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SOCIOECONOMIC DIFFERENCES IN ALCOHOL HABITS,
ALCOHOL-RELATED DISORDERS AND MORTALITY

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Socioeconomic differences in alcohol habits, alcohol-related disorders and mortality

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'Vanity of vanities; all is vanity.

What do people gain from all their labors at which they toil under the sun?

Generations come and generations go, but the earth remains forever.

The sun rises and the sun sets and hurries back to where it rises.

The wind blows to the south and turns to the north; round and round it goes, ever returning on its course.

All streams flow into the sea, yet the sea is never full. To the place the streams come from, there they return again.

All things are wearisome, more than one can say.

The eye never has enough of seeing, nor the ear its fill of hearing.

What has been will be again, what has been done will be done again; there is nothing new under the sun.

Is there anything of which one can say, 'Look! This is something new!'

It was here already, long ago; it was here before our time.

...

For in much wisdom is much grief:

and thou that increase knowledge increase sorrow.'

Ecclesiastes 1:1

ABSTRACT

The overall aim of this thesis is to enhance knowledge about stability and predictors of change in alcohol habits among different sociodemographic subgroups, and to assess the contribution of alcohol use to social differences in alcohol-related disorders and all-cause mortality. Furthermore, as examples of exposure to stressful life events, we examine how parental separation in childhood and separation from partner in adulthood affect alcohol habits over time. This research is approached in four observational studies (Study I-IV), using data from two general population survey cohorts from Stockholm County, Sweden during the first decade of the 21st century.

The findings from Study I show an overall modest contribution of gender to variability in pattern of change in drinking, and that increasing age predicted more stable pattern of drinking. When we measured level of consumption, self-employed women stood out, showing more risky normal weekly alcohol consumption, which was also stable over time. Socioeconomic position did not predict change in alcohol habits for the measurement of AUDIT but low educational level and self-employment predicted change in the normal weekly alcohol consumption.

Study II and III confirm that there are social differences in alcohol-related disorders and in all-cause mortality. In addition, social inequalities in alcohol use were found to contribute to the socioeconomic position differences in alcohol-related disorders and all-cause mortality; this was most evident when we examined frequencies of heavy episodic drinking.

In Study IV, parental divorce in childhood was found to affect the individual's alcohol habits throughout life, whereas separation in adulthood has a shorter effect on and a stronger association with alcohol habits during the years after the event. These observations did not differ by gender, age or length of education.

The main conclusion of this thesis is that socioeconomic differences in alcohol use partly explain the health inequalities in alcohol-related harm and all-cause mortality found in Sweden. Furthermore, use of measures of both levels and patterns of drinking is recommended when assessing the impact of alcohol on social inequalities in alcohol-related harm or all-cause mortality, so as not to underestimate the role of alcohol use in differences between socioeconomic groups.

Reduced social inequalities in alcohol-related morbidity and all-cause mortality could in principle be achieved if the social differences in heavy episodic drinking were reduced in the general population. Moreover, there is a need to monitor the growing group of self-employed, since this group was found to practice stable risky alcohol habits, and are potentially more vulnerable due to less social security as self-employed.

LIST OF SCIENTIFIC PAPERS

- I. Syden L, Wennberg P, Forsell Y, Romelsjo A. Stability and change in alcohol habits of different socio-demographic subgroups - a cohort study. *BMC Public Health*. 2014;14:525.
- II. Syden L, Sidorchuck A, Makela P, Landberg J. The contribution of alcohol use and other behavioural, material, and social factors to socioeconomic differences in alcohol-related disorders in a Swedish cohort [submitted].
- III. Syden L, Landberg J. The contribution of alcohol use and other lifestyle factors to socioeconomic differences in all-cause mortality in a Swedish cohort. *Drug and Alcohol Review*. 2016 [accepted 21/7 2016].
- IV. Syden L, Forsell Y, Wennberg P. Separation in childhood and adulthood and the development of alcohol habits in a Swedish cohort of adults [manuscript].

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LIST OF ABBREVIATIONS

AUDIT	Alcohol Use Disorders Identification Test
BMI	Body Mass Index
GBD	Global Burden of Disease
HED	Heavy Episodic Drinking
ICC	Intraclass correlation
ICD	International Classification of Diseases
NWAC	Normal weekly alcohol consumption
PART	Study of mental health, work, and relationships (in Swedish: <i>Psykisk hälsa, Arbete och RelaTioner</i>)
SA	Separation in adulthood
SC	Separation in childhood
SEP	Socioeconomic position
SES	Socioeconomic status
SPHC	Stockholm Public Health Cohort

1 INTRODUCTION

Alcohol use contributes to a significant proportion of the disease burden in the world and, according to the Global Burden of Disease (GBD) estimates from 2013, ranks as the number six risk factor to overall disease burden, including both mortality and morbidity (Forouzanfar et al., 2015, Gowing et al., 2015). In the Nordic countries, the majority of the disease burden attributed to alcohol is due to premature mortality (Agardh et al., 2016). Therefore, monitoring patterns of alcohol consumption and alcohol-related harm is an important part of public health work in countries and regions.

The development of alcohol consumption in the Swedish population during the last decade (2001-2012) was inventoried from various survey studies and summarized in a report by Leifman and Trolldal (2014). This study showed a relatively clear picture of changes and stability in alcohol consumption. Risky consumption decreased among men, while women's alcohol use was more stable over the time period (Leifman, 2014). Closer analyses revealed that the decline among men was mainly found among the younger men, and there was an increase in alcohol consumption among older people, especially women.

Numerous studies have documented a social gradient in alcohol-related harm, regardless of which alcohol-related health outcome is measured, groups with lower socioeconomic position (SEP) typically experience higher levels of alcohol-related harm compared to higher social strata (Mackenbach et al., 2015, Schmidt, 2010). Socioeconomic disparities in alcohol-related mortality tend to be significantly larger than those found for all-cause mortality (Probst et al., 2014), and in Sweden recent findings revealed that men with low education levels have approximately 4 times higher rates of alcohol-related mortality relative to the group with the highest education (Budhiraja and Landberg, 2016).

While the more disadvantaged parts of the population suffer from higher risk of alcohol-related harm, the differences in hazardous levels of alcohol consumption are smaller (Bloomfield et al., 2006, Makela and Paljarvi, 2008). Little is known about the processes and causes for these disparities. One possible explanation is that the disadvantaged are more exposed – and more vulnerable – to stressful life events, where chronic stressors increase the vulnerability to psychological distress and problem drinking (Mulia et al., 2008). The differences in alcohol use are expected to contribute to the social differences in alcohol-related harm, but there is a lack of knowledge of to what extent.

However, the GBD study and the Swedish consumption monitoring surveys mentioned above do not take social differences in alcohol use or alcohol-related harm into account, and are based on cross-sectional data. This indicates a need of a longitudinal perspective, which offers a possibility to study socioeconomic differences in alcohol use and changes in drinking over time. The reduction of health inequalities has been a widely promoted goal of general health policy for a long time; nonetheless, issues related to inequity have not been addressed in the Swedish alcohol policy agenda until recently.

Moreover, a recent review concluded, that further research is needed to better characterize the relationship between socioeconomic position, alcohol use and alcohol-related harm so as to

gain a greater understanding of the processes that influence the differential risk of harm between people of low and high socioeconomic status (Jones et al., 2015).

Taken together, this raises questions about the processes that cause the excess alcohol-related harm among the socioeconomically disadvantaged, and how much alcohol use explains those differences. In this thesis, we want to get a better understanding of the phenomenon of socioeconomic inequalities in alcohol use and alcohol-related harm, and to explore explanations for this discrepancy.

2 AIMS

The overall aim of this thesis is to enhance knowledge about stability and predictors of change in alcohol habits by sociodemographic subgroups, and to assess the contribution of alcohol use to social differences in alcohol-related disorders and all-cause mortality.

Furthermore, as examples of exposure to stressful life events, we examine how parental separation in childhood and separation from partner in adulthood affect alcohol habits over time.

2.1 STUDY AIMS

Study I: While a number of studies have described changes over time in the level of alcohol consumption in subgroups, the literature on longitudinal stability in alcohol habits (including alcohol-related problems and consequences) in socioeconomic subgroups is sparse (Rehm et al., 2003). Study I explores two different measures of alcohol habits to give a broader picture of the stability of alcohol habits in the studied population, and how age, gender, educational level, and occupational class predict longitudinal stability and change in two Swedish cohorts.

Study II: This study aims to identify factors that underlie the relationship between SEP and alcohol-related disorders. More specifically, we estimate the socioeconomic differences, measured by occupational class, in alcohol-related disorders and assess to what degree it may be explained by differences in levels of alcohol consumption, patterns of heavy episodic drinking or a combination of both. We also sought evidence on whether, and to what extent material and social factors as well as other health behaviours account for the association between SEP and alcohol-related disorders – over and above the effect of alcohol use.

Study III: Different alcohol use measures may have differential impact on the perceived social gradient in mortality, which may explain why previous studies have presented somewhat contradictory results concerning the contributions of alcohol use to social inequalities in all-cause mortality (Stringhini et al., 2010, Lantz et al., 1998) Moreover, most studies within the field have focused on only one SEP indicator. For this reason the aim is to investigate to what degree the association between education, occupational class, and income, on one hand, and all-cause mortality on the other, is explained by socioeconomic differences in alcohol use and other lifestyle factors. In addition, we will assess whether the separate and combined effects of volume of consumption and HED differ in this context.

Study IV: Exposure to stressful life events, such as separation from partner, is an important component in an individual's risk for high alcohol consumption and alcohol use disorders (Keyes et al., 2011a) and parental divorce has been associated with increased risk for alcohol dependence in adulthood (Hansagi et al., 2000), especially among women (Kendler et al., 2002). However, it remains unknown whether separation in childhood and in adulthood have an interacting effect on changes in alcohol habits over time and whether it varies between genders. This study aimed to examine how parental separation in childhood and separation from partner in adulthood affect the development of alcohol habits over time in an adult cohort and whether they affect men and women differently.

3 PREVIOUS RESEARCH

3.1 ALCOHOL HABITS OVER THE LIFE COURSE

Alcohol habits vary over time, over shorter or longer intervals, among individuals, cohorts, and whole populations. Different studies address different levels when examining alcohol habits over time: macro level (time-series and aggregated data) and individual (cross-sectional or longitudinal). This research project focuses on individual level and longitudinal alcohol habits in the general adult population.

The typical drinking pattern over the life course begins with a debut in the teenage years, followed by increasing consumption until early adulthood, and gradually decreasing consumption thereafter (Moore et al., 2005). The drinking pattern also changes over the life course, and while teenagers and young adults tend to be more prone to high episodic drinking, adults tend to have more continuous consumption (Quigley and Marlatt, 1996, Molander et al., 2010).

Longitudinal studies of alcohol consumption generally find age-related changes (Moore et al., 2005, Karlamangla et al., 2006, Molander et al., 2010) and decreasing consumption with age is common. In studies of the pattern of change in alcohol use across the life course, Fillmore et al. (1991) and Johnstone et al. (1996) found an overall modest contribution of gender to variability in the patterns of change in drinking. Beyond this, increasing age predicted more stable patterns of drinking. In addition, Kerr et al. (2002), examining three longitudinal population surveys in the United States, found lower stability in alcohol consumption when the follow-up time was longer.

3.2 ALCOHOL POLICY AND HABITS IN SWEDEN

The total consumption model is a vital ingredient in alcohol epidemiology and the basis for the restrictive alcohol policy in Sweden. In brief, the model comprises the theory of the collectivity of drinking behaviour, elaborated by Skog (1985). The theory is based on the assumption that drinking is a social behaviour and the individual's drinking is affected by the drinking in the surrounding environment. This implies that changes in alcohol consumption would be synchronous across all drinking categories, and that increase in the per capita alcohol consumption is associated with increasing rates of alcohol-related harm.

The hypothesis that various consumption groups, from light to heavy drinkers, tend to move up and down the consumption scale in concert has received strong empirical support when whole populations are examined (Rossow et al., 2014). On the other hand, there is little evidence for whether drinking across socioeconomic groups also tends to move in concert. Raninen et al. (2013) found a decline in all consumption levels among men and women under 50 years of age. However, the decline was smaller in the groups with the highest consumption. Moreover, among those aged over 50 years, consumption actually increased among the heaviest drinkers, which implies exceptions from the collectivity theory, and hints at a possible social component.

In Sweden, as in other countries, the gender gap in alcohol consumption and alcohol-related problems has been narrowing, with a slight increase in both consumption and problems

among women, and a decrease among men (Kallmen et al., 2011, Keyes et al., 2011b). In a multi-national study by Bloomfield et al. (2006) abstinence was found to differ between the lowest and highest educational groups for both men and women in Sweden. No social differences were found for high alcohol consumption, but for binge drinking the results for men (and not women) demonstrated a social gradient.

3.3 HARMS OF ALCOHOL USE

Social inequality in health behaviours can make an important contribution to social inequality in health and life expectancy. Alcohol consumption is causally – and detrimentally – related to more than 60 medical conditions and is responsible for increased illness and death (Rehm et al., 2003). Regarding alcohol use, two aspects are of particular importance for health and life expectancy: overall alcohol consumption and drinking patterns. High alcohol consumption, especially over a long time, increases the risk of many diseases, including cirrhosis of the liver, pancreatic inflammation, depression, and cancer in the oesophagus (Norstrom and Ramstedt, 2005). Furthermore, stable high consumption over time increases the risk of alcohol dependence (or alcohol abuse). The drinking pattern that includes high alcohol intake per drinking occasion increases the risk of traffic accidents, drownings, violence, and deliberate self-harm (Babor, 2010). To elucidate the possible social inequality in both of these aspects of alcohol use is therefore important, when considering the importance of alcohol use in social inequality in health.

3.4 FACTORS RELATED TO CHANGE IN ALCOHOL HABITS

Socioeconomic position and socio-demographic factors are presumed predictors of alcohol habits (Room et al., 2005). Women are more likely to decrease or quit drinking than men at all ages. Molander et al. (2010) found education to predict changes in drinking across different drinking measures. However, these associations vary, and women's risky drinking may be associated with lower levels of education in high-income countries but with higher levels of education in low-income countries (Wilsnack et al., 2009, Grittner et al., 2012). Furthermore, the declines in alcohol consumption with age are more consistent in North America and Europe than elsewhere.

Exposure to stress is an important component in individual risk for high alcohol consumption and alcohol use disorders (Keyes et al., 2011a), since alcohol consumption is one of many possible reactions to psychological strain. Health-related stressors, e.g., hospitalization, illness, and mental disorders, have been found to be associated with decreased alcohol consumption in adults (Brennan et al., 1999, Perreira and Sloan, 2001, Brennan et al., 2010). Conversely, other non-health-related stressors, e.g. life events, personal separation (divorce, widowhood, or death of a child), are associated with increased alcohol consumption (Romelsjö et al., 1991, Perreira and Sloan, 2001, Kendler et al., 2002). Separation from partner has been reported to be associated with increased drinking among men, but in women this association has varied in different studies (Veenstra et al., 2006).

Parental divorce has been found to be associated with high alcohol consumption in young adulthood (Backer-Fulghum et al., 2012, Rothman et al., 2008) and later increased risk for

alcohol dependence in adulthood (Hansagi et al., 2000), especially among women (Kendler et al., 2002). However, Pirkola et al. (2005) found no increased risk of alcohol dependence in adulthood among those who experienced the death of a parent in childhood.

3.5 SOCIOECONOMIC POSITION

Equity in health is an ethical concept based on the principles of distributed justice and the absence of socially unfair health disparities (Whitehead, 1992). Health inequality is defined as a situation where a health outcome differs systematically, where disadvantaged groups experience worse health than more advantaged groups (Braveman and Gruskin, 2003). Socioeconomic position (SEP) is defined as the social and economic factors that influence a group's position within a society (Galobardes et al., 2006a, Galobardes et al., 2006b) and the most frequent measures of SEP are education, occupational class and income.

Indicators of socioeconomic status, such as education, income, and occupational status are partially overlapping and therefore positively correlated; for instance, higher education is often associated with high occupational class and high income. Yet they capture different phenomena and possibly also different causal mechanisms (Geyer et al., 2006, Lahelma et al., 2004). In view of this, more than one SEP indicator was used for the analyses in Study I-III. It is important to note that this thesis focuses on socioeconomic differences in alcohol use and alcohol-related health and does not address other types of social inequalities in drinking, such as those related to gender, age, or ethnic group.

3.6 SEP AND ALCOHOL

The various factors used as indicators of SEP affect alcohol consumption and thus, indirectly, affect alcohol-related problems. Conversely, alcohol use and alcohol-related problems can affect several indicators of SEP, such as occupational class and income (Auld, 2005, MacDonald and Shields, 2001). In the literature, socioeconomic factors are often expected to affect alcohol-related problems indirectly, through alcohol consumption and drinking patterns. Furthermore, groups with lower SEP are believed to be more vulnerable, compared to higher SEP groups, experiencing more negative consequences given same consumption level and drinking patterns (Bellis et al., 2016, Lewer et al., 2016). Similarly, it is also possible that the alcohol problems themselves affect alcohol consumption, as when the problems are perceived as so serious that the person seeks assistance or treatment that is successful in getting him or her to drink less.

3.7 SEP, ALCOHOL-RELATED DISORDERS AND MORTALITY

Groups with lower SEP experience higher levels of alcohol-related harm compared to those in higher social strata (Mackenbach et al., 2015, Schmidt, 2010). Socioeconomic disparities in alcohol-related mortality have been found to be larger than those found for all-cause mortality (Probst et al., 2014, Tarkiainen et al., 2016), and in Sweden recent findings revealed a social gradient in alcohol-related mortality for men with low education relative to the group with the highest education (Budhiraja and Landberg, 2016).

Regarding the link between SEP and mortality, recent research has shown that a substantial proportion of the social gradient in mortality may be attributed to differences in health

behaviours across socioeconomic groups (Probst et al., 2014, Martikainen et al., 2014, Nandi et al., 2014, Stringhini et al., 2010). However, these studies only used one SEP indicator, or only looked at alcohol volume, and the results therefore differed concerning the contribution of alcohol use to the social inequalities in mortality.

3.8 THE DISCREPANCY BETWEEN CONSUMPTION AND CONSEQUENCES

Previous evidence shows that even though individuals in higher socioeconomic position are more likely to report exceeding recommended drinking limits, it is the lower socioeconomic groups that experience more alcohol-related harm. This is called the ‘alcohol harm paradox’. Several studies, foremost from the UK, have studied this phenomenon and found that low socioeconomic groups are more likely to drink at extreme levels (Lewer et al., 2016), and depending on which SEP indicator that is used, the alcohol harm paradox is observed as a linear trend (gradient) or as an association foremost with the most disadvantaged groups (Beard et al., 2016), partly explaining the alcohol harm paradox.

3.8.1 Theories for the social gradient in alcohol-related harm

Socioeconomic factors are assumed to affect alcohol use and alcohol-related disorders through both differences in *exposure* and *vulnerability* (Diderichsen et al., 2012). Differential exposure means that people in different socioeconomic groups drink different amounts or in differentially harmful ways. The reason for this is often thought to be a higher exposure to stress, or to greater combined health challenges (e.g. smoking, obesity, poor exercise). Differential vulnerability, on the other hand, means that the same amount and pattern of drinking may result in more harmful consequences in disadvantaged groups.

Regarding the *difference in exposure*, some studies suggest that the more severe the alcohol-related outcomes that are being studied, the larger the social differences that are found (Paljarvi et al., 2013). However, a Finnish study (Makela & Paljarvi, 2008) observed that lower SEP groups had an increased risk of alcohol-related hospitalization and mortality, even after controlling for both level of consumption and harmful drinking patterns. A review of numerous studies indicates that social differences in alcohol exposure are an inadequate explanation for the negative social gradient in alcohol-related mortality (Probst et al. 2014).

Risk factors that contribute to increased *vulnerability* include various lifestyle factors (diet and smoking), social isolation, lack of job control and poorer access to health care. This is due to the fact that unfavourable lifestyle factors that amplify the effects of alcohol occur more often in groups with low SEP. For instance, there is strong evidence that smoking, which seems to have an interaction effect with alcohol (Castellsague et al., 1999), is more common among individuals in more disadvantaged groups.

Examples of other factors that seem to have effects on the risk of alcohol-related diagnoses, include social isolation (Grant, 1997) and little control over the work situation (Hemmingsson and Lundberg, 2001). In some countries, people with low SEP have more limited access to professional treatment (Probst et al., 2014). A Finnish study of patients hospitalized for an alcohol-related diagnosis (Makela et al., 2003) found no evidence for a social gradient in

survival after hospitalization with an alcohol-related diagnosis, which was interpreted as there being no social inequality in access to good health services.

Furthermore, several studies indicate that *selection* may explain the social gradient in alcohol-related morbidity and mortality, i.e. that poor health in childhood and adolescence is associated with both poorer school performance and poorer health as adults (Currie, 2009), which can in turn increase vulnerability to alcohol-related disorders (Gauffin et al., 2013). Problem drinking in early adolescence increases the risk for both scholastic underachievement and low-status jobs (Wiles et al., 2007) and for alcohol-related problems later in life (McCambridge et al., 2011).

4 METHODS

4.1 STUDY POPULATION

For this research project, the study populations derived from two longitudinal studies in Stockholm County, Sweden: the Stockholm Public Health Cohort (SPHC) and the PART-study of mental health, work, and relations (Swedish: *Psykisk hälsa, Arbete och Relationer*; PART). These two cohorts were followed, 1998-2010 and 2002-2010 respectively. In Study I both data sets were used and analysed separately, to compare the two different alcohol measures AUDIT and NWAC. Study II-III explored the SPHC with linkages to registers. The fourth study on separation and alcohol habits used data from the PART study.

4.1.1 The Stockholm Public Health Cohort

The Stockholm Public Health Cohort (SPHC) is a cohort study with baseline survey undertaken in 2002 and with follow-up in 2007 and 2010, in a population-based random sample of residents of Stockholm County, Sweden. A full description of the SPHC data collection and response rates is available elsewhere (Svensson et al., 2013). The survey is sent out every fourth year, consisting questions on health, lifestyle, social relations, housing, finances, occupation, work environment and sick-leave, and the data collection is done by Statistics Sweden. At baseline, the sample frame consisted of 50 067 individuals, aged 18-84 years. A total of 31 182 individuals (62%) responded to the questionnaire at baseline. In 2007, at the first follow-up, 23 794 (76%) subjects participated. At the second follow-up, conducted in 2010, 19 327 (80%) subjects participated.

For Study I, the cohort of people who had responded to all three surveys (n=19 327) comprised the study sample. In Study II, respondents to the 2002 survey who gave consent for linkages to registers in 2007, and who were of working age at baseline (25-64 years) constituted the study sample (n=18 035). Study III examined the responders who were between 25 and 74 years of age at baseline, and for whom information on all studied covariates was available, resulting in 21 064 individuals. The restriction on age in Study II and III was primarily intended to allow for more established SEP and drinking patterns and because of the increased mortality with increasing age.

4.1.2 PART

PART is a longitudinal population-based study of mental health, work, and relationships that was carried out from 1998 to 2010 (Hallstrom, 2003, Lundberg et al., 2005, Bergman et al., 2010). The study population at baseline in 1998 to 2000 included 19 457 randomly selected Swedish citizens, aged 20-64 years, residing in Stockholm County and 10 341 individuals participated in the postal survey (53%). The collection of data at baseline and the first follow-up were done by researchers at Karolinska Institutet. The second follow-up was done by Statistics Sweden. At the first follow-up in 2001-2003, 10 203 participants from baseline were invited to complete the questionnaire, and 8 518 individuals (83%) did so. At the second follow-up in 2010, 5 227 (63%) individuals who had responded on the previous occasions participated, and they constituted the study population used for Study I and Study IV.

4.2 INDEPENDENT VARIABLES

4.2.1 Alcohol measures

In SPHC, the respondents were asked about the amount of different alcoholic beverages (in centilitres or standard glasses) they consume during a “normal week” (Romelsjo et al., 1995) at baseline in 2002 and the second follow-up in 2010, and about the number of times they consumed alcoholic beverages corresponding to at least 120 g 100% alcohol on a single occasion during the previous 12 months, at baseline.

Study I: *Normal weekly alcohol consumption (NWAC)*

The normal weekly alcohol consumption was measured by centiliters of alcohol at baseline and number of glasses alcohol at second follow-up, per different beverages: strong cider/alcopop, medium-strong beer, strong beer, wine, strong wine and spirits. The NWAC was converted into grams of 100% alcohol per week based on standard Swedish serving sizes, defined as containing 12 grams 100% alcohol. Those who reported not drinking alcohol during the last 12 months were defined as abstainers. No information on lifetime abstainers was available.

Study II-III: *Volume of consumption, heavy episodic drinking and combined alcohol use*

The normal weekly alcohol consumption was calculated from the number of centilitres of different beverages consumed, converted to grams of pure alcohol, and summed to give intake per week. Consumption was categorized into four groups, with separate cut-offs for men and women (Smyth et al., 2015, Holmes et al., 2014): abstainers (0 g); light consumers (men and women: >0-84 g 100% alcohol/week); moderate consumers (men: >84-252, women: > 84-68 g) and heavy consumers (men: > 252, women: >168 g).

The frequency of heavy episodic drinking (HED) was defined as the number of occasions when the person consumed alcoholic beverages corresponding to at least 120 g 100% alcohol during the previous 12 months, and was divided into 5 groups: abstainers, alcohol consumers with no HED, HED 1-6 times per year, HED 1-3 times per month, and HED once a week or more often.

Out of the two measures above, a combined alcohol use measure was created, including both the volume consumed and the frequency of HED, and divided in 10 groups: (i) abstainers; (ii) light drinkers with no HED; (iii) light drinkers with HED; (iv) moderate drinkers with no HED; (v) moderate drinkers with HED 1-6 times/year; (vi) moderate drinkers with HED monthly or more often; (vii) heavy drinkers with no HED; (viii) heavy drinkers with HED 1-6 times/year; (ix) heavy drinkers with HED 1-3 times/month; and (x) heavy drinkers with HED weekly or more often.

Study I and IV: *Alcohol Use Disorders Identification Test*

In PART, alcohol habits during the last 12 months were measured at baseline and at both follow-ups with the Alcohol Use Disorders Identification Test (AUDIT).

AUDIT consists of ten questions, reflecting the individual’s level of risk related to alcohol by consumption, dependence symptoms, and alcohol-related consequences (Babor, 2001b). The

measure is considered suitable for studies in the general population (Bergman and Kallmen, 2002) and was found to accurately identify risk drinking and alcohol use in a recent validity study of PART (Lundin et al., 2015). The AUDIT scores 0–40 points, where a low score indicates low consumption and few alcohol-related consequences, while a high score indicates high consumption and more severe consequences (Babor, 2001a).

4.2.2 Indicators of SEP

To study SEP, three indicators were chosen for the studies.

Study I-IV: *Education* was obtained from linked register data from Statistics Sweden, the Integrated Database for Labour Market Research, LISA (2009) and defined as the length of completed education at the time of the survey. Education was divided into three groups: Primary School or less (<9 years), Secondary School (10–12 years) and Postsecondary/University (>12 years).

Study II-III: *Income*, the annual individual disposable income, was also obtained from the LISA register (SCB, 2009), including taxable and tax-free income minus the taxes, and was divided into quintiles from lowest to highest.

Study I-III: *Occupational class*, an often used indicator of SEP in Sweden, was based on the self-reported current (or previous) occupation in the questionnaire and categorized according to the Swedish socioeconomic classification (Statistics Sweden, 1983) into six groups: unskilled workers, skilled workers, lower, intermediate and higher non-manual workers and self-employed.

4.2.3 Covariates

Study I: included *sex*, *age*, *education* and *occupational class*, all measured at baseline, as covariates in the analyses.

In Study II, the following covariates, retrieved from the baseline survey were used: *smoking* categorized as; never-daily smoker (reference group), current daily smoker, and former daily smoker; *current employment status* categorized into five groups: employed (full or part time or self-employed; reference group), other activity (e.g. students), retired early (disability pension or pension by agreement), retired by age, and unemployed; *marital status* categorized as married/partnership (reference group), unmarried, divorced/separated, widow/er; and *social support* reported as having (reference group) or not having someone who could provide support if personal problems or crises occurred. Further, *sex*, *age*, and *country of birth* divided into five groups: Sweden, Scandinavia (except Sweden), Europe (except Scandinavia), Middle East and North Africa, and other countries in the world, were the studied socio-demographic variables.

In Study III, the studied lifestyle factors comprised, beyond volume of consumption, HED, and smoking (described above): *physical activity*, based on reported workouts in leisure time during a normal week the previous year, divided into three groups: inactive, active and regular active leisure time; and *BMI*, where body weight was considered as a proxy for caloric imbalances determined in large measure by behaviour, and the respondents were

categorized by cut-points as being underweight (<18.49), normal weight (18.5–24.99), overweight (25–29.99) and obese (>30).

Study IV had two exposures, namely: *separation in childhood (SC)* measured as self-reported parental separation (separation, divorce or death of parent) before the age of 18, and categorized into no parental separation (No SC), parental divorce/separation (SC: divorce) or parental death (SC: death) in childhood; and *separation in adulthood (SA)* self-reported divorce/separation from partner/wife/husband during the last year. Separation in adulthood was categorized into no separation from partner (No SA) or separation from partner (SA). The covariates were *age*, *sex* and *education*, as described above.

4.3 OUTCOME MEASURES

In Study I the outcome in the multinomial logistic regression analyses was measured by the individual change in NWAC and AUDIT, separately, between baseline and second follow-up. The outcome variable of change in alcohol habits was defined as stable (-0.49 to 0.49 SD: reference group), increases (>0.5 SD) or decreases (\leq -0.5 SD) in AUDIT score and NWAC.

In Study II, the outcome was *Alcohol-related disorders*, obtained from linked register data on patient care, including in- and outpatient care in hospitals and primary health care, from the Swedish National Patient register and from the Swedish Cause-of-Death register. Individuals were followed for the first admission to in- or outpatient care for an alcohol-related diagnosis either as a main or any of the secondary diagnoses between 2 November 2002 (entry into the study) and 31 December 2011 (end of the study). The data on alcohol-related underlying or contributory causes of death were collected from the Swedish Death Register from the date of consent in 2007 to the end of the study.

The selection of alcohol-related diagnoses basically followed the ICD codes included in the alcohol index compiled by the National Board of Health and Welfare: mental and behavioural disorders due to use of alcohol (F10.0 to F10.9), toxic effect of alcohol (T51), alcoholic cardiomyopathy (I42.6), alcoholic liver disease (K70), alcohol gastritis (K29.2), degeneration of nervous system due to alcohol (G31.2), neuropathy (G62.1), alcohol-induced acute pancreatitis (K85.2), alcohol-induced chronic pancreatitis (K86), myopathy (G72.1), alcohol-induced pseudo-Cushing's syndrome (E24.4), maternal care for (suspected) damage to fetus from alcohol (O35.4), accidental poisoning by and exposure to alcohol (X45), alcohol rehabilitation (Z50.2), intentional self-poisoning by and exposure to alcohol (X65), alcohol abuse counselling and surveillance (Z71.4), problems related to lifestyle – alcohol (Z72.1), evidence of alcohol involvement determined by blood alcohol level (Y90) and by level of intoxication (Y91).

In addition, a pre-baseline *history of alcohol-related disorders* was defined as having had at least one admission with main or any secondary alcohol-related diagnoses (as described above) before the year 2002, earliest in 1964.

The outcome measure in Study III was *mortality*, regardless of cause, based on the date of death in the Swedish Death Register, and traced from the date when the questionnaire was received in November 2002 to the end of the study, 31 December 2007. In total, 300 participants died during the study period.

And lastly, in Study IV the change in *alcohol habits*, measured by the AUDIT score at all three occasions and treated as a continuous variable, was the studied outcome.

4.4 STATISTICAL ANALYSIS

Study I: Intraclass correlations

To study the stability and change in alcohol habits, intraclass correlation coefficients (ICC), with two-way mixed effects model and 95% confidence interval (CI) (Bartko, 1966, Muller and Buttner, 1994) were calculated for the AUDIT score on the three occasions in PART, and for NWAC at baseline and second follow-up in SPHC. The two study populations were analysed and presented separately and then explored in order to find possible consistent subgroup differences in stability of alcohol habits.

In brief, ICC tests the proportion of variance explained by individual scores, where values closer to 1 are more consistent over time. The ICC is often used and interpreted as an indication of reliability (Johnson and Mott, 2001) but when time between observations increases, the ICC can be used to estimate stability over time (Muller and Buttner, 1994).

To study predictors of change in alcohol habits, multinomial logistic regression analyses were carried out to estimate crude and adjusted ORs with 95% CIs. The variable of change in alcohol habits between baseline and second follow-up was defined as stable (-0.49 to 0.49 SD: reference group), increased (>0.5 SD) or decreased (\leq -0.5 SD) in AUDIT score and NWAC. Included variables in the regression analysis were sex, age, educational level and occupational class at baseline.

Study II and III: Cox regression

The hazard of developing alcohol-related disorders across different SEP groups was assessed using survival analyses, Cox proportional regression models, with the regression estimates expressed as Hazard Ratios (HRs) with 95% confidence intervals (CI).

The analyses for both studies were weighted, using calibrated weights created for SPHC to account for the non-response and sampling methods and to allow better inferences about the study population (Svensson et al., 2013).

In Study III the total person-time at risk was calculated from the date a participant entered the study (1 November 2002 at earliest) until being censored by either date of emigration, date of death, or end of follow-up (31 December 2007).

In Study II the total person-time at risk was calculated from the date the participant entered the study (1 November 2002 at earliest) until the date the person was given the first alcohol-related diagnosis or the date of alcohol-related death, censored by date of emigration, date of death from other causes, or end of follow-up (31 December 2011) whatever occurred first.

The effect of the covariates on SEP differences in alcohol-related disorders and all-cause mortality was estimated by calculating the HR's attenuation, using the following formula (Brotman, 2006):

$1 - [\ln \text{HR}_{\text{Crude model} + \text{Independent variable}} / \ln \text{HR}_{\text{Crude model}}] \times 100$ to get the proportion of the effects explained on a multiplicative scale.

Study IV: Linear mixed models

To analyse how parental separation in childhood and separation in adulthood at baseline affected the change in alcohol habits over time we used linear mixed models, with both fixed and random effects. The effect of separation in childhood and separation in adulthood on alcohol habits over time was tested unadjusted and adjusted for the covariates age, gender, and education.

The statistical analyses for study I and IV were carried out using SPSS Statistics version 20.0 and version 21, and for study II and III we used Stata version 13.1 and 13, respectively.

4.5 ETHICAL CONSIDERATIONS

The data used for the studies were collected in postal surveys, where the participants gave informed consent to linkage of register data and the use for research. The ethical permits for use of data from PART for the included studies had already been granted and are listed below. There was an additional need for ethical approval for the studies based on SPHC. The work in this thesis was granted ethical approval from the Regional Ethical Review Board in Stockholm Stockholm regional ethics board (registrationsnumber: 96-260, 01-218, 03-201, 2009/880-31/4, 2010/2053-31/5).

5 RESULTS IN SUMMARY

Stability and predictors of change in alcohol habits by sociodemographic subgroups

Alcohol habits, including alcohol consumption and alcohol-related problems, were more stable over time compared to the measure of alcohol consumption only. From the somewhat scattered results, we found four patterns of stability in alcohol habits that were consistent for both drinking measures: (i) There were no major differences in stability between men and women; (ii) The stability tended to be greater in older age groups; (iii) No conclusive pattern of stability in alcohol habits was found with regard to educational level or occupational class, except for tendencies towards risky alcohol consumption, more stable over time among self-employed women; (iiii) Being a man, and in the age group 30-39 predicted changes, both increase and decrease, in alcohol habits.

The contribution of alcohol use to social differences in alcohol-related disorders and all-cause mortality

The results revealed a social gradient in the risk of alcohol-related disorders where the group with the most disadvantaged SEP had an approximate four-fold risk for alcohol-related disorders relative to the least disadvantaged group. Alcohol use, expressed as combined levels of consumption and frequencies of HED, contributes one fourth of the SEP differences in alcohol-related morbidity. Over and above alcohol use, the studied covariates attenuated the SEP differences by almost half among the unskilled workers. Taken together with alcohol use, the covariates explained nearly 60% of the differences in alcohol-related disorders between the most and least disadvantaged SEP groups.

In addition, our findings show that a significant proportion of the social differentials in all-cause mortality can be explained by an unequal distribution of hazardous alcohol use and daily smoking between the most disadvantaged relative to the least disadvantaged SEP groups. Regardless of whether SEP was defined by education, occupational class or income, HED at least once a week and daily smoking (the categories associated with the highest mortality) were more prevalent in the most disadvantaged group than in the least disadvantaged group. Conversely, the groups with lowest mortality (non-smokers and moderate alcohol consumers who did not report HED) were most strongly represented in the least disadvantaged SEP groups. Alcohol use accounted for around one-fifth of the socioeconomic differences in all-cause mortality. Daily smoking attenuated socioeconomic differences in all-cause mortality differently across the SEP indicators; the attenuation seemed to be considerable for education (22%) but of less importance for the differences in mortality for occupational class (10%) and income (6%). Physical activity attenuated the SEP differences in mortality by 10%, whereas adjustment for BMI did not reduce the socioeconomic differences in mortality. Inclusion of all lifestyle factors concurrently showed that it is foremost combined alcohol use and daily smoking that affects the socioeconomic differences in mortality by one-fourth to one-third.

Parental separation in childhood, separation from partner in adulthood and alcohol habits

Individuals who had experienced separation from partner during the last year had higher AUDIT scores than individuals who had not. They also showed a steeper decrease in signs of risky alcohol use (consumption, dependence, problems) over the twelve-year follow-up, and there was no difference between sexes in this regard. Persons who had experienced parental separation in childhood had a slightly higher AUDIT score at baseline but a similar pattern of decrease compared to the group with no separation in childhood, indicating that the association with parental separation in childhood did not weaken over time. In contrast to our hypothesis, experiencing separations both in childhood and in adulthood had no detectable interaction effect on changes in alcohol habits over time.

6 DISCUSSION

6.1 MAIN FINDINGS

The findings in Study I showed an overall modest contribution of gender to variability in pattern of change in drinking, and that increasing age predicted more stability in the pattern of drinking. Self-employed women were found to practice more risky alcohol consumption that was quite stable over time. Socioeconomic position did not predict change in alcohol habits as measured by AUDIT, but low educational level and self-employment predicted change in the normal weekly alcohol consumption.

The results from Study II provide support for the existence of a social gradient in alcohol-related disorders. Overall, the findings in study II indicate that nearly 60% of the social differences in alcohol-related disorders can be explained by an unequal distribution of alcohol use, behavioural, social, and material factors.

In Study III we found that the unequal distribution of hazardous alcohol use and smoking contribute to a significant proportion of the socioeconomic differences in all-cause mortality in Sweden, irrespective of educational length, occupational class, or annual disposable income.

In addition, based on the findings in Study II and III, using measures of both levels and patterns of drinking is recommended when assessing the impact of alcohol on social inequalities in alcohol-related harm or all-cause mortality, so as not to underestimate the role of alcohol use in differences between socioeconomic groups.

When we explored examples of stressful life events and their impact on alcohol habits over time in Study IV, parental divorce in childhood was found to affect the individual's alcohol habits throughout life. Separation in adulthood had a shorter effect on and a stronger association with alcohol habits during the years after the event. Taken together, these stressful life events did not have an interaction effect on the change in alcohol habits over time and the findings did not differ by gender, age or length of education.

Furthermore, the finding that self-employed (women) tended towards hazardous alcohol use which was stable over time, is in line with the findings in Study II, where differences in the exposure of alcohol use in this group (with fewer abstainers, more moderate to heavy drinkers and more frequent HED compared to the other occupational classes), attenuated the risk of alcohol-related disorders by almost half. Our findings indicate that part of the explanation for the observed social gradient in alcohol-related disorders and mortality is that lower SEP groups differ in both exposure and vulnerability; they practice more harmful alcohol use (HED) and score higher on other risk factors that tend to strengthen harmful alcohol-related effects.

However, social inequalities in health and health behaviours vary considerably between and within countries (Mackenbach et al., 2015, Mackenbach et al., 2008). Our findings regarding social inequality in alcohol habits, and alcohol-related morbidity and mortality are therefore unlikely to be directly transferable to other countries.

A possible explanation for the negative social gradient found in alcohol-related disorders and mortality is associated with reversed causality, meaning that problematic drinking leads to downward social mobility. It is presumably primarily the SEP indicators income and occupation class that reverse causality is valid for, since groups outside of the labour market have elevated alcohol-related mortality. However, only a few studies have elucidated this mechanism, showing a correlation between alcohol-related diagnosis and increased risk of later leaving the labour market, in terms of unemployment or early retirement (Romelsjo and Diderichsen, 1989, Romelsjo et al., 2004). Furthermore, the marginalization and stigma attached to alcohol probably contribute to a downward spiral in social status and increase the social gradient in alcohol-related mortality. But as Room (2005) discusses, the focus on stigma and marginalization on the one hand, and socioeconomic disparities on the other, has rarely been combined in research.

6.2 METHODOLOGICAL CONSIDERATIONS

The main strengths of these studies are the large population-based samples, deriving from the same demographic area and covering the same time period, and the longitudinal design. The large samples provide a solid base for the statistical analyses and to stratify the data and maintain the statistical power. At the same time, population-based sampling and use of survey data constitute limitations.

The four studies in this thesis are based on general population surveys, and therefore have the same limitations as all studies that employ survey data, including sampling issues and the validity of self-reported information. Survey respondents reporting their own alcohol use tend to underreport the actual alcohol intake for several plausible reasons, such as recall bias if the reference period is long, and faulty memory, since drinking alcohol makes it hard to recall alcohol intake accurately (Stockwell et al., 2004). The social desirability bias should also be mentioned: respondents might adjust their reported alcohol use to social norms or expectations. However, our focus on changes in alcohol habits over time should make the issue of underreporting less of an issue since the problem should be the same on all occasions and for all alcohol use measures for all responders.

The generalizability of the results is limited by methodological problems of the underlying population surveys used in the present studies. To account for missing data, non-participation analyses were made for both study samples. In PART, after the first two waves using data from official registers, it was found that lower participation rates were associated with being male, younger, having low income, low education, being of non-Nordic origin, being unmarried and having previous psychiatric diagnoses (Lundberg et al., 2005, Bergman et al., 2010). The mean AUDIT score at baseline was significantly higher for non-responders than for responders, and this was also found between first and second follow-up.

In SPHC non-responders were more likely to be men, young, born outside of Sweden, unmarried, have low income and low educational level (Svensson et al., 2011). The mean NWAC at baseline differed significantly between responders (99.46 grams) and non-responders (93.81 grams) at second follow-up, but in this case the responders had higher alcohol consumption. When the analyses were stratified by age group, the non-responders in the age 18-29 had higher weekly alcohol consumption than the responders, but in all the older

age groups, the responders consumed more alcohol than the non-responders. Furthermore, the analyses were weighted, using calibrated weights created for SPHC to account for the non-response and sampling methods and to allow better inferences about the study population.

Study II and III comprised fairly large study samples; this enabled us to construct a combined measure of alcohol use that takes average weekly consumption – both volume and frequency of HED – into account. Although the combined alcohol use was well fitted to explain our data in Study II and III, the possible incomparability of results across studies could be a weakness, as each study will use different combined measures. In addition, this strategy places a high demand on sample size, as some combinations that are theoretically relevant are relatively rare. Moreover, it should be mentioned that Sweden has a relatively high prevalence of binge drinking (Leifman, 2002), and it is possible that socioeconomic differences in HED are less important for the mortality inequalities in countries where drinking to intoxication is a less dominant feature of the drinking culture (Rehm, 2000).

We use light drinkers as the reference group for volume of consumption and combined alcohol use, and drinkers with no HED for heavy episodic drinking. Like other observational studies, we found j-shaped associations, where abstainers run higher risks than light drinkers (for alcohol-related diagnoses) and moderate consumers (for all-cause mortality).

Population surveys typically exclude institutionalized and homeless, and the heaviest alcohol users, who are less prone to respond. This is related to the old problem of ‘the two worlds of alcohol problems’, which refers to the fact that alcohol use, alcohol-related problems, and their determinants are very different in clinical samples and the general population (Room, 1977). Since these groups have an elevated risk for alcohol-related morbidity, the SEP differences reported in foremost Study I-III probably represent an underestimate of the social differences in alcohol habits, alcohol-related disorders and all-cause mortality. However, a methodological study showed that increased non-response rate was not likely to lead to lower levels of assessed alcohol use (Wennberg et al., 2011). The most obvious alternative data source, registers, are a good source of information on alcohol-related disorders or mortality. However, they may have less to offer when the objective is to study changes, mechanisms, risk factors, protective factors, and their effect on alcohol-related health outcomes.

Our hazard ratios were somewhat lower than the rate ratios in mortality by education and income reported by Östergren (2015) based on Swedish cause of death data from the total population register for the period 2000–2009. This indicates that our findings represent an underestimation of the socioeconomic differences in mortality in the Swedish population that probably is explained by the fact that marginalized people most likely were underrepresented in our sample, as argued above.

It is worth mentioning that the number of occasions and the time period differed somewhat for the two cohorts examined in Study I, although the studied subgroup variables were the same in the both cohorts. This may affect possible consistency between the results. However, due to these differences, and because alcohol habits were measured with two different drinking measures, we used ICC to compare the patterns between the two samples. ICC is relatively seldom employed to study stability and change in alcohol habits, but was

considered to fit the aims of the study since the time between observations were long and then the ICC can be used to estimate stability over time.

The calibrated weights used for the SPHC data in Study II and III accounted for socioeconomic differences and, therefore, to some extent balance possible underrepresentation of individuals with low SEP.

In study II we used measures of alcohol use and the other independent variables at baseline, which, for instance, prevented us from examining potential mediation effects. Recent studies indicate that a longitudinal assessment of health behaviours reveals a larger effect on socioeconomic differences in health (Nandi et al., 2014, Stringhini et al., 2010). Finally, the results can only be generalized to the healthier segment of the general population, because sampling and register linkage was done only for respondents who were alive at the 5-year follow-up.

The differential impact of smoking for the SEP indicators on all-cause mortality found in Study III is probably explained by the fact that the size of the social gradient in daily smoking differs between the indicators, with the highest prevalence of daily smoking found in the group with shortest education. Furthermore, the mean age was higher in the group with shortest education, implying longer exposure to smoking. Consequently, the group with shortest education might capture the duration of smoking more than the other groups of SEP indicators.

Another limitation in Study III relates to problems capturing actual levels of the lifestyle factors: (i) there is possible underreporting of responder's alcohol use, smoking and BMI, and over reporting of physical activity; and (ii) heterogeneous 'non-groups', e.g. abstainers probably includes both life-time abstainers and former drinkers, and non-daily smokers include both passive and occasional smokers. This may imply that our assessments of the contribution of alcohol use and smoking to the SEP differences in mortality are somewhat underestimated. Likewise, analysing changes in health behaviours over time tend to find even larger effects on the social gradient (Nandi et al., 2014, Stringhini et al., 2010), whereas we had information on the lifestyle factors only at baseline.

The PART study, used for Study IV had a high non-participation rate at baseline, and recently divorced people may have been overrepresented among non-participants for various reasons (unhappy/moved to new address/heavy drinking). Moreover, data on loss of a parent were obtained retrospectively and we had no opportunity to explore the impact of the participant's age at the time of the loss. An unmeasured possible confounder is alcohol-related problems of the participants' parents, which could affect parental separation since parental separation in childhood is more common when at least one parent have alcohol dependence (Waldron et al., 2013), the participant's own separation from partner in adulthood, and alcohol habits in adulthood (Pirkola et al., 2005). This might have attenuated the associations found between separation from parents in childhood/from partner in adulthood and adult alcohol habits.

7 CONCLUSION

The main conclusion of this thesis is that alcohol habits were fairly stable over time and that there were signs of different impact of socioeconomic factors in predicting change in alcohol habits over time, depending on the level of consumption. Socioeconomic differences in alcohol use partly explain the health inequalities in alcohol-related harm and all-cause mortality found in Sweden. Separation in childhood and adulthood affected long term alcohol habits; however we did not find evidence of increased vulnerability when a person had experienced both of the stressful life events. When assessing the impact of alcohol on social inequalities in alcohol-related harm or all-cause mortality, use of measures of both levels and patterns of drinking is recommended, so as not to underestimate the role of alcohol use in differences between socioeconomic groups.

7.1 CONTRIBUTION AND RELEVANCE

This thesis contributes to the knowledge regarding behavioural factors behind the socioeconomic gradient in alcohol-related morbidity and all-cause mortality. This contribution originates particularly from the more specific measurement of alcohol use, including both levels and patterns than in previous studies. Furthermore, it showed that changes in alcohol habits over time tend to be different depending on the user's socioeconomic position, with the alcohol habits of self-employed women as an example. For research policy and practice, it is important to consolidate previous research, and for policy makers to be reminded of the importance of alcohol consumption, and how it differs in socioeconomic groups.

7.2 IMPLICATIONS AND FUTURE DIRECTIONS

Based on the surprising finding from Study I and II, we need to look into the growing group of self-employed in today's society, especially self-employed women. This group is often overlooked in research (our studies are no exception) because the group is often too small and/or too heterogeneous to be analysed together. Since this group was found to practice more stable and risky alcohol habits that also explained a sizeable part of the excess risk of alcohol-related disorders, we need to further investigate self-employed and their drinking habits. Overall, change in women's alcohol consumption warrants additional longitudinal studies on women; this was also the conclusion of a previous study where the overall disease burden attributed to alcohol in Sweden was seen to increase in women, but not in men (Kellerborg et al., 2016).

The results from this thesis could be of interest for planning future strategies for health in Sweden. The Swedish government recently stated that a long-term goal for its public health policy is to pursue health equity, and has appointed a Swedish national commission with the goal of closing the preventable health gaps within a generation (Kommissionen för jämlik hälsa, 2016). Moreover, the latest plan of action in the alcohol policy area (Folkhälsomyndigheten, 2016) has a focus on health inequities. In line with these initiatives and previous research (Marmot and Bell, 2012, Whitehead, 2007), our findings suggest that policies and interventions, designed to prevent negative health behaviours, in particular HED and smoking, should specifically evaluate their potential differential impact across

socioeconomic groups. Furthermore, while the theory of the collectivity of drinking cultures (Skog, 1985) would lead us to expect small differences in stability between subgroups, we found it possible to identify social subgroups whose alcohol habits are more stable or prone to change. This suggests a need to look into a possible socioeconomic dimension to the total consumption model. Taken together, it is of interest to evaluate the efficacy of traditional alcohol policies and interventions on the social gradient in alcohol-related harm and mortality.

7.3 CONCLUDING PERSONAL REFLECTIONS

The report on health inequalities, *Fair Society Healthy Lives, the Marmot Review* (Marmot, 2010) laid out six areas in which action is required to create the social conditions to reduce unfair inequalities in health. I would like to highlight and expand on one of these, which I believe to be important for future work on reducing social differences in alcohol use and health: education and lifelong learning.

Education and lifelong learning, in this case, does not necessarily mean number of years in school (or a PhD...), but rather ‘enlightenment’ or to be ‘well-rounded’, in Swedish *bildning, att vara bildad*. In this sense, culture, in whatever form, plays an important role for lifelong learning, and is argued to have a positive, or protective, effect on health, and may counteract detrimental aspects of alcohol use.

I argue that people feel better when they read books or imbibe culture or music. Not necessarily because it makes them feel happier – they might even feel worse – but because the state of things is becoming clearer to them. As alluded to in the foreword (‘and thou that increase knowledge increase sorrow’), this has been known for a long time. Nevertheless, the likelihood that engaged, well-informed, socially aware people place greater demands on their surroundings, be it health care or other institutions, is much greater than if the people are indifferent and passive.

Then why do I bring this up here?

Well, first of all, this might be my only chance to speak my mind freely on a research-oriented platform; it is my kappa after all. But perhaps more to the point, is another thing that differs according to socioeconomic position: access to the fine arts, attendance at various cultural events, number of books read – and I could go on – all these potential benefits are differentially distributed in our society. Furthermore, it has to do with exclusion versus inclusion. Although it might be too costly for the most disadvantaged to attend certain cultural events, culture offered free of charge is still experienced unevenly across socioeconomic groups, perhaps because of subtle cues that signal to some people ‘you belong’ and to others ‘this is not for you’.

Is the purpose of culture to make us happier or healthier?

The purpose of culture is not, and should not be, to make people happier or healthier. Culture, the fine arts – call it what you will – is a source of deep subjective insights and knowledge that create commitments, dedication, engagement and a sense of coherence, and that also fosters community participation and democracy. Hence, striving for equitable access to culture should be an important tool on the way to attaining equal health for all people. It

might even reduce inequalities in health (and in alcohol habits and hence maybe alcohol-related disorders?) if we gave all people the possibility and capability to access, and express themselves through culture. I end with a quote from Marmot's article, page 1614 (Marmot, 2015):

'The good society is one that brings wellbeing to all its members, and I measure that by progress in reducing health inequalities or, more positively, promoting health equity.'

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9 REFERENCES

- AGARDH, E. E., DANIELSSON, A. K., RAMSTEDT, M., LEDGAARD HOLM, A., DIDERICHSEN, F., JUEL, K., VOLLSET, et al. 2016. Alcohol-attributed disease burden in four Nordic countries: a comparison using the Global Burden of Disease, Injuries and Risk Factors 2013 study. *Addiction*, 111, 1806-13.
- AULD, M. C. 2005. Smoking, drinking, and income. *Journal of Human Resources*, 40, 505-518.
- BABOR, T. 2010. *Alcohol : no ordinary commodity : research and public policy*, Oxford ; New York, Oxford University Press.
- BABOR, T., HIGGINS-BIDDLE J. C., AAUNDERS J.B. & MONTEIRO MG 2001a. Audit. The alcohol disorders Identification Test. Guidelines for use in primary care.: World Health Organization (WHO).
- BABOR, T. H.-B. J. C., AAUNDERS J.B., MONTEIRO M.G. 2001b. Audit. The alcohol disorders Identification Test. Guidelines for use in primary care. . Second ed. Geneva: World Health Organization (WHO).
- BACKER-FULGHUM, L. M., PATOCK-PECKHAM, J. A., KING, K. M., ROUFA, L. & HAGEN, L. 2012. The stress-response dampening hypothesis: how self-esteem and stress act as mechanisms between negative parental bonds and alcohol-related problems in emerging adulthood. *Addict Behav*, 37, 477-84.
- BARTKO, J. J. 1966. The intraclass correlation coefficient as a measure of reliability. *Psychol Rep*, 19, 3-11.
- BEARD, E., BROWN, J., WEST, R., ANGUS, C., BRENNAN, A., HOLMES, J., KANER, E., MEIER, P. & MICHIE, S. 2016. Deconstructing the Alcohol Harm Paradox: A Population Based Survey of Adults in England. *PloS one*, 11, e0160666.
- BELLIS, M. A., HUGHES, K., NICHOLLS, J., SHERON, N., GILMORE, I. & JONES, L. 2016. The alcohol harm paradox: using a national survey to explore how alcohol may disproportionately impact health in deprived individuals. *Bmc Public Health*, 16, 111.
- BERGMAN, H. & KALLMEN, H. 2002. Alcohol use among Swedes and a psychometric evaluation of the alcohol use disorders identification test. *Alcohol Alcohol*, 37, 245-51.
- BERGMAN, P., AHLBERG, G., FORSELL, Y. & LUNDBERG, I. 2010. Non-participation in the second wave of the PART study on mental disorder and its effects on risk estimates. *Int J Soc Psychiatry*, 56, 119-32.
- BLOOMFIELD, K., GRITTNER, U., KRAMER, S. & GMEL, G. 2006. Social inequalities in alcohol consumption and alcohol-related problems in the study countries of the EU concerted action 'Gender, Culture and Alcohol Problems: a Multi-national Study'. *Alcohol Alcohol Suppl*, 41, i26-36.
- BRAVEMAN, P. & GRUSKIN, S. 2003. Defining equity in health. *J Epidemiol Community Health*, 57, 254-8.
- BRENNAN, P. L., SCHUTTE, K. K. & MOOS, R. H. 1999. Reciprocal relations between stressors and drinking behavior: a three-wave panel study of late middle-aged and older women and men. *Addiction*, 94, 737-49.

- BRENNAN, P. L., SCHUTTE, K. K. & MOOS, R. H. 2010. Patterns and predictors of late-life drinking trajectories: a 10-year longitudinal study. *Psychol Addict Behav*, 24, 254-64.
- BROTMAN, D. J. 2006. Mediators of the association between mortality risk and socioeconomic status. *JAMA*, 296, 763-4; author reply 764.
- BUDHIRAJA, M. & LANDBERG, J. 2016. Socioeconomic Disparities in Alcohol-Related Mortality in Sweden, 1991-2006: A Register-Based Follow-Up Study. *Alcohol Alcohol*, 51, 307-14.
- CASTELLSAGUE, X., MUNOZ, N., DE STEFANI, E., VICTORA, C. G., CASTELLETTO, R., ROLON, P. A. & QUINTANA, M. J. 1999. Independent and joint effects of tobacco smoking and alcohol drinking on the risk of esophageal cancer in men and women. *Int J Cancer*, 82, 657-64.
- CURRIE, J. 2009. Healthy, Wealthy, and Wise: Socioeconomic Status, Poor Health in Childhood, and Human Capital Development. *Journal of Economic Literature*, 47, 87-122.
- DIDERICHSEN, F., ANDERSEN, I., MANUEL, C., ANDERSEN, A. M., BACH, E., BAADSGAARD, M., BRONNUM-HANSEN, H., HANSEN, F. K., JEUNE, B., JORGENSEN, T. & SOGAARD, J. 2012. Health inequality--determinants and policies. *Scand J Public Health*, 40, 12-105.
- FILLMORE, K. M., HARTKA, E., JOHNSTONE, B. M., LEINO, E. V., MOTOYOSHI, M. & TEMPLE, M. T. 1991. A meta-analysis of life course variation in drinking. *Br J Addict*, 86, 1221-67.
- FOLKHÄLSOMYNDIGHETEN. 2016. *ANDT-strategin 2016–2020* [Online]. Stockholm. Available: <https://www.folkhalsomyndigheten.se/andtuppfoljning/om-andt-strategin/> [Accessed 2016-10-14].
- FOROUZANFAR, M. H., ALEXANDER, L., ANDERSON, H. R., BACHMAN, V. F., BIRYUKOV, S., BRAUER, M., et al. 2015. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*, 386, 2287-323.
- GALOBARDES, B., SHAW, M., LAWLOR, D. A., LYNCH, J. W. & DAVEY SMITH, G. 2006a. Indicators of socioeconomic position (part 1). *J Epidemiol Community Health*, 60, 7-12.
- GALOBARDES, B., SHAW, M., LAWLOR, D. A., LYNCH, J. W. & DAVEY SMITH, G. 2006b. Indicators of socioeconomic position (part 2). *J Epidemiol Community Health*, 60, 95-101.
- GAUFFIN, K., HEMMINGSSON, T. & HJERN, A. 2013. The effect of childhood socioeconomic position on alcohol-related disorders later in life: a Swedish national cohort study. *J Epidemiol Community Health*, 67, 932-8.
- GEYER, S., HEMSTROM, O., PETER, R. & VAGERO, D. 2006. Education, income, and occupational class cannot be used interchangeably in social epidemiology. Empirical evidence against a common practice. *J Epidemiol Community Health*, 60, 804-10.
- GOWING, L. R., ALI, R. L., ALLSOP, S., MARSDEN, J., TURF, E. E., WEST, R. & WITTON, J. 2015. Global statistics on addictive behaviours: 2014 status report. *Addiction*, 110, 904-19.

- GRANT, B. F. 1997. Prevalence and correlates of alcohol use and DSM-IV alcohol dependence in the United States: results of the National Longitudinal Alcohol Epidemiologic Survey. *J Stud Alcohol*, 58, 464-73.
- GRITTNER, U., KUNTSCHE, S., GMEL, G. & BLOOMFIELD, K. 2012. Alcohol consumption and social inequality at the individual and country levels--results from an international study. *Eur J Public Health*.
- HALLSTROM, T., DAMSTROM THAKKER, K., FORSELL, Y., LUNDBERG, I., TINGHOG, P. 2003. The PART Study
A Population Based Study of Mental Health in
the Stockholm County: Study Design. Phase I (1998-2000).
- HANSAGI, H., BRANDT, L. & ANDREASSON, S. 2000. Parental divorce: psychosocial well-being, mental health and mortality during youth and young adulthood - A longitudinal study of Swedish conscripts. *European Journal of Public Health*, 10, 86-92.
- HEMMINGSSON, T. & LUNDBERG, I. 2001. Development of alcoholism: interaction between heavy adolescent drinking and later low sense of control over work. *Alcohol Alcohol*, 36, 207-12.
- HOLMES, M. V., DALE, C. E., ZUCCOLO, L., SILVERWOOD, R. J., GUO, Y., YE, Z., PRIETO-MERINO, D., et al. 2014. Association between alcohol and cardiovascular disease: Mendelian randomisation analysis based on individual participant data. *BMJ*, 349, g4164.
- JOHNSON, T. P. & MOTT, J. A. 2001. The reliability of self-reported age of onset of tobacco, alcohol and illicit drug use. *Addiction*, 96, 1187-98.
- JOHNSTONE, B. M., LEINO, E. V., AGER, C. R., FERRER, H. & FILLMORE, K. M. 1996. Determinants of life-course variation in the frequency of alcohol consumption: meta-analysis of studies from the collaborative alcohol-related longitudinal project. *J Stud Alcohol*, 57, 494-506.
- JONES, L., BATES, G., MCCOY, E. & BELLIS, M. A. 2015. Relationship between alcohol-attributable disease and socioeconomic status, and the role of alcohol consumption in this relationship: a systematic review and meta-analysis. *Bmc Public Health*, 15.
- KALLMEN, H., WENNERBERG, P., LEIFMAN, H., BERGMAN, H. & BERMAN, A. H. 2011. Alcohol habits in Sweden during 1997-2009 with particular focus on 2005 and 2009, assessed with the AUDIT: a repeated cross-sectional study. *Eur Addict Res*, 17, 90-6.
- KARLAMANGLA, A., ZHOU, K., REUBEN, D., GREENDALE, G. & MOORE, A. 2006. Longitudinal trajectories of heavy drinking in adults in the United States of America. *Addiction*, 101, 91-9.
- KELLERBORG, K., DANIELSSON, A. K., ALLEBECK, P., COATES, M. M. & AGARDH, E. 2016. Disease burden attributed to alcohol: How methodological advances in the Global Burden of Disease 2013 study have changed the estimates in Sweden. *Scand J Public Health*, 44, 604-10.
- KENDLER, K. S., SHETH, K., GARDNER, C. O. & PRESCOTT, C. A. 2002. Childhood parental loss and risk for first-onset of major depression and alcohol dependence: the time-decay of risk and sex differences. *Psychol Med*, 32, 1187-94.

- KERR, W. C., FILLMORE, K. M. & BOSTROM, A. 2002. Stability of alcohol consumption over time: evidence from three longitudinal surveys from the United States. *J Stud Alcohol*, 63, 325-33.
- KEYES, K. M., HATZENBUEHLER, M. L. & HASIN, D. S. 2011a. Stressful life experiences, alcohol consumption, and alcohol use disorders: the epidemiologic evidence for four main types of stressors. *Psychopharmacology*, 218, 1-17.
- KEYES, K. M., LI, G. & HASIN, D. S. 2011b. Birth cohort effects and gender differences in alcohol epidemiology: a review and synthesis. *Alcohol Clin Exp Res*, 35, 2101-12.
- KOMMISSIONEN FÖR JÄMLIK HÄLSA 2016. Det handlar om jämlik hälsa, Utgångspunkter för Kommissionens vidare arbete. Stockholm: Statens Offentliga Utredningar.
- LAHELMA, E., MARTIKAINEN, P., LAAKSONEN, M. & AITTOMAKI, A. 2004. Pathways between socioeconomic determinants of health. *J Epidemiol Community Health*, 58, 327-32.
- LANTZ, P. M., HOUSE, J. S., LEPKOWSKI, J. M., WILLIAMS, D. R., MERO, R. P. & CHEN, J. M. 1998. Socioeconomic factors, health behaviors, and mortality - Results from a nationally representative prospective study of US adults. *Jama-Journal of the American Medical Association*, 279, 1703-1708.
- LEIFMAN, H., TROLLDAL, B. 2014. Hur mycket dricker svensken? - alkoholkonsumtionen i siffror 2001-2012. Stockholm: Centralförbundet för alkohol- och narkotikaupplysning, CAN.
- LEWER, D., MEIER, P., BEARD, E., BONIFACE, S. & KANER, E. 2016. Unravelling the alcohol harm paradox: a population-based study of social gradients across very heavy drinking thresholds. *Bmc Public Health*, 16, 599.
- LUNDBERG, I., DAMSTROM THAKKER, K., HALLSTROM, T. & FORSELL, Y. 2005. Determinants of non-participation, and the effects of non-participation on potential cause-effect relationships, in the PART study on mental disorders. *Soc Psychiatry Psychiatr Epidemiol*, 40, 475-83.
- LUNDIN, A., HALLGREN, M., BALLIU, N. & FORSELL, Y. 2015. The Use of Alcohol Use Disorders Identification Test (AUDIT) in Detecting Alcohol Use Disorder and Risk Drinking in the General Population: Validation of AUDIT Using Schedules for Clinical Assessment in Neuropsychiatry. *Alcoholism-Clinical and Experimental Research*, 39, 158-165.
- MACDONALD, Z. & SHIELDS, M. A. 2001. The impact of alcohol consumption on occupational attainment in England. *Economica*, 68, 427-453.
- MACKENBACH, J. P., KULHANOVA, I., BOPP, M., BORRELL, C., DEBOOSERE, P., KOVACS, K., LOOMAN, C. W., et al. 2015. Inequalities in Alcohol-Related Mortality in 17 European Countries: A Retrospective Analysis of Mortality Registers. *PLoS Med*, 12, e1001909.
- MACKENBACH, J. P., STIRBU, I., ROSKAM, A. J., SCHAAP, M. M., MENVIELLE, G., LEINSALU, M. & KUNST, A. E. 2008. Socioeconomic inequalities in health in 22 European countries. *N Engl J Med*, 358, 2468-81.
- MAKELA, P., KESKIMAKI, I. & KOSKINEN, S. 2003. What underlies the high alcohol related mortality of the disadvantaged: high morbidity or poor survival? *J Epidemiol Community Health*, 57, 981-6.

- MAKELA, P. & PALJARVI, T. 2008. Do consequences of a given pattern of drinking vary by socioeconomic status? A mortality and hospitalisation follow-up for alcohol-related causes of the Finnish Drinking Habits Surveys. *J Epidemiol Community Health*, 62, 728-33.
- MARMOT, M. 2015. The art of medicine What kind of society do we want: getting the balance right. *Lancet*, 385, 1614-1615.
- MARMOT, M., ATKINSON, T., BELL, J., BLACK, C., BROADFOOT, P., CUMBERLEGE, J., DIAMOND, I., GILMORE, I., HAM, C., MEACHER, M., MULGAN, G. 2010. Fair Society Healthy Lives, the Marmot Review Strategic Review of Health Inequalities in England post-2010.
- MARMOT, M. & BELL, R. 2012. Fair society, healthy lives. *Public Health*, 126, S4-S10.
- MARTIKAINEN, P., MAKELA, P., PELTONEN, R. & MYRSKYLA, M. 2014. Income differences in life expectancy: the changing contribution of harmful consumption of alcohol and smoking. *Epidemiology*, 25, 182-90.
- MCCAMBRIDGE, J., MCALANEY, J. & ROWE, R. 2011. Adult consequences of late adolescent alcohol consumption: a systematic review of cohort studies. *PLoS Med*, 8, e1000413.
- MOLANDER, R. C., YONKER, J. A. & KRAHN, D. D. 2010. Age-related changes in drinking patterns from mid- to older age: results from the wisconsin longitudinal study. *Alcohol Clin Exp Res*, 34, 1182-92.
- MOORE, A. A., GOULD, R., REUBEN, D. B., GREENDALE, G. A., CARTER, M. K., ZHOU, K. & KARLAMANGLA, A. 2005. Longitudinal patterns and predictors of alcohol consumption in the United States. *Am J Public Health*, 95, 458-65.
- MULIA, N., SCHMIDT, L., BOND, J., JACOBS, L. & KORCHA, R. 2008. Stress, social support and problem drinking among women in poverty. *Addiction*, 103, 1283-93.
- MULLER, R. & BUTTNER, P. 1994. A critical discussion of intraclass correlation coefficients. *Stat Med*, 13, 2465-76.
- NANDI, A., GLYMOUR, M. M. & SUBRAMANIAN, S. V. 2014. Association among socioeconomic status, health behaviors, and all-cause mortality in the United States. *Epidemiology*, 25, 170-7.
- NORSTROM, T. & RAMSTEDT, M. 2005. Mortality and population drinking: a review of the literature. *Drug Alcohol Rev*, 24, 537-47.
- OSTERGREN, O. 2015. Growing gaps: The importance of income and family for educational inequalities in mortality among Swedish men and women 1990-2009. *Scand J Public Health*, 43, 563-70.
- PALJARVI, T., MARTIKAINEN, P., LEINONEN, T., PENSOLA, T. & MAKELA, P. 2014. Non-employment histories of middle-aged men and women who died from alcohol-related causes: a longitudinal retrospective study. *PloS one*, 9, e98620.
- PERREIRA, K. M. & SLOAN, F. A. 2001. Life events and alcohol consumption among mature adults: a longitudinal analysis. *J Stud Alcohol*, 62, 501-8.
- PIRKOLA, S., ISOMETSA, E., ARO, H., KESTILA, L., HAMALAINEN, J., VEIJOLA, J., KIVIRUUSU, O. & LONNQVIST, J. 2005. Childhood adversities as risk factors for adult mental disorders: results from the Health 2000 study. *Soc Psychiatry Psychiatr Epidemiol*, 40, 769-77.

- PROBST, C., ROERECKE, M., BEHRENDT, S. & REHM, J. 2014. Socioeconomic differences in alcohol-attributable mortality compared with all-cause mortality: a systematic review and meta-analysis. *Int J Epidemiol*, 43, 1314-27.
- QUIGLEY, L. A. & MARLATT, G. A. 1996. Drinking among young adults - Prevalence, patterns, and consequences. *Alcohol Health & Research World*, 20, 185-191.
- RANINEN, J., LEIFMAN, H. & RAMSTEDT, M. 2013. Who is not drinking less in Sweden? An analysis of the decline in consumption for the period 2004-2011. *Alcohol Alcohol*, 48, 592-7.
- REHM, J., ROOM, R., GRAHAM, K., MONTEIRO, M., GMEL, G. & SEMPOS, C. T. 2003. The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease: an overview. *Addiction*, 98, 1209-28.
- ROMELSJO, A. & DIDERICHSEN, F. 1989. Changes in alcohol-related inpatient care in Stockholm County in relation to socioeconomic status during a period of decline in alcohol consumption. *Am J Public Health*, 79, 52-6.
- ROMELSJO, A., LAZARUS, N. B., KAPLAN, G. A. & COHEN, R. D. 1991. The relationship between stressful life situations and changes in alcohol consumption in a general population sample. *Br J Addict*, 86, 157-69.
- ROMELSJO, A., LEIFMAN, H. & NYSTROM, S. 1995. A comparative study of two methods for the measurement of alcohol consumption in the general population. *Int J Epidemiol*, 24, 929-36.
- ROMELSJO, A., STENBACKA, M., LUNDBERG, M. & UPMARK, M. 2004. A population study of the association between hospitalization for alcoholism among employees in different socio-economic classes and the risk of mobility out of, or within, the workforce. *Eur J Public Health*, 14, 53-7.
- ROOM, R. 2005. Stigma, social inequality and alcohol and drug use. *Drug Alcohol Rev*, 24, 143-55.
- ROOM, R., BABOR, T. & REHM, J. 2005. Alcohol and public health. *Lancet*, 365, 519-530.
- ROSSOW, I., MAKELA, P. & KERR, W. 2014. The collectivity of changes in alcohol consumption revisited. *Addiction*, 109, 1447-55.
- ROTHMAN, E. F., EDWARDS, E. M., HEEREN, T. & HINGSON, R. W. 2008. Adverse childhood experiences predict earlier age of drinking onset: results from a representative US sample of current or former drinkers. *Pediatrics*, 122, e298-304.
- SCB, S. S. 2009. Integrated database for labour market research/ Longitudinell Integrationsdatabas för Sjukförsäkrings- och Arbetsmarknadsstudier (LISA) 1990-2007. Örebro: Statistics Sweden
- SCHMIDT, L. A., MÄKELÄ, P., REHM, J., ROOM, R. 2010. Alcohol: equity and social determinants. In: BLAS E., K. A. S. (ed.) *Equity, social determinants, and public health programmes*. Geneva, Switzerland: World Health Organization.
- SKOG, O. J. 1985. The collectivity of drinking cultures: a theory of the distribution of alcohol consumption. *Br J Addict*, 80, 83-99.
- SMYTH, A., TEO, K. K., RANGARAJAN, S., O'DONNELL, M., ZHANG, X. H., RANA, P., LEONG, D. P., et al. 2015. Alcohol consumption and cardiovascular disease, cancer, injury, admission to hospital, and mortality: a prospective cohort study. *Lancet*, 386, 1945-1954.

- STATISTICS SWEDEN 1983. Socioekonomisk Indelning (SEI) [Swedish socio-Economic Classification]. *Reports on statistical co-ordination*. Stockholm: Statistics Sweden.
- STOCKWELL, T., DONATH, S., COOPER-STANBURY, M., CHIKRITZHS, T., CATALANO, P. & MATEO, C. 2004. Under-reporting of alcohol consumption in household surveys: a comparison of quantity-frequency, graduated-frequency and recent recall. *Addiction*, 99, 1024-33.
- STRINGHINI, S., SABIA, S., SHIPLEY, M., BRUNNER, E., NABI, H., KIVIMAKI, M. & SINGH-MANOUX, A. 2010. Association of Socioeconomic Position With Health Behaviors and Mortality. *Jama-Journal of the American Medical Association*, 303, 1159-1166.
- SVENSSON, A. C., FREDLUND, P., LAFLAMME, L., HALLQVIST, J., ALFREDSSON, L., EKBOM, A., FEYCHTING, M., FORSBERG, B., PEDERSEN, N. L., VAGERO, D. & MAGNUSSON, C. 2013. Cohort profile: The Stockholm Public Health Cohort. *Int J Epidemiol*, 42, 1263-72.
- SVENSSON, A. C., MAGNUSSON, C. & FREDLUND, P. 2011. Hälsoenkät 2010 - teknisk rapport [Health survey 2010- technical report]. Stockholm: Karolinska Institutets folkhälsoakademi.
- TARKIAINEN, L., MARTIKAINEN, P. & LAAKSONEN, M. 2016. The contribution of education, social class and economic activity to the income-mortality association in alcohol-related and other mortality in Finland in 1988-2012. *Addiction*, 111, 456-64.
- WALDRON, M., BUCHOLZ, K. K., LYNSKEY, M. T., MADDEN, P. A. & HEATH, A. C. 2013. Alcoholism and timing of separation in parents: findings in a midwestern birth cohort. *J Stud Alcohol Drugs*, 74, 337-48.
- VEENSTRA, M. Y., LEMMENS, P. H., FRIESEMA, I. H., GARRETSEN, H. F., KNOTTNERUS, J. A. & ZWIETERING, P. J. 2006. A literature overview of the relationship between life-events and alcohol use in the general population. *Alcohol Alcohol*, 41, 455-63.
- WENNBERG, P., SVENSSON, J. & RAMSTEDT, M. 2011. The effects of missing data when surveying alcohol habits. *Nordic Studies on Alcohol and Drugs*, 28, 43-50.
- WHITEHEAD, M. 1992. The concepts and principles of equity and health. *Int J Health Serv*, 22, 429-45.
- WHITEHEAD, M. 2007. A typology of actions to tackle social inequalities in health. *Journal of Epidemiology and Community Health*, 61, 473-478.
- WILES, N. J., LINGFORD-HUGHES, A., DANIEL, J., HICKMAN, M., FARRELL, M., MACLEOD, J., HAYNES, J. C., SKAPINAKIS, P., ARAYA, R. & LEWIS, G. 2007. Socio-economic status in childhood and later alcohol use: a systematic review. *Addiction*, 102, 1546-63.
- WILSNACK, R. W., WILSNACK, S. C., KRISTJANSON, A. F., VOGELTANZ-HOLM, N. D. & GMEL, G. 2009. Gender and alcohol consumption: patterns from the multinational GENACIS project. *Addiction*, 104, 1487-500.