.11 times (95% CI 1.24 to 3.57) the odds of someone who never had a LSI of being a self-identified 'lifetime abstainer' at age 30 and 2.80 times the odds at age 34 (95% CI 1.62 to 4.84). In this model having previously had a LSI but not currently was also significantly associated with being a 'lifetime abstainer (SI)' at age 30 (OR 2.07, 95% CI 1.08 to 3.98) and 34 (OR 2.02, 95% CI 1.20 to 3.42). Having children aged under 16 years in the household was the only other variable to be associated with being a 'lifetime abstainer' (SI) at age 30 (OR 1.89, 95% CI 1.21 to 2.97).

Table 12.1 Odds ratio of being a lifetime abstainer (n) and changes in limiting longstanding illness (fully adjusted), NCDS

	1991				2000			
	33 years (N=9290)				**42 years (N=8448)**			
	n=164	Odds Ratio	p-value	(95 % CI)	n=119	Odds Ratio	p-value	(95 % CI)
Sex (female)	111	**2.05**	**<0.001**	**(1.41 to 2.88)**	81	**1.95**	**0.001**	**(1.31 to 2.88)**
Limiting longstanding illness since age 23								
Never had a LLSI	135	1		-	76	1		-
Had a LLSI but not currently	13	**2.82**	**0.001**	**(1.57 to 5.08)**	13	**3.16**	**<0.001**	**(1.73 to 5.77)**
Currently has a LLSI	9	1.44	0.308	(0.72 to 2.88)	26	**2.13**	**0.002**	**(1.33 to 3.45)**
Persistent LLSI in all waves	7	**4.50**	**<0.001**	**(1.99 to 10.18)**	4	**7.02**	**<0.001**	**(2.39 to 20.66)**
Malaise inventory score (high)	15	1.09	0.763	(0.62 to 1.91)	23	1.21	0.439	(0.74 to 1.99)
Highest qualification								
Degree	16	1		-	13	1		-
Other	111	1.19	0.516	(0.70 to 2.04)	83	1.48	0.191	(0.82 to 2.68)
No qualifications	37	1.77	0.067	(0.96 to 3.25)	23	1.75	0.114	(0.87 to 3.52)
Marital Status								
Single	32	1		-	17	1		-
Married	121	0.95	0.847	(0.59 to 1.56)	91	0.96	0.886	(0.51 to 1.78)
Separated/widowed/divorced	11	**0.48**	**0.045**	**(0.23 to 0.99)**	11	0.45	0.052	(0.20 to 1.01)
Children under 16 in the household (yes)	116	0.99	0.961	(0.65 to 1.51)	91	0.96	0.874	(0.58 to 1.59)

Table 12.2 Odds ratio of being a lifetime abstainer (n) and changes in longstanding illness (fully adjusted), BCS70

	2000				**2004**			
	30 years N=6809				**34 years N=5960**			
	n=152	Odds Ratio	p-value	(95 % CI)	n=115	Odds Ratio	p-value	(95 % CI)
Sex (female)	87	0.96	0.814	(0.69 to 1.33)	62	0.86	0.43	(0.59 to 1.25)
Longstanding illness since age 26								
Never had a LLSI	93	1		-	56	1		-
Had a LLSI but not currently	9	1.14	0.711	(0.57 to 2.28)	18	1.71	0.051	(1.00 to 2.93)
Currently has a LLSI	13	0.80	0.459	(0.44 to 1.44)	18	1.02	0.942	(0.60 to 1.75)
Persistent LLSI in all waves	**37**	**2.80**	**<0.001**	**(1.88 to 4.18)**	**23**	**3.33**	**<0.001**	**(2.01 to 5.53)**
Malaise inventory score (high)	25	1.38	0.159	(0.88 to 2.19)	19	1.08	0.757	(0.65 to 1.81)
Highest qualification								
Degree	36	1		-	31	1		-
Other	77	0.74	0.157	(0.49 to 1.12)	57	0.90	0.642	(0.58 to 1.41)
No qualifications	39	0.86	0.538	(0.53 to 1.39)	27	1.02	0.918	(0.60 to 1.75)
Marital Status								
Single	61	1		-	32	1		-
Married	84	1.30	0.173	(0.89 to 1.88)	79	0.89	0.621	(0.55 to 1.43)
Separated/widowed/divorced	7	0.78	0.535	(0.35 to 1.73)	4	0.76	0.613	(0.26 to 2.20)
Children under 16 in the household (yes)	80	1.32	0.140	(0.91 to 1.92)	75	1.27	0.305	(0.81 to 1.99)

Table 12.3 Odds ratio for 'lifetime abstainers' (SI) (n) at age of the model and changes in longstanding illness since age 26 (fully adjusted), BCS70

	2000				**2004**			
	30 years	**N=6834**			**34 years**	**N=5986**		
	n=108	Odds Ratio	p-value	(95 % CI)	n=110	Odds Ratio	p-value	(95 % CI)
Sex (female)	64	1.02	0.91	(0.69 to 1.52)	70	1.32		(0.88 to 1.97)
Longstanding illness since age 26								
Never had a LLSI	64	1		-	52	1		-
Had a LLSI but not currently	11	**2.07**	**0.028**	**(1.08 to 3.98)**	20	**2.02**	**0.008**	**(1.20 to 3.42)**
Currently has a LLSI	14	1.29	0.395	(0.72 to 2.32)	19	1.13	0.646	(0.66 to 1.93)
Persistent LLSI in all waves	19	**2.11**	**0.006**	**(1.24 to 3.57)**	19	**2.80**	**<0.001**	**(1.62 to 4.84)**
Malaise inventory score (high)	16	1.18	0.560	(0.68 to 2.06)	21	1.27	0.352	(0.77 to 2.08)
Highest qualification								
Degree	26	1		-	30	1		-
Other	49	**0.60**	**0.043**	**(0.36 to 0.98)**	57	0.95	0.824	(0.60 to 1.49)
No qualifications	33	0.92	0.766	(0.53 to 1.59)	23	0.94	0.835	(0.54 to 1.65)
Marital Status								
Single	44	1		-	33	1		-
Married	59	1.06	0.788	(0.68 to 1.65)	73	0.83	0.438	(0.52 to 1.33)
Separated/widowed/divorced	5	0.70	0.455	(0.27 to 1.79)	4	0.73	0.554	(0.25 to 2.10)
Children under 16 in the household (yes)	64	**1.89**	**0.005**	**(1.21 to 2.97)**	68	1.04	0.860	(0.66 to 1.64)

12.5 Discussion

People who reported having a limiting longstanding illness or longstanding illness in consecutive waves in the NCDS and BCS70 were more likely to have remained non-drinkers over the same time waves. Whilst associations have been found with higher rates of limiting longstanding illness and non-drinking among young adults (31), this is the first study to show that poor health over time is associated with simultaneous non-drinking over time. This was the case for LLSI from age 23 to 33 and then up to 42 in the NCDS and LSI from age 26 to 30, and then up to 34 in the BCS70. Consistent evidence at each time point and between cohorts provides strong evidence that ill health is associated with continued non-drinking at different stages of the life course particularly if the condition is persistent. Furthermore an association with both LSI and LLSI shows that it is not only people with severe illness or with disability that do not drink alcohol. LLSI in the NCDS had stronger associations with LSI in the BCS70 which may reflect greater effect on non-consumption with the severity of health conditions, however due to this analysis being conducted in different cohorts, a direct comparison cannot be made.

Consistent associations between persistent LSI were found for two definitions of lifetime abstainers, firstly through those derived by taking successive non-drinking answers and secondly 'lifetime abstainers' (SI), a current status measure derived from all those who reported 'never had an alcoholic drink' in the BCS70 at 30 and 34 years. It has been found that over half of those who self-reported being a 'lifetime abstainer' in midlife had reported drinking in the past waves in two different prospective cohort studies (112, 113) thus a bottom up approach used here may be a more accurate way of deriving lifetime abstainers. In the BCS70 around 38% of self-identified 'lifetime abstainers' at age 34 reported drinking in the previous two waves. This provides a more valid measurement than in other studies (112) including the NCDS (113). Furthermore over half of self-identified 'lifetime abstainers' who reported drinking in previous waves were special occasion drinkers only (Table 7.3, section 7.4.2.2). This may reflect ambiguity between being a special occasion and non-drinker when claiming to be a lifetime abstainer, for example if

someone only drank occasionally when they were younger may still consider themselves to be a lifetime abstainer decades later due to their very infrequent consumption in the past which may or may not have been forgotten. Furthermore it is possible that the measure appears more accurate than in past studies as it is taken at a younger time point where at older ages it may be more difficult to recall past drinking, especially if a long time period has elapsed. Odds ratios for persistent LSI and lifetime abstention was slightly lower for 'lifetime abstainers' (SI) than using a bottom up approach which may reflect a greater proportion of 'healthier' previous drinkers or special occasion drinkers among self-identified 'lifetime abstainers'.

As well as having a limiting longstanding illness consistently across waves, having previously had a LLSI but not having one currently, was also significantly associated with lifetime abstention in the NCDS at 33 and 43 years which supports the argument that some people never take up drinking because of ill health at an early age. The same applied with longstanding illness in the BCS70 at age 30 and 34 using self-identified 'lifetime abstainers'. This may reflect people who never start drinking due to illness and continue to abstain even once health improves, particular when young adulthood is a prime time when adults are introduced to alcohol and develop drinking habits where age of onset of drinking has been shown to have an influence on later life drinking (195). Alternatively a condition may have improved with medication however continued use of medication prohibits the use of alcohol. A further explanation could be that the condition has normalised over the time frame so that the participant no longer sees it as limiting their activities or as an illness. Unfortunately this is not possible to verify from the dataset.

It is possible that mental health may actually be the limiting longstanding illness or there may be an element of self-perceived health influencing the decision not to drink given that this is a self-report measure. However LLSI has been found to have stronger associations with physical functioning than mental and social wellbeing (142) while another study using the NCDS found that the stability of limiting longstanding illness in early adulthood across a decade was associated with prior diagnoses of disability in childhood (143). Also medically

assessed and self-reported conditions that were not mental health in adolescence were more common among non-drinkers in early adulthood, thus mental health is unlikely to explain the whole association (Chapter 8). Furthermore and perhaps more importantly it was shown in Chapter 10 that there was no associations between poor psychosocial health in the form of a high malaise inventory score and lifetime abstention even without adjusting for limiting longstanding illness in the NCDS, and an association only at 30 years in the BCS70.

It is hypothesized in this thesis that remaining a non-drinker may be a consequence of persistent longstanding illness. This may be via direct effects of health through the use of medication as suggested in section 8.6, where rates of conditions such as epilepsy and depression were higher among non-drinkers where a list of 19 conditions and corresponding medication that prohibit alcohol use has been found (187). Direct effects may also include interactions between alcohol and the actual health condition which would discourage the use of alcohol for example heavy drinking may increase the risk of seizures among epilepsy sufferers, alternatively people with a physical disability, whose mobility is reduced, may avoid alcohol since it can increase risks of accidents. Alternatively there may be indirect effects in that the people who have a persistent longstanding illness are the least likely to take up drinking. One indirect pathway may be that the effects of health may be a factor contributing to social exclusion where alcohol is often a precursor to socialising. Indeed certain conditions could contribute to exclusion such as problems with speech, facial and general appearance and mental disability which were more prevalent among non-drinkers in the NCDS (Table 8.1) and BCS70 (Table 8.2 and Table 8.3). It has also been shown that those with lower education are more likely to be non-drinkers, another possible contributor to exclusion alongside poor health. However in these models the higher odds of those with no qualifications of being a lifetime abstainer lost significance with the inclusion of limiting longstanding illness in the NCDS. This could signify that illness is a confounder between lower education and lifetime abstention however given the small sample size there is not enough evidence to draw this conclusion,

particularly since poor health and lower social economic position are known to be related (131). It may also be possible that the it is the norm for those who have a limiting longstanding illness to be non-drinkers, particularly if coming from a lower socio-economic group where abstinence is more common (31, 83, 84).

Rates of lifetime abstainion did not differ greatly between cohorts which may represent a stable and steady group among the drinking population. Women were had higher odds of being lifetime abstainers in every wave in the NCDS, however among the younger cohort in the BCS70 gender had no effect. This may be a consequence of more acceptable drinking norms for women, among the younger cohort in the BCS70 where drinking rates among women have risen (196).

12.5.1 Limitations

A limitation of the study is the small sample size of lifetime abstainers. For example in the NCDS lifetime abstainers accounted for 1.8% (n=164) of the sample at 33 years and 1.4% (n=119) at 42 years. The sample size is likely to be reduced due to attrition from using consecutive data from several waves of the survey. Although in the raw BCS70 sample self-identified 'lifetime abstainers' accounted for only a slightly higher proportion of the sample 2.1% (n=108) at 30 years and 2.2% (n=110) at 34 years, (Table 7.3). However consistent findings between two different cohorts and with two different definitions of lifetime abstainers make the argument that persistent poor health is a reason for persistent abstention from alcohol more convincing. Whilst we can never be certain to assume causality from observational data, plausible mechanisms in the discussion were suggested such as via direct effects of health through alcohol's interaction with medication or the health condition, and indirectly through social exclusion or social norms. Furthermore the descriptive analyses in Chapter 8 showed higher rates of medical conditions in adolescence among non-drinkers in young adulthood, which would also support the temporal order of events from the proposed argument.

Another possible limitation is that whilst those who consistently said 'never nowadays' in successive waves were referred to as lifetime abstainers there is a possibility that they may have been drinkers in-between waves particularly since there is a decade span between data collection in the NCDS. However since over half of those who reported never having an alcoholic drink in middle age were found to be drinkers in previous waves using two prospective studies including the NCDS (112, 113), this derivation perhaps may even be more valid than traditional definitions of lifetime abstainer through self-identification. Furthermore results have been compared with self-identified 'lifetime abstainers' in this thesis and very similar findings were obtained. Comparing the bottom up derived lifetime abstainers and self-identified 'lifetime abstainers' in the BCS, lifetime abstainers accounted for 62% of self-identified lifetime abstainers at 34 years meaning substantial overlap (section 7.4.2.2). Furthermore self-identified 'lifetime abstainers' in the BCS70 appeared to be more valid than other prospective cohort studies (112, 113) where around 38% of self-identified lifetime abstainer reported drinking in past waves and the majority of these people were special occasion drinkers.

Finally the sick non-starter hypothesis that some people may never take up drinking because of poor health, was broken down into two components:

1.) Poor health precedes non-drinking
2.) On-going illnesses from childhood and early adulthood may be a direct factor in the non-consumption of alcohol throughout the life course.

The first was assessed through descriptive analysis in Chapter 8 which showed higher rates of medical conditions in adolescence among non-drinkers in young adulthood, although was limited due to being just descriptive bi-variate analysis. The second component was explored in this section through the use of changes in limiting longstanding and longstanding illness from early adulthood and persistent non-drinking. Ideally the hypothesis would be best explored on a base of sick non-drinkers, however given the already small sample size of lifetime abstainers to reduce them further by health status would provide too small of a sample.

12.6 Summary and Conclusion

- Having a persistent LSI or LLSI across all time points of the study was associated with remaining a non-drinker from early adulthood This is consistent with hypothesis 2 in Chapter 3.
- Having previously had a LLSI or LSI was also associated with being a lifetime abstainer at each time point. This is consistent with hypothesis 1 in Chapter 3.
- Relationship was observed for both lifetime abstainers derived by taking consecutive non-drinking statuses across waves, and self-identified 'lifetime abstainers' at a single time point of the survey
- Results were largely consistent between the NCDS and BCS70

Consistent with what was hypothesized those who had a LLSI or LSI across waves had increased odds of being a lifetime abstainer or self-identified lifetime abstainer, even after adjusting for social and demographic factors. In addition having previously had a LSI or LLSI was associated with being a lifetime abstainer, which may be indicative of those who abstain from early age due to poor health and continue to abstain even when health improves. This association was present at the two time points assessed and in each cohort using two different measures of lifetime abstention. Poor health from an early age or persistent poor health from an early age may be a reason for why someone might abstain across the life course. This implies that lifetime abstainers may be subject to a pre-existing poor health bias if compared with drinkers and may be a reason why we observe a J-curve relationship between drinking frequency and morbidity and mortality outcomes in later life between non-drinkers and drinkers.

13. General Discussion

13.1 Summary of Findings

The main findings of this thesis are that poor health from an early age and persistent poor health is associated with persistent abstention from alcohol. Poor health from an early age may be a reason for lifetime abstention. Therefore lifetime abstainers may not be free from a pre-existing poor health bias, which is an original contribution to knowledge. This is described as the sick non-starter hypothesis. The sick-quitter hypothesis, that some people stop drinking in relation to poor health was also confirmed in this thesis as has been found in other studies (56, 61, 63, 64, 197) however these studies have used a middle-aged cohort only. This thesis adds to the literature by showing the association between worsening of health and reducing consumption to non-drinking is present across three decades of the life course from the thirties, and therefore is not just a phenomenon that co-occurs with ageing and a worsening of health providing further support of a direct relationship between poor health and non-drinking. Furthermore an association was also found between a worsening of health and a reduction to occasional drinking at age 42 and 50, meaning the sick-quitter bias may also apply to occasional drinkers. This was hypothesised as being a source of bias among non-drinkers since many studies which use non-drinkers as a reference group did not exclude occasional drinkers (71) however to my knowledge this hypothesis has not been verified before.

In chapter 4 limiting longstanding illness, longstanding illness and self-rated poor health was found to be associated with increased odds of being a non-drinker for men and women aged 18 to 34 years, using the Health Survey for England. This association held after adjusting for age, ethnicity, region, income, education, marital status, presence of children in the household, physical activity, anxiety and smoking status. This study also established that the social gradient in non-drinking exists in early adulthood with those with the lowest income and educational qualifications having the greatest odds of being

a non-drinker. Men and women with the lowest physical activity levels were also more likely to be non-drinkers.

The rest of the thesis investigated the sick non-starter and sick quitter hypothesis using longitudinal data meaning the temporal order of poor health and non-consumption could be explored directly. Descriptive analysis in Chapter 7 found lifetime abstainers at age 42 to have higher rates of limiting longstanding illness from early adulthood and consistently across adulthood than drinkers. Ex-drinkers at age 42 had higher rates of limiting longstanding illness in the same wave that they reported non-drinking, than drinkers. In chapter 8 bi-variate associations were found between health conditions assessed by a health visitor in childhood and adolescence and drinking status in young adulthood. Consistent between two cohorts, rates of epilepsy, physical disability and emotional and behavioural problems experienced in adolescence were higher among non-drinkers in young adulthood. Furthermore rates of having a heart condition in childhood among non-drinkers at age 23 were higher than drinkers.

Logistic regression on the odds of being an ex-drinker and lifetime abstainer, based on highest educational qualification adjusting for sex, and marital and parental status in Chapter 9, showed that having no qualifications was associated with being a lifetime abstainer, and reducing consumption to non-drinking (ex-drinker (non)), or occasional drinking (ex-drinker (SO)). Greater social inequalities from an early age and throughout the life course may additionally contribute to higher rates of mortality in later life compared with drinkers. Including poor psychosocial health, as modelled using the malaise inventory set of questions in these models, showed that it predicted being an ex-drinker, with stronger associations with reducing to non-drinking than occasional drinking discussed in Chapter 10. An association was found between poorer psychosocial health and lifetime abstention in the BCS70 at age 30 only, with no association found using the NCDS. However lifetime abstainers in the NCDS were found to score higher than drinkers on traits related to anxiety or low sociability for example 10.4% of lifetime abstainers claimed to be frightened of going out alone or of meeting people. Furthermore

lifetime abstainers at age 42 had higher rates of poor psychosocial health earlier on in life at age 23 (Table 7.8).

In the fully adjusted models shown in Chapter 11, the development of limiting longstanding illness (LLSI) was associated with a simultaneous reduction in consumption to non-drinking from reporting drinking in the previous wave at age 33, 42 and 50, and a reduction in consumption to occasional drinking at age 42 and 50 using the NCDS. Having a persistent LLSI across two waves had stronger associations in predicting being an ex-drinker in all waves. In these models having no qualifications remained significant in predicting being an ex-drinker in all waves. In addition poor psychosocial health had an independent association with being an ex-drinker (non) at 42 and 50 years and being an ex-drinker (SO) at 50 years. Results from this chapter were consistent with the sick-quitter hypothesis, that a worsening of health was associated with a reduction in drinking to non-drinking or occasional drinking.

In the fully adjusted models Chapter 12 persistent poor health in the form of a limiting longstanding illness or longstanding illness was associated with continued non-drinking over time. In the NCDS the association was found between having a persistent limiting longstanding illness and being a lifetime abstainer from age 23 to 33 and in the second model up to age 42. In a younger cohort using the BCS70 the association was found between having a persistent longstanding illness and being a lifetime abstainer from age 26 to 30 and in the second model up to age 34. The same association was found for self-identified 'lifetime abstainers' at 30 and 34 years in this thesis. In addition having had a LLSI in early adulthood but no longer having it in the current wave was associated with being a lifetime abstainer in the NCDS and a self-identified 'lifetime abstainer' in the BCS70. Models in Chapter 11 and 12 were adjusted for sex, highest educational qualification, marital status, children in the household and poor psychosocial health as measured by the malaise inventory. Results from this chapter were consistent with the sick non-starter hypothesis, that poor health and in particular persistent poor health from an early age was associated with being a persistent non-drinker.

13.2 Implications and relevance of findings

The J-curve (or U-curve) has long been established since Pearl in 1926 found that moderate drinkers had lower mortality rates than non-drinkers and heavy drinkers (51). In 1988 however Shaper and colleagues argued that some non-drinkers are ex-drinkers whom may have quit drinking due to problems related to alcohol or to poor health and this is what is influencing their poor health outcomes relative to drinkers (56, 197). This was confirmed in this thesis where people who developed a limiting longstanding illness had increased odds of reducing consumption to non-drinking at each stage of the life course. This occurred even in early adulthood (at age 33) showing that the association is not a factor that co-occurs with ageing and a worsening of health, as many previous studies confirming the sick-quitter hypothesis have used a middle aged cohort only (61, 63, 64). This suggests there to be direct effect of poor health on non-drinking and there may be bias at any age, or length of abstinence among non-drinkers.

Where ex-drinkers have been removed from non-drinkers, and lifetime abstainers used as a reference category, findings have been mixed with some reporting no substantive change in health outcomes to when ex-drinkers were included (16) or reduced beneficial effects for light to moderate drinkers (15, 18). Despite this criticism, given the consistency of the J-curve throughout time and among diverse populations (17), particularly in the area of coronary disease (15, 16, 24), it is a consensus among many epidemiologists that the reason for better health among moderate drinkers is a protective effect of moderate alcohol consumption (16, 17, 22-24). However findings from this thesis suggest that poor health from an early age and persistent poor health may be a reason why someone never takes up drinking (sick non-starters), which is an original contribution to knowledge. This was found when assessing rates of limiting longstanding illness which was consistently greater among lifetime abstainers than drinkers (Chapter 4 and Chapter 7) across the life course from early adulthood. Secondly regression analysis found persistent poor health and poor health from an early age to be associated with persistent non-drinking, after accounting for sex, education, demographic factors and mental health. Poor

health could directly cause abstention through wanting to prevent interactions between alcohol and medication or the health condition, or indirectly via social norms among disadvantaged groups where non-drinking is consistently higher among those with lower social position. This implies that lifetime abstainers may also suffer from a pre-existing poor health bias.

Existing conditions among non-drinkers from an early age may have direct implications for later life health, in conditions where a J-curve has been found. Currently studies have found J-curves related to cognitive functioning (19-21) dementia (20), ageing (74), rheumatoid arthritis (75) all-cause mortality (18) and even obesity (77) and the common cold (78). A list of studies which suggested moderate alcohol consumption is protective ranged across 24 different conditions including low birth weight to osteoporosis (30, 79, 80). Findings in this thesis suggests a plausible explanation as to why non-drinkers consistently have worse outcomes than drinkers across a broad range of conditions via social and health disadvantage from an early age. Certain conditions which non-drinkers suffer more greatly from than drinkers in early life may have a direct influence on health in older ages. For example non-drinkers in early adulthood had the highest rates of having a heart condition in childhood, which may contribute to their worse cardiovascular health in later life; however the percentage rates were small. Secondly non-drinkers in early adulthood were found to have higher rates of physical disability in childhood in the NCDS and greater levels of persistent joint or back pain in the BCS70 relative to drinkers (Chapter 8). Problems with physical mobility early on in life may create a sedentary lifestyle which could contribute to the higher rates of osteoporosis observed among non-drinkers relative to drinkers in older ages (30, 79, 80). Problems with mobility may be a hindrance to drinking alcohol since it can increase risks of accidents and injuries, alternatively problems with mobility may be a barrier to socialising in settings where alcohol is consumed.

Secondly, anxiety and depression in young adulthood was associated with non-drinking in the HSE (Chapter 4), and poor psychosocial health was associated with ex-drinking across the life course in the NCDS (Chapter 10). Worse psychosocial health may be a contributor towards the greater risk of cognitive

decline and dementia among non-drinkers relative to drinkers in later life, since studies have found early life depression and the cumulative effects of depression to increase the risk of cognitive decline and dementia in older age groups (192, 193). Although ex-drinkers had worse psychosocial health overall, lifetime abstainers had traits that appeared to relate to social anxiety compared with drinkers. For example non-drinkers had higher rates of being frightened of going out alone, or of meeting people, than drinkers; this may be a barrier to drinking alcohol which is often used as a precursor to socialising. Non-drinkers in young adulthood were also found to have having higher rates of emotional and behavioural problems during adolescence in both cohorts which was objectively assessed by a health visitor (Chapter 8). Furthermore although lifetime abstainers did not appear at greater risk of poor psychosocial health relative to drinkers in regression models, they were found to have worse psychosocial health compared with drinkers early on in life at age 23 (Table 7.8). Poorer mental health and emotional and behavioural problems from an early age, and traits suggestive of social anxiety may be a barrier towards social integration. This could increase the risk of cognitive decline, ageing, dementia and higher mortality among non-drinkers relative to drinkers since lack of social relationships has been found to be a risk factor for death on a par with smoking and excessive alcohol consumption, and had a greater protective effect than physical activity (110). Poorer social relationships may also affect healthy ageing, which has found to be greater among moderate drinkers than non-drinkers in later life (74).

Other childhood conditions non-drinkers appeared to suffer from may affect the outcomes of non-drinkers in later life indirectly through disadvantage and social exclusion. For example problems with speech, facial and general appearance and mental disability were higher among non-drinkers in the NCDS (Table 8.1) and BCS70 (Table 8.2 and Table 8.3) which may be a barrier to socialising or taking part in the workforce. Indeed studies have found that conditions, adversities and persistent disadvantage experienced early on in life impacts on health later in life (114-117, 198), and this includes increased risk of cardiovascular and coronary heart disease (115, 117). Furthermore ex-drinkers

and lifetime abstainers were also found to have a lower social position than drinkers in terms of lower educational qualifications (Chapter 7 and 9). A combination of poorer health and lower social position may interrelate and increase the risk mortality found among non-drinkers relative to drinkers later on in life where early life social position has been found to be a major determinant of health later on in life (116, 131).

Findings from this thesis support past studies which argue that non-drinkers are not an inadequate reference group (30, 61, 63, 112, 113, 197). The novelty of findings here however suggest that lifetime abstainers may also suffer from a pre-existing poor health bias, where lifetime abstainers are often used instead of ex-drinkers, since they are subject to a 'sick-quitter' bias. As mentioned in the previous paragraphs lifetime abstainers suffer more greatly from childhood conditions which could increase their risk of certain conditions such as cognitive decline, osteoporosis, and increase the risk of mortality. Some studies have attempted to account for pre-existing poor health by using only people who are healthy at baseline (129, 199). These papers excluded or adjusted for participants with similar characteristics at baseline for example heart disease, hypertension and cancer. Borfetta's paper found evidence of a protective effect on coronary heart disease (CHD) when using people who were healthy at baseline (1990) (129), however 'the protective effect of moderate drinking fell short of significance' when using lifetime abstainers as the reference category in Dawson's paper which adjusted for poor health at baseline (2000) (199). Borfertta's paper also failed to exclude ex-drinkers. In any case this thesis suggests that although these studies excluded participants with adult chronic conditions, lifetime abstainers may suffer from childhood conditions which could affect health later on in life which these studies do not account for.

Furthermore non-drinkers have a lower social position earlier on in life, (Chapter 4 and 9) where early-life health and social position could potentially increase the risk of mortality among non-drinkers. Although some J-curve studies using a middle-aged cohort have adjusted for social position; social position in later life has been found to be difficult to measure due to changes in occupational status and income among those in retirement (190) and therefore

these studies may not correctly account for disadvantage, particular throughout the life course beginning in childhood. One J-curve study which accounted for father's social class at birth, found no significant association between moderate alcohol consumption and reduced risk of mortality from CHD, which would be consistent with this argument.

In any case, whether moderate alcohol is protective for CHD has yet to be verified, a biologically plausibility and consistency of findings would provide support in favour for this relationship, however a causal relationship from observational studies can never be guaranteed. Even if moderate alcohol confers some kind of protective effect on CHD, results from this thesis have important implications for other conditions where a J-curve has been found for example cognitive decline, dementia, ageing and osteoporosis. Persistent poor health from an early age may be why non-drinkers consistently have worse outcomes across a broad range of conditions rather than moderate alcohol being protective across a spectrum of conditions.

Rates of lifetime abstainers (1.4-2.2%) were similar between cohorts, and the Health Survey from England from 1993-2003, demonstrating that they are a stable group within the population (34). Similarities were also found in the proportions among lifetime abstainers with a self-reported illness. Around 34.1% of white non-drinkers aged 18 to 34 years had a longstanding illness in 2006 and 2009 in the Health Survey for England, in the BCS70 this percentage rate was similar (36%). Furthermore around 14.3% of lifetime abstainers at age 42 in the NCDS (born in 1958) had a limiting longstanding illness from early adulthood, compared with 5.1% of drinkers, this shows that the sick non-starter group accounts for substantial proportion of lifetime abstainers across cohorts. Excluding those who are unhealthy from an early age would leave a very small reference group, where it has already been suggested that due to their small sample size they are an inadequate reference group (61). Therefore studies which wish to compare the health of drinkers and non-drinkers in later life should approach interpretation with caution exploring the early life characteristics of lifetime abstainers where possible and critically examine potential reasons why someone might abstain from alcohol throughout life,

otherwise abandon the comparison altogether and explore the effects of heavier consumption among drinkers.

13.3 Strengths and limitations

The strengths of this thesis include the use of three nationally representative studies, including two of prospective design conducted on cohorts from different generations. The association between self-rated poor health among young non-drinkers was observed consistently between studies even adjusting for social and demographic factors, and with the use of longitudinal data showed that this was also associated with persistent non-drinking across three decades of the life course. This was also shown to apply to both lifetime abstainers derived through consistent non-drinker statuses at successive sweeps, and self-identified 'lifetime abstainers' through responses to questions on current drinking status. Consistent findings across generations, in a cohort born in 1958, one born in 1970 and among younger adults born between 1974 and 1990 provides strong support that poor health has an influence on the non-consumption of alcohol, rather than being an artefact of the sample.

A further strength of this study is the use of objectively assessed medical conditions as carried out by a medical officer where non-drinkers showed higher rates of having worse health conditions in adolescence establishing that worse health existed before the non-consumption of alcohol. Whilst self-reported health in the form of limiting longstanding illness and longstanding illness may be influenced by an element of self-perceived health, which was attempted to be partially offset through adjusting for poor psychosocial health, consistent findings with objectively assessed conditions provides further support for associations between physical health, and not just mental health which has been established in previous studies (94, 95, 97, 100) and the non-consumption of alcohol.

A limitation of these findings is the large amount of missing longitudinal data which was largely due to attrition, which resulted in a smaller sample size and a loss in statistical precision (Chapter 6). Missing data appeared to be not missing completely at random (MCAR), resulting in a wealthier and more

educated sample which may lead to biased estimates. Furthermore attrition may have affected the relationship between sex and social position and lifetime abstention in the BCS70 where it was not significant (Section 9.5). Multiple imputation was not carried out due to item response being under 4%, and after deleting the imputed outcome variables, which essentially contain no information (183), would leave a relatively few number of missing values to impute, meaning imputation would be unlikely to affect results. However despite suffering from missing data, consistent findings between two cohorts confirming the hypothesis, and also using a nationally representative cross-sectional sample where missing data was not as large, strengthens findings. Furthermore analysis of missing data showed higher attrition from those with limiting longstanding illness or longstanding illness. This may be missing not at random, (MNAR) as people may be too ill to participate in the next wave of the survey. If the hypothesis that those who have poor health are more likely to be non-drinkers is true then this would underestimate associations due to the lower sample of ill people. Unfortunately this is impossible to verify.

The small sample size of lifetime abstainers is a limitation which made degrees of freedom within the model small, which is why covariates were limited to sex, education, malaise inventory score, marital status and presence of children. Another limitation of this thesis is that the oldest category of lifetime abstainers was at age 42, due to using successive waves of the survey and the lower sample size at age 50. Therefore we cannot be certain whether these people take up drinking later on in life. However this is a problem also for existing studies which use self-identified lifetime abstainers. There is also a decade span between waves therefore 'lifetime abstainers' may have drunk alcohol in between waves, however a self-identified measure was also used and consistent results were found using this measure.

Certain conditions such as increased risk of diabetes among lifetime abstainers later on in life(200), where not discussed in this thesis.e Low physical activity at an earlier age relative to drinkers found in Chapter 4 may be a potential factor, however studies have controlled for physical activity later in life. Future studies which wish to examine the relationship between diabetes and alcohol

could assess the nutritional status of non-drinkers and drinkers, analysing the implications of non-drinking towards diabetes was beyond the scope of this thesis. Ethnicity, (Asian, Black or Chinese) was also strong predictor of non-drinking (Chapter 4), where certain ethnic groups are at greater risk of diabetes and therefore studies using a multi-ethnic cohort need to account for this. Unfortunately ethnicity was not adjusted for in the prospective cohort studies. The population in the two British cohorts used here was predominately white, and not everyone had data on ethnicity, furthermore ethnic minorities were not over-sampled as has been done in other studies for example in the Millennium Cohort Study (201).

13.4 Future work

Future studies wishing to assess the effects of alcohol consumption on health between lifetime abstainers and drinkers, would need to consider early life health and social circumstances particular in areas such as cognitive decline where non-drinkers from an early age appear to be more socially disadvantaged. This could involve adjusting for early life measures such as father's social class at birth or particular conditions that could influence outcomes later in life. To my knowledge only one study has adjusted for father's social class at birth and in the association between reduced risk of CHD among drinkers was non-significant (127) however additional studies need to be carried out to observe whether results are replicated. The lack of studies on this may be due to requiring a dataset that follows a cohort from an early age. As an alternative, verifying past and current health conditions of non-drinking in middle age could be a way accounting for past health conditions within an older cohort, however this may be subject to problems with retrospective recall in particular when recalling past childhood conditions. Asking for reasons for not drinking and excluding those who respond 'for health reasons' may not properly capture past disadvantage as well, since poor health may have an indirect relationship in the decision to not drink alcohol from an early age. This could occur via social norms among disadvantaged groups or at the more extreme end via social exclusion since poor health and low social position to interrelate and contribute towards disadvantage. "I have no interest in drinking" was found to be the

most popular reason for not drinking among lifetime abstainers in a cross-country comparison suggesting norms to be the major influencing factor for abstaining, rather than health being the explicit reason (47). Alternatively due to the problematic nature of using such a small group as a reference category and the difficulty in adjusting for pre-existing social and health disadvantage, the comparison between non-drinkers and drinkers should be abandoned and the health effects of alcohol examined only among drinkers using observational data.

Future work could also look at the effects of a worsening of health on alcohol consumption in general. Whilst this thesis focused on the non-consumption of alcohol it was found that poor health increased odds of being a moderate rather than a heavy drinker, whilst developing a limiting longstanding illness was associated with reduction in alcohol consumption to occasional drinking, as well as non-drinking. Therefore poor health may have the effect of reducing alcohol consumption along a scale which requires further investigation using longitudinal data. This may create strong health selection effects into who remains a drinker in later life, where drinking in older age may be a sign of better health rather than a cause of it. In the NCDS, developing a limiting longstanding illness had a stronger association with a reduction in consumption to non-drinking than occasional drinking, which may suggest that the effect of reducing consumption is stronger with the severity of the health condition which could be explored in future analysis. It also suggests that non-drinkers fare worse in terms of health than special occasion drinkers which was also the case looking at rates of adolescent health among drinkers in young adulthood (Chapter 8). However occasional drinkers were also shown to have the highest rates of suffering from migraines and back-pain in young adulthood in the BCS70 (Table 8.2), demonstrating that occasional drinkers early on in life, as well as in later life (Chapter 11) (56), may also suffer from worse health, which could be an area for future research.

More complex models could also look at whether sociability or social capital such as number of friends mediates the association between poor health and non-drinking from an early age and in later life. Low income, education and

poor health found to be associated with non-drinking (Chapter 4) may be interrelated contributing to social exclusion. Studies suggest that non-drinkers appear to be less social (Section 2.3.1.2) where poor health could be a potential confounder. In this thesis it was found that lifetime abstainers had higher rates of saying yes to items on the malaise inventory that were related to low sociability (section 10.4.1), and non-drinkers in early adulthood had the lowest physical activity (Chapter 4).

Whilst this thesis has established an association between poor health and non-drinking through time, using different cohorts, studies could be carried out in other populations as the J-curve has been found to exist in many different countries. In such countries where drinking is less of a norm and rates of non-drinking is higher, abstinence may be less of a deviance from the norm and therefore the effects of health may be smaller due to more 'average' healthier people among the sample, as discussed in the literature review (Section 2.3.1.2). This was observed when comparing white non-drinkers to the total non-drinking population (including ethnic minorities) and white non-drinkers had the highest rates of self-rated poor health where non-drinking is more of a norm among ethnic minorities (Table 4.1). As mentioned earlier studies assessing the effects of morbidity outcomes by drinking group would need to ensure, where possible, that the sample is healthy at baseline or adjust for early life circumstances. A dose-response relationship that was no longer J-shaped would confirm that the poor health outcomes of non-drinkers was an artefact of the worse health and social position they began with and not to do with the non-consumption of alcohol.

Although the focus on this thesis has been on observational studies, in the future more sophisticated methods may be carried out to assess causality. For example a recent Mendelian randomisation study which uses gene variants to assess causality, and so in not subject to the same confounding bias in observational studies, found no relationship between alcohol consumption and cognitive function (202). This is consistent with this thesis which has suggested that non-drinkers do not have worse health outcomes, particularly in the area of cognitive functioning (19-21, 72, 73), because of not-drinking

alcohol, but because of early life confounding factors such as poorer mental health in adolescence which is not accounted for in the majority of studies. As more Mendelian randomisation studies are carried out in the future this may confirm whether moderate amounts of alcohol are protective on health. A recent Mendelian randomisation study found no association between moderate alcohol and CVD risk factors (203). If this finding is replicated in other Mendalian randomisation studies, this thesis offers as an explanation as to why non-drinkers consistently have worse health outcomes than moderate drinkers in later life in observational studies, even after accounting for measures in later life because of failure to capture early life disadvantage.

13.5 Policy and public health implications

Non-drinkers appear to have worse health consistently throughout life. Poor health appears to affect lifetime abstainers from an early age and coincides with a reduction in consumption across the life course, strongly suggesting there to be direct effects of poor health on non-consumption. Claims that alcohol in moderation is beneficial for health is based upon a comparison between moderate drinkers in later life and non-drinkers and the finding that moderate drinkers have better outcomes. However if non-drinkers suffer from social and health disadvantages across life, then this may exaggerate their worse outcomes relative to drinkers suggesting that the benefits of moderate alcohol consumption accruing to moderate drinkers to be overestimated or non-existent. This may particularly be the case for conditions such as cognitive decline and osteoporosis, since non-drinkers suffer from anxiety, behavioural and emotional problems and physical disability early on in life (Chapter 8). It may also affect CHD outcomes due to persistent social and health disadvantage; however a biological plausibility that moderate alcohol is protective and consistent evidence across studies means the claim of the protective effect has not been refuted. In any case a public health message that promotes moderate drinking is ill advised since increases in average consumption has been found to lead to greater levels of problematic drinking (13, 14). This thesis further supports a public health message that does not promote moderate consumption since it provides additional evidence that non-drinkers and even lifetime abstainers may

be subject to a pre-existing poor health bias, being found to be consistently worse off in terms of health than drinkers throughout the life course. As mentioned in section 13.2, perhaps the comparison between non-drinkers and drinkers should be abandoned altogether, and the focus placed on reducing harm among drinkers since this where the health of the population can benefit most.

Furthermore if the benefits of moderate alcohol consumption have been overestimated this has important implications for policy where there exists a tension between supply side policies and interventions that focus solely on the heaviest drinkers. In past the Government focused on the latter (87), where it has been argued that supply side policies, such as increases in the price of alcohol, would, as well reduce consumption among heavier drinkers, penalise the majority of drinkers who drink moderately. An influential factor behind this and heeded by the drinks industry (22, 25) is the perception that moderate amount of alcohol offers a protective effect on heart disease, and therefore moderate drinkers should be free from interventions. However this disregards that such studies apply only to middle-aged people, that alcohol consumption increases risk of liver disease and cancer and with findings from this thesis that these conclusions drawn from studies may be subject to bias due to comparing moderate drinkers with an already unhealthy reference group. There has been criticism of the Government's alcohol strategy in adopting softer policies such as educating individuals rather than supply side policies despite evidence to suggest that the most effective way to reduce harm would be to reduce general alcohol consumption (204). A current example of this is the Sheffield alcohol policy model which predicted that a rise to a 50p minimum unit price of alcohol in England after ten years would lead to 3,060 fewer deaths and 98,000 fewer hospital admissions, as well as reduction in crime and work days lost to abstention (196). Despite the evidence a minimum unit pricing act was not passed in England and Wales, but was passed in Scotland in June 2012(205) (205).

The scientific evidence shows that alcohol causes physical harms to the drinker and society however findings from this thesis suggests that alcohol has no or

little benefits to physical health, and the worse health outcomes of non-drinkers is due to the worse health they begin with rather than the non-drinking itself. This could have implications for the public health guidelines on alcohol consumption. In the past abstinence was advocated as a 'respectable' choice by members of the temperance movement however, whilst the public health message centres on sensible guidelines of drinking per day the option to not drink is often over looked (11), where the belief of a protective effect of moderate alcohol consumption may have been an influential factor. For example the World Cancer Research Fund, and the American Institute for Cancer Research consider a protective effect of moderate alcohol consumption when setting their guidelines of one to two drinks per day (206).

Recently in Britain however the drinking guidelines of recommended limits per day have been revised to include drink free days following recommendations from The Royal College of Physicians after recognising the risk of daily drinking on developing long-term conditions such as liver disease or cancer (207). As it currently stands the NHS recommends 'not regularly' drinking over the limits, where 'regularly' is defined as drinking most days or every day (208). Perhaps the public message needs to convey that not drinking is a healthy option and this could be included in the recommendations, or that it is ok to abstain. If poor health precedes non-drinking even from an early age and a reason for not drinking, than this may explain why non-drinkers consistently have worse outcomes than drinkers in observational studies and would suggest that there is nothing inherent with non-drinking in it itself. One in four people in Britain claimed to actually drink alcohol because they believed it to have health benefits (28) a view also found to be held in other populations (26-29).

13.6 Conclusions

Poor health from an early age and persistent poor health is associated with being a lifetime abstainer. Furthermore a worsening of health is associated with reducing consumption to non-drinking across the life course, even in early adulthood showing that poor health has a relationship with non-drinking across the life course and does not only co-occur with ageing and illness. Lifetime abstainers had worst health than drinkers from an early adulthood and across

the life course, whilst ex-drinkers had worse health than drinkers closer to the point of non-consumption. Both ex-drinkers and lifetime abstainers appear to be more socially disadvantaged than drinkers from an early age and throughout life. Furthermore lifetime abstainers appear to be less social and have higher rates of emotional and behaviour problems. This may contribute to their greater risk of cognitive decline and dementia in later life. Alternatively these conditions and other conditions that non-drinkers suffer more from in adolescence such as physical disability and backache, may indirectly increase the risk of morbidity and mortality later on in the life course, through persistent multiple disadvantage from an early age. J-curve studies which adjust for social position in later life may not correctly account for early life disadvantage. Studies which wish to compare non-drinkers with drinkers need to consider early life health and social characteristics, as this may influence their negative outcomes relative to drinkers. This may be why non-drinkers consistently have worse health outcomes than drinkers in later life across a broad range of conditions.

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Appendix B. Health condtions recorded by a health visitor at age 16 NCDS

Section 4
Summary of Findings

Having completed the examination, would you please read the following instructions and fill in the summary table.

For each category (a) to (u) below:

If no abnormal condition is present, ring '1'

If unable to decide whether condition present, ring '2'

If condition present but *will not handicap ordinary employment in future,* ring '3'

If the condition *might handicap the child in future employment,* ring '4', '5' or '6' as applicable.

If the condition is present and you cannot judge the degree of severity, please ring '7'

	None	Insufficient information	Degree of Handicap if Condition Present: No handicap	Slight	Moderate	Severe	Degree unknown	CDI	Please describe any condition present
a) General motor handicap	1	2	3	4	5	6	7	45	N2018
b) General physical abnormality	1	2	3	4	5	6	7	46	N2019
c) Mental retardation	1	2	3	3	4	5	6	47	N2020
d) Emotional/behavioural problem	1	2	3	4	5	6	7	48	N2021
e) Head and neck	1	2	3	4	5	6	7	49	N2022
f) Upper limb	1	2	3	4	5	6	7	50	N2023
g) Lower limb	1	2	3	4	5	6	7	51	N2024
h) Spine	1	2	3	4	5	6	7	52	N2025
i) Respiratory system	1	2	3	4	5	6	7	53	N2026
j) Alimentary system	1	2	3	4	5	6	7	54	N2027
k) Urogenital system	1	2	3	4	5	6	7	55	N2028
l) Heart	1	2	3	4	5	6	7	56	N2029
m) Haematological	1	2	3	4	5	6	7	57	N2030
n) Skin	1	2	3	4	5	6	7	58	N2031
o) Epilepsy	1	2	3	4	5	6	7	59	N2032
p) Other CNS condition	1	2	3	4	5	6	7	60	N2033
q) Diabetes	1	2	3	4	5	6	7	61	N2034
r) Eye condition	1	2	3	4	4	6	7	62	N2035
s) Hearing defect	1	2	3	4	5	6	7	63	N2036
t) Speech defect	1	2	3	9	5	6	7	64	N2037
u) Any other abnormal condition	1	2	3	4	5	6	7	65	N2038

For any remarks the Medical Officer wishes to add

Before signing the form would you mind please checking that ALL QUESTIONS have b answered and suitably recorded.

Signature of Medical Officer ..... date

Please thank the child (and parent if present) on our behalf.

THANK YOU

Appendix C. Health condtions recorded by a health visitor at age 10, BCS7

NOW PLEASE MAKE A GENERAL AND SYSTEMIC EXAMINATION OF THE CHILD AND ANSWER QUESTIONS B21, B22, B23, B24, B25 and B26 BASED ON YOUR FINDINGS.

B21. Please state whether or not any abnormal condition has been found in any of the following systems in the child.
Please record *all* abnormal clinical findings.

Please put a tick on each line	No abnormal condition	Abnormal condition present	Please describe and give diagnosis
(a) Facial and general appearance	☐ MEB21.1	☐	MEB21.2
(b) Skin condition	☐ MEB21.3	☐	MEB21.4
(c) Ear, nose or throat condition	☐ MEB21.5	☐	MEB21.6
(d) Upper respiratory condition	☐ MEB21.7	☐	MEB21.8
(e) Lower respiratory condition	☐ MEB21.9	☐	MEB21.10
(f) Cardiovascular condition	☐ MEB21.11	☐	MEB21.12
(g) Gastrointestinal condition	☐ MEB21.13	☐	MEB21.14
(h) Other abdominal condition	☐ MEB21.15	☐	MEB21.16
(i) Urogenital tract condition	☐ MEB21.17	☐	MEB21.18
(j) Neurological condition	☐ MEB21.19	☐	MEB21.20
(k) Musculo-skeletal condition	☐ MEB21.21	☐	MEB21.22
(l) Endocrine condition	☐ MEB21.23	☐	MEB21.24
(m) Blood or lymphatic condition	☐ MEB21.25	☐	MEB21.26
(n) Mental handicap	☐ MEB21.27	☐	MEB21.28
(o) Behavioural or emotional problem	☐ MEB21.29	☐	MEB21.30
(p) Other abnormal condition(s) or syndrome(s)			MEB21.31

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Appendix D Bi-variate analysis of non-drinkers compared with drinkers on the raw sample at age 34 (BCS70)

	Non-drinkers			Self-identified 'lifetime abstainers'			Drinkers	
	%	n		%	n		%	n
		620			215			9635
Sex (Male)	36.13	224	<0.001	**37.8**	**81**	**0.003**	48.6	4385
Highest qualification obtained								
Degree or higher	19.4	120		23.3	50		23.0	2168
Other	66.5	412		64.7	139		66.2	6238
No Qualifications	14.2	88	<0.001	12.1	26	0.808	10.8	1014
Social class at age 42*								
Higher	42.8	177		48.3	70		46.7	3537
Middle	41.8	173		37.2	54		39.7	3008
Lower	15.5	64		14.5	21		13	984
Other	-	-	0.116	-	-	0.717	0.6	43
Father's social class*								
Higher	17.2	91		11.6	19		20.2	1690
Middle	56.6	299		53.7	88		59.6	4990
Lower	**25.6**	135		34.2	56		**19.7**	1647
Other	0.6	3	0.009	0.6	1	<0.001	0.49	41

Appendix E Logistic regression on the odds of being a lifetime abstainer adjusting for father's social class at birth

Odds of being a lifetime abstainer versus drinker age 34	**2000**			**2004**		
	30 years N=6321			**34 years N=5528**		
	Odds Ratio	p-value	(95 % CI)	Odds Ratio	p-value	(95 % CI)
Sex (female)	0.98	0.926	(0.69 to 1.40)	0.89		
Longstanding illness since age 26						
Never had a LLSI	1			1		
Had a LLSI but not currently	1.16	0.685	(0.56 to 2.43)	1.56	0.137	(0.87 to 2.79)
Currently has a LLSI	0.82	0.531	(0.44 to 1.52)	0.92	0.793	(0.52 to 1.66)
Persistent LLSI in all waves	**2.89**	**<0.001**	**(1.88 to 4.44)**	**3.23**	<0.001	**(1.89 to 5.52)**
Malaise inventory score (high)	1.26	0.35	(0.77 to 2.06)	0.97	0.924	(0.55 to 1.72)
Father's Social Class at birth						
Higher	1			1		
Middle	0.86	0.523	(0.55 to 1.35)	1.03	0.921	(0.61 to 1.74)
Lower	1.26	0.377	(0.75 to 2.12)	1.62	0.115	(0.89 to 2.97)
Other	1.43	0.733	(0.18 to 11.02)	-		
Marital Status						
Single	1			1		
Married	1.21	0.341	(0.82 to 1.79)	0.9	0.699	(0.55 to 1.50)
Separated/widowed/divorced	0.71	0.441	(0.30 to 1.69)	0.66	0.505	(0.20 to 2.23)
Children in the household (yes)	1.27	0.223	(0.86 to 1.86)	1.16	0.544	(0.72 to 1.86)

Odds of being a self-identified 'lifetime abstainer' versus drinker	**2000 30 years N=6345**			**2004 34 years N=5552**		
	Odds Ratio	p-value	(95 % CI)	Odds Ratio	p-value	(95 % CI)
Sex (female)	0.99	0.963	(0.64 to 1.52)	1.39	0.13	(0.91 to 2.13)
Longstanding illness since age 26						
Never had a LLSI	1		-	1		
Had a LLSI but not currently	**2.04**	**0.05**	**(1.00 to 4.20)**	**1.98**	**0.016**	**(1.14 to 3.43)**
Currently has a LLSI	1.51	0.181	(0.83 to 2.75)	1.01	0.964	(0.57 to 1.80)
Persistent LLSI in all waves	**2.04**	**0.049**	**(1.13 to 3.68)**	**2.77**	**0.001**	**(1.56 to 4.92)**
Malaise inventory score (high)	1.14	0.668	(0.62 to 2.11)	1.2	0.5	(0.71 to 2.04)
Highest qualification						
Higher	1		-	1		
Middle	1.24	0.499	(0.67 to 2.28)	1.27	0.413	(0.71 to 2.27)
Lower	1.69	0.138	(0.85 to 3.37)	2.37	0.008	(1.26 to 4.47)
Other	**5.13**	0.039	(1.09 to 24.15)	-	-	-
Marital Status						
Single	1		-	1		
Married	1.07	0.778	(0.66 to 1.73)	0.85	0.528	(0.54 to 1.37)
Separated/widowed/divorced	0.66	0.441	(0.23 to 1.89)	0.62	0.432	(0.18 to 2.07)
Children under 16 in the household (yes)	**1.68**	**0.033**	**(1.04 to 2.70)**	0.86	0.522	(0.54 to 1.37)

Appendix F. Logistic regression on the odds of being an ex-drinker (non) and (SO) stratified by gender

Ex-drinker (non) Males	**1991**				**2000**				**2008**			
	Age 33 (N=4408)				**Age 42 (N=4570)**				**Age 50 (N=4239)**			
	n=65	OR	p-value	(95% CI)	n=90	OR	p-value	(95% CI)	n=91	OR	p-value	(95% CI)
Limiting longstanding illness since previous sweep												
No LLSI	53	1			60	1			56	1		
No longer LLSI	2	0.84	0.808	(0.20 to 3.50)	4	2.11	0.163	(0.74 to 6.05)	9	**2.17**	**0.035**	**(1.06 to 4.46)**
Developed LLSI	8	**3.16**	**0.004**	**(1.44 to 6.94)**	17	1.82	0.050	(1.00 to 3.33)	13	**2.04**	**0.029**	**(1.08 to 3.89)**
Persistent LLSI	2	1.89	0.400	(0.43 to 8.35)	9	**3.31**	**0.003**	**(1.52 to 7.23)**	13	**2.65**	**0.004**	**(1.36 to 5.16)**
Malaise score (high)	7	1.99	0.109	(0.86 to 4.59)	28	**3.06**	**<0.001**	**(1.84 to 5.10)**	19	1.61	0.098	(0.92 to 2.81)
Top qualification												
Degree	5	1			15	1			7	1		
Other	38	1.69	0.273	(0.66 to 4.34)	50	0.85	0.592	(0.47 to 1.54)	55	**2.44**	**0.028**	**(1.10 to 5.40)**
No qualifications	22	**3.78**	**0.009**	**(1.40 to 10.23)**	25	1.33	0.407	(0.68 to 2.61)	29	**3.75**	**0.002**	**(1.61 to 8.74)**
Marital Status												
Single	18	1			21	1			14	1		
Married	45	0.94	0.860	(0.46 to 1.92)	48	0.73	0.344	(0.39 to 1.39)	56	0.72	0.29	(0.39 to 1.33)
Separated/widowed/divorced	2	0.24	0.059	(0.06 to 1.05)	21	1.07	0.842	(0.57 to 2.01)	21	0.96	0.900	(0.48 to 1.91)
Children in household	38	0.76	0.422	(0.40 to 1.47)	45	**0.52**	**0.014**	**(0.30 to 0.88)**	18	0.85	0.566	(0.50 to 1.46)

Ex=drinker (non) Females	**1991 Age 33 (N=4718)**				**2000 Age 42 (N=4887)**				**2008 Age 50 (N=4662)**			
	163	OR	p-value	(95% CI)	159	OR	p-value	(95% CI)	181	OR	p-value	(95% CI)
Limiting longstanding illness since previous sweep												
No LLSI	135	1			96	1			99	1		
No longer LLSI	10	**2.37**	**0.012**	**(1.21 to 4.64)**	5	1.74	0.241	(0.69 to 4.37)	19	**2.15**	**0.003**	**(1.29 to 3.60)**
Developed LLSI	12	1.82	0.058	(0.98 to 3.40)	42	**3.00**	**<0.001**	**(2.02 to 4.46)**	35	**2.48**	**<0.001**	**(1.64 to 3.76)**
Persistent LLSI	6	**4.66**	**0.001**	**(1.88 to 11.54)**	16	**4.93**	**<0.001**	**(2.71 to 8.95)**	28	**2.65**	**<0.001**	**(1.67 to 4.22)**
Malaise inventory score (high)	20	1.17	0.544	(0.70 to 1.95)	46	1.47	0.052	(1.00 to 2.16)	60	**1.70**	**0.002**	**(1.21 to 2.40)**
Top qualification					0							
Degree	18	1			14	1			23	1		
Other	107	0.90	0.683	(0.54 to 1.51)	108	1.53	0.146	(0.86 to 2.70)	106	1.29	0.276	(0.81 to 2.06)
No qualifications	38	1.53	0.162	(0.84 to 2.78)	37	**1.97**	**0.038**	**(1.04 to 3.75)**	52	**2.29**	**0.002**	**(1.37 to 3.85)**
Marital Status												
Single	26	1			27	1			23	1		
Married	114	1.00	0.998	(0.60 to 1.67)	93	**0.43**	**0.001**	**(0.26 to 0.71)**	106	**0.61**	**0.039**	**(0.38 to 0.97)**
Separated/widowed/divorced	23	0.99	0.982	(0.54 to 1.83)	39	0.68	0.159	(0.39 to 1.17)	52	0.80	0.398	(0.48 to 1.34)
Children in household	120	0.91	0.671	(0.60 to 1.39)	129	1.46	0.106	(0.92 to 2.32)	27	0.89	0.602	(0.58 to 1.37)

Ex-drinker (SO) Males	**1991**				**2000**				**2008**			
	Age 33 (N=4343)				**Age 42 (N=4480)**				**Age 50 (N=4148)**			
	311	OR	p-value	(95% CI)	187	OR	p-value	(95% CI)	129	OR	p-value	(95% CI)
Limiting longstanding illness since previous sweep												
No LLSI	276	1			148	1			90	1		
No longer LLSI	13	1.18	0.589	(0.65 to 2.12)	9	**2.46**	**0.013**	**(1.21 to 5.00)**	9	1.38	0.368	(0.68 to 2.79)
Developed LLSI	14	1.20	0.541	(0.67 to 2.12)	24	**1.65**	**0.033**	**(1.04 to 2.63)**	14	1.39	0.278	(0.76 to 2.54)
Persistent LLSI	5	1.29	0.595	(0.50 to 3.36)	6	1.41	0.435	(0.60 to 3.32)	16	**2.08**	**0.016**	**(1.15 to 3.78)**
Malaise inventory score (high)	20	1.44	0.144	(0.88 to 2.36)	21	1.05	0.852	(0.64 to 1.71)	24	**1.64**	**0.049**	**(1.00 to 2.70)**
Top qualification												
Degree	18	1			22	1			19	1		
Other	213	**2.61**	**<0.001**	**(1.60 to 4.27)**	125	1.63	0.037	(1.03 to 2.60)	68	1.18	0.523	(0.70 to 1.99)
No qualifications	80	**4.16**	**<0.001**	**(2.45 to 7.06)**	40	2.05	0.009	(1.20 to 3.50)	42	**2.36**	**0.003**	**(1.34 to 4.17)**
Marital Status												
Single	68	1			31	1			26	1		
Married	226	0.78	0.177	(0.54 to 1.21)	135	0.91	0.693	(0.56 to 1.48)	81	**0.49**	**0.003**	**(0.31 to 0.78)**
Separated/widowed/divorced	17	**0.47**	**0.007**	**(0.27 to 0.82)**	21	0.63	0.144	(0.35 to 1.12)	22	**0.51**	**0.026**	**(0.29 to 0.92)**
Children in household	215	**1.44**	**0.030**	**(1.04 to 2.01)**	129	0.83	0.353	(0.55 to 1.23)	32	1.13	0.572	(0.74 to 1.72)

Ex-drinker (SO) Females	**1991**				**2000**				**2008**			
	Age 33 (N=4555)				**Age 42 (N=4728)**				**Age 50 (N=4281)**			
	275	OR	p-value	(95% CI)	149	OR	p-value	(95% CI)	105	OR	p-value	(95% CI)
Limiting longstanding illness since previous sweep												
No LLSI	533	1			250	1			167	1		
No longer LLSI	18	1.14	0.611	(0.68 to 1.90)	12	1.72	0.084	(0.93 to 3.18)	13	0.98	0.958	(0.55 to 1.76)
Developed LLSI	27	1.12	0.596	(0.73 to 1.72)	61	**1.88**	**<0.001**	**(1.38 to 2.56)**	38	**1.89**	**0.001**	**(1.29 to 2.77)**
Persistent LLSI	11	**3.36**	**0.001**	**(1.61 to 7.03)**	13	**1.86**	**0.047**	**(1.01 to 3.43)**	16	1.08	0.780	(0.63 to 1.87)
Malaise inventory score (high)	59	1.16	0.351	(0.85 to 1.57)	70	1.28	0.107	(0.95 to 1.72)	57	**1.49**	**0.016**	**(1.08 to 2.06)**
Top qualification												
Degree	41	1			34	1			34	1		
Other	446	**1.59**	**0.008**	**(1.13 to 2.22)**	236	**1.51**	**0.029**	**(1.04 to 2.19)**	155	1.35	0.126	(0.94 to 2.98)
No qualifications	99	**1.74**	**0.006**	**(1.17 to 2.58)**	66	**1.93**	**0.003**	**(1.25 to 2.99)**	45	**1.72**	**0.024**	**(1.07 to 2.75)**
Marital Status												
Single	69	1			36	1			13	1		
Married	447	0.92	0.579	(0.67 to 1.25)	229	0.83	0.376	(0.56 to 1.25)	174	1.67	0.082	(0.94 to 2.98)
Separated/widowed/divorced	70	0.79	0.230	(0.54 to 1.16)	71	1.00	0.994	(0.64 to 1.56)	47	1.32	0.386	(0.70 to 2.48)
Children in household	491	**1.78**	**<0.001**	**(1.36 to 2.33)**	274	1.11	0.511	(0.81 to 1.53)	44	1.05	0.799	(0.74 to 1.47)

Appendix H: Dissemination of findings

Publications

Ng Fat, L. Cable, N., Marmot, M, Shelton, N., (In Press). *Persistent longstanding illness and lifetime abstention from early adulthood, findings from two prospective British Cohorts,* Journal of Epidemiology and Community Health

Ng Fat, L. Cable, N., Shelton, N., Marmot, M (2013) *Poor health may be a reason for lifetime abstention; Implications for the protective effects of moderate alcohol consumption,* Abstract published in the European Journal of Epidemiology, 28 (1): p48

Ng Fat, L (2012) *Are we overestimating the beneficial effects of alcohol in later life? The case of young non-drinkers,* Abstract published in the Journal of Epidemiology and Community Health, 66 (Suppl I):A1-A66

Ng Fat, L. and Shelton, N. (2012), *Associations between self-reported illness and non-drinking in young adults.* Addiction, 107(9): p. 1612-1620.

Oral presentations

08/11/13	Are we overestimating the beneficial effects of alcohol in later life? The sick quitter and sick non-starter hypotheses, SSA Conference, York
13/09/13	Poor health may be a reason for lifetime abstention; Implications for the protective effects of moderate alcohol consumption, EuroEpi Congress, Aarhus Denmark
04/06/13	Poor health may be a reason for lifetime abstention; Adolescent health conditions and drinking status among young adults. KBS Conference, Kampala, Uganda
13/09/12	Are we overestimating the beneficial effects of alcohol in later life? The sick quitter and sick non-starter hypotheses, Society of Social Medicine Conference, London School of Tropical Hygiene
11/09/12	Poor health and non-drinking across the life course; the sick-quitter and sick-non-starter hypothesis, ENRGHI 2012, UCL

06/06/12 Poor health and non-drinking across the life course; the sick-quitter and sick-non-starter hypothesis KBS Annual Alcohol Epidemiology conference, University of Stavanger, Norway

24/04/12 Are we over-estimating the beneficial effect of alcohol? The case of young non-drinkers, MRC Population Health and Methods Challenges, Birmingham ICC, Birmingham

09/12/12 Understanding the behaviour and lifestyles of young non-drinker Upgrade to PhD, Department of Epidemiology and Public Health, Torrington Place, UCL, London

27/10/11 Associations between self-reported illness and non-drinking among young adults 71st Alcohol Problems Research Symposium, Kendal, Cumbria

05/07/11 Understanding the behaviour and lifestyles of young non-drinkers, ESDS Health Survey User conference, the Royal Statistical Society, London

Awards

13/09/12 Top ten scoring abstract for paper presented at the Society of Social Medicine conference, London School of Tropical Medicine and Hygiene

06/06/12 Winner of the Ole-Jørgen Skog Early Career Scientist award for paper presented at Kettil Bruun Society conference, University of Stavanger, Norway