



# LUND UNIVERSITY

## Alcohol Use in Swedish Halls of Residence

Ståhlbrandt, Henrietta

2008

[Link to publication](#)

*Citation for published version (APA):*

Ståhlbrandt, H. (2008). *Alcohol Use in Swedish Halls of Residence*. [Doctoral Thesis (compilation), Clinical Health Promotion Centre]. Department of Health Sciences, Lund University.

*Total number of authors:*

1

### General rights

Unless other specific re-use rights are stated the following general rights apply:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: <https://creativecommons.org/licenses/>

### Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117  
221 00 Lund  
+46 46-222 00 00

From

Clinical Alcohol Research, Malmö University Hospital,  
Department of Health Sciences, Lund University, Sweden

## **Alcohol Use in Swedish Halls of Residence**

Cluster Randomised Interventions,  
Drinking Trajectories,  
Social Climate and Cross-Cultural Influence

**Henriettæ Ståhlbrandt**

**Academic Dissertation**  
**for the degree of Doctor of Medical Science (Ph.D.)**

**Faculty Opponent**  
Jim McCambridge  
London School of Hygiene & Tropical Medicine

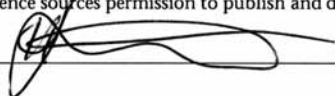
With due permission of the Medical Faculty of Lund University,  
the public defense of this thesis will take place  
in the Medicine Lecture Hall, Malmö University Hospital  
on May, 31st 2008 at 10.00 a.m.

Organization LUND UNIVERSITY		Document name DOCTORAL DISSERTATION
Clinical Alcohol Research Department of Health Science Malmö, Sweden		Date of issue 2008-05-31
Author(s) Henriettae Ståhlbrandt		Sponsoring organization
Title and subtitle Alcohol Use in Swedish Halls of Residence – Cluster Randomised Interventions, Drinking Trajectories, Social Climate and Cross-Cultural Influence		
<p>Abstract</p> <p>In the year 2000, the alcohol habits of 1460 Swedish university students living in residence halls were assessed. The students had a mean age of 23.8 years, and 64% were male. The results from this baseline assessment show that the mean AUDIT score (<math>\pm</math> sd) was <math>10.3 \pm 5.2</math> for males and <math>8.1 \pm 4.7</math> for females. AUDIT stands for Alcohol Use Disorders Identification Test and is used world-wide to assess alcohol habits. Scores equal to or above eight for males, and equal to or above four for females indicate an at-risk drinking pattern. It was shown that AUDIT scores were correlated with high levels of Distance and Expressiveness in the social climate of the residence halls, assessed by the students themselves.</p> <p>The students were cluster randomised (with the residence hall as the cluster unit) into three groups. One group received a three hour cognitive-based harm reduction education (called BSTP), and one group received a three hour lecture by therapists trained in twelve-step philosophy (called TSI). The third group did not receive any intervention. The students were then monitored for three years. All students answering the questionnaires received a short personalized feedback, independently of randomisation group. The two-year assessment showed that all groups had reduced their AUDIT scores. When assessing only those who belonged to the at-risk drinking group, the students in the BSTP group reduced their AUDIT scores significantly more than the students in the control group (a reduction of 3.9 and 2.8 points, respectively, <math>p &lt; 0.05</math>). There was no significant difference between the TSI group and the BSTP or control group, with a reduction in the TSI group of 3.0 points. Furthermore it could be seen that more students participated in the BSTP education than in the TSI lecture (63% versus 25%, <math>p &lt; 0.001</math>). Using trajectory analyses on all assessment points, five different trajectory groups could be identified with AUDIT. All slopes showed reduction of AUDIT scores over time. No women could be found in the highest AUDIT trajectory group, which also included younger persons.</p> <p>The students were also compared with students in other parts of Sweden and in the US, and similar moderators of drinking patterns could be found, although country was of importance.</p> <p>To conclude, in mean all students reduced their drinking over time. This reduction could be further reduced by participation in a harm reduction education for the students having an at-risk drinking pattern. The social climate of the residence halls and the students' drinking habits are correlated, as are the students' country of residence.</p>		
Key words: Students, residence halls, alcohol, intervention, cluster randomised controlled trial, social climate, trajectories, cultural influence, AUDIT		
Classification system and/or index terms (if any):		
Supplementary bibliographical information:		Language English
ISSN and key title: 1652-8220 Alcohol Use in Swedish Residence Halls		ISBN 978-91-86059-15-6
Recipient's notes	Number of pages 167	Price
	Security classification	

Distribution by (name and address)

I, the undersigned, being the copyright owner of the abstract of the above-mentioned dissertation, hereby grant to all reference sources permission to publish and disseminate the abstract of the above-mentioned dissertation.

Signature



Date 2008-04-15

# **Alcohol Use in Swedish Halls of Residence**

Cluster Randomised Interventions,  
Drinking Trajectories,  
Social Climate and Cross-Cultural Influence

**Henriettæ Ståhlbrandt**

Clinical Alcohol Research, Malmö,  
Department of Health Sciences, Lund University, Sweden  
2008



*To Marcus*



*It's just... for the first time, I feel wicked*



# CONTENTS

<b>ABBREVIATIONS</b> .....	10
<b>ORIGINAL PAPERS</b> .....	11
<b>FOREWORD</b> .....	13
<b>INTRODUCTION</b>	
Alcohol .....	15
Alcohol Consumption	
Definitions of Alcohol Use Disorders	
Background Causes of Alcohol Consumption and Alcohol Disorders	
Consequences of Alcohol Consumption	
Alcohol and Students .....	33
Emerging Adulthood	
Alcohol Consumption in Emerging Adulthood and amongst Students	
Course of Alcohol Consumption in College Students	
Factors influencing College Alcohol Consumption	
Alcohol Consequences amongst College Students	
Differences and Similarities between Different Cultures	
Alcohol Interventions .....	49
Alcohol Interventions amongst College Students	



<b>AIMS OF THE PRESENT STUDY</b> .....	55
<b>MATERIALS AND METHODS</b> .....	57
Sample	
Design	
Limitations	
Power Analysis	
Instruments	
Statistics	
<b>RESULTS</b> .....	69
Internal Attrition	
Baseline Population Data and Alcohol Measurements	
Social Climate and Drinking Correlation	
Effects of Intervention	
Lecture Participation	
Drinking Trajectories	
Student Alcohol Patterns in Sweden and in the US	
<b>GENERAL DISCUSSION</b> .....	79
Sample	
Statistics	
Measurements	
Main Findings	
Suggested Research in the Future	
<b>GENERAL CONCLUSIONS</b> .....	91
<b>POPULÄRVETENSKAPLIG SAMMANFATTNING (SUMMARY IN SWEDISH)</b> .....	93

<b>REFERENCES</b> .....	95
<b>ACKNOWLEDGEMENTS</b> .....	117
<b>PAPER I</b> .....	119
<b>PAPER II</b> .....	129
<b>PAPER III</b> .....	141
<b>PAPER IV</b> .....	155

## ABBREVIATIONS

ACoA	Adult Children of Alcoholics
ANOVA	ANalysis Of VAriance
APA	American Psychiatric Association
AUDIT	Alcohol Use Disorders Identifications Test
BASICS	Brief Alcohol Screening and Intervention for College Students
BI	Brief Intervention
BIC	Bayesian Information Criteria
BRFSS	Behavioural Risk Factor Surveillance System
BSTP	Brief Skills Training Programme
CAN	The Swedish Council for Information on Alcohol and Other Drugs
CAS	Harvard School of Public Health College Alcohol Study
CI	Confidence Interval
DSM	Diagnostic and Statistical Manual
eBAC	Estimated Blood Alcohol Concentration
FHI	Folkhälsoinstitutet [Swedish National Institute of Public Health]
GDP	Gross Domestic Product
GENACIS	Gender, Alcohol, and Culture: an International Study
ICD	International Classification of Disease
MI	Motivational Interviewing
MLM	Multilevel Modelling
NCHRBS	National College Health Risk Behavior Survey
NESARC	National Epidemiologic Survey on Alcohol and Related Conditions
NHSDA	National Household Survey on Drug Abuse
NHTSA	National Highway Traffic Safety Administration
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NLAES	National Longitudinal Alcohol Epidemiologic Survey
NLSY	National Survey of Labor Market Experience in Youth
OR	Odds Ratio
RR	Relative Risk
SAS	Statistical Analysis System
SGM	Semiparametric Group-based Model
SIP	Short Index of Problems
SoRAD	Centre for Social Research on Alcohol and Drugs
SPSS	Statistical Package for the Social Sciences
TSI	Twelve-Step Influence
VIF	Variance Inflation Factor
WHO	World Health Organization

## ORIGINAL PAPERS

The thesis is based on the following papers, which will be referred to in the text by their Roman numerals.

- I Ståhlbrandt H, Johnsson KO & Berglund M  
**Alcohol patterns and their relation to social climate in student residence halls – a multilevel analysis**  
*submitted*
- II Ståhlbrandt H, Johnsson KO & Berglund M  
**Two-year outcome of alcohol interventions in Swedish university halls of residence. A cluster randomized trial of cognitive behavioural intervention, twelve-step influenced intervention and controls.**  
*Alcoholism: Clinical and Experimental Research* Mar 31(3): 458-466: 2007
- III Ståhlbrandt H, Leifman A, Johnsson KO & Berglund M  
**Alcohol trajectories over four years in a Swedish residence hall student population**  
*submitted*
- IV Ståhlbrandt H, Andersson C, Johnsson KO, Tollison S, Berglund M & Larimer M  
**Cross-cultural patterns in college student drinking and its consequences – a comparison between US and Sweden**  
*submitted*



## FOREWORD

During medical school, while working on another project with Professor Mats Berglund, he introduced me to the subject of alcohol interventions among university students, and offered me a doctoral student position. Like most students I imagine, I had had random thoughts on the subject of alcohol consumption and consequences, I found the area fascinating, and have done so ever since.

It is both fun and challenging to do research in an area about which most people already have strong opinions, and it is rewarding on a personal level to formulate hypotheses, find a suitable statistical test to apply, and write a paper about the result. I have always been drawn to research, and I am grateful to have been given the opportunity to contribute to this exciting field.



# INTRODUCTION

## ALCOHOL

At a global level, the influence of alcohol and its adverse effects differ according to the stage of development of the country. WHO measures negative consequences in “disability-adjusted life years” (DALYs), which is the number of years lost to a less than full healthy life (Murray, 2002). In developed countries, the disability-adjusted life years caused by alcohol is 9.2% (WHO, 2004). The main cause of disability-adjusted life years in the high-income countries of the world is smoking, followed by nutrition-related risk factors and physical activity (high blood-pressure, overweight and obesity, high cholesterol), and then alcohol use. (Lopez et al., 2006). An analysis of DALYs in Sweden shows the same pattern (Agardh et al., 2008). In the low-mortality developing countries, alcohol accounts for approximately 6.2% of the disability-adjusted life years. In those regions, alcohol is mostly drunk with meals. Although the total volume of alcohol is high in those regions, the heavy drinking episode frequency is also low, and more long-term consequences than immediate consequences are seen (WHO, 2004). In the high-mortality developing regions of the world, only 1.6% of the disability-adjusted life years are attributable to alcohol. In those regions, people die of poor nutrition, the consequences of unsafe sex, water pollutants and poor hygiene (WHO, 2004).

### Alcohol Consumption

In Sweden, the Centre for Social Research on Alcohol and Drugs (SoRAD) summarises the alcohol habits of the Swedish population each year. The data comes from Systembolaget’s (the Swedish Retailing Monopoly) own data of sales, sales of low to medium-strength beer in grocery stores, and from sales at restaurants. The data SoRAD uses also includes estimates of unregistered alcohol sales. This part of the data is based on several large national surveys, and includes legal and illegal imports from abroad, home-distilled liquor and sales through the Internet. Although this is by no means a perfect record of alcohol consumption in Sweden, it is a good estimate. The most recent data is from 2006, and shows a mean individual consumption of 9.70 litres of pure alcohol per year and individual over 15 years of age (SoRAD, 2007). The level was considerably lower at the end of the 1980’s and in the beginning of the 1990s, with a mean consumption of around 7.7 litres per year and person in 1989-1995 (SoRAD, 2006). Consumption has increased steadily since then, except for small decreases in 2005 and 2006. This increase reflects an increase in wine and stronger beer, whereas the consumption of medium-strength beer has decreased,



and the level of spirits remains about the same (SoRAD, 2006). This increase can be explained by several components of state policies, and is elaborated upon under “State policies” below.

Parallel with those reported alcohol sales self-reported alcohol consumption is also measured. In 2005, the age group consuming the greatest amounts of alcohol was 16-29 year old males (reporting 7.6 litres of pure ethanol per person and year), followed by men in the age group 30-49 years (with 6.2 litres pure ethanol consumed), men 50-64 years (with 5.8 litres), and above 65 years of age, with a mean individual consumption reported to be 4.3 litres. Women drink less than men, but have approximately the same distribution across ages: 16-29 year olds report the highest amounts (3.5 litres). They are followed by the age group 50-64 (2.8 litres), 30-49 (2.7 litres) and finally 65 and above (1.9 litres) (SoRAD, 2006).

Globally, WHO estimated in 2004, in their Global Status Report on Alcohol, that about 2 billion people worldwide consume alcoholic beverages, and that 76.3 million people have an alcoholic disorder. The largest worldwide alcohol consumption from the 1960s to the 1990s can be seen in the European region, averaging around 10 litres of pure alcohol per capita in 1999. The American region (including both North and South America) takes the second place at around 7 litres per capita in 1999, followed by the West Pacific Region (around 5 litres per capita), the African Region (around 4 litres), the South-East Asian region (just over 1 litre per capita), and finally, the East Mediterranean region (at below one litre per capita in 1999; WHO, 2004). With this in mind, it is not surprising that the frequency of abstainers and heavy episodic drinkers varies considerably among the countries world-wide. In Egypt, an estimated 99.5% of the population abstain, while, at the other end of the spectrum, Luxembourg has 2.5% abstainers.

### **Heavy Episodic Drinking**

Heavy episodic drinking in SoRAD’s data is based on self-reports, defined as a single drinking occasion where alcohol consumption is at least the equivalent of 75 cl wine, four cans (50 cl each) of strong beer, or six cans (50 cl each) of medium-strength beer. No gender difference is offered in this definition. It is in the age group 16-29 years that heavy episodic drinking is at its peak, with 2.2 episodes a month for men and 1.1 episodes a month for women. In both genders, the frequency of heavy drinking episodes decreases with age (SoRAD, 2007). In this data, 2.0% of women in the age 50-64 years, reported heavy episodic drinking episodes. However, in a study by Rundberg et al. (doctoral thesis, 2007), 56.6% of the women drinking alcohol in the age group 50-59 years in the south of Sweden reported binge drinking, which is a much higher number than the one previously reported.

Turning to heavy episodic drinking in the US, Naimi et al. (2003) analysed data

from over 212,000 Americans in 2001 participating in the Behavioural Risk Factor Surveillance System (BRFSS). Heavy drinking is defined as consuming five or more drinks on one drinking occasion, irrespective of gender. According to this data, 14.3% of the American population had at least one episode of binge drinking during the previous 30 days.

Data from NESARC (Borders & Booth, 2007) estimates that around 23.6% of the adult population exceed their daily recommended drinking limits, defined as five or more drinks in one day for men, or four or more drinks in one day for women.

### **Alcohol Use Disorders**

Using the DSM-IV criteria for alcohol dependence, the National Longitudinal Alcohol Epidemiologic Survey (NLAES; Grant, 1997) shows that 13.3% of the participating population had fulfilled the criteria for alcohol dependence during their lifetime. When only those 66.0% having used alcohol during the past year are included, the figure of dependence rose to 20.1%. The highest frequency of alcohol dependence prevalence could be seen in the 18-24 year cohort, both in men and women. 4.4% of the total sample fulfilled the alcohol dependence criteria in the previous year (Grant et al., 1997). As for alcohol abuse, a total of 3.0% of the population had a twelve-month prevalence (Grant et al., 2004a).

For a summarising table of the population studies reviewed, see Table 1, p.30. Another large study of representative Americans is the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), including over 43,000 persons interviewed in the 2001-2002 survey (Grant et al., 2004a). NESARC also uses the DSM-IV system for diagnoses. In the whole population, 4.7% were diagnosed with alcohol abuse, and 3.8% of alcohol dependence. These numbers suggest an increase in alcohol abuse in the ten years that have passed between the 1991-1992 NLAES study and the 2001-2002 NESARC study – but a decrease in alcohol dependence.

### **Definitions of Alcohol Use Disorders**

The World Health Organization (WHO) and the American Psychiatric Association (APA) both have definitions of alcohol use disorders that are the most commonly used today, both in clinical work and research. The WHO has created the International Classification of Diseases (ICD), currently in its tenth edition (WHO, 1993), while APA's classification is called Diagnostic and Statistical Manual of Mental Disorders (DSM), currently in its fourth version, text-revised edition (APA, 2000).

Both definitions of alcohol dependence include criteria on tolerance, withdrawal, impaired control, neglect of activities or time spent in alcohol-related activity, and continued use despite problems. ICD-10 also includes a criterion on compulsion, but

none include criteria on inability to fulfil roles or hazardous use. Three of the criteria have to be fulfilled during a twelve-month period. Test-retest studies have shown excellent reliability on both definitions (see Hasin, 2003 for review).

The two systems differ more in their definitions of abuse or harmful use of alcohol. DSM-IV states that the abuse diagnosis can never apply if a person has been given a diagnosis of alcohol dependence during his or her lifetime, whereas ICD-10 only states that the two diagnoses cannot occur at the same time. DSM-IV diagnosis of alcohol abuse states that at least one of four criteria should be met within a twelve-month period. The criteria include inability to fulfil roles, hazardous use, repeated legal alcohol-related problems or continued use despite social/interpersonal problems. ICD-10 requires a clearly identifiable and specified physical or mental damage, not further defined in the manual, which has persisted continuously for at least one month or repeatedly during twelve months.

In addition to the widely used and accepted definitions of alcohol dependence and alcohol abuse/harmful drinking, a few other terms and definitions are worth mentioning. The WHO uses the terms problem drinkers, heavy drinkers and high-risk drinkers interchangeably, defined as people “drinking regularly at a level where there is a high risk of chronic or acute consequences” (WHO, 2004). The term heavy episodic drinking, or binge drinkers, is used for people “drinking occasionally at a level where there is a high risk of intoxication and acute consequences” (WHO, 2004).

The American National Institute on Alcohol Abuse and Alcoholism (NIAAA) uses a term called “at-risk drinker”. This refers to a person who is at risk of developing alcohol-related problems, and is defined as a person having one or more heavy drinking days a year (where a heavy drinking day is defined as five or more standard drinks in a day for men or four or more standard drinks in a day for women), or scoring eight or above for men, or four or above for women, on the Alcohol Use Disorder Identification Test (AUDIT). An American standard drink has no standard definition, but varies between 12 and 14 grams of ethanol. However, in the NIAAA “Helping patients who drink too much”, a standard drink is defined as 14 grams of ethanol (NIAAA, 2005).

In Sweden, risky alcohol consumption is defined as 14 or more standard drinks per week for men, or eight or more standard drinks per week for women, or drinking to levels of intoxication. This level of intoxication is defined as five or more standard drinks per drinking occasion for men, or four or more per drinking occasion for women. A Swedish standard drink is defined as the equivalent of 12 grams of ethanol (Andreasson, 2005).

Based on the above definitions of risky drinking, recommendations of alcohol drinking levels have been developed. In Sweden, the recommendations are to drink less than risky alcohol consumption (FHI, 2005). In the US, where most alcohol studies have

been performed, several recommendations exist. The Department of Agriculture and Department of Health & Human Services recommend no more than 14-28 grams per day, or 196 grams per week, for men, and no more than 14 grams per day or 98 grams per week for women (ICAP, 2003). The National Institute of Alcohol Abuse and Alcoholism (NIAAA) recommends no more than 56 grams per day, or 196 grams per week for men, and no more than 42 grams per day and 98 grams per week for women (ICAP, 2003). The American Heart Association recommends that the consumption should not exceed 28 or 14 grams a day for men and women respectively (ICAP, 2003).

### **Measuring Alcohol Consumption**

As can be understood from the above, a standard drink is a common way to measure alcohol consumption. Several other instruments exist for measuring alcohol consumption, including biological tests. Each of those has their own advantages and disadvantages.

Measuring alcohol consumption through self-reporting methods is a common way of getting an understanding of a person's alcohol consumption, and is widely used in clinical work as well as research. Advantages include easiness of use and a relatively low cost, but drawbacks in the departments of reliability and validity always have to be considered. In statistics, reliability ensures that the results can be replicated using the same materials and methods, and validity verifies that the instrument measures what it actually supposed to measure. Since the 1980's, there has been a large debate on the reliability and validity of alcohol consumption questionnaires, but the general conclusion has been that the reliability and validity are satisfactory for most research purposes, as long as bias is minimised (Del Boca & Darkes, 2003). Factors that influence self-reporting of alcohol consumption include social context factors (such as assessment setting and cultural norms), respondent characteristics (such as age, gender, religious affiliation and reference groups), and task attributes (such as mode of survey completion – Internet, telephone, paper-and-pencil, length of questionnaire and instrument design). Alcohol consumption can be measured using a quantity/frequency method or a daily estimation method, as well as retrospectively (where a common method is timeline follow-back), or as a typical drinking period.

Biological markers are another means to measure alcohol consumption and alcohol use disorders. As with all biological markers, the goal is high specificity (ensuring the marker will catch all persons with the disorder) and high sensitivity (ensuring the number of false positives will be as low as possible). Breath, urine or blood alcohol concentrations can be measured, but these usually remain high only hours after consumption (Neumann & Spies, 2003). CDT (carbohydrate-deficient transferrin) is increased in subjects consuming around 60 gram of alcohol per day (Heilig, 2004). The specificity is high (around 90%), but the sensitivity lower (50-80%; Heilig,

2004). Other biological markers exist, such as  $\gamma$ -GT (gamma-glutamyl transferase), MCV (mean corpuscular volume), ASAT (aspartate amino transferase), and ALAT (alanine amino transferase). Although those markers are low in specificity, they are useful in clinical contexts, following individuals over time. In addition to those markers, a new biological marker for alcohol consumption has now been introduced in Sweden. It is called phosphatidylethanol (PEth), which is a phospholipid only formed in the presence of ethanol in the body. It has a high sensitivity (99%; Aradottir et al., 2006), and correlates to CDT,  $\gamma$ -GT, MCV and grams of ethanol consumed in the past seven days (Hartmann et al., 2006). Drawbacks with the biological markers are, apart from the issues of non-perfect specificity and sensitivity, correlated to the non-perfect reliability and validity in the self-report questionnaires, a relatively higher cost and the fact that most of them are invasive, requiring a blood sample.

## **Background Causes of Alcohol Consumption and Alcohol Disorders**

### **Genetics**

Studies of twins have shown that the male heritability of alcoholism lies between 49% and 64%, with similar percentages for female twins (Köhnke, 2008). Although research shows that alcoholism is a disease with a genetic component, it is not one specific gene that causes the disease. In the alcohol dehydrogenase and aldehyde dehydrogenase system, which is the system breaking down the alcohol molecules in the body, several genes exist that predict alcohol behaviour. Some of the gene alleles protect against alcohol dependence, some predict alcohol dependence, some regulate the alcohol intake, and some protect against alcohol-related birth defects (Köhnke, 2008). Gene alleles (variations in genes between individuals) in the dopamine system also seem to be involved in alcohol matters, although the results are mixed.

It is possible that dopamine receptor genes could predict alcohol dependence, regulate alcohol intake, and predict alcohol craving. It is also possible that dopamine transporter gene alleles play a role in alcohol dependence as well as in alcohol withdrawal. The results are also mixed for dopamine-metabolising enzyme genes. Some studies show that they might be involved in alcohol dependence, as well as in regulating alcohol consumption, and to explain the antisocial behaviour in alcohol dependence. They do not seem to be involved in alcohol withdrawal (Köhnke, 2008).

The GABA system is known to be involved in the brain's reaction to alcohol. It causes sedative effects in the short term, and increases alcohol tolerance in long-term alcohol use. Several GABA gene alleles have been shown to be of importance in alcohol dependence – most promote it, but some have been shown to have protective effects

(Köhnke, 2008). Alcohol intake also affects the glutamate system, but no studies have been able to show a connection between alcohol dependence and glutamate receptor genes. Evidence suggests some gene alleles might alter alcohol withdrawal (Köhnke, 2008).

Other signal system genes are being investigated to examine whether they have an influence on alcohol disorders and related conditions and, although their role is not clear, further research will be able to tell if the opioid system, the cholinergic system, the serotonin system and neuropeptide Y genes are involved. It should not be forgotten that different gene alleles might have different effects and manifestations in different ethnic groups.

### **Influence of Family**

NLAES (Grant, 1997) shows that married people have a higher percentage of lifetime alcohol use than separated, divorced, widowed or people that have never married. However, married people had a significantly lower prevalence of dependence, and were less likely to persist in the dependence diagnosis. There is evidence that assortative mating is present in the context of alcohol use disorders (Grant et al., 2007). This means that persons with similar phenotypes are more likely to mate than two persons with different phenotypes. In the case of alcoholism, having two persons prone to alcohol use disorders means an offspring is exposed to two parents with potential alcohol problems, as well as a possibly detrimental environment. It has also been shown that the prevalence of alcoholism is higher in the spouses of persons with major depression, and children with mothers suffering from alcoholism run a higher risk of being diagnosed with major depression (Merikangas, 1988).

Families with alcohol problems seem to have high levels of conflict, and low levels of family cohesion. They also have higher divorce rates, which might affect the family members in negative ways, as well as the presumptive marital conflict leading up to the divorce. Families with alcohol problems, especially if combined with antisocial personality disorder, have elevated levels of family violence (Ellis et al., 1997).

### **Children of Alcoholics**

One of the factors leading to increased risks of alcohol problems in offspring to alcoholics is genetics. Apart from variation in genes (see above), Schuckit & Smith (1996) have shown that men with a family history of alcoholism have a higher risk of developing alcohol use disorders than men without this family history. However, this relationship diminishes when the level of response to alcohol is introduced: it seems that a low level of response to alcohol is a mediator of alcohol use disorders. The same finding seems to hold for women with a positive family history of alcohol use disorders (Schuckit et al., 2000a; Evans & Levin, 2003).

The other factor is the environmental influence. American data from the NESARC study estimates that between 15% and 43% of the children in the US are living with one or more parents with a lifetime alcohol use disorder (Grant, 2000). Children of alcoholics are exposed to their parents' alcohol use, and this affects the child's perception of alcohol and alcohol use. They also have more positive expectancies of alcohol than other children. Those expectancies have been shown to exist at ages before alcohol drinking is initiated (Ellis et al., 1997). Zhou et al. (2006) found adolescent family harmony to be a mediator of adolescent drug use in adolescents with a high family history density of alcoholism. They also found that family harmony was a protective factor against drug dependence in adolescence, but that this protection reached non-significant levels when the family history density of alcoholism was high.

Zucker and colleagues (2006) introduced the concept of nestedness, which states that many risk factors aggregate in high-risk families. Often, more than one risk factor can be seen in one family. It is important, however, to remember that not all families with alcohol problems are identical, and not all children of alcoholics will become alcoholics themselves.

## **Gender**

In almost all studies included in this thesis where gender separate analyses were made, men had higher alcohol consumption patterns than women. A literature review by Kerr-Corrêa et al. (2007) showed that gender differences were apparent, not only in actual alcohol consumption but also in the subsequent alcohol-related consequences, physical and mental health, and social acceptance.

In the large American NLAES study (Grant, 1997), men in all age cohorts drank more than the corresponding women (a total of 78.3% lifetime prevalence amongst men and 54.7% amongst women). The same relationship was found in alcohol dependence (18.6% in the males and 8.4% in the females).

In the NLAES and NESARC studies respectively, 4.7% and 6.9% of the males had an alcohol abuse diagnosis, compared to the females who had 1.5% and 2.6% respectively. Turning to alcohol dependence, 6.3% of the males in the NLAES study and 5.4% of the males in the NESARC study fulfilled the criteria, compared to 2.6% and 2.3% respectively for the females (Grant et al., 2004a).

In the BRFSS study, analysed by Naimi et al. (2003), 81% of the heavy episodic drinking in 2001 occurred amongst men.

The Gender, Alcohol, and Culture: an International Study (GENACIS) project, sponsored by American organisations as well as EU and WHO, was initiated to investigate those universal gender differences and try to offer an explanation. The analyses of GENACIS are ongoing, but a smaller part of the project, including thirteen European countries as well as Brazil and Mexico, are reported upon in an



EU report by Bloomfield et al. (2005). The report supports the observed gender differences in alcohol consumption, both in actual grams of consumed alcohol, and by AUDIT scores. The study was not able to support a theory that social stratification is more important for men and family for women, and in that way explain the gender differences in drinking behaviour. However, the gender differences in drinking rates and consequences, but not intensity of drinking, diminish with modernisation and gender equity. Following this, the Nordic countries (including Sweden), which have greater gender equality, also have smaller gender differences in drinking.

## **Race**

In the American NLAES study (Grant, 1997), black people and Hispanic people had a lower prevalence of lifetime alcohol use than white people. Black people also had a lower frequency of lifetime alcohol dependence than white people. Interestingly, blacks and Hispanics were more likely than whites to persist in their dependence once they had acquired it.

The twelve-month prevalence of alcohol abuse and alcohol dependence in both NESARC and NLAES studies shows a strong overrepresentation of native Americans across both genders (Grant et al., 2004a). Measuring heavy episodic drinking, Hispanics and white are more likely to binge drink than blacks and others (Naimi, 2003).

In Sweden, there is a race living in the North, called the Sami people, with their own ancient culture and tradition. No alcohol research has been identified, that could separate the alcohol consumption of the Sami people from the rest of the population in Sweden. Surprisingly, Swedish alcohol research does not have the same focus on background racial data as the US. However, the Swedish Council for Information on Alcohol and Other Drugs (CAN) has attempted to draw focus on asylum seekers and immigrants and their alcohol and drug use. From literature reviews and interviews, Helling (2005) conclude that alcohol misuse does not seem to be common amongst asylum seekers in Sweden, but that contacts with this group of people are not sufficient for reliable conclusions. Probable reasons for the absence of misuse are several: the asylum seekers want to behave properly to prevent diminishing their chances of staying in the country; they often lack money and many of them belong to religious affiliations where alcohol (and other drugs) are forbidden. Hjern & Allebeck (2004), using national cohort data, showed that first-generation immigrants from Eastern Europe, Southern Europe, and the Middle East had lower risks of being hospitalised for alcohol-related disorders, while first-generation immigrants from Finland had a higher risk. They also showed the same pattern in second-generation immigrants.



## **Religion**

As is touched upon in different part of this thesis, alcohol and religion can be closely related. In some religions, such as Islam and most non-conformist churches in Sweden, alcohol is strongly discouraged. Michalak et al. (2007) in the US found that persons belonging to a religion where alcohol is discouraged abstain more than other persons. They also found that ex-drinkers are over-represented in some religious denominations. However, drinking habits are not only correlated to specific religions, but it seems that general religious or spiritual involvement is associated with less risky alcohol habits. The mechanisms behind this are probably multiple, but are not yet fully understood (Miller, 1998).

## **Socio-Economic Status**

The term socio-economic status is defined by the WHO as “a description of a person’s position in society, which may be expressed on an ordinal scale (i.e. classification into qualitative categories) using such criteria as income, educational level attained, occupation, value of dwelling place, etc.” (WHO, 2003). There is some evidence that the socio-economic status correlates with alcohol consumption patterns.

The report “Gender, culture and alcohol problems: a multi-national study”, sponsored by the EU (2005), showed that men with lower education and women with higher education seem to have a heavier use of alcohol. Heavy episodic drinking occurred more often in lower educated men than in men with a higher education, but no differences could be seen in women. In Finland, it was found that alcohol-related mortality was higher in the low socio-economic status group (Mäkelä, 1999). It was also found that personal income was a predictor of alcohol-related mortality amongst men, whereas spending power was a better predictor amongst women. The US and the Mäkelä study thus suggest different underlying mechanisms for alcohol consumption and alcohol-related mortality in men and women. A meta-analysis by Wiles et al. (2007) found no clear evidence to support for childhood socio-economic status and any correlation to later alcohol use.

## **State Policies**

State policies are important tools for countries to regulate alcohol sales and alcohol consumption. Several state and international policies can explain the cause of the increasing Swedish alcohol consumption since the middle of the 1990s. According to Leifman (2003), the most important changes are the following: the disappearance of production, import, export and wholesale monopoly (by state-owned Systembolaget) when Sweden entered the European Union in 1995; import quotas which increased steadily from 1995 to 2004, when the level of the rest of the European Union was reached; taxes on beer were lowered in 1997; taxes on wine were lowered in 2001;

alcohol taxes are not adjusted according to inflation, which in reality means a lowering of general alcohol prices; more alcohol retail stores were opened; the alcohol retail stores are now have longer opening hours during the week and are open on Saturdays. Also, more restaurants are serving alcohol, more grocery stores are selling medium-strength beer, and new alcohol-containing drinks have been introduced, such as cider >3.5% and bag-in-box wines.

One of the most well-known and discussed state policies regarding alcohol is the legal age-limit of consuming alcoholic beverages. In Sweden, alcohol can be served in bars and restaurants to people aged 18 and upward, but buying alcohol through Systembolaget. Although this age limit has remained the same in Sweden for quite some time, research from the US and New Zealand shows that lowering this age increases traffic injuries in young persons (Kypri et al., 2006b, Shults et al. 2001). Research also shows that raising the minimum alcohol purchase age also effectively reduces self-reported impaired driving as well as objective alcohol-related crashes in the affected age groups (Yu & Shacket, 1998).

For a discussion of state policies and their effectiveness in reducing general alcohol consumption, see Alcohol Interventions.

### **Alcohol Expectancies, Drinking Motives and Personality**

Leading researchers in the field define expectancies as “processes within the nervous system that use neurophysiological and cognitive residues of previous experience to guide future behaviour” (Del Boca et al., 2002). The experiences do not have to involve alcohol drinking personally – observing the behaviour of alcohol consumption by others is also of importance. Studies have shown that expectancies held by teenagers predict both onset of drinking and drinking behaviour (Christiansen et al., 1989; Smith et al., 1995a). Using subjects from a national alcohol study, Leigh & Stacy showed that, amongst alcohol drinkers (thus excluding abstainers) younger than 35 or older than 60, positive alcohol expectancies were stronger predictors of drinking than negative expectancies, while they were both of importance in drinkers aged 35-60. Therefore, it seems that different kinds of alcohol expectancies are important in different life stages.

Goldman argues that alcohol expectancies should not necessarily be separated from drinking motives, or even personality, since personalities could be seen as expectancies accumulated over a lifespan (Del Boca et al., 2002). McCarthy has shown in two studies that persons with reward-seeking personalities have more positive alcohol expectancies than other personalities, and this is a mediator for alcohol consumption. The reward-seeking personality in itself does not mediate alcohol consumption levels (Del Boca, 2002). In NESARC, Grant et al. (2006) found that persons with an alcohol use disorder had higher odds of a comorbid personality disorder,

with antisocial personality disorder (Odds Ratio 4.8, 95% CI 4.1, 5.6), histrionic personality disorder (OR 4.7, 95% CI 3.8, 5.8) and dependent personality disorder (OR 3.0, 95% CI 1.9, 4.8) as the most commonly occurring.

In a meta-analysis by McCarthy & Smith (1996), alcohol expectancies explain 12% of the cross-sectional drinking behaviour and 4% longitudinal. Moderators were found to be gender, method of measuring expectancies and type of expectancy (positive or negative). They also found that alcohol expectancies were mediators for family history of alcoholism. Agrawal et al. (2007), studying female twin pairs, showed that although both expectancies and enhancement drinking motives are similar within the twin pairs, this is rather an effect of shared environment than genetic heritage. Drinking motives such as social, coping, and conforming motives seem to have some heritable influence.

### **Psychiatric Co-Morbidity**

Several studies have shown a correlation between alcohol disorders and depressive disorders (WHO, 2004; FHI, 2005; Grant, 2004b). In their review, Berglund & Öjehagen (1998) showed that the suicide prevalence amongst persons with alcoholism is 60 to 120 times higher than the prevalence amongst persons who have no psychiatric problems. However, the increased mortality due to alcohol is not only found in persons with an alcohol use disorder. It has been shown that around 44% of the unnatural deaths in Sweden have alcohol involved. Of the suicides, 35% were alcohol-related (Sjögren et al., 2000).

Correlations between alcohol use disorders and other psychiatric diagnoses have also been shown. NESARC showed that 17% of those with an alcohol use disorder diagnosis during the past year also had an anxiety disorder during the same period (Grant, 2004b), and other data confirms that around 20% of those with an anxiety disorder have alcohol use disorders (Randall et al., 2001). Bipolar disorder and alcohol use disorders are co-occurrent in 40-50% of those with a bipolar (I or II) diagnosis (Sonne, 2002), and the lifetime prevalence of alcohol use disorders in those diagnosed with schizophrenia or schizofreniform disorder is around 34% (Drake & Mueser, 2002). Other studies have shown correlations with childhood antisocial behaviour (Clark et al., 2002) and ADHD (Smith et al., 2002), and problematic gambling (Grant et al., 2002).

Alcohol use is also correlated to the use of other substances, especially tobacco, where data from NESARC shows that 21.7% of the population used both tobacco and alcohol in the past year, and that 2.9% had both an alcohol use disorder and nicotine dependence (Falk et al., 2006). NESARC data also shows that persons with a twelve-month prevalence of alcohol use disorders are overrepresented amongst those with sedative, tranquilliser, opioid, amphetamine, hallucinogen, cannabis and cocaine use disorders (Stinson et al., 2005).

## Consequences of Alcohol Consumption

Nutt et al. (2007) recently published a scale to assess the harm of twenty drugs of potential misuse. Using nine parameters of physical harm, dependence and social harm, a panel of experts, ranging from medical specialists such as psychiatrists, pharmacologists and epidemiologists to police and legal experts, each scored those compounds. Alcohol was rated as number five out of twenty, exceeded only by heroin, cocaine, barbiturates and street methadone. Although this is no perfect scale, it reflects the harms of alcohol.

The harm of alcohol drinking can be divided into different areas, and depends both upon the volume and patterns of alcohol drinking, and upon the mediating mechanism of alcohol: biochemical effects, intoxication and dependence (WHO, 2004).

The pattern of alcohol consumption is of importance when considering alcohol drinking patterns: it is better to drink low amounts of alcohol regularly, than to have episodes of heavy episodic drinking. Data from NESARC shows that 0.2% of persons never exceeding daily or weekly alcohol limits, are diagnosed with alcohol abuse or dependence. Exceeding both the daily and weekly alcohol limits increases the prevalence of an alcohol use disorder to 42.3%. However, the prevalence of an alcohol use disorder when, exceeding weekly limit only, is around 1.5%, whereas the prevalence of an alcohol use disorder in the group exceeding the daily alcohol limit is around 20.6% (Dawson et al., 2005a). This data clearly shows that exceeding the daily drinking limit is more pathological than exceeding the weekly limit. Furthermore, it has been shown that persons who daily or nearly daily exceed the daily recommended limits have a higher risk of alcohol abuse (Odds Ratio 3.93), alcohol dependence (OR 7.23), drug use (OR 1.87), tobacco use (OR 4.67), nicotine dependence (OR 3.93), liver disease (4.76), and increased risks of divorce/separation (OR 2.54), violent behaviour (1.61), withdrawal of driving licence (OR 2.11) and abuse of spouse (2.06; Dawson et al., 2008).

Even though the risks of negative consequences increase with a higher alcohol consumption, most alcohol-related problems can be related to the low to moderate alcohol consumers. This is called the prevention paradox and can be explained by the fact that the group of low to moderate drinkers is so much larger than the high consumption group, and thus give rise to more negative consequences in absolute numbers than the high consumption group (Skog, 1999). The prevention paradox calculations are mostly based on weekly alcohol consumption. In countries such as Sweden, where drinking patterns of heavy episodic drinking exist, the approach of measuring weekly consumption levels might produce results that are not immediately applicable. However, some newer studies have found that the prevention paradox largely still applies when examining the frequency of intoxication instead of mean alcohol consumption (Rossow & Romelsjö, 2006).

## **Immediate**

SoRAD's annual estimate of the alcohol habits of the Swedish population includes self-reported alcohol-related negative consequences. A total of 1.7% reported fights in conjunction with alcohol consumption, where men in the age group 16-29 years had the highest proportion of affirmative answers (10.6%). Of the whole study population (n = 14,468), both genders included, 6.4% had got into an argument, 1.6% felt it had affected their work/studies, 5.5% recognised it had affected their financial situation and 0.8% claimed alcohol had affected their marriage or family relations (SoRAD, 2006).

In Sweden 0.2% of all drivers drive under the influence of alcohol, and around 25% of all traffic fatalities are alcohol related (Vägverket, 2007). The limit for driving is a maximum blood alcohol concentration of 0.2‰. In the US, about 39% of all traffic fatalities are alcohol-related. It is illegal to drive with a blood alcohol concentration of 0.8‰ (NHTSA, 2005), but some states have lesser charges for lower limits of blood alcohol concentrations.

According to a large review by WHO (2004), alcohol is involved in a number of immediate negative consequences, such as accidents in traffic (pedestrians, bicycles, vehicles), falls, fires, sport and recreational injuries, suicides, rapes and child battering. As is also shown by the Swedish report above, the WHO has also found alcohol to be the cause of work-related problems as well as family related-problems, including negative financial effects and family violence (WHO, 2004).

In 2005, perceived alcohol use by the offender was involved in 14.1% of the violent crimes, and in 4.6% of the violent crimes there was a perceived use of both alcohol and drugs. It has to be added that alcohol or drug use was not known in 49.2% of the cases, making the numbers uncertain (Bureau of Justice Statistics, 2005).

## **Long-Term**

Alcohol has a contributing role in several cancer forms, including most gastrointestinal cancers (lip, oropharyngeal, oesophageal, stomach, liver, colon and rectum), as well as female breast cancer, where alcohol consumption is of importance even in amounts of 25 g per day (WHO, 2004; FHI, 2005).

Alcohol consumption is also a contributing cause to hypertension, cardiac arrhythmias and heart failure, as well as liver cirrhosis, foetal alcohol spectrum disorders, and acute and chronic pancreatitis (WHO, 2004; FHI, 2005). Alcohol consumption also increases the risk of haemorrhagic stroke in males, as well as in females drinking 40 g of pure alcohol or more a day (WHO, 2004).

Wernicke-Korsakoff's disease is a condition that affects persons with long-term alcohol use. Wernicke's encephalopathy is an acute syndrome caused by vitamin B1

(thiamine) deficiency. Korsakoff's syndrome often accompanies or follows Wernicke's encephalopathy, and is manifested as a severe loss of working memory (Sechi & Serra, 2007).

To sum up, persons with alcohol use disorders have consequences in different areas of their lives, as is also highlighted by the diagnostic criteria of the disorders. Their lifestyle is different, and in many aspects inferior, to persons without alcohol use disorders.

### **Social Harm**

Trying to estimate the consequences of alcohol consumption in economic costs is a difficult task. Direct costs (such as measures delivered to address the harmful consequences) as well as indirect costs (such as valuing the time lost at work due to alcohol-induced absence) must be taken into consideration. Estimates from 1.1% to 6% of the gross domestic product (GDP) have been calculated for costs of alcohol abuse in different countries. In 1998, the United States estimated that social and economic costs due to alcohol abuse were USD 185 billion (WHO, 2004).

In Sweden, the total costs have been estimated in one report to SEK 20.3 billion (USD 3.1 billion; 1.1% of GDP), which is almost 1% of the gross domestic product. This includes costs of health care, social service and crime, and also includes deduction of the money saved by the positive consequences of light alcohol consumption (Jarl et al., 2006; 8.4% of GDP). However, in another report, the costs are estimated at SEK 156 billion (USD 24 billion). There is an obvious difference, which according to the author of the later study, A Johnson, can be explained to 80% by the different measures in the two studies. That leaves an actual difference of 20%, largely explained by larger estimates of the costs of early retirement, sick leave and health care in the larger estimate (Johnson, 2006).

### **Positive Effects**

Although perhaps less controversial today than a few years ago, alcohol consumption has also been shown to have positive effects on the human body.

Alcohol also seems to protect against coronary heart disease, with low to moderate levels of alcohol consumption being the most protective ones. It is hypothesised that this protection is multifactorial, such as gaining a more profitable blood lipid profile, coagulation profile, insulin resistance, hormonal profile, vasodilatation and a reduction of inflammation, and perhaps the anti-oxidative effects of some alcoholic beverages (WHO, 2004). However, no protective effects of alcohol can be seen in European countries at a population level (Hemström, 2001).

The positive effects of alcohol on ischemic heart disease has been given a separate

chapter in the Swedish Alcohol and Health publication from the Swedish National Institute of Public Health, FHI (2005). After a thorough literature search, the authors conclude that a high level of alcohol consumption is undoubtedly bad, but that the effect of low to moderate amounts is more uncertain. Due to considerable limitations in the studies performed addressing this issue, no formal recommendations can be made. It seems the possible preventive effect might be of the same order as some medicines, but in order to produce a medicine with approved preventive effects on ischaemic heart disease, extensive and highly controlled studies need to be carried out. The studies on the possible preventive effects of alcohol do not rise to this standard. Some problems with the studies are the lack of prospective randomised controlled trials, the definition of abstainers (the lack of separating life-long abstainers compared to those abstaining due to previous alcohol problems), and not controlling for confounders (such as socio-economic status). There is, however, no reason to recommend a lowering of a low to moderate alcohol consumption in the elderly in order to prevent heart disease (FHI, 2005).

Studies show that low amounts of alcohol consumption (less than 40 grams a day) decrease the risk of haemorrhagic stroke in females (WHO, 2004). Alcohol seems to have protective effects when it comes to the other type of stroke – ischaemic, when alcohol is consumed in low to moderate amounts (WHO, 2004). Other studies, however, show an increased risk of stroke when engaging in heavy episodic drinking (FHI, 2005).

Some studies also show a possible protective effect of alcohol on diabetes type 2: persons with a moderate alcohol intake are at lower risk of developing diabetes type 2 when compared to persons with no or low alcohol intake (FHI, 2005). The probable pathway is through a higher glucose tolerance and lower insulin resistance (WHO, 2004; FHI, 2005). The relationship between type of alcohol, pattern of alcohol intake, the importance of body weight and diabetes is not clear.

*Table 1. American epidemiological studies mentioned in the thesis*

<b>Study name (author)</b>	<b>N</b>	<b>Year conducted</b>	<b>Population</b>	<b>Mode of survey</b>
BRFSS	> 350,000	1984 and annually, ongoing	General, over 18 years	Telephone interviews
CAS	> 14,000	1993, 1997, 1999, 2001	Students in 120 colleges	Posted questionnaire
Monitoring the Future	~ 50,000/year	1975 and annually, ongoing	Students in 8th, 10th and 12th grade	Questionnaires, in-person and posted
NCHRBS	4,383	1995	Students 18 years and above	Posted questionnaires
NESARC	43,093	2001-2002, 2004-2005	General, over 18 years	In-person interviews
NHSDA/NSDUH	~ 67,500/year	1971 and annually, ongoing	General, 12 years and above	In-person interviews
NLAES	42,862	1992	General, over 18 years	In-person interviews
NLSY	12,686	Annually from 1979 to 1994, biannually since 1994	14-22 year olds in 1979 (no new since then)	In-person interviews





# ALCOHOL AND STUDENTS

## Emerging Adulthood

During the last decades, the number of people continuing to secondary and tertiary education has risen. According to a survey in 2006, 35% of the 65-year-olds had completed primary and lower secondary education as their highest level of education, and a total of 23% post-secondary education. The same year, 8% of 30-year-olds had a highest education level of primary and lower secondary education, and 45% had post-secondary education (Statistics Sweden, 2007a).

Between 18 and 25 years of age, most people move out of their parents' house and start living together with people of their own age, or on their own. Most people continue their education and postpone marriage and building a family. The age of marriage and age when the first child is born is rising in Sweden: in 2006, the mean age of marriage was 31.9 years for women and 34.5 years for men, and the mean age for first-time mothers was 29.0 years, and 31.5 years for first-time fathers (Statistics Sweden, 2007b). When asked about their own perception of adulthood, most people in the age of 18 to 25 are ambiguous about reaching adulthood. This seems to suggest a new period in life, in-between adolescence and adulthood. This period has been called young adulthood, but Arnett (2000) has argued for it to be called emerging adulthood. It is characterised by a time of changes. According to those in emerging adulthood, the three most important factors when defining adulthood are: accepting responsibility for one's self, making independent decisions, and becoming financially independent (Arnett, 2000).

Emerging adulthood is a time when people explore their personalities and limits, and as is reported in the following section, the use of alcohol, as well as other substances, is high.

## Alcohol Consumption in Emerging Adulthood and amongst College Students

Across different epidemiological studies, people in emerging adulthood stand out as a group with exceptional drinking habits and alcohol problems.

In the NESARC study, as well as the NLAES study, the highest twelve-month prevalence of alcohol abuse and alcohol dependence is amongst 18-29 year olds (Grant et al., 1997; Grant et al., 2004a).

In BRFSS, the two groups with the highest heavy episodic drinking frequency were the 21-25 year olds (with 18 heavy episodic drinking episodes per person and year),

and the 18-20 year olds (with 15 episodes per person and year) (Naimi, 2003). As partly cited in the previous chapter, self-reported population data from Sweden indicates that the age group 16-29 age group contain the biggest alcohol consumers in Sweden, with 7.3 litres pure alcohol consumed by the males in this age group, and 3.3 litres by women (SoRAD, 2007). The same group also contains the largest group of heavy episodic drinkers, with 20.4% of the males and 8.5% of the females in the 16-29 age group reporting heavy episodic drinking at least once a week (SoRAD, 2007).

The emerging adulthood group includes both students and non-students. Most epidemiological studies do not separate people according to their student status, though some researchers have attempted such subanalyses. Dawson et al. (2004) made a subgroup analysis of students and non-students in the 18-29 age group in the NESARC study. They found that drinking patterns were more dependent on residence settings than college status. Men living on college campuses did not differ in drinking behaviour from men not enrolled in college living independently, but women living on college campus had higher risk drinking patterns than women not in college living independently. A survey among Swedish 19-29 year olds showed no differences in drinking patterns between students, workers and unemployed persons (Eriksson & Olsson, 2004). However, data from the Monitoring the Future survey (Johnston, 2007) suggest there is indeed a difference in alcohol consumption depending on college enrolment or not: the percentage of students engaged in heavy episodic drinking in the past two weeks is 40.2%, compared to 34.7% within the persons in the same age group not enrolled in college. However, the same study shows similar rates of daily drinking (4.8% in college students, 5.7% in others), as well as in 30-day prevalence of alcohol (65.4% in students, 61.0% in others). Muthén & Muthén (2000) have shown that dropping out of high school does not have an immediate effect on heavy drinking in their study, but is associated with an increased risk of heavy drinking in the later 20s and in the 30s.

Studies performed in Sweden also show high alcohol consumption amongst college and university students. Several studies show that the rate of alcohol abstinence is around 5% (Bullock, 2004; Andersson, 2007), compared to around 11% in the UK (Webb et al., 1996), around 15% in US (Johnston et al., 2007) and around 16% in Brazil (Bitarello do Amaral et al., 2006). Bullock (2004) studied four Swedish universities, with 4,575 students in total. The percentage of students consuming alcohol two or more times a week was 10.4% and two to four times a month 56.6%. The consumption differed between the universities, with Lund University having the highest alcohol consumption frequency. Lund University is one of Sweden's oldest universities (founded in 1666) with a traditional university atmosphere in a small town.

Andersson et al. (2007) showed that in two Swedish universities (one being included

in both the Andersson 2007 and the Bullock 2004 study), 75% of the males and 66% of the females consumed alcohol at least once a month, and 13% of the males and 8% of the females at least twice a week. The mean AUDIT score amongst the males was 8.8 points, and amongst the females 6.0 points. The eBAC score obtained was 0.09% amongst the males and 0.08% amongst the females. In the Bullock (2004) study, 35.7% of the men scored eight or above on AUDIT, and 56.6% of the women scored six or above. (For a discussion on AUDIT cut-off scores, see the Instruments/ Discussion section). New Zealand residence hall students scored even higher on the AUDIT scale, with the mean  $\pm$  sd score for men being  $10.9 \pm 7.6$  and women  $7.6 \pm 5.9$  (Kypri et al., 2002).

In the Swedish Bullock (2004) survey, 55.0% of the students reported episodes of heavy drinking at least once a month, where heavy drinking was defined, for both genders, as consuming five standard drinks on one occasion. Almost 36% of the students had heavy drinking episodes at least twice a month. In an American freshmen college study from 2003, 41% of the males and 34% of the females reported heavy episodic drinking in the previous two weeks, where heavy episodic drinking was defined as five or more standard drinks for men, and four or more for women (White, 2006). Furthermore, White et al. showed that those students who were frequent binge drinkers were more likely to drink two and even three times the heavy episodic drinking threshold level (ORs of 3.54 and 5.42 respectively).

### **Trends in Alcohol Consumption Over the Years**

In the US, the CAS study was carried out at 119 colleges in 1993, 1997, 1999 and 2001. Over the years, the rate of heavy episodic drinking remained stable, with around 44% of the students engaging in such activities at least once in the previous two weeks. The rate of abstainers rose from 16.4% in 1993 to 19.3% in 2001 (OR 1.22, 95% CI 1.13, 1.32), but the number of frequent binge drinkers also rose, from 19.7% to 22.8% (OR 1.21, 95% CI 1.13, 1.30; Wechsler, 2002). Data from the Monitoring the Future studies over the years indicates that alcohol use amongst college students decreased slightly in the 1980s and has been consistently high since then: in 1993 as well as in 2006, 40% of college student have heavy drinking episodes (Johnston et al., 2007).

In Sweden, amongst the 19-29 age group, the consumption of alcohol rose slowly from 1990 to 2000, and has since then remained at a steady level (Leifman, 2003).

### **Alcohol Dependence in Youth**

Studies from the US, using the DSM-IV diagnostic system on adolescents and young adults up to 30 years of age, show that alcohol dependence is more common in the lower ages. Results from NLAES showed that 24.9% of the males in the aged 18-24

had a lifetime prevalence of alcohol dependence, as compared to 20.1% in the 35-44 age group. In females, the corresponding figures were 13.8% in the 18-24 year age group and 8.6% in the 35-44 year age group (Grant, 1997). Similarly, Harford et al. (2005) showed that the 12-month prevalence of an alcohol dependence diagnosis was 1.6% in the 12-17 years old male group, 6.7% in the 18-23 age group and decreased thereafter. For females, the corresponding figure for the 12-17 year olds was also 1.6%, rising to 3.8% in the 18-24 age group and decreasing thereafter. Grekin & Sher (2006) followed college freshmen over a period of a year. They concluded that there was a moderate stability of dependence symptoms over time. In total, 11.5% - 15.1% of all included students recognized alcohol dependence symptoms over the study period.

Slutske (2005) looked at the difference between people attending and not attending college aged 19-21 from the National Household Survey on Drug Abuse (NHSDA). She found that although college students have a higher percentage of alcohol-related problems (18% versus 15%) than non-student youth, and were more likely to receive an alcohol abuse diagnosis (OR 1.56, 95% CI 1.37-1.77), they were not more likely to receive an alcohol dependence diagnosis (OR 0.96, 95% CI 0.69-1.33). Using a large college sample, Knight et al. (2002) showed that 31.6% of the over 14,000 students included in the study fulfilled the criteria for alcohol abuse, and 6.3% for alcohol dependence. Most students fulfilling those criteria were under 21 years of age (46.0% of the students with an alcohol abuse diagnosis and 53.6% of the students with an alcohol dependence diagnosis). Only 12.8% and 9.9% of the students with respective diagnosis were above 24 years old.

## **Course of Alcohol Consumption in College Students**

### **Age of Onset**

Using data from several different large American surveys, there is increasing evidence for a link between the age of alcohol drinking onset and severity of alcohol problems later in life. NESARC analyses show that 47% of those who started to drink before the age of 14 years received a lifetime diagnosis of alcohol dependence. The percentage decreases with increasing age of onset, and is 9% in those starting to drink at age 21 or older (Hingson et al., 2006). Using data from the National Survey of Labor Market Experience in Youth (NLSY), Grant et al. (2001) showed that the age of drinking onset predicted alcohol dependence seven years ( $p < 0.05$ ) and twelve years ( $p < 0.01$ ) later. Age of drinking onset also predicted alcohol abuse twelve years later ( $p < 0.01$ ), but not seven years later. Finally, data from NLAES shows similar results: age on onset is not significant for a lifetime alcohol abuse diagnosis, but for a lifetime dependence diagnosis ( $p < 0.01$ ; Grant 1998).

This trend is shown also in Europe. In an Italian study of college students, drinkers

were defined as social drinkers (not drinking more than four times a week), binge drinkers (having one or two heavy episodic drinking episodes a week,  $\geq 5$  standard drinks for a man and  $\geq 4$  standard drinks for a woman), and heavy drinkers (three or more heavy drinking episodes per week). The social drinkers were older than the binge drinkers, who were older than the heavy drinkers, at the age of first trying alcohol outside of the family context ( $p < 0.001$ ), at the age regular drinking began ( $p < 0.001$ ) and at the age they first became intoxicated ( $p < 0.001$ ; D'Alessio et al., 2006).

### **Transition from High School to College**

Monitoring the Future (Johnston et al., 2007) showed that 12th graders bound for college report less heavy drinking than non-college bound 12th graders. Drinking increases in the transition from high school to college, in both frequency and quantity. Yu & Shackett (2001) found that high-school alcohol use significantly predicted alcohol use in college. Baer et al. (1995) showed that 29% of the students reported drinking at least once a week in high school, a percentage that rose to 63% during the first term in college. Similar, 45% of the students reported drinking at least five to six drinks per weekend drinking occasion when in high school, rising to 53% in college. Forty-two percent reported drinking seven to eight drinks on one occasion in the previous 30 days in high school, a fact endorsed by 53% in college.

### **Consumption During College**

Monitoring the Future (Johnston et al., 2007) showed that heavy drinking has its peak in the early 20's and declines after that. This peak in the early 20's put the college students at the same level, or a bit higher, than their non-college student peers.

Data suggests that the Swedish student peak occur a few years later, which might be a result of people starting university later in Sweden. In a study by Andersson et al. (2007), amongst Swedish university students, the mean AUDIT scores were shown to be greatest within the 24-25 years age group in men and 20-21 years age group in women.

### **Drinking Past the College Years**

Several studies have attempted to follow students past college, in order to gain a greater knowledge of the alcohol habits after graduation. O'Neill et al. (2001) followed a group of high-risk students from their freshman year for eleven years. Over the years, the heavy drinking decreased (measured as number of times lightly affected by alcohol, number of times drunk, and number of heavy drinking occasions). However, from their results it is clear that risky alcohol consumption during college predicted risky alcohol consumption at year eleven, as well as number of recognised alcohol-related consequences, symptoms of alcohol dependence and the diagnosis of an alcohol

use disorder by DSM-III, DSM-III-R and DSM-IV. Male gender also predicted risky alcohol consumption at year eleven, but not clearly alcohol use disorders. A family history of alcohol use disorder successfully predicted alcohol use disorder and symptoms of alcohol dependence at year eleven, but not measures of risky drinking. Muthén & Muthén (2000) have shown that college education has a protective effect on heavy drinking, more apparent in the 30s than in the 20s.

### **Alcohol Development in Emerging Adulthood**

Far from all longitudinal studies have concentrated on college students, but have followed alcohol consumption in the general population, from youth to young adulthood. Earlier data on the development of alcohol problems found no continuity between adolescent/student drinking status and the drinking status as young adults (Donovan et al., 1983). However, with more advanced statistical tools at hand, another pattern is emerging. Several studies have used trajectory analyses and other sophisticated statistics in order to gain further knowledge regarding the development of alcohol use. Although not all studies find all different kinds of pattern, combing the research results produce a picture of diversity.

Bennett et al. (1999) used data from the Health and Human Development Project, following people through emerging adulthood (age range 12-31 years). Using cluster analysis, they found four clusters of alcohol patterns. The first cluster, comprising 9.1% of the total sample, showed high levels of alcohol use and consequences in the 18-24 age group, and lower levels before and after. Male gender was a predictor of membership in this cluster. The second cluster, consisting of 38.2% of the total sample, showed moderate levels of alcohol use and consumption across time. The third cluster, with 23.2% of the total sample, showed stable high levels of alcohol use and consequences across time, and the fourth cluster, 29.5% of the total sample, showed low levels of alcohol use and consequences over time. Persons in the first and third clusters were more likely to use alcohol for escape reasons and experience seeking, and exhibited more problem behaviours than the other two clusters. Chassin et al. (2002) analysed binge drinking between the ages of 13 and 20. An early-heavy trajectory (20.9% of the sample) was found, with people starting to drink in a binge manner in early ages, peaking around the age of 19-20. Thirty percent belonged to the late-moderate group, which began heavy episodic drinking at the age of 16-17 years, and who peaked at a lower level than the previous group, at around 21 years. The third group (9.6%) was an infrequent one, starting out as the early-heavy group with heavy episodic drinking in early ages, but not continuing this pattern. Finally, a non-binge group of 39.5% was found. Several trajectory analysis studies in the US have found several diverse patterns of alcohol consumption: those who had never had any episodes of heavy episodic drinking, those with stable patterns of low, medium or high use, increasers, decreaseers and those with an increase followed by a decrease (sometimes

called a “fling” pattern), as well as those with infrequent and indeterminable trajectory patterns (Schulenberg et al., 1996a; 1996b; Tucker et al., 2003; Windle et al., 2005).

Casswell et al. (2002) analysed alcohol quantity consumed per occasion, and frequency of drinking in people aged 18-26 years in New Zealand. For both men and women, four trajectory groups were found in terms of typical quantity per occasion. In both genders, three of the four groups (consisting of 96% of the males and 94% of the females) had peaks in quantity consumed at the age of 21. The last group showed increased quantities with increased age. Contrary to the American studies, membership in the male increasing trajectory group was predicted by low educational achievement. Ease of access at age 15 was also a predictor for this group. Three trajectories were found for drinking frequency in males and females respectively. For males, a stable low group (involving 7% of the subjects) could be found, as well as two groups of increasing frequency (a lower group with 53% of the males, and a group starting at a higher level and increasing faster, comprised of 40%). Predictors of belonging to the increasing groups were access to licensed premises, early alcohol consumption, frequent alcohol consumption by the mother, and low educational achievement. For the females, a slow increasing group was found (33% of the women), and a faster increasing group (58%), as well as a stable group with a high alcohol frequency (9%). Predictors of belonging to a higher trajectory group were greater access to licensed premises, living with parents and higher alcohol consumption by the mother.

Johnsson et al. (2008) studied the changes in AUDIT over four years, in a Swedish college sample. Combining data from high risk and low risk populations, two groups were found (16% of the students) with stable high AUDIT scores. One decreasing group was found (11%), and two decreasing groups (13%). The rest of the students (60%) were found in three different groups with stable low AUDIT scores.

In a British national birth cohort, alcohol consumption was followed from the age of 16 to the age of 42 (Jefferis et al., 2005). It was shown that those 16-year old men reporting a high alcohol consumption the previous week (more than 55g of alcohol), had a higher frequency of heavy episodic drinking at the ages of 23, 33 and 42 years (OR varying from 1.64 to 2.07). Having a weekly consumption of 2-4 drinks as an adolescent also correlated to adult heavy drinking episodes (OR ranging from 1.26 to 1.38). The same trend was also found amongst women, but with less significant results. However, only 8% of the men and 1% of the women reported heavy episodic drinking on all three survey occasions.

Bingham et al. (2005) followed a group of persons from 12th grade to the age of 24, and analysed their alcohol consumption patterns in relation to their education level (high school or less, some post-secondary education, or college completers). They found that alcohol consumption (measured by quantity/frequency) and heavy episodic drinking increased in all groups, regardless of the education level. Male college completers had the largest increases in at-risk drinking and heavy episodic drinking.



Female college completers had the lowest levels of at-risk drinking and heavy episodic drinking throughout the study years. Females completing high school or less showed high initial patterns of drinking, but had a lower increase than the post-secondary education group.

It is becoming increasingly clear that the earlier research, showing no correlation between the alcohol consumption in adolescent and early emerging adulthood, must be reconsidered. Instead, it seems as if we are standing in front of a smorgasbord of different longitudinal alcohol outcomes, where it is no longer sufficient to only include alcohol data in the studies performed. Other explanations, predictors and moderators, need to be fitted into the models for a better understanding.

Although a longitudinal study beginning at the age of 20 can only be squeezed into the heading above with the best of intentions, no review of longitudinal alcohol studies is complete without mentioning the work of Vaillant and Öjesjö.

In Vaillant's study of alcoholic men, one college sample and one core city sample, the follow-up has now passed 60 years, beginning in 1940. The latest results (Vaillant, 2003) show that 58% of the 19 alcohol dependent men successfully followed from the college sample group had died by the age of 70, compared to 54% of the 72 alcohol dependent men successfully followed from the core city group. The death rate of alcoholics is two to three times greater than expected, mostly due to reasons mentioned in the "Consequences of Alcohol Consumption" above. 21% of the men in the college group were abstinent, 10.5% were controlled drinkers, and 10.5% still abused alcohol. In the core city group, 32% were abstinent, 1% were controlled drinkers, and 12% still abused alcohol. Therefore, it seems that alcoholism is not a progressive disease per se, but that the alcohol trajectories, as we have seen on a shorter time scale above, are individual. Results also seem to imply that predictors for onset of alcoholism do not predict recovery. Although alcoholism is not the main focus of this exposé, it can be mentioned that Vaillant found the main predictors of recovery from alcoholism to be severity of the disease, finding a non-pharmacological substitute, compulsory supervision, new relationships and involvement in spiritual programmes.

The second long-term study is the Swedish Lundby study, which started in 1947. It is a pure population study, and in the 40-year follow-up of the 41 males diagnosed with alcohol dependence, 43.9% had died, 29.3% had recovered, and 26.8% still abused alcohol (Öjesjö, 2000).

## **Factors Influencing College Alcohol Consumption**

### **Family and Children of Alcoholics**

Andersson et al. (2007) showed significant correlations between a first-degree family history of alcoholism and alcohol expectancies for men. Other Swedish data showed that 54% of university students with parental alcohol problems had AUDIT scores above risk drinking, defined as eight or above for men and six or above for women (Hansson, 2006).

Knight et al. (2002) found family history of alcoholism to be of importance in students with alcohol dependence (OR 1.5, 95% CI 1.2-1.8), but not in alcohol abuse (OR 1.1, 95% CI 1.0-1.3). Having parents who drank alcohol was of importance in both diagnoses.

In a review by Baer (2002), it was shown that some studies could detect correlations between alcohol consumption in college students and a positive family history of alcoholism, but that some could not. Several explanations for those mixed results are reviewed. It could be a methodology error when failing to find a correlation (for example, using too broad a definition when measuring family environments), or it could be that student children of alcoholics do not consume more alcohol per se than children of non-alcoholics, but that they report a greater frequency of alcohol-related problems. College students do care about their parents' attitudes on alcohol: 30% claim that their parents' expectations matter somewhat, and 40% claim that their parents' expectations matter very much when it comes to their own use of alcohol, cigarettes and other drug use (Califano, 2007).

### **Gender and Race**

As for the rest of the population, age, gender and race are strong predictors for alcohol consumption in the college population.

Swedish studies frequently found that male students consume alcohol more often and in greater quantities than women (Bullock, 2004). Similarly, CAS shows that heavy episodic drinking occurs in 50.7% of college males and 40.0% of college females (Wechsler et al., 2000). Monitoring the Future also found gender differences in alcohol consumption, in that men are more likely to drink alcohol daily, as well as having more frequent heavy drinking episodes (Johnston et al., 2007). Interestingly, Grekin & Sher (2006) found a weak but significant over-representation for female gender as a predictor of alcohol dependence. Knight et al. (2002) found that 54.0% of college students with an alcohol dependence diagnosis were male, but that 54.6% of college students with an alcohol abuse diagnosis were female. Those findings suggest that the over-representation of males with alcohol use disorders constantly recurring in the general population might be less robust in the college student population.

When it comes to race, CAS showed that heavy episodic drinking was most common in Whites (49.2%), followed by Hispanics (39.5%). Least likely to have heavy episodic drinking episodes were Blacks (15.5%) and Asians (23.1%) (Wechsler et al., 2000). Similar findings come from NCHRBBS, where white students were found to exercise heavy episodic drinking significantly more often than black students and Hispanic students (Jones et al., 2001). The pattern of alcohol consumption amongst different races thus seems to be no different for college students than for the population as a whole.

### **Personality**

Personality affects the way a person thinks and reacts, and it comes as no great surprise that it affects alcohol consumption. Several studies and reviews have shown that students with high sensation-seeking and impulsivity drink more frequently, in higher quantities, and have more alcohol-related consequences than other students (see Baer, 2002 for a review). Baer (2002) also concluded that students with an extrovert personality and who regarded parties as important had higher alcohol consumption than other students. However, a large sample study failed to find a correlation between any personality disorder and alcohol drinking in the college sample, but did find correlations in the young non-college group as well as for older adults (Dawson et al., 2005b). According to the authors, the results might fail to find this correlation in college students, since alcohol use is so abundant that the selective process of different personalities might not matter. However, another reason might be that the college environment offer such good access to treatment of mood and anxiety disorders that the students do not have to self-medicate with alcohol.

### **Drinking Motives and Expectancies**

The two most common drinking motives found in literature are drinking for social purposes and drinking to reduce tension and stress. Other motives are also present, such as enjoying the taste of alcohol and to get drunk (Baer, 2002; Califano, 2007). Martens et al. (2003) reported that the alcohol-related negative consequences of college athletes are related to negative drinking motives, especially the drinking to cope motive.

Several studies have shown correlations between alcohol expectancies and alcohol use (see Baer, 2002 for a review). An Italian study of college students and alcohol expectancies showed that heavy drinkers have higher positive expectancies about alcohol than students with less heavy alcohol consumption (D'Alessio et al., 2006). Students in Brazil scored higher on AUDIT if they had more positive beliefs about alcohol (Bitarello do Amaral, 2006). Age as a predictor and moderator of alcohol consumption is clear and has been discussed throughout the chapter, but age

differences are also seen in alcohol expectancies, which were highest in the 22-23 years age group in men and 20-21 years age group in women (Andersson et al., 2007).

Drinking motives and expectancies are intertwined. It is interesting to see, however, that while negative, but not positive, drinking motives are predictors for alcohol consumption (Carey & Correia, 1997; Miles Cox et al., 2006), positive alcohol expectancies were more important for alcohol consumption than negative ones (Leigh & Stacy, 2004). It has also been shown that among the students with high alcohol expectancies, those who also have high studying expectancies drink less and experience fewer alcohol-related problems (Levy & Earleywine, 2003).

### **Norms and Social Influences**

In the last two decades, alcohol norms have been studied thoroughly in the college population. Most studies found evidence of “pluristic ignorance”, a concept introduced to the field of college student alcohol research by Prentice & Miller (1993). It is defined as “a psychological state characterised by the belief that one’s private attitudes and judgments are different from those of others, even though one’s public behaviour is identical (Prentice & Miller, 1993). Related to this field, it means students tend to believe that other students drink more alcohol than they do themselves. Perkins et al. (1999) showed that even in college campuses where abstinence was the norm, the perceived norm was that the typical student was drinking every week. In a study by Bullock (2004), 75.6% of all students agreed with the statement “Drinking alcohol is a normal part of student behavior at university”.

Alcohol consumption is not only affected by the perceived norm of other students, but by the behaviour of friends and partners: in a study by D’Alessio et al. (2006), heavy drinking college students had significantly more friends who drank alcohol on a regular basis than college students with lower alcohol consumption. Andersson et al. (2007) have shown that being in a serious relationship affects students’ alcohol habits; being in a serious relationship lowered the AUDIT scores compared to those not in a serious relationship. However, the relationship status did not affect alcohol expectancies or eBAC values.

### **Religion**

Students who have religious and traditional beliefs are less prone to drink alcohol, and the same applies to the general population. Patock-Peckham et al. (1998) reported that college students with no religious affiliation had a higher frequency of alcohol consumption and consumed alcohol in greater quantities than students with Catholic or Protestant affiliations. Johnson et al. (2008) found that the mediators of this relationship are negative beliefs about alcohol, social influences and spiritual wellbeing.

## Living Arrangements

In Sweden, there are several different alternatives available for living arrangements during the university period. Some universities offer residence halls, where a number of students live together in a hall, with separate bedrooms, but with a common kitchen and living area. The students might also chose to share a normal flat with friends, live on their own, with a partner, or to stay at home with their parents. In a study by Bullock (2004), almost 30% of the students lived alone in a flat, 13.2% lived in residence halls, and 3.8% shared accomodation with friends. These three categories of students had a higher alcohol consumption frequency and heavy episodic drinking frequency than students living with their parents or with a partner. Knight et al. (2002) found living with a roommate to be of significance for both alcohol abuse and alcohol dependence, with odds ratios of 1.5 and 1.9 respectively. Living with children was a protective factor: students who lived with children had fewer heavy drinking episodes than those who did not live with children.

Several studies have considered alcohol use in the Greek house system. The Greek houses system, or the fraternity/sorority system, is a living arrangement at college, where students, members of Greek houses, live closely together in large houses or block of flats. The members of those Greek houses often have close social bonds. Such organisations do not exist in Sweden. In the CAS study, 78.9% of those residing in fraternity or sorority houses had heavy episodic drinking episodes, as compared to 44.5% of students in dormitories and 43.7% of the students living off campus (Wechsler et al., 2000). Similarly, data from Monitoring the Future showed that heavy episodic drinking was significantly more prevalent among fraternity and sorority members than others (McCabe et al., 2005). In the NCHRBS, students in Greek houses were more likely to have heavy drinking episodes than students not involved in Greek houses ( $p < 0.001$ ; Jones et al., 2001). Grekin & Sher (2006) found that persons associated with the Greek house system were over-represented in the group of students with alcohol dependence symptoms, as did Knight et al. (2002). Greek house members have also been found to experience more negative consequences of their drinking than non-Greek members (Cashin, 1998).

Research has shown that students choosing to join Greek houses have high alcohol consumption even in the senior year of high school, particularly men (Baer et al., 1995; Capone et al., 2007). Thus, there is a positive selection process in Greek house involvement. Once involved in Greek houses, it has been shown that the high alcohol consumption is mediated by several factors. Cashin et al. (1998) found that Greek house students had more positive beliefs about the effects of alcohol than non-Greek members. Capone et al. (2007) found effects of three mediators on Greek house involvement and alcohol consumption and problems: social modelling, alcohol offers and peer norms.

Although alcohol consumption decreases after the college years, involvement in Greek

houses during college remains a risk factor after the college years. Bartholow et al. (2003) showed that, even when controlling for peer norms, students who had been involved in Greek houses during college were more prone to heavy drinking up to four years after graduating from college.

### **Activities**

Apart from the students' living arrangement, other more or less college-associated activities have also been found to influence the students' alcohol consumption. Those include drinking games and college athletics (see Califano, 2007 for a review). Greenbaum et al. (2005) used data from freshmen college students over one year. They showed that drinking levels varied during the year, with the highest drinks per week during Spring Break week, followed by Christmas & New Year's week, and Thanksgiving.

### **College Characteristics**

According to Bullock (2004), the students report that the main social problem at their university due to alcohol consumption is the student's alcohol use in itself (rated 2.6 on a four point scale, where 4 indicated a very large problem and 1 not a problem). Vandalism and theft of property was also reported as a problem (with a mean rating of 2.15), as well as students drug use (2.01) and sexual discrimination (2.00). Students in the same study were asked if they knew whether the university had an alcohol policy, and only 10.6% knew.

### **Geographical Location**

Some data suggests that differences in alcohol consumption at student level may be influenced by geographical location. Andersson et al. (2007) found that both alcohol expectancies and AUDIT scores were higher at a university in the south of Sweden (Växjö), than in the north (Luleå University). Bullock (2004) compared four universities, and found that the weekly drinking prevalence was greater in the south, with Odds Ratios ranging from 0.67 at the most northern university to 1.61 at Lund University, located in the most southern part of Sweden. This could be explained by the fact that the southern part of Sweden is located closer to Europe, with Denmark, Germany and Poland all having lower taxes, and therefore less expensive, alcohol. However, at the general population level, the differences are less clear. Although the population in the northern part of Sweden consume less alcohol (3.5 litres per person in 2006), there are no differences between central Sweden (consuming 4.8 litres per person in 2006), and the southern part (consuming 4.6 litres per person in 2006) (SoRAD, 2007).

## **Alcohol Consequences Amongst College Students**

Most consequences of alcohol consumption are experienced by the population as a whole, but some alcohol consumption consequences are unique to college students. Bullock (2004) showed that 57.3% of the students in Sweden consuming alcohol in the previous year, did not report any negative consequences. However, 26.3% experienced negative consequences in their physical health, and 25.7% in their financial health, due to alcohol. Less than ten percent reported negative effects on their studies or work, their family life, or their friendships and social life. Several studies report immediate consequences of alcohol consumption, such as hangovers, blackouts and vomiting (Wechsler, 2002; Windle, 2003; McGee & Kypri, 2004; Bendtsen, 2006). Other consequences reported are sexual (such as unprotected sex, sex that made them unhappy at the time, and sex later regretted), as well as of a more violent nature (physical aggressiveness, stolen property, vandalism; Wechsler, 2002; Windle, 2003; McGee & Kypri, 2004; Murphy et al., 2006). On an even more serious note, data from the National College Health Risk Behavior Survey (NCHRBS) showed that students involved in heavy episodic drinking contemplated suicide more often than other students (OR 1.74, 95% CI 1.35-2.25; Brener, 1999), and Hingson et al. (2005), using data from multiple resources, calculated that over 1,700 college student aged 18-24 had alcohol-related unintentional injury deaths in 2001.

The consequences of alcohol consumption on academic success are unclear. A large Swedish study showed no correlation between frequency of drinking and academic success (Bullock, 2004). It did, however, show that students who had fewer academic points (usually freshmen) had a higher frequency of heavy episodic drinking. A Canadian study by Carson et al. (2007), studying undergraduate students living in student houses, also failed to demonstrate a relationship between alcohol and academic performance, as did Wood et al. (1997). In contrast, McGee & Kypri (2004) showed that 38.6% of the male students in New Zealand reported a little negative impact of drinking on academic performance, 5.0% quite a lot and 1.6% a lot. The corresponding figures for female students were 30.0%, 4.4% and 0.8%. Using the large CAS, Williams et al. (2002) showed that alcohol negatively affects the students' GPA, reducing the number of hours spent studying. Aertgeerts & Buntinx (2002) found that of 62.5% of Belgian students fulfilling the alcohol dependence criteria (3.6% of all students) failed in their first college year, as compared to 50% of those not fulfilling the alcohol dependence criteria (RR 1.24, 95% CI 1.08, 1.43). This association could not be seen for alcohol abuse (RR 0.93, 95% CI 0.84-1.04).

In Sweden, 1.57% of the students having access to a car admitted driving under the influence of alcohol at least once during the current term. Around 4.3% of the students reported having been passengers in a car where the driver was under the influence of alcohol (Bullock, 2004). In the US, the frequency of students driving under the influence is considerably higher than in Sweden: NCHRBS reported that in

the previous 30 days, 27.4% of the surveyed students reported driving after drinking (Windle, 2003).

In addition to the negative consequences of alcohol consumption, there are also some positive ones. Murphy et al. (2006) reported a positive relationship between men's drinking frequency and social benefits (such as participating in recreational activities and talking to classmates), but not for women.

### **Co-Occurrence of Tobacco and Substance Use**

Significant correlations have been shown between alcohol consumption, cannabis use (Jones et al., 2001; Knight et al., 2002; Bullock, 2004), cigarette use (Jones et al., 2001; Knight et al., 2002), cocaine and other illegal drugs (Jones et al., 2001). No correlation was found with prescription drug use in Sweden (Bullock, 2004). It has also been shown that an early onset of tobacco smoking (before age 13) is a predictor of alcohol abuse and alcohol dependence (Hanna & Grant, 1999).





# ALCOHOL PREVENTION AMONGST COLLEGE STUDENTS

## Alcohol Interventions Amongst College Students

### Information Programmes and Knowledge Programmes

Programmes informing students about the effects of alcohol have continuously shown no effect on alcohol consumption by the students. However, since they are cost-effective and readily available, they continue to be used at colleges and universities across the world (NIAAA, 2002; Detels et al., 2002).

### Self-Assessment Interventions

Although not an intervention per se, studies have often used an assessment-only condition as a control group, or to study the effects of the actual assessment. In the three studies reviewed by Larimer & Cronce (2002) evaluating self-assessment as an intervention, reductions were seen in alcohol consumption, negative consequences, or both. This finding might change the conclusions from studies that used self-assessment as a control group.

### Alcohol Expectancy Challenge Interventions

As reviewed above, students have expectancies of the effects of their alcohol consumption. The theory states that, by highlighting and challenging these expectations, there will be an effect on the alcohol consumption.

Although several studies have intervened using this approach, results are not uniform. Larimer & Cronce, in their two reviews of alcohol consumption amongst college students, concluded that evidence suggests the intervention works among college men. However, the follow-up times in the studies are not long, six weeks at the most, and no effect is shown in women (Larimer & Cronce, 2002; 2007). In a review by Barry et al. (2001), they show that the interventions seem to work better amongst those having negative expectations of alcohol consumption, and less well amongst those who harbour positive expectations. However, as described above, it seems that positive alcohol expectations are more important for alcohol consumption than negative ones. Dunn et al. (2000) performed one such alcohol expectancy challenge intervention. After 30 days, significant alcohol consumption reductions could be seen in men, but not in women. They also showed that the expectancies amongst the men could well be described using expectancy axes: positive - negative expectations and arousal - sedation

expectations. The women in the study could not be classified into those different axes. Larimer & Cronce (2007) could see that the interventions tended to work better when an experimental part was included. It might be that we do not yet fully understand the theory behind the expectations and how to develop an effective intervention in this field. More studies are needed to further evaluate this kind of intervention.

### **Feedback Interventions**

Feedback on the students' alcohol consumption has proved effective in a number of studies. The feedback can be given in person, by post or via computer with the same results. The feedback seems to be more effective when combined with a normative component. (Larimer & Cronce, 2002; 2007; Walters & Neighbors, 2005). Feedback has also proved effective outside the US. Kypri et al. (2004) showed that students receiving a web-based assessment and personal feedback on their drinking reduced the drinking significantly more than the control group at the six-week follow-up. Consumption did not differ between the groups at six-month follow-up, but the personal alcohol-related problems were significantly lower in the feedback group than in the control group. Web-based feedback is also implemented among Swedish students, with a 44% response rate. No results of drinking habits have been published from this study, but 30% of the females and 20% of the males thought they would benefit from personalised feedback (Bendtsen et al., 2006).

### **Normative Re-Education and Values Clarification Interventions**

Trying to change alcohol consumption through discussing and challenging the norms in student drinking has also been studied. Both the injunctive (how students perceive things) and the descriptive norms (how students behave) have been included, as well as the pluralistic ignorance described above.

Overall, those interventions seem to be effective in re-educating the students on the norms. However, this change in perception of norms does not seem to change the alcohol consumption amongst the students, except for in a few non-randomised smaller studies with short follow-up times (Agostinelli et al., 1995; Schröder et al., 1998; Larimer & Cronce, 2007). Attempts have also been made to conduct larger campaigns targeting the social norms of the students, but these have had mixed results (NIAAA, 2007). Studies where the norms are more specific than previously (i.e. using the norms of black, female college students instead of the generic college student) may produce more encouraging results for this type of intervention.

## **Motivational Enhancement**

Motivational interviewing (MI) is an intervention approach developed by William R. Miller (Rollnick & Miller, 1995). It is an intervention that is client-centred and non-judgemental, where the goal is to increase the willingness to change. It has five components, described by the acronym FRAMES (Natarajan & Kaner, 2007).

- Feedback (using feedback on the alcohol consumption as a component of the interviewing)
- Responsibility (making it clear that it is the individual itself who is responsible for the change)
- Advice (but that the interviewer can give advice helping the individual to achieve this)
- Menu (by a wide array of options)
- Empathy (all in an empathic manner)
- Self-efficacy (and encouraging optimism)

Using motivational interviewing components in a brief, secondary intervention is often called brief intervention (BI; Heather, 1989).

In a review by Natarajan & Kaner (2007), including brief interventions and students, the effectiveness is yet again shown. However, most studies are performed within the student group in the US, and they argue that more research should be done on other populations in the same age group, as well as in other locations (such as emergency departments, primary health care and in schools).

## **Multi-Component Alcohol Skills Interventions**

A selection of different intervention programmes exists, combining several different intervention parts. Most of those multi-component programmes include adaptations of motivational interviewing. There is strong evidence that multi-component interventions work, especially when they include motivational techniques (Larimer & Cronce, 2002; 2007; Burke et al., 2003).

The components most effective in this multi-component approach seem to be personalised, normative feedback, eBAC training and discussion of protective behaviours (Larimer & Cronce, 2007). One such multi-component intervention is the Brief Alcohol Screening and Intervention for College Students (BASICS; Dimeff et al., 1999). It has been shown effective in a freshmen population two years after intervention (Marlatt et al., 1998), where alcohol consumption decreased, both in quantity and frequency. In the same study population, results four years after the intervention showed similar results, but with the main difference between the BASICS group and the control lying in the reported negative consequences (Baer et al., 2001). Using a cluster randomised design in fraternities in the US, Larimer et al. (2001) found greater reductions in average alcohol use and typical eBAC in

the fraternities receiving BASICS intervention as compared to those randomised to treatment-as-usual. They also showed that outcomes were similar in groups receiving the intervention from peers and those receiving the intervention from professional interviewers. In a smaller study, Murphy et al. (2001) showed that the intervention had larger effects on the more heavy-drinking students. It also showed greater reductions in the students' alcohol consumption in the BASICS group than in a traditional education group. McNally et al. (2005) also found reductions in alcohol consumption and alcohol-related problems, significantly larger in the BASICS group than in the assessment-only group. Larimer et al. (2007) implemented BASICS in a general student population, and found further support for the intervention, with the BASICS group reducing its alcohol consumption significantly more than the control group. Contrary to Murphy et al. (2001), Larimer et al. (2007) found no effect of baseline drinking levels on the outcome parameters. BASICS has been implemented in high-risk college students in Sweden as well, where Johnsson & Berglund (2006) found no difference between the BASICS group and the control group, which received posted minimal intervention in the form of AUDIT score feedback with additional recommendation to change behaviour.

Three studies have tried to find mediators of the intervention effects. Borsari & Carey (2000) found perceived norms to be a mediator, but not alcohol expectancies. McNally et al. (2005) studied the possible discrepancy effects as mediators. The theory is that there may be discrepancies between a person's actual drinking behaviour and the ideal drinking behaviour, and that drinking might be reduced as a consequence of trying to merge the actual drinking behaviour closer to the ideal drinking behaviour. McNally et al. did indeed find evidence of such processes in their study, but found no evidence of a casual mediating effect of those processes. Finally, Larimer et al. (2007) found no evidence of perceived norms mediating the effects on alcohol outcomes, but did find a mediating effect on protective behaviour, suggesting that the students in the BASICS group used more protective behavioural strategies than the control group.

### **Interventions Among Risk Groups**

Effectiveness of interventions amongst students who are Adult Children of Alcoholics (ACoA) do not seem to differ from the general effectiveness of the interventions. However, there is a trend for the more minimal interventions (such as traditional information and values clarification interventions) to work better in this group (Larimer & Cronce, 2002). Hansson et al. (2006) implemented a BASICS intervention amongst Swedish students who were ACoAs, and found that the groups receiving the alcohol intervention decreased their standardised alcohol scores significantly more than the group receiving a coping intervention programme alone. This difference in alcohol habits between the groups persisted at the two-year follow-up (Hansson et al., 2007).

In the risk populations of Greek house members, freshmen, athletes and mandated students, no interventions were found effective other than the ones already found effective in the more general student population, as described above (Larimer & Cronce, 2007). It is noted, however, that even though interventions do work in the fraternity/sorority population, the level of alcohol consumption after intervention still seems to be higher than amongst other students. It is also noted that the interventions work well in the freshman population, suggesting perhaps a more responsive population than the general student population (Larimer & Cronce, 2002).

### **Deterrence**

Some prevention strategies work through deterrence, or negative persuasion. Examples of these are prohibitions on driving under the influence of alcohol, laws against public drunkenness and consequences when violating the college alcohol policies. Studies have shown that some of the deterrents are effective (such as the laws to reduce alcohol-impaired drinking, and enforcement of laws of minimum drinking age), some are ineffective (such as laws against public drunkenness), and some inconclusive (such as increasing enforcement at campus events that promote excessive drinking, and disciplinary actions when violating college alcohol policies) (NIAAA, 2002; Detels et al., 2002).

### **Providing and Encouraging Alternative Activities**

Alternative preventive strategies to those involving drinking are promising, but no long-lasting effects have been found (Detels et al., 2002). Such activities in colleges include implementation of alcohol-free, expanded late-night student activities and prohibiting tailgating parties that model heavy alcohol use (NIAAA, 2002).

### **Insulating Use from Harm**

Using harm reduction principles, it is possible to successfully reduce negative consequences related to alcohol drinking. Examples are designated drivers (Detels et al., 2002).

### **Regulating the Availability and Conditions of Use**

Other strategies proved to be successful in the general population are those regulating the availability and conditions of use of alcohol. Examples of such strategies are a minimum drinking age law, restriction of alcohol retail outlet density, increased prices and increased taxes on alcoholic beverages and responsible beverage services (NIAAA, 2002; Detels et al., 2002, Johnsson & Berglund, 2003). Promising strategies, which have not yet proven successful, include regulations of happy hours and sales (NIAAA, 2002).

### **Social Movements, and Community Action**

According to “A call to Action: Changing the Culture of Drinking at US Colleges” (NIAAA, 2002), it is vital to involve the community in order to successfully implement the strategies that have proved effective. Co-operation between colleges and the communities is a key to success. Other promising strategies include increasing publicity about the underage drinking laws, and marketing campaigns to correct students misperceptions about alcohol use (NIAAA, 2002).

## **AIMS**

The overall aim was to increase knowledge about the alcohol habits of Swedish university students, in order to develop effective alcohol preventions, and to be able to generalise the wealth of information from American studies to the Swedish student community. The specific aims of the four papers were as follows:

### **Paper I**

To chart the alcohol habits of residence hall students in Sweden and investigate the effects of the social climate in the residence halls on the students' alcohol habits.

### **Paper II**

To compare the effects of a brief skills training programme and a twelve-step influenced programme, compared with a control group, on various alcohol measures for students living in residence halls.

### **Paper III**

To monitor the drinking habits of students in Swedish university residence halls over four years. To analyse whether different co-variates affect those patterns.

### **Paper IV**

To compare Swedish and US college populations to attain a further understanding of the comparability of drinking rates and factors related to alcohol use in these two countries.

The studies in this paper included the study in Papers I to III, and an additional two studies.





# MATERIALS AND METHODS

## Sample

In all articles, students from residence halls at Lund University, Sweden, were included. The university is located in the town of Lund, in the south of Sweden, and is one of Sweden's oldest and largest universities. The university has a foundation that owns residence halls and flats, called AF Bostäder. When a student is accepted into the university, he or she is eligible to apply for accommodation through AF Bostäder. An applicant wishing to live in a residence hall is given a queue number. In the beginning of each term, AF Bostäder holds a meeting, where all available residence hall rooms are distributed according to queue numbers. The students are allowed to live in the residence halls throughout their whole time at the university, from undergraduate to post-graduate studies, as long as they study at the university at least half-time. Most students, however, move to another form of accommodation within the first couple of years at the university.

There are some private residence halls in Lund as well, but those halls were not included in the study. AF Bostäder has 271 residence halls, divided into eight larger residence hall areas. There is no campus area at the university, and the halls are located in different parts of the town. It is difficult to give an exact figure of the number of students living in the residence halls, but an estimate of 2,900 has been made. The mean number of students living in each residence hall is 10.6 students, and most halls are of mixed gender. All halls have a common kitchen and living room area, and the students have private bedrooms. Some halls have communal bathrooms and some halls have private bathrooms.

In the autumn of 2000, members of our research group contacted AF Bostäder and were given permission to initiate and conduct the study. All AF Bostäder residence halls were visited in person, in the evening. The student opening the door at the hall was given a brief explanation of the study, and was asked to find a time when a more formal visit could be made to provide more information. If the student refused any further contact at this stage, the residence hall was excluded from the study. If a date was agreed upon, posters with the date and some information about the study were displayed in the hall. At this second meeting, the students were given in-depth information about the study, and were asked to sign a consent form before filling out the questionnaires the research team brought with them. Students were asked to provide their address, phone number and e-mail address in order for the research team to contact them with follow-up questionnaires after one, two and three years. Refreshments were provided for the students who attended this information meeting, and no other compensation was given.

Research assistants were used throughout the study. Those research assistants were found through advertisements in the student newspaper, as well as through personal recommendation. The research assistants, eight in total, were students themselves, most within the field of sociology. They were all briefly trained in proper research conduct and professional secrecy, as well as training in the different questionnaires and intervention methods used.

### **Additional Samples in Paper IV**

In paper IV, two additional student samples were added, one American and one Swedish.

The American sample was taken from the Motivating Campus Change study (Geisner et al., 2004; Larimer et al., 2004; 2007), which was a three-campus, five-year study of alcohol prevention programmes. Participants were randomly selected from all enrolled students. Students were invited to participate in a longitudinal study of alcohol education programmes, and to complete web surveys annually for five years or until graduation. The survey took approximately 45 minutes. All participants provided informed consent, and all measures and procedures were approved by the human subjects review boards on each campus. Data for the current study is from the baseline assessment for four cohorts, collected in 2000-2003. Women, as well as freshmen, were slightly over-represented in the sample, which was otherwise demographically representative of the campus population.

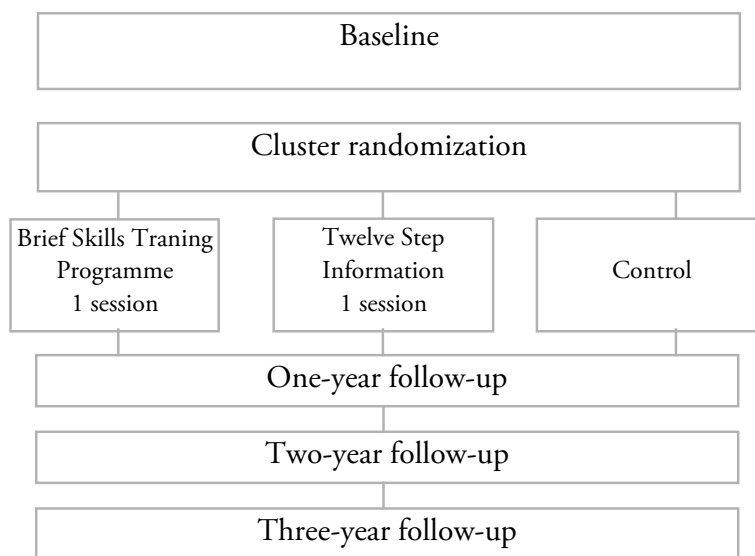
The additional Swedish study (called the Swedish Freshmen study or Sweden 1) contained two entire universities, originally selected for participation in a four-year research project. The aim was to compare the development of one cohort of freshmen in the areas of stress (coping) and alcohol use (Andersson et al., 2007). In the analysis in Paper IV the baseline assessments were used, gathered prior to any intervention delivery. Luleå Technical University in the north and Växjö University in the south of Sweden had similar characteristics and curriculum.

All freshmen in autumn 2002 that were accepted onto a university course exceeding three years were invited to participate in the research project. Prior to the assessment all freshmen were given both oral and written information about the study and acceptance was verified by signature in the questionnaire. Assessments from this study included alcohol use, alcohol expectancies, psychological symptoms and family history of alcohol problems. Seventy-two percent of all freshmen agreed to participate in the study.

## Design

### Paper 1-3

Figure 1. Residence Hall study design



All students who completed the baseline questionnaire received a personalised feedback by post, indicating their personal AUDIT, SIP and eBAC scores compared with the mean scores of the group as a whole (gender separated). If the AUDIT score or the SIP score was in the upper quartile, the students were advised to consider reducing their alcohol consumption. No follow-up of this was made, and no further advice was given. From the data collection on this total population, baseline analyses were made and were used in analyses in Papers I and IV.

From the residence halls where more than half of the inhabitants completed the baseline questionnaire and agreed to participate in the study, 98 halls were randomly selected and were cluster randomised to one of three study groups (described below). Personnel at the Lund University Computing Center performed the cluster randomisation, but were otherwise not involved in the study. The randomisation was stratified for gender, AUDIT score and size of residence hall. Follow-up questionnaires were posted to the students after one, two and three years. Reminders, up to six, were in the forms of phone calls and letters, to all students not sending in the follow-up questionnaires. Students asking to be excluded from the study, or moving without leaving a forwarding address, were excluded from the study.

All students participating in the study year 1, 2 or 3, no matter to which group they were randomised, were sent personalised feedback on AUDIT, SIP and eBAC scores by post, similar to the feedback of the baseline year described above.

## **Follow-up**

The students were sent a follow-up questionnaire each year for three years after completing the baseline questionnaire and interventions, when applicable. The follow-up questionnaires included AUDIT (unfortunately omitted in year one due to technical problems), SIP, eBAC, and academic achievements.

## **Interventions**

All students randomised to one of the two intervention groups were invited to attend a three-hour long session at the Student Health Care clinic in Lund. The content of the session is described below. Each intervention was given on several different occasions. Each student was contacted by telephone to arrange which session to attend. If the student did not turn up, he or she was contacted again to arrange a new time. For practical reasons, no attempts were made for students living in the same residence hall to attend the same session. The students were given light refreshments at the session.

## **BSTP**

One-third of the residence halls were randomised to a Brief Skills Training Programme (BSTP). This programme was based on an early version of the Brief Alcohol Skills Intervention in College Students (BASICS; Dimeff 1999). Similar adaptations of this manual-based intervention has been used in previous studies within Clinical Alcohol Research (Hansson et al., 2006; Johnsson et al., 2006; Andersson et al., unpublished data), and the intervention was taught by K.O. Johnson, who had visited the authors of the manual, and who had supervised the previous interventions.

During the three-hour session, the students were given a brief overview of the theory behind alcohol and its effects on the body. Focus was then put on discussions amongst the students, and personal reflections. Alcohol advertisements were shown and the underlying message was discussed (e.g. Is it true that alcohol makes you sexier? More adventurous?) The students were taught how to calculate their own eBAC, and were given advice on how to achieve an optimal eBAC level (in order to achieve the positive effects of alcohol, without obtaining the negative consequences). The students were also taught an Alconac, where they were to fill in their alcohol consumption and reflect upon it. The intervention was taught with a cognitive behavioural approach.

The students randomised to the BSTP, but who did not attend the session, were sent the BSTP information in the form of a 22-page booklet.

## **TSI**

Another third of the residence halls were randomised to a Twelve-Step Influenced programme (TSI). This programme was equal in length to the BSTP, but was taught by two therapists from Nämndemansgården, a Swedish twelve-step institution. The session was in form of a lecture, teaching the students about the risks and dangers of alcohol and alcoholism. This lecture was of one of the ordinary lectures given by this twelve-step institution, and has previously been used on students. Accompanying the therapists was a person with previous alcohol problems, who had been helped by Nämndemansgården and the twelve steps, and he or she told the students about his or her experiences.

The students randomised to this intervention, but who did not attend the gathering, were sent a CD from Nämndemansgården with the same content as the lecture, including the personal experience of a former alcoholic.

## **Control Group**

Each year the questionnaire was sent to the students in the control group, but no further contacts were made with them, apart from the same posted personalised feedback as the rest of the students submitting a completed questionnaire (see above).

## **Power Analysis**

The main purpose of the study was to compare alcohol interventions in residence hall university students. The primary outcome measure was absolute changes in AUDIT scores. The secondary outcome measures were changes in SIP and eBAC. The BSTP was assumed to influence alcohol consumption with a standardised effect size of 0.37, and heavy episodic drinking with a standardised effect size of 0.33. The figures were based on a meta-analysis by Berglund et al. (Alkoholförselutredningen, 2005).

With a  $p$  of 0.05 and a power of 80%, 250 subjects needed to be included to document effect sizes of BSTP compared with a control group in a randomised trial (Altman, 1990). There is a power loss because of the cluster randomization, which was difficult to estimate.

A sample size of 400 was regarded as a reasonable estimation. No figures were available for TSI, but 200 subjects were estimated as reasonable. The total sample size would therefore amount to 600. Ninety-nine halls of residence would satisfy this, assuming that at least 7 persons were included from each hall.

## **Instruments**

### **AUDIT**

The Alcohol Use Disorders Identification Test (Saunders et al., 1993) was developed by the World Health Organization (WHO) in the 1980s, as an international test for early identification of hazardous and harmful alcohol use. The maximal total score is 40 points. The AUDIT scores of the total student sample as well as of those with high-risk consumption are analysed. The instrument can be divided into 3 subscales: alcohol consumption, dependence, and harm. The Swedish version of the test was used (translation by Bergman et al., 1998). One standard drink was defined as the average equivalent volume of 12 g of alcohol. The instrument has been tested on a general population sample (n = 997), giving an internal consistency of Cronbach's  $\alpha$  0.81 (Bergman and Källmén, 2000). In this study, Cronbach's  $\alpha$  is 0.84 on standardised items in the baseline population.

### **SIP**

The Short Index of Problems is a shorter version of DrInC (The Drinker Inventory of Consequences; Miller et al., 1995) and has been used in previous studies in college student alcohol prevention research in Sweden (Hansson et al., 2006). It has been translated to Swedish by the Clinical Alcohol Research group at Lund University. Miller et al. (1995) obtained an internal consistency of 0.81 and, in Cronbach's  $\alpha$  was 0.91 in our study. This questionnaire was used in all four years of the study.

### **eBAC**

The Estimated Blood Alcohol Concentration) is a retrospective self-reporting measure of the estimated blood alcohol concentration, calculated from the given gender, body weight, hour of drinking and number of standard drinks consumed on the last pleasant drinking occasion, using the formula given by the National Highway Traffic Safety Administration (NHTSA, 1994). This questionnaire was used in all four years of the study. The wording "pleasant drinking occasion" was used to overcome the problem of not measuring a typical drinking occasion when asked about the previous one. This approach, using the word "pleasant", works only when it is assumed that most of the individual's drinking occasions are pleasant ones. The assumed risks when asking about a "pleasant" drinking occasion are several. The risk of underestimating the actual drinks consumed might increase, since it is more probable that a drinking occasion involving high amounts of alcohol is less pleasant than one involving low amounts of alcohol drinking. Secondly, a confounding factor is introduced, since a drinking occasion might be judged pleasant in other ways than just by the amounts of consumed alcohol. This problem is avoided when asking about a "typical" or "usual" drinking occasion.

## **Family Climate**

Family climate (Hansson, 1989) consists of a list of 85 words, and the respondents underline the ones that apply to the measured climate. It is a self-reporting instrument developed to measure family climate in four dimensions, identified by factor analysis: Closeness (28 words, such as harmony, warmth and security), Distance (11 words: intolerance, indifference, bad, coolness, discontent, meaningless, ruthlessness, insensitive, affected, strenuous, aggressive), Expressiveness (6 words: spontaneity, childishness, liveliness, explosive, rush, wild) and Chaos (6 words: confusion, nervousness, instability, insecure, division, restlessness). An index is calculated for each factor, and a factor score of 1 indicates that the same proportion of words has been marked on that subscale as on the whole scale. Similarly, numbers above 1 indicate that proportionately more words have been marked on that subscale than on the whole scale. The heading of the instrument was changed to "Residence hall climate" in the questionnaires, in order to prevent the students being confused about which climate they were to rate. In this article, the original heading "Family climate" will be used in reference to this instrument. The word "Family" in this instrument does not primarily refer to a traditional family consisting of parents and children, but rather the broader definition of a family being a group of people emotionally connected to each other and having lived together long enough to form certain reaction patterns, according to the validation of the Family Climate scale (Söderlind & Johnsson, 2004).

The instrument is used on a daily basis in practical work in Sweden. It is validated through comparison to other similar instruments and through comparison with 20 studies that used the instrument (Söderlind & Johnsson, 2004). The test-retest reliability is 0.95 for three weeks and 0.89 for five months (Hansson, 1989). The Family Climate instrument scales correlate to the Swedish version of the Family Environment Scale (Hansson, 1992; Moos & Moos, 1994). Closeness correlates positively to the positive subscales of the Family Environment Scale, whereas Distance, Expressiveness and Chaos correlate negatively to those subscales. Closeness is inversely correlated to the more negative subscales of the Family Environment Scale, whereas Distance, Expressiveness and Chaos are directly correlated. Thus, Closeness is regarded as a positive attribute, whereas the other three subscales (Distance, Expressiveness and Chaos) are regarded as subscales representing a negative social environment.

## **Academic Success**

In this self-reporting academic success questionnaire, students report the credits achieved during the past year, and the maximum possible number of credits that could have been achieved. From this, academic success could be derived, defined as having achieved 75% or more of the possible credits (using the same definition as the Swedish Student Loan Foundation). This questionnaire was used in all four years of the study.



### **Additional Instruments in Paper IV**

The *Harmful Drinking Scale* is a new scale constructed from the AUDIT (used in the Swedish studies), Q/F, DDQ, YAAPST and RAPI (used in the American study). For all AUDIT questions, except for number nine, similar questions were found in one or several of the other four instruments. As an example, AUDIT question “How often during the last year have you found that you were not able to stop drinking once you had started” was found equivalent to “How often during the last three months have you kept drinking when you promised yourself not to?” Because response options did not match, all but one question was rescored to create dichotomous answers of “No/not in the past year” or “Yes, in the past year” The value of the new scale ranged from 0 to 13. Cronbach’s  $\alpha$  of the new scale was 0.73.

The *Alcohol Problems Scale* is a new scale constructed from SIP, YAAPST and RAPI (used in the American study). Four different questions were found to match, for example “I have felt guilty or ashamed because of my drinking” from SIP was found to match “Have you ever felt guilty about your drinking?”. The answers were dichotomised because of the different time scales, thus the new scale uniformly measured consequences experienced within the previous month. The value of the new scale ranged from zero to four. Cronbach’s  $\alpha$  of the new scale was 0.50.

The Quantity/Frequency/Peak Alcohol Use Index (Q/F; Baer, 1993; Marlatt et al., 1995) is a self-reporting measure of drinking over the past month. This five-item questionnaire includes two items on peak drinking occasion, two items on typical weekend drinking, and one item on typical frequency (past month), and was used in the US study in Paper IV to document alcohol use.

The Daily Drinking Questionnaire (DDQ; Collins et al., 1985; Kivlahan et al., 1990) asks participants to report their drinking on each day of a typical week, averaged over the past 3 months, and was also utilized in the US study in Paper IV as a measure of alcohol consumption. Standard drink equivalents approximating 12 grams of alcohol were provided on all measures of alcohol consumption in the US.

The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) asks participants to rate the occurrence of 23 common alcohol consequences in the previous three months. The RAPI has shown good internal consistency (Cronbach’s  $\alpha = 0.92$ ). The measure was used in the US study to document alcohol consequences.

The Young Adult Alcohol Problems Screening Test (YAAPST; Hurlbut & Sher, 1992) includes 27 items regarding alcohol related consequences specific to college drinking. The YAAPST includes a broader range of consequences than assessed on the RAPI. For the current study, only YAAPST items, that were non-duplicative of those items already assessed on the RAPI were utilised in the US study.

The *Expectancy Scale* is a new scale constructed from AEQ (used in the Freshmen Swedish study) and CEoA (used in the US study). It matches five items from the two scales, for example “A few drinks make it easier to talk to people” was matched to “If I were under the influence of alcohol it would be easier to talk to people.” The answers were dichotomised to reflect whether or not the participant expected that effect to occur. The values of the new scale ranged from zero to five. All matched alcohol expectancies were seen as positive reinforcers. Cronbach’s  $\alpha$  of the new scale is 0.55.

The Alcohol Expectancy Questionnaire (AEQ; Brown et al., 1987) is an empirically derived self-reporting measure assessing anticipated experiences associated with alcohol use. AEQ originally consisted of 90 items with 6 subscales, but was reduced to 18 items in the Sweden Freshmen study - three items from each of the six dimensions, assessing the same domains of alcohol reinforcement expectancies. This version has been translated by the Clinical Alcohol Research group at Lund University. The Cronbach’s  $\alpha$  of the shortened Alcohol Expectancy Questionnaire was calculated to 0.75.

A short form of the Comprehensive Effects of Alcohol Questionnaire (CEoA; Fromme et al., 1993) was utilised to assess alcohol outcome expectancies in the US study. The CEOA assesses participants’ perceptions of both likelihood and value of common expected effects on 7 dimensions. The short form is 15 items, and includes 2-3 items representing each subscale.

The *Family History of Alcohol Problems* was defined here as first-degree relatives - parents and/or siblings. In the US Motivating Campus Change study, Family History was measured using a modified version of the Family History Subscale of the Brief Drinker Profile (Miller & Marlatt, 1987). Participants who reported any first-degree relative as currently having or having previously had alcohol problems were scored as family history positive for the current analyses. The Swedish instrument was derived from the same instrument as the American sample.

The *Mental Health Scale* was a new scale, constructed from BSI (used in the US study) and SCL-8 (used in the Sweden Freshmen study). Since both scales are derived from SCL-90, all the eight questions in SCL-8 were found to have an exact match in BSI. The answers were dichotomised to match in the time aspect. The maximum total score is eight. Cronbach’s  $\alpha$  of the new scale was 0.83.

The Brief Symptom Inventory (Derogatis & Melisaratos, 1982) is a 53-item measure of psychological symptoms. The BSI, a derivative of the Symptom Checklist (SCL-90; Derogatis et al., 1974), is a well-validated screening measure of psychological distress, and has been utilised in both community and college samples (Derogatis & Savitz, 2000; Hayes, 1997). For the current study, three subscales of the BSI were included in US, representing depression, anxiety, and hostility.

The Symptom Checklist 8 (SCL-8; Fink et al., 1995) is also a reduced version of

SCL-90 (Derogatis et al., 1974), and was used in the Swedish Freshmen as a measure of Psychiatric Distress.

## **Statistics**

### **Paper 1**

For all analyses, only residence halls where five or more students had answered the baseline questionnaire were included (n=154). The Family Climate scales are used on a contextual level, and halls where few students participated were judged not to be representative in this analysis.

Population characteristics were analysed using means and standard deviations. Family Climate distribution was described using means, standard deviations and skewness. Correlations between the different Family Climate subscales were examined using Spearman correlations.

For the main analyses, multilevel modelling (MLM) was used (Peugh & Enders, 2005; Tabachnick & Fidell, 2007). First-level units were the individual students. Second-level units were the residence halls in which the students resided. The third level of analysis was the residence hall area. Residence halls and residence hall area were marked as random effects, in order to assess the variability among individuals within residence halls, among residence halls and among residence hall areas. AUDIT, SIP and eBAC were run as dependent variables. Intercepts were used for both fixed and random effects. Age and gender were used as fixed factors in all analyses. The four Family Climate scales were analysed in a combined model. Mean Family Climate scores across the residence hall were used throughout the analyses, as Family Climate was regarded as a contextual factor. Due to the nature of the Family Climate scale, quartiles produce more understandable results than logarithmically transforming the scales. The reference quartiles were the highest Closeness quartile and the lowest of Distance, Expressiveness and Chaos, in order to make comparisons comprehensible. The reference quartiles thus represent the most positive climate possible within the residence halls.

The analyses were carried out in SPSS MIXED MODELS, version 15.

### **Paper 2**

Differences in baseline results were calculated as t-tests and chi-squares, using 0.05 as the level of significance.

Differences in treatment outcome were calculated as ANOVAs according to Altman (1990). The 2-year outcome was the dependent outcome, type of intervention was regarded as the fixed variable, and the baseline score was the covariate. All analyses

were performed at the individual rather than the residence hall level. The influence of the cluster randomisation was adjusted according to Wears (2002). The variance inflation factor (VIF) was calculated to 1.184, and was used to correct all confidence intervals for differences in treatment outcomes. The influence of the cluster randomisation was thus somewhat lower than estimated in the power calculations described above.

The Statistical Package for Social Sciences (SPSS) 13.0 was used for the statistical calculations. Scale reliability was tested with Cronbach's  $\alpha$ . All tests were two-tailed, and the level of significance was set at  $p = 0.05$ . In addition to analysing all students, subanalyses were performed of those students who, according to NIAAA (2005), have a high-risk alcohol consumption—AUDIT scores of 8 or above for men and 4 or above for women. The same analyses as described above were performed on this subgroup (who did not receive treatment any different from the other students).

### **Paper 3**

Trajectories were identified using the semiparametric group-based model (SGM) described by Nagin (1999). The analysis assumes the population studied consists of a mixture of heterogeneous groups defined by different developmental trajectories, and fits semiparametric mixtures of several distributions including censored normal to longitudinal data. It is a particularly useful model for repeated measurements, since it only needs two trajectory values to determine parameter estimates, which means a minimal data loss. In the SAS/TOOLKIT computer program, data is analysed and sorted into different trajectory groups. Each individual is then assigned to a group, depending on the individual's fit in the different groups. BIC (Bayesian Information Criteria) values are analysed in order to determine the number of trajectory groups best fitting the data, where smaller absolute values indicate a better fit (Kass and Wasserman, 1995; Schwarz, 1978). Trajectory groups were created from three different instruments: AUDIT, SIP and eBAC.

Independent variables were individually added to the analysis as covariates. These included gender, age, academic success, intervention group, and attendance at the intervention group meeting, and the four Family Climate subscales of Closeness, Distance, Expressiveness and Chaos. A combined scale with Distance and Expressiveness was also used, since this combination proved to be significant for the student's alcohol habits in an earlier analysis of this study (Stahlbrandt et al., Paper I). The age variable was dichotomised to above and below mean age (i.e. 24 years and above, or below 24 years). The variables that were significant (at the 0.05 level) in this analysis were put through a multivariate analysis, including gender and (dichotomised) age as covariates. The different groups were compared to the base group, the lowest one, for each of the three instruments AUDIT, SIP and eBAC.

## **Paper 4**

SPSS 14.0 was used for all analyses. For comparisons of means, independent t-tests were used, with a p-value set at 0.05. Dichotomous data was compared using Chi-Square analyses. Moderation analyses evaluating cross-cultural differences in the relation between predictors and alcohol use outcomes were conducted utilising regression strategies described in Jaccard et al. (1991) and Aiken & West (1995). Based on these procedures, the country of origin variable was coded with 0 representing US students and 1 representing Swedish students. An interaction term was created by multiplying the country of origin variable by the independent variable of interest. This term was entered in the final step of the regression analysis and provided a standardised regression coefficient,  $\beta$ . This regression coefficient is a numerical value representing the deviation of the relationship between the independent and dependent variables by the group coded 1 (Sweden) compared to the group coded 0 (US). All continuous predictors were mean-centred to facilitate interpretation of interaction effects (Jaccard, Turrisi & Wan, 1995; Aiken & West, 1991), and all analyses were conducted separately for men and women. Given the significant age difference between the two samples, the influence of age on harmful drinking patterns was evaluated first, followed by whether this relationship differed by country of residence. Harmful drinking score was specified as the dependent variable. Individuals with missing values were omitted from the analysis.

## **Missing Data**

Data missing from the students' AUDIT and SIP questionnaires was supplemented manually, using completed questionnaires as guidelines, in a regression imputation manner (Wood et al., 2004). If more than 20% of the questions within the same questionnaire were left unanswered, the questionnaire was regarded as incomplete and was omitted from the analysis.

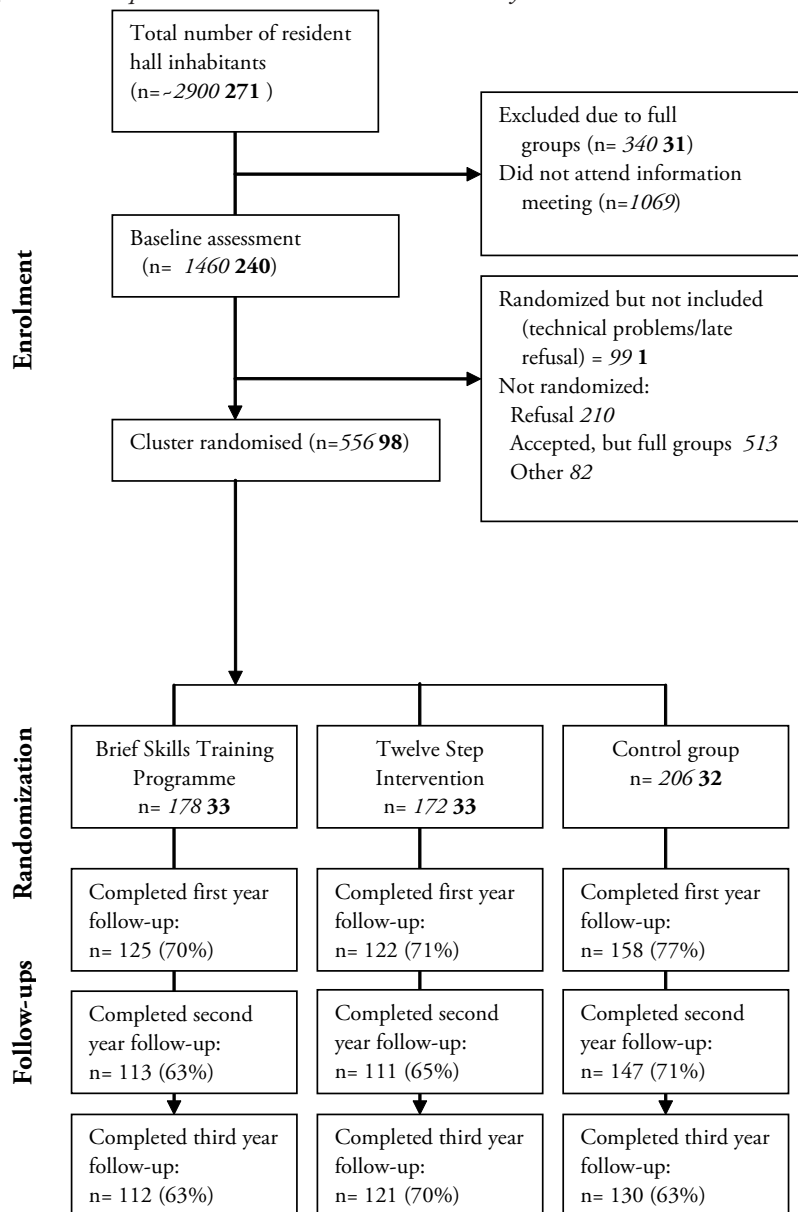
Questionnaires for eBAC and academic results that lacked data were regarded as incomplete and were excluded from the analysis. The Family Climate questionnaire was of such a nature that there was no missing data.

# RESULTS

## Internal Attrition

As can be seen in Figure 2, the attrition rate decreased over the years. There was no difference between the three groups in attrition rates.

Figure 2: Participants and attrition rates across the study.



## **Baseline Population Data and Alcohol Measurements**

231 residence halls (1,388 students) filled out the baseline questionnaire. Of this population, 64.4% were male and 35.6% female. The mean age was  $23.8 \pm 4.5$  years for men and  $22.9 \pm 2.5$  years ( $p=0.03$ ).

As for the baseline alcohol measurement data, the mean AUDIT score amongst men was  $10.3 \pm 5.2$ , and for women  $8.1 \pm 4.7$ , significantly different at the 0.03 level. Mean SIP score for men was  $3.1 \pm 3.7$  and for women  $2.5 \pm 3.3$  ( $p=0.02$ ), and the eBAC reached a level of 0.107% for men 0.108% for women, not significantly different from each other.

## **Social Climate and Drinking Correlation**

Using multilevel modelling statistics, it could be seen that AUDIT was influenced by gender and the Family Climate subscale Expressiveness. SIP was influenced by gender alone, and eBAC was influenced by the Family Climate subscale Distance.

It could also be seen that those in the highest quartile of Distance had significantly higher scores of SIP and eBAC compared to the lowest quartile. Those in the highest quartile of Expressiveness had significantly higher levels on all three drinking measures than the lowest quartile, and those in the next highest quartile of Chaos had significantly higher AUDIT scores than those in the lowest quartile. Closeness quartiles did not differ in their drinking measures. For estimates and levels of significance, see Table 2.

The main AUDIT variance was between the individuals in the residence halls (23.14,  $p<0.001$ , 95% CI 21.0, 25.5), with some variance between the residence halls (1.74,  $p=0.01$ , 95% CI 0.81, 3.74), but none between the residence halls areas ( $p=0.41$ ).

The variance of SIP scores was within residence hall level (11.45,  $p<0.0001$ , 95% CI 10.4, 12.7) and between residence halls level (1.11,  $p<0.01$ , 95% CI 0.57, 2.17), but not at residence hall area level ( $p=0.23$ ).

The variance in eBAC was primarily within residence halls (estimate 0.51,  $p<0.0001$ , 95% CI 0.46, 0.57). No variance of significance could be seen between residence halls ( $p=0.14$ ) or between residence hall areas ( $p=0.55$ ).

Table 2. Family Climate subscales and their influence on drinking parameters.

		<b>AUDIT</b> (estimate, p, 95% CI)	<b>SIP</b> (estimate, p, 95% CI)	<b>eBAC</b> (estimate, p, 95% CI)
<b>Age</b>		-0.06, 0.34 (-0.17, 0.06)	-0.03, 0.44 (-0.12, 0.05)	-0.01, 0.28 (-0.03, 0.01)
<b>Gender</b> (male reference)		-2.61, <0.0001 (-3.28, -1.93)	-0.62, 0.01 (-1.11, -0.13)	0.01, 0.91 (-0.10, 0.11)
<b>Closeness</b>	<i>Fixed</i>	p = 0.79	p = 0.97	p = 0.33
	<i>Lowest quartile</i>	0.08, 0.90 (-1.20, 1.37)	-0.20, 0.67 (-1.16, 0.75)	-0.02, 0.83 (-0.20, 0.16)
	<i>Next lowest quartile</i>	0.49, 0.40 (-0.66, 1.65)	-0.13, 0.77 (-1.00, 0.74)	0.04, 0.63 (-0.12, 0.20)
	<i>Next highest quartile</i>	0.41, 0.48 (-0.74, 1.57)	-0.18, 0.68 (-1.05, 0.68)	0.12, 0.15 (-0.04, 0.28)
	<i>Highest quartile</i>	Reference quartile		
<b>Distance</b>	<i>Fixed</i>	p = 0.11	p = 0.06	p = 0.04
	<i>Lowest quartile</i>	Reference quartile		
	<i>Next lowest quartile</i>	0.12, 0.83 (-1.03, 1.27)	0.37, 0.40 (-0.49, 1.22)	-0.04, 0.60 (-0.20, 0.12)
	<i>Next highest quartile</i>	1.06, 0.07 (-0.07, 2.20)	0.57, 0.19 (-0.30, 1.42)	0.08, 0.32 (-0.08, 0.24)
	<i>Highest quartile</i>	1.19, 0.05 (-0.00, 2.37)	1.23, 0.01 (0.34, 2.11)	0.20, 0.02 (0.03, 0.36)
<b>Expressiveness</b>	<i>Fixed</i>	p = 0.004	p = 0.16	p = 0.10
	<i>Lowest quartile</i>	Reference quartile		
	<i>Next lowest quartile</i>	0.96, 0.09 (-0.14, 2.06)	0.07, 0.87 (-0.76, 0.89)	0.04, 0.59 (-0.11, 0.19)
	<i>Next highest quartile</i>	1.24, 0.03 (0.10, 2.38)	0.40, 0.35 (-0.45, 1.25)	0.12, 0.13 (-0.04, 0.28)
	<i>Highest quartile</i>	2.31, <0.0001 (1.08, 3.54)	0.97, 0.04 (0.05, 1.88)	0.20, 0.02 (0.03, 0.37)
<b>Chaos</b>	<i>Fixed</i>	p = 0.08	p = 0.69	p = 0.26
	<i>Lowest quartile</i>	Reference quartile		
	<i>Next lowest quartile</i>	1.30, 0.07 (-0.10, 2.71)	0.40, 0.45 (-0.64, 1.44)	0.14, 0.15 (-0.05, 0.33)
	<i>Next highest quartile</i>	1.17, 0.03 (0.13, 2.22)	0.43, 0.28 (-0.35, 1.21)	0.10, 0.16 (-0.04, 0.25)
	<i>Highest quartile</i>	0.51, 0.36 (-0.58, 1.61)	0.14, 0.74 (-0.68, 0.96)	0.12, 0.13 (-0.03, 0.27)



## Effects of Intervention

As can be seen in Table 3, all groups decreased their AUDIT, SIP and eBAC scores over time. Comparing the groups, no difference of significance could be seen between either of the groups within the entire population. When separating the at-risk group from the rest (i.e. those with at-risk consumption according to NIAAA's definition of AUDIT scores equal to or above eight for men and equal to or above four for women), a significant greater decrease in AUDIT could be seen in the BTSP group compared with the control group. There was also a tendency for the BSTP group to have lower follow-up AUDIT scores than the TSI group, but the difference did not reach significant levels ( $p=0.06$ ).

Table 3. Two year outcome values in BSTP, TSI and control. ANCOVA statistics adjusted according to variation influencing factor. Changes between the years are marked in italics.

	Statistics					
	BSTP (mean ± sd)	TSI (mean ± sd)	Control (mean ± sd)	Treatment contrasts time (B, 95% CI)		
				BSTP - TSI	BSTP - control	TSI - control
<b>AUDIT</b>						
Initial	9.9 ± 5.0	10.0 ± 4.5	9.5 ± 5.0	-.75	-.51	.23
Follow-up	7.1 ± 3.8	7.9 ± 3.9	7.4 ± 3.8	<i>[-1.66, .15]</i>	<i>[-1.31, .29]</i>	<i>[-.63, 1.09]</i>
Change	<i>-2.7 ± 4.1</i>	<i>-2.1 ± 3.9</i>	<i>-2.1 ± 3.7</i>			
Number of students (n)	113	111	147			
<b>AUDIT at-risk group</b>						
Initial	11.5 ± 4.6	11.4 ± 4.0	11.1 ± 4.4	-1.02	-1.01	.01
Follow-up	7.5 ± 3.9	8.5 ± 3.9	8.3 ± 3.5	<i>[-2.08, .05]</i>	<i>[-1.94, -.07]</i>	<i>[-.98, .99]</i>
Change	<i>-3.9 ± 3.8</i>	<i>-3.0 ± 3.8</i>	<i>-2.8 ± 3.7</i>			
Number of students (n)	87	87	112			
<b>SIP</b>						
Initial	3.5 ± 2.7	3.4 ± 2.6	3.5 ± 3.2	-0.13	0.02	0.15
Follow-up	2.1 ± 2.3	2.2 ± 2.8	2.1 ± 2.2	<i>[-.79, .54]</i>	<i>[-.52, .57]</i>	<i>[-.45, .75]</i>
Change	<i>-1.3 ± 2.7</i>	<i>-1.2 ± 2.9</i>	<i>-1.4 ± 2.9</i>			
Number of students (n)	113	111	147			
<b>SIP at-risk group</b>						
Initial	4.0 ± 2.6	4.0 ± 2.6	4.0 ± 2.9	-0.28	-0.23	0.05
Follow-up	2.3 ± 2.4	2.6 ± 2.9	2.5 ± 2.2	<i>[-1.08, .53]</i>	<i>[-.86, .41]</i>	<i>[-.66, .76]</i>
Change	<i>-1.7 ± 2.8</i>	<i>-1.4 ± 3.1</i>	<i>-1.4 ± 2.7</i>			
Number of students (n)	87	87	112			
<b>eBAC</b>						
Initial	0.11 ± 0.07	0.11 ± 0.06	0.11 ± 0.07	-0.01	-0.00	0.01
Follow-up	0.08 ± 0.05	0.09 ± 0.06	0.08 ± 0.06	<i>[-.26, .05]</i>	<i>[-.14, .13]</i>	<i>[-.03, .25]</i>
Change	<i>-.04 ± .08</i>	<i>-.02 ± .06</i>	<i>-.04 ± .07</i>			
Number of students (n)	112	109	145			
<b>eBAC at-risk group</b>						
Initial	0.12 ± 0.07	0.13 ± 0.06	0.13 ± 0.06	-0.02	-0.01	0.01
Follow-up	0.08 ± 0.05	0.10 ± 0.06	0.09 ± 0.06	<i>[-0.34, .02]</i>	<i>[-.23, .10]</i>	<i>[-.07, .26]</i>
Change	<i>-.04 ± .08</i>	<i>-.03 ± .06</i>	<i>-.04 ± .07</i>			
Number of students (n)	87	85	110			

## **Lecture Participation**

In total, 113/178 individuals (63%) attended the BSTP session, and 43/172 individuals (25%) attended the TSI session (difference in attendance between groups  $p < 0.001$ ). There was no difference between genders amongst the attending students. Within the entire population, AUDIT, SIP and eBAC did not differ significantly between the attending and non-attending students.

## **Drinking Trajectories**

### **Identification of Trajectories**

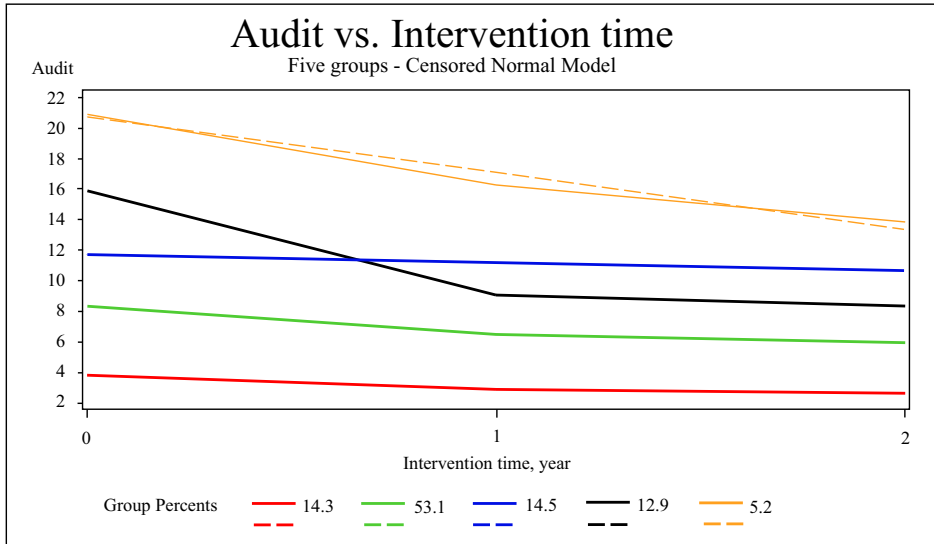
Trajectory groups were detected using BIC values as determinants of the number of groups used. The best-fit models contained five groups for AUDIT, four groups for SIP and three groups for eBAC. The best-fit model for AUDIT is linear for groups 1, 3 and 5, and quadratic for groups 2 and 4. As for SIP and eBAC, all group models are linear.

### **AUDIT**

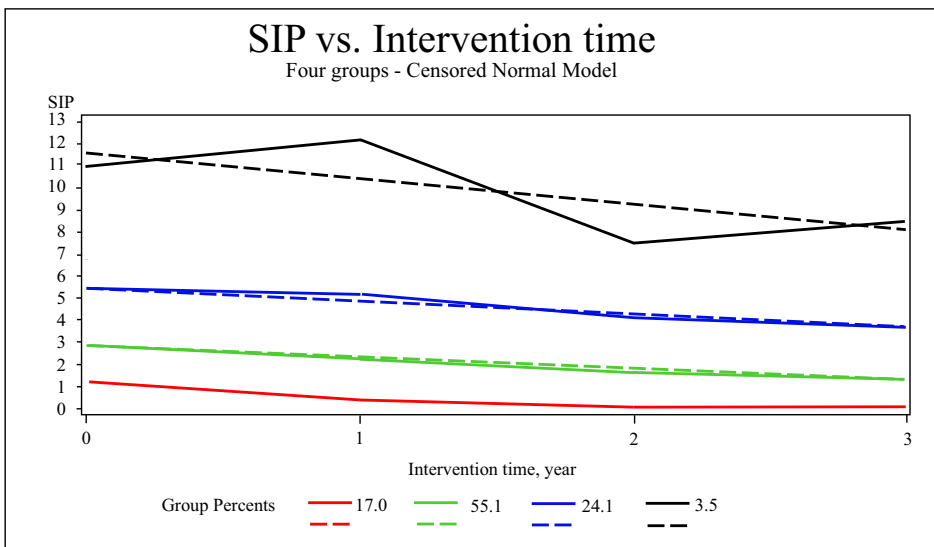
Five different trajectory groups were identified, as shown in Graph 3. While all groups decreased their scores over the years, the groups called stable only show minor decreases. The identified trajectory groups were: stable low (14.3%, with a mean decrease of 1.2 points over the years), medium decreasing (53.1%, mean decrease 2.3), stable high (14.5%, mean decrease 1.0 points), high decreasing (12.9%, mean decrease 7.7) and very high decreasing (5.2%, mean decrease 7.3).

### **SIP**

All four groups best fitting the trajectory model and SIP scores over the years decreased their SIP scores. The four defined trajectory groups included stable low (group 1 in Graph 4; 17.0%, with a mean decrease of 3.8 points over the years), stable medium (55.5%, mean decrease 1.3), stable high (24.1%, mean decrease 1.2) and very high decreasing (3.5%, mean decrease 2.3). The high decreasing group showed increases in SIP scores for years 1 and 3, but showed an overall decrease.



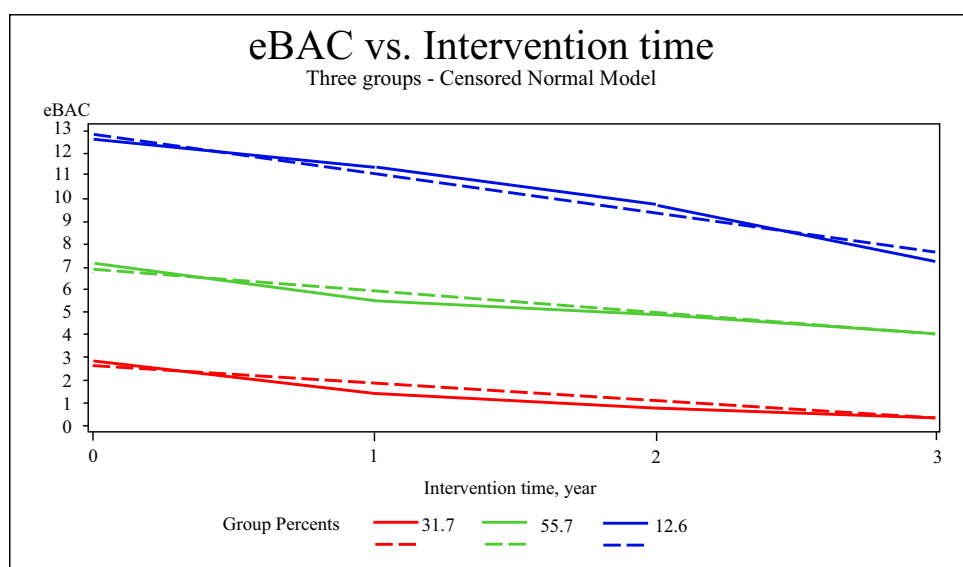
Graph 3. AUDIT trajectories including year 0, 2 and 3. Trajectory groups: stable low (red), medium decreasing (green), stable high (blue), high decreasing (black) and very high decreasing (yellow).



Graph 4. SIP trajectories. Groups: Stable low (red), stable medium (green), stable high (blue), very high decreasing (black).

## eBAC

Three trajectory groups were defined for eBAC over time, and all of those groups decreased their eBAC levels with time (graph 5): low decreasing (group 1 in Graph 3; 31.7%, with a mean decrease of 0.3% over the years), medium decreasing (55.7%, mean decrease 0.3) and high decreasing (12.6%, mean decrease 0.5).



Graph 5. eBAC trajectories. Groups: low decreasing (red), medium decreasing (green) and high decreasing (blue).

## Covariate Analyses

After analysis of the separate trajectories for the three different drinking instruments, univariate analyses were performed on each of them.

### AUDIT

Age and gender were significant for group membership in most groups. The lowest trajectory group of AUDIT had the highest mean age, and included more women. Students with low Closeness were more likely to belong to the very high decreasing trajectory group. Students with high Expressiveness were more likely to belong to the lowest trajectory group. Distance and Chaos were not significant, nor were the other covariates, including intervention groups and academic success.

### SIP

Both age and gender were significant for most trajectory group membership (see Table 2), with lower trajectory groups more likely to include older students and more women. Students reporting high expressiveness were more likely to belong to the lowest

trajectory group. Academic success was significant for belonging to the high stable group compared to the low stable group.

#### eBAC

Lower age significantly predicted membership of the medium decreasing group, see Table 2. Gender did not have a significant influence. Higher levels of chaos and higher levels of academic success predicted membership in the medium decreasing group.

#### Adjustments

Since age and gender were significant in all three drinking instruments and in almost all trajectories, the significant covariance analyses described above were re-run, adjusted for age and gender. All significant differences except one - low Expressiveness predicting membership in the SIP stable medium group - then became non-significant.

## Student Alcohol Patterns in Sweden and in the US

### Freshmen

There were 5,266 American freshmen participating in the study. Of these, 35.3% were male, and the mean age was 18.7 years. In Sweden, 2,032 freshmen participated, 46.1% male, and the mean age was 23.5 years.

The *total harmful drinking score* amongst freshmen was higher in Sweden for both males ( $5.97 \pm 3.45$  versus  $3.67 \pm 3.74$ ,  $p < 0.01$ , 95% CI -2.59, -2.01) and females ( $3.83 \pm 2.84$  versus  $3.33 \pm 3.48$ ,  $p < 0.01$ , 95% CI -0.72, -0.27). American male freshmen were less likely to engage in heavy episodic drinking than Swedish male freshmen (43.6% versus 57.2%,  $\chi^2 = 46.04$ ,  $df = 1$ ,  $p < 0.01$ ), but American female freshmen were significantly more likely to engage in heavy episodic drinking than Swedish female freshmen (30.2% versus 26.8%,  $\chi^2 = 4.79$ ,  $df = 1$ ,  $p = 0.03$ ).

Overall *expectancy scores* were similar amongst American and Swedish male freshmen ( $3.04 \pm 1.34$  for US students versus  $2.95 \pm 1.31$  for Swedish students,  $p = 0.12$ , 95% CI -0.02, 0.19), but American female freshmen scored somewhat higher than their Swedish counterparts ( $2.86 \pm 1.34$  versus  $2.35 \pm 1.32$ ,  $p < 0.01$ , 95% CI 0.42, 0.61).

Interestingly, despite slightly higher rates of alcohol use in Sweden, the American freshmen report a higher prevalence of a *family history* of alcohol disorder than the Swedish freshmen, irrespective of gender (for men, 22.6% versus 9.3%,  $\chi^2 = 70.44$ ,  $df = 1$ ,  $p < 0.01$ ; for women 31.6% versus 14.3%,  $\chi^2 = 125.91$ ,  $df = 1$ ,  $p < 0.01$ ).

There was no significant difference between the countries regarding *mental health*

*symptoms* reported by freshmen males ( $1.98 \pm 2.15$  in the US and  $2.15 \pm 2.04$  in Sweden;  $p=0.05$ , 95% CI  $-0.35, 0.00$ ), whereas females in the US reported fewer mental health symptoms than in Sweden ( $2.28 \pm 2.36$  in the US and  $3.07 \pm 2.25$  in Sweden;  $p<0.01$ , 95% CI  $-0.95, -0.63$ ).

### **Greek Houses and Residence Halls in the US and Sweden**

For both genders, the *total harmful drinking score* was lower in American residence halls than in Swedish residence halls ( $3.49 \pm 3.60$  versus  $5.35 \pm 2.99$ ,  $p<0.01$ , 95% CI  $-2.17, -1.55$  for men, and  $3.24 \pm 3.39$  versus  $3.75 \pm 2.53$ ,  $p=0.01$ , 95% CI  $-0.86, -0.16$  for women). In contrast, both male and female students residing in the American Greek system (fraternities and sororities) reported higher scores on the harmful drinking scale than students in Swedish residence halls ( $7.45 \pm 3.89$  versus  $5.35 \pm 2.99$ ,  $p<0.01$ , 95% CI  $1.61, 2.58$  in males, and  $5.58 \pm 3.36$  versus  $3.75 \pm 2.53$ ,  $p<0.01$ , 95% CI  $1.39, 2.27$  in females).

The *alcohol problems scale* indicated lower problem prevalence in US residence halls than in Swedish residence halls amongst males ( $0.57 \pm 0.87$  versus  $0.83 \pm 0.96$ ,  $p<0.01$ , 95% CI  $-0.34, -0.18$ ), but about equal in females ( $0.62 \pm 0.87$  versus  $0.71 \pm 0.82$ ,  $p=0.06$ , 95% CI  $-0.18, 0.00$ ). American fraternity and sorority members scored higher on the alcohol problems scale than men and women living in Swedish residence halls (with males scoring  $1.20 \pm 1.08$  in the US and  $0.83 \pm 0.96$  in Sweden,  $p<0.01$ , 95% CI  $0.23, 0.52$ , and females scoring  $0.94 \pm 0.91$  versus  $0.71 \pm 0.82$ , respectively,  $p<0.01$ , 95% CI  $0.11, 0.36$ ).

### **Country as Mediator for Drinking Predictors**

As can be seen in Table 4, and explained more in depth in Materials and Methods above, tests were carried out to see whether the country of residency moderated the relationship of age, expectancies, mental health or family history of drinking with heavy drinking scores.

The results show that for women, the country mediated the effect of age on heavy drinking: harmful drinking scores were predicted by age more strongly for women in Sweden than women in the US. For men, country and age independently predicted harmful drinking scores, but not together. However, country predicted the effect of expectancies on harmful drinking in men, where this relationship was stronger in Sweden but not in the US. No mediating effect of the country of residence could be seen on the relationship between mental health scores and harmful drinking scores. Country of residence mediated the relationship between harmful drinking scores and family history for women but not for men. A positive family history was stronger correlated to a high harmful drinking score among American women, but not among Swedish women. For all figures, see Table 4.

Table 4. Mediating effects of country on harmful drinking for four different variables.

Predictor	Males					Females				
	R <sup>2</sup>	B	SE B	$\beta$	T	R <sup>2</sup>	B	SE B	$\beta$	T
Step 1: Age	0.007	0.08	0.02	0.08	4.24***	0.005	-0.05	0.01	-0.07	-4.78***
Step 2: Country	0.088	2.58	0.17	0.33	15.32***	0.020	1.10	0.14	0.14	8.05***
Step 3: Age X Country	0.089	-0.08	0.04	-0.06	-1.94	0.022	-0.08	0.03	-0.08	-2.92**
Step 1: Age	0.006	0.07	0.02	0.08	3.80***	0.006	-0.06	0.01	-0.08	-5.13***
Step 2: Expectancies	0.134	1.03	0.05	0.36	19.47***	0.104	0.78	0.04	0.32	21.14***
Step 3: Country	0.208	2.45	0.16	0.31	15.55***	0.126	1.32	0.13	0.18	10.20***
Step 4: Expectancies X country	0.214	0.45	0.11	0.09	4.27***	0.127	0.10	0.08	0.02	1.15
Step 1: Age	0.006	0.07	0.02	0.08	3.91***	0.006	-0.06	0.01	-0.08	-5.01***
Step 2: Mental Health	0.018	0.19	0.03	0.11	5.64***	0.023	0.18	0.02	0.13	8.34***
Step 3: Country	0.095	2.49	0.17	0.32	14.76***	0.033	0.90	0.14	0.12	6.49***
Step 4: Mental Health X country	0.095	0.07	0.07	0.02	1.05	0.033	-0.05	0.05	-0.02	-0.93
Step 1: Age	0.006	0.07	0.02	0.08	3.73***	0.006	-0.05	0.01	-0.07	-4.67***
Step 2: Family history	0.006	0.13	0.21	0.01	0.61	0.012	0.58	0.12	0.07	4.68***
Step 3: Country	0.101	2.77	0.18	0.36	15.63***	0.036	1.34	0.14	0.19	9.60***
Step 4: Family history X country	0.101	-0.04	0.47	-0.01	-0.09	0.038	-0.66	0.31	-1.09	-2.09*

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

# GENERAL DISCUSSION

## Sample

### Establishing Contact

In the student residence hall sample, analysed in all four studies, contact was initiated by visiting the residence halls in person. The general impression from those visits was positive: only 31 out of the 271 visited halls (11.4%) refused further contact, and the students were generally interested in the study. Visiting all residence halls in person ensured that all students were accessed in this initial stage. In the second visit, when the study was explained in more detail and the students completed the first questionnaires, project leader or research assistants once again made personal visits to the halls of residence. The students did not need to take any action to participate in the study, which was thought to increase participation, especially among those students who would not normally engage in studies.

In the cross-cultural study, two other studies were added. The first additional study was another Swedish one, consisting of two complete freshmen cohorts at two different universities (described in further detail in Andersson et al., 2007). In this study, all freshmen classes at two different universities were visited by the project leaders and asked to participate in the study. The consent form was signed and the baseline questionnaires were completed in the same session. The second study was an American study, Motivating Campus Change (described in further detail in Larimer et al., 2007). Here, a random sample of enrolled students at three different campuses, belonging to the University of Washington, were invited by post, and were asked to complete a web-based survey. Women and freshmen were over-represented. Contacting students by post, asking them to participate in a study, is a common way of establishing contact in studies of college student populations, used both in Sweden (Hansson et al., 2006; Andersson et al., unpublished data) and elsewhere (Marlatt et al., 1998). As in the personal visits approach, this allows contact with all students, requiring no active participation from the students in the initial contact.

In contrast to the residence hall study, where students were to fill out the questionnaire and return it to the study representative by hand, in the two latter studies the students had to post the questionnaire (in the Swedish freshmen study), or log onto a computer and complete a web survey (in the US study). This does require a somewhat greater effort from the students. However, it might be argued that it is intimidating for the students to fill out a questionnaire and hand it directly to the study representative, as in the student residence hall study, and the students might therefore not be entirely truthful in their survey completion. Underestimation of alcohol consumption



measures has, however, not been reported being such a large problem in the student samples as compared to a general population, probably due to a less pronounced social pressure. See the “Measurements” section below for a more detailed discussion on this. The students were also well informed about the confidentiality to minimise this problem.

It should also be noted that, while the initial contact with the students was on a more personal level in the Residence Hall study, the follow-up questionnaires were posted.

### **Representativity**

In the Residence Hall study, 231 out of 271 residence halls participated in filling out the initial survey. Although it is hard to estimate the exact number of students residing in the residence halls, due to unoccupied rooms etc, an estimation of 2,869 has been made. A total of 1,069 students did not attend the information meeting where the consent form was signed and the baseline questionnaire completed, representing about 37% of the students. No attempts were made to further contact those persons to ascertain why they did not attend. Only 57 students refused participation at the actual information meeting (4%), which should be regarded as a low figure.

Neighbors et al. (2004) found that drinkers were more likely than non-drinkers to express interest in participating in an intervention study, and that there was an underrepresentation of students with very low or very high alcohol consumption in those students expressing interest in participation in intervention studies. Andersson et al. (unpublished data) have observed that male students participating in voluntary primary prevention alcohol lectures had significantly higher AUDIT scores and alcohol expectancies than those students not participating. This data suggests a possible bias towards students with lower alcohol consumptions not being interested in, nor participating in, alcohol interventions. Although ideally, all students are interested in participation, this is the group least in need of such interventions. In the total baseline sample (1,388 students), the mean AUDIT scores were similar to the mean AUDIT scores found in students living in residence halls in New Zealand (Kypri et al., 2002), suggesting good representativity. There is no data on alcohol consumption in Swedish residence halls, that could be used for further comparison of representativity, exist.

As for the baseline representativity of the Swedish Freshmen study included in the fourth cross-cultural paper, 72% of the students accepted inclusion, and participants were more often females, and younger than the non-participants. In the US Motivating Campus change study, 14,233 students completed the baseline survey and were included in this analysis. Those students were representative demographically when compared to the total student population of the three included schools. The amount of missing data in this sample was less than 5%, making the sample reliable.

## **Internal Attrition**

Of the 1,388 students completing the baseline questionnaire in the Residence Hall study, 556 were selected for inclusion in the randomised study (for further information on this selection, see Materials and Methods). In year one, 405 students (72.7%) completed the follow-up, in year two, 371 students (66.7%) completed the follow-up, and in year three, 363 students (65.3%) completed the follow-up. Three hundred and four students (54.7%) completed all four questionnaires. There were no differences between the intervention groups in attrition rate. Those attrition rates are similar to other studies in this population. Johnson et al. (2008) found retention rates of 76% in year three in a similar Swedish population, whereas a review of the young adult alcohol consumption studies by Berglund et al. (2005) found retention rates ranging from 97% to 72%.

The Freshmen group and the Motivating Campus Change group used in the cross-cultural study were not monitored over time in the cross-sectional study, and the internal attrition rates are not reported here.

## **Multivariate Statistics**

Sophisticated statistical methods have been used throughout the studies. The first article on social climate and drinking habits (Paper I) used multilevel modelling in order to fit the data accurately in residence halls. The advantage of using multilevel modelling is that several levels of analysis can be included simultaneously - here the students, the residence hall, and the residence hall area as three separate analysis levels.

In the two-year outcome of alcohol interventions (Paper II), analyses of variance (ANOVA) were used, combined with a variance inflation factor. The ANOVA analyses permitted the two-year level of drinking outcomes to be adjusted to the levels of drinking at baseline, and the variance inflation factor took the cluster randomisation into account.

As for the drinking trajectories in Paper III, semiparametric trajectory analyses were used. This statistical method allowed for the grouping into different trajectories based on the statistical patterns of the answers, which could identify patterns of drinking trajectories other than those found when manually dividing the students into groups.

In the cross-cultural analysis (Paper IV), moderation analyses were used to allow the relationship between predictors of harmful drinking and harmful drinking outcomes to be moderated by country.

Although perhaps making it harder to comprehend the statistical analyses and findings, these sophisticated statistical methods have allowed the data to be analysed in more suitable ways than more simple statistics, which was judged necessary in such a complex sample of students, living in residence halls, being cluster randomised,

subjects of intervention, followed through a number of years, and finally being compared to peers in other cultures.

## **Measurements**

### **Mode of Surveys**

The main study reported in the four papers making up the thesis, as well as the Swedish Freshmen study in the cross-cultural article, used pen-and-paper questionnaires, whereas the American Motivating Campus Change study was performed with a computerised online questionnaire. Geisner et al. (2004) analysed alcohol use, alcohol related problems in a student population, where both paper-based and web-based assessments were used, and found no difference in psychometric properties.

### **Self-Reporting Alcohol Consumption**

Self-reported alcohol consumption data is commonly used in this population. General strengths and weaknesses with this approach were discussed in the introduction of the thesis. Although it is generally thought that self-reporting underestimates alcohol consumption, several studies have shown that self-reporting data shows no response bias and, in some studies, is even more accurate than collateral data and biochemical markers in both younger and older study populations within the alcohol field (Babor et al., 1987; Winters et al., 1990; Smith et al., 1995b; Grant et al., 1997; Babor et al., 2000; Del Boca & Darkes, 2003). By monitoring the students over time using the same instruments, a possible underestimation should be more constant over time than would have been the case if the instruments were changed.

### **At-Risk Drinking**

Throughout the articles, AUDIT score cut-offs for at-risk drinking of eight for men and four for women have been used. Higher cut-off values have previously been suggested. Johnsson and Berglund (2006) showed a general reduction in AUDIT scores among those with high initial scores (11 and 8, respectively, in men and women), regardless of the intervention (cognitive alcohol skills programme vs posted personalised feedback). Students below these scores did not receive intervention of any kind.

Our study shows that those scores can be reduced even further, by giving intervention to students with lower AUDIT scores. AUDIT scores of 6 for both genders have been suggested by Aertgeerts et al. (2000), and cut-off scores of 5 by Adewuya (2005), but neither of those has been tested in a clinical setting, with the exception of validation studies.

## **Alcohol Dependence in Youth**

As has been shown in the Introduction, the number of young people with alcohol dependence is astonishingly high. Caetano & Babor (2006) argue that it is probable that those high prevalence numbers are measurement errors. The DSM-IV criteria most recognised by the young people are impaired control and tolerance. However, given the phrasing of the criteria and the circumstances of the interviews, the actual symptoms that are used to describe impaired control and tolerance, might be confused for normal developmental symptoms: symptoms due to inexperience of alcohol and physiological reactions to heavy episodic drinking. Another group of researchers believe that the high prevalence of alcohol dependence shows a developmental disorder, where it is true that the young people diagnosed with alcohol dependence indeed have a problematic relationship to alcohol and suffer negative consequences from it during a certain period of their development. Supporting this theory is the high number of young people, especially students, demonstrating risky alcohol drinking behaviour during emerging adulthood, but whose alcohol habits decline as they mature (Sher & Gotham, 1999; Schulenberg et al., 2001).

## **Limitations**

There are several limitations to the studies presented, in terms of the residence halls student group. In the sample, more men than women participated in the study, although there are more women than men at the university as whole. The attrition is in the lower end compared to studies of the same kind. There are also some limitations at the measurement level. Only self-reporting instruments were used in the assessment of alcohol habits. In the first-year follow-up, due to technical problems, the AUDIT questionnaire mistakenly was left out. The Family Climate measuring the social context of the residence halls, only measured the perceived social climate at an individual level, and did not measure alcohol correlations to this climate in itself, and no questions on peer alcohol consumption were included in the instrument. As for the intervention part, there was no pure control group, since all students answering the questionnaires received a posted personalised feedback. This was done for ethical reasons, but makes the evaluation harder.

In the fourth paper, comparing alcohol habits of American and Swedish students, there were also several limitations worth mentioning. The US sample contained more students than the both Swedish samples. They were also performed using different medias - Internet assessments in the American sample and pen-and-paper assessments in the Swedish samples, and were carried out in different years. The studies were analysed retrospectively and were performed without this comparison in mind, so the instruments used were not the same and new instruments had to be created to allow direct comparisons. Another implication of the fact that the studies were not designed

to be compared is that not all studies had included questions about important predictors and mediators, such as perceived drinking norms or other peer influences. Consequently, those could not be evaluated, which would have been desirable in a comparison study of this kind.

The implications of the most important of these limitations can be found in the General Discussion section.

## **Main Findings**

### **High AUDIT Scores in the Student Residence Hall Population**

The general mean AUDIT levels of  $10.3 \pm 5.2$  for men and  $8.1 \pm 4.7$  for women were well above the limits for at-risk alcohol consumption, as defined by the NIAAA (2005). They were, however, quite similar to the AUDIT levels found by Kypri et al. (2002) in students living in residence halls in New Zealand:  $10.9 \pm 7.6$  and  $7.6 \pm 5.9$  (mean  $\pm$ s.d.) for men and women, respectively. Also, students in halls of residence tend to drink more than the average university student, and students at the University of Lund have amongst the highest levels of alcohol consumption amongst Swedish university students (Bullock, 2004). This may be attributed to the classic university atmosphere in the small town of Lund, which is largely dominated by students.

### **Social Climate Affects Drinking**

Residence halls with the character of high Distance or high Expressiveness measured by the Family Climate (Hansson, 1989) had higher AUDIT, SIP and eBAC scores than halls with lower Distance or Expressiveness, indicating a more problematic approach to drinking. Closeness, the one Family Climate factor that can be regarded as a positive one, had no influence on the drinking habits of the residence hall students. When compared to a systematic review of studies performed with the Family Climate instrument ( $n=31$ ; Söderberg & Johnsson, 2004), the residence hall student population seems to have scores in line with the other well-functioning groups, although the Distance scores were lower than those of the other populations. Even with low Distance scores, this subscale correlated to more problematic drinking. It seems clear that the social climate of the residence halls affects drinking – or is it the other way round? Are the residence halls inhabited by a large number of risky drinkers influenced by this, and the students report a more negative residence hall climate due to the drinking already in place, rather than the drinking reflecting a more negative social climate? Which is the chicken and which is the egg cannot be answered by this study.

## **Effects of Intervention**

In this study, intervention was applied to all students, regardless of their baseline alcohol consumption. However, the only significant differences could be seen in the group with AUDIT scores reaching at-risk alcohol consumption. Studying the changes in AUDIT scores between baseline assessment and the second-year assessment in the Residence Hall study, the BSTP proved to be significantly better than the control group in the at-risk consumption group, but not in the total sample. Although not significant, the same tendency is evident in a comparison between the BSTP group and the TSI group.

As for SIP and eBAC, the tendency for the BSTP group to yield better results can be seen, but with no significant differences.

This is consistent with Larimer et al. (2001), who found a significantly greater decrease in drinking patterns among the intervention student group than among the control student group in the Greek 2000 project – but no such differences could be seen in Rutgers Alcohol Problem Index (RAPI). An explanation for this is that the problems are not solely dependent on alcohol consumption, but on other environmental factors. The problem indexes may not be sensitive enough to pick up decreases in negative consequences (Larimer et al., 2001).

The Number Needed to Treat in the BSTP group is 8.5 compared with the control group, which shows that the intervention is effective, similar to the Number Needed to Treat when considering problem drinkers and brief intervention within the health care system (Salaspuro, 2003).

## **Lecture Participation**

A major problem was to get the students to attend the lectures despite several attempts by the research group. The acceptance among the students toward the BSTP is significantly higher (63%) than toward the more conventional TSI (25%). Similar results have been found in previous studies. Larimer et al. (2001) achieved an attendance rate of 78%. Kivlahan et al. (1990) had participation rates of 97 and 100% in the individualised feedback group (2 cohorts), 65 and 72% in the classroom group (2 cohorts), and 37% in the self-help manual group. In the invitation to the lectures, the students were told which group they had been allocated to. This might have influenced the students as to whether or not to attend the lecture. Twelve-step oriented interventions have had a strong influence on prevention in the alcohol field, but little data is available that specifically applies to university students. However, BSTP and TSI had effects rather similar to our study in a study of treatment-refusing abusers, where skills training of concerned significant others (corresponding to our BSTP group) gave an attendance rate of 63% of the abusers compared with an Al-Anon/Nar-Anon or Johnson Institute approach (corresponding to our TSI), which

only encouraged 22% of the abusers to enter treatment (Meyers et al., 2002; Miller et al., 1999). This difference might in part be due to the students' presumed knowledge of the TSI programme, in contrast to a BSTP, which was new to the students. No valuation of the programmes was transmitted to the students from the research group, and there was no attempt to find out whether such valuations indeed existed among the students.

### **Decreasing Trajectories Over the Years and Student Groups**

No groups were found with increasing alcohol habits measured with AUDIT, SIP or eBAC. This finding is consistent with the findings of Bartholow et al. (2003), when studying students in the Greek house system in the US, and there are probably several reasons for this. In a similar study of freshmen engineering students at the same university, increases were found (Johnsson et al., 2008), and it has been shown that students have higher alcohol consumption during their first year in college (Bullock, 2004). The mean age of the students included in the study was 23.2 years at baseline, which is two years older than the mean freshman age that year. Consequently, it is possible that no increasing trajectory could be identified because the year of highest alcohol consumption had already passed and most students were at, or had already passed, the peak of their consumption curve at the beginning of the study. In the engineering freshmen study (Johnsson et al., 2008), the highest trajectory group was found at around AUDIT score 20, and in our university residence hall study the high decreasing group in AUDIT started at a score of 20.7, further supporting this hypothesis. Unfortunately, no questions were asked about the year of study of the student.

Another possibility is that the students were affected by the study and the posted minimal feedback after each questionnaire, and that their alcohol drinking habits decreased as a consequence of this. Regardless of the intervention randomisation, all students completing the questionnaires each year received a posted minimal personalised feedback. Research has shown that posted personalised feedback influences the students' alcohol habits, especially when normative feedback was included (Larimer and Cronce, 2007).

Although the design of the personalised feedback in this study was indeed minimal, no assessment-only group was included, and it cannot be excluded that the posted personalised feedback had an effect on the trajectory pattern.

One of the inclusion criteria in this study was living in a residence hall at the initiation of the study. It is probable that at least some of the students moved out during the course of this four-year study. It is also known, as discussed above, that students living in residence halls have higher alcohol consumption than other students. The finding of only stable and decreasing trajectories could thus be partly due to students



moving out of the residence halls, changing their alcohol habits to fit their new living environment.

In most trajectories, male gender and lower age predicted membership in the higher drinking group trajectories. Higher alcohol consumption is common in younger males and has been reported in most previous studies (Bennett et al., 1999; Casswell et al., 2002; Chassin et al., 2004; Hill et al., 2000; Jackson et al., 2001; Tucker et al., 2003; Windle et al., 2005).

The relationship between age and membership of a higher trajectory group only reaches significant levels in the low- and mid-level trajectory groups, and not in the highest ones. This is also true for gender and trajectory group membership when it comes to eBAC. Persons with genetic risk factors for alcoholism are known to have a lower level of response to alcohol (Schuckit and Smith, 1996; Schuckit et al., 2000b; Evans and Levin, 2003). A low level of response to alcohol at age 20 predicts the later development of alcohol abuse or alcohol dependence (Schuckit and Smith, 1996). Perhaps the highest eBAC trajectory groups include persons with low levels of response, having discovered they have to drink larger amounts of alcohol in order to have the same effects as other people. This would then reflect a persistent pathological relationship to alcohol in the highest trajectory groups.

### **Similar Drinking Patterns amongst Swedish and American Students**

Results indicate that Swedish students are, on average, at higher risk in terms of alcohol use and harmful consequences than American students. Swedish freshmen in the Sweden 1 study have a mean age of 23.5 years, which means they are both at a legal drinking age and a legal purchasing age. However, the mean age of the American freshmen is 18.7 years, which is below the legal drinking age in the US. Thus, American freshmen may have less access to alcohol, accounting for lower drinking rates and consequences. These findings are consistent with findings from other American-European research (Engs et al. 1991; Delk et al. 1996; Cox et al. 2001). However, there are exceptions to this general finding. Specifically, American freshmen women were more likely to report heavy episodic drinking than Swedish freshmen women, consistent with recent research suggesting gender differences in heavy episodic drinking are narrowing in the US (Wallace et al., 2003; Wechsler et al., 2002). American students residing in fraternities and sororities report higher drinking rates and negative consequences than Swedish residence hall students.

Swedish and US students are significantly different from one another in several other dimensions. However, it is important to note that in many cases these differences are of relatively small magnitude, as indicated by inclusion of 95% confidence intervals demonstrating small separations between groups on many variables. Thus, while it is concluded that Swedish students on average report both more drinking and



consequences, we also note substantial similarities between students in these two countries.

In contrast to the general pattern of more risk factors among Swedish students, we found that American students reported more family history of alcohol problems than Swedish students. We also found that the relationship between family history and harmful drinking was slightly stronger for American than Swedish women, though a family history of problems was related to greater levels of harmful drinking for women in both countries. It may be that the US population has a higher prevalence of alcohol problems (abuse and dependence) than the Swedish population, despite lower drinking rates overall, leading to higher rates of reported family history of alcohol problems in the US. However, it is also possible that alcohol problems are more easily recognised and identified at lower levels in the US, due to greater awareness or lower cultural acceptance of heavy drinking. This explanation is supported by the fact that American students also reported a greater likelihood that others had expressed concern that their drinking was harming their health.

In addition to cross-cultural differences in the relation between family history and harmful drinking for women, we found that the relation between age and harmful drinking was moderated by country for women. Specifically, though drinking declined with age for both men and women in both countries, this relationship was more pronounced for women in Sweden compared to women in the US. This finding may relate to the capturing of different places in the drinking trajectory for these different samples, as Swedish freshmen women were on average more than two years older than US freshmen women. Consequently, the bulk of the Swedish freshmen may have begun the developmental maturation out of heavy drinking, whereas US freshmen were experiencing the continuation of heavy drinking that occurs in the late teens and early twenties. Future research, tracking drinking rates and harmful consequences for students in Sweden and the US using age-matched samples of individuals still enrolled in or just leaving high schools, is needed to better disentangle cultural, developmental, and environmental (i.e., college setting) effects on drinking cross-culturally.

### **Effects Related to Other Factors**

Sending the students a questionnaire containing mostly questions regarding their alcohol consumption might in itself have an effect on the consumption of alcohol. To investigate whether completing an AUDIT questionnaire in itself alters alcohol consumption, McCambridge & Day (2008) performed a study amongst British university students. Blinded to the true purpose of the study, students were to fill out a health questionnaire, which included AUDIT for one of the two randomised groups. At follow-up three months later, all students completed the AUDIT questionnaire. Mean AUDIT score in the group that had previously completed the questionnaire was  $8.3 \pm 6.0$  points, with 45% scoring eight or above. This was a decrease from the initial

mean of  $9.8 \pm 7.0$ , and 49% scoring eight or above. The control group at follow-up scored  $9.7 \pm 5.5$  with 61% scoring eight or above (McCambridge & Day, 2008). This shows that completing the questionnaire can lead to reduced drinking. It is not clear whether this is because of a greater awareness of one's drinking behaviour after having completed a questionnaire concerning alcohol, or by a heightened awareness that one's drinking behaviour is being assessed (known as the Hawthorn effect). In this particular study, the self-report bias was held to a minimum using a bogus pipeline procedure, but the authors do not exclude self-report bias as part of the effect. Furthermore, it seems assessment in itself can reduce alcohol habits. Kypri et al. (2006a) showed, by randomising students to receiving an information leaflet about alcohol or to receiving the leaflet and a brief assessment, that the persons receiving both the leaflet and the brief assessment reduced their hazardous drinking more than the group only receiving the leaflet.

Two of the four included articles show that the mean AUDIT score decreased with time. One of the reasons might be that students drink less as they become older, start working, and form families of their own (Galanter, 2006). However, all students answering the baseline questionnaire received a personalised feedback form. It cannot be excluded that this is part of the reason for the general decrease in AUDIT scores among the groups, as personalized feedback has been shown to be effective in previous studies. It should be noted, however, that the significant difference in AUDIT scores in the risk consumer population in the residence hall study, as discussed above, persist despite this general intervention.

## **Suggested Research in the Future**

It has been shown that AUDIT scores correlate with the social climate in the student residence halls. However, no casual relationship can be derived, nor do we know the alcohol consumption of the students before entering college. People in emerging adulthood may self-select the residence halls. There is a need for a longitudinal, preferably prospective, study in order to answer those questions, following the students from high school to college.

Several questions also remained unanswered in the trajectory analyses. The design of the study is adequate for answering a number of interesting hypotheses, but a larger battery of questionnaires are needed for this – with a risk of losing more students in the follow-ups. However, ideally, such a longitudinal study would contain questions on moderators and mediators of alcohol consumption, such as family history of alcohol use disorders, norms, alcohol expectancies, etc. It would also be desirable to be allowed to use the Swedish equivalent of the students' social security numbers, and to access the students' academic results on the university databases.

The results on students' alcohol habits, alcohol-related problems and the mediating roles of expectancies on alcohol consumption and family history are shown to be similar in the US and Sweden. However, the cross-cultural study reported on in this thesis was performed using data from three already completed studies. By designing a specific study implemented in both the US and Sweden, using the same measurements and methods, more knowledge can be gained in this field. It is of particular importance to Sweden, to make better use of the results from the multitude of American college student alcohol intervention studies that have already been reported.

## GENERAL CONCLUSIONS

- The findings in this study suggest that it is the more negative aspects of the residence hall social climate that predict higher drinking levels. Finding ways of decreasing this negative climate would then be of value, both in decreasing the alcohol habits of the students and in giving them a more pleasant living environment and a more enjoyable university experience.
- A BSTP showed significant reductions in AUDIT scores compared with a control group, within the student population with risky alcohol consumption. No significant differences could be seen between a TSI programme and the BSTP or the control group within the high-risk group. There were no significant differences between the groups at the residence hall population level.
- In an analysis of alcohol trajectories in this high alcohol-consumption group, no trajectories of increasing alcohol habits could be found. This might be due to normal development, or due to alcohol interventions given in the first year of the study.
- Regardless of limitations, this research has nonetheless provided important information about alcohol consumption and its predictors in US and Swedish college students. Despite some differences between the countries, results indicate that the overall pattern of relationships is quite similar. This finding supports the application of basic and applied research on college drinking and drinking prevention in the US to the population of Swedish college students. This research further suggests that research conducted in Swedish college populations could be generalised to the US student population.



# POPULÄRVETENSKAPLIG SAMMANFATTNING

## Alkoholkonsumtion i svenska studentkorridorer

### Klusterrandomiserade prövningar, dryckesförlopp, socialt klimat och kulturell påverkan

Sedan några år tillbaka är det visat runtom i världen att studenter dricker stora mängder alkohol, och framför allt att de dricker stora mängder alkohol vid ett och samma tillfälle – ett mönster som är visat sig vara extra riskfyllt. Det finns många konsekvenser med ett riskfyllt drickande. De följder man kanske först tänker på är de omedelbara, bland annat ökat våld, ett riskfyllt sexuellt beteende (oskyddat sex och sex som man senare ångrar), olyckor, ekonomiska konsekvenser och självmord. Det finns också följder som kommer längre fram, vilket främst är ökad risk för alkoholproblem såsom alkoholmissbruk och beroende. Naturligtvis kan de omedelbara konsekvenserna också få följder under en längre period, om man exempelvis hoppar av sin utbildning eller råkar ut för en olycka som gör att man blir handikappad.

Man har i USA visat att studenter som bor på så kallade Greek houses har högre alkoholkonsumtion än andra studenter, och vi i Sverige har därför valt att titta på studenter som bor på studentkorridor – det närmaste Greek houses vi kommer i Sverige. Greek houses är ett fenomen unikt för amerikanska högskolor och universitet, där studenter bor nära inpå varandra i hus, som ofta är döpta efter en grekisk bokstav. Studenterna boendes i dessa hus har rykte om sig att vara socialt aktiva och ha en hög alkoholkonsumtion, något som man också har kunnat bekräfta i amerikanska studier.

Till att börja med har vi sett att studenter som bor på studentkorridor har en hög alkoholkonsumtion: ungefär tre fjärdedelar av studenterna kommer upp på nivåer som anses vara riskabla alkoholnivåer. Vi har också kunnat visa att det sociala klimatet på studentkorridoren spelar roll för alkoholkonsumtionen. Det sociala klimatet är mätt genom att studenterna fått stryka under adjektiv som de tycker passar in på den korridor man bor på. På de studentkorridorer där man upplever klimatet som mer negativt (med mer distans och spontanitet än andra korridorer) har man också en högre alkoholkonsumtion. Dock är det inte så att man dricker mindre på de korridorer där det sociala klimatet kännetecknas av en hög nivå av närhet.

Vi har också försökt att få dessa studenter att minska sin alkoholkonsumtion genom att lotta in dem i tre olika grupper, där två av grupperna fick olika utbildningar och den tredje gruppen fungerade som en kontrollgrupp. Den första gruppen fick en utbildning på tre timmar då de lärde sig om alkohol och dess effekter på kroppen, samt erhöll beteendearbetad utbildning där man lärde studenterna räkna ut sin egen

optimala promillehalt och bland annat tog upp förväntningar på deras alkoholdrickande. Den andra gruppen fick en sedvanlig utbildning av tolvstegsterapeuter, också tre timmar lång, där man föreläste om faror och risker med alkohol. Den tredje gruppen fungerade som kontrollgrupp, och fick ingen ytterligare utbildning. Två år efter dessa utbildningar visade det sig att de studenter med riskfyllt alkoholbeteende som ingick i den första, kognitivt inriktade gruppen, minskade sin alkoholkonsumtion betydligt mer än kontrollgruppen. De minskade även konsumtionen mer än tolvstegsgruppen, men inte så mycket att det blev statistisk signifikant. Tolvstegsgruppen och kontrollgruppen minskade sin riskabla alkoholkonsumtion ungefär lika mycket.

Efter tre år kunde vi se att alla studenter i snitt glädjande nog minskade sin alkoholkonsumtion, oavsett vilken utbildning de fått. De studenter som låg högst i sin alkoholkonsumtion var oftare yngre i ålder, och män snarare än kvinnor.

Vi har också tittat på likheter och olikheter bland studenter i Sverige och studenter i USA, och det visar sig att deras alkoholvanor är relativt lika varandra, men att svenska studenter i snitt dricker på lite högre nivåer än amerikanska studenter. Svenska studenter som bor på korridor dricker mindre än amerikanska studenter på Greek houses, men mer än amerikanska studenter som bor på korridor. I båda länderna finns det faktorer som spelar roll för studenternas drickande: man dricker generellt på en mer riskfylld nivå om man är yngre, har högre förväntningar på alkoholens effekter, samt har alkoholproblem i familjen.

## REFERENCES

- Adewuya, A.O. (2005) Validation of the alcohol use disorders identification test (AUDIT) as a screening tool for alcohol-related problems among Nigerian university students. *Alcohol & Alcoholism*, 40(6), 575-578.
- Aertgeerts, B. & Buntinx, F. (2002) The relation between alcohol abuse or dependence and academic performance in first-year college students. *Journal of Adolescent Health*, 31, 223-225.
- Agardh, E., Moradi, T. & Allebeck, P. (2008) Riskfaktorernas bidrag till sjukdomsburden i Sverige. Jämförelse mellan svenska och WHO-data. [Contribution of the risk factors to the burden of disease in Sweden. A comparison between Swedish and WHO data.] *Läkartidningen*, 105(11), 816-821.
- Agostinelli, G., Brown, J.M. & Miller, W.R. (1995) Effects of normative feedback on consumption among heavy drinking college students. *Journal of Drug Education*, 25(1), 31-40.
- Agrawal, A., Dick, D.M., Bucholz, K.K., Madden, P.A.F., Cooper, M.L., Sher, K. & Heath, A.C. (2007) Drinking expectancies and motives: a genetic study of young adult women. *Addiction*, 103, 194-204.
- Aiken, L.S. & West, S.G. (1991) *Multiple Regression: Testing and Interpreting Interactions*. Sage, Thousand Oaks, CA.
- Alkoholinförelutredningen (2005). Gränslös utmaning - alkoholpolitik i ny tid. [Alcohol Import Inquiry. Boundless challenge – alcohol policies in a new era.], Slutbetänkande från Alkoholinförelutredningen, Stockholm. Statens Offentliga Utredningar, SOU 2005:25 Stockholm.
- Altman, D.G. (1990) *Practical Statistics for Medical Research*. Chapman & Hall/CRC, Boca Raton, FL.
- Andersson, C., Johnsson, K.O., Berglund, M. & Öjehagen, A. (2007) Alcohol involvement in Swedish university freshmen related to gender, age, serious relationship and family history of alcohol problems. *Alcohol & Alcoholism*, 42(5), 448-455.
- Andreasson, S. & Allebeck, P. (red, 2005) *Alkohol och hälsa: en kunskapsöversikt om alkoholens positiva och negativa effekter på vår hälsa*. Statens Folkhälsoinstitut, Östersund. Available online at: <http://www.fhi.se/upload/ar2005/rapporter/r200511alkoholhalsa0601.pdf>
- APA, American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, text revision edition*. APA, Washington DC: APA.



- Aradottir, S., Asanovska, G., Gjerss, S., Hansson, P. & Alling, C. (2006) Phosphatidylethanol (PEth) concentrations in blood are correlated to reported alcohol intake in alcohol-dependent patients. *Alcohol & Alcoholism*, 41 (4), 431-437.
- Arnett, J.J. (2000) Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*, 55(5), 469-480.
- Babor, T.F., Stephens, R.S. & Marlatt, G.A. (1987) Verbal report methods in clinical research on alcoholism: Response bias and its minimization. *Journal of Studies on Alcohol*, 48, 410-424.
- Babor, T.F., Steinberg, K., Anton, R. & Del Boca, F. (2000) Talk is cheap: measuring drinking outcomes in clinical trials. *Journal of Studies on Alcohol*, 61, 55-63.
- Baer, J.S. (1993) Etiology and secondary prevention of alcohol problems with young adults. In: Baer, J.S., Marlatt, G.A., McMahon, R.J. (eds.), *Addictive Behaviors across the Lifespan*, pp. 111-137. Sage, Newbury Park, CA.
- Baer, J.S., Kivlahan, D.R. & Marlatt, G.A. (1995) High-risk drinking across the transition from high-school to college. *Alcoholism: Clinical and Experimental Research*, 19(1), 54-61.
- Baer, J.S., Kivlahan, D.R., Blume, A.W., McKnight, P. & Marlatt, G.A. (2001) Brief intervention for heavy-drinking college students: 4-year follow-up and natural history. *American Journal of Public Health*, 91, 1310-1316.
- Baer, J.S. (2002) Students factors: understanding individual variation in college drinking. *Journal of Studies on Alcohol*, Suppl. 14, 40-53.
- Barry, J., Corbin, W. & Fromme, K. (2001) A review of expectancy theory and alcohol consumption. *Addiction*, 96(1), 57-72.
- Bartholow, B.D., Sher, K.J. & Krull, J.L. (2003) Changes in heavy drinking over the third decade of life as a function of collegiate fraternity and sorority involvement: a prospective, multi-level analysis. *Health Psychology*, 22(6), 616-626.
- Bendtsen, P., Johansson, K. & Åkerlind, I. (2006) Feasibility of an email-based electronic screening and brief intervention (e-SBI) to college students in Sweden. *Addictive Behaviors*, 31, 777-787.
- Bennett, M.E., McCrady, B.S., Johnson, V. & Pandina, R.J. (1999) Problem drinking from young adulthood to adulthood: patterns, predictors and outcomes. *Journal of Studies on Alcohol*, 60, 605-614.
- Berglund, M. & Öjehagen, A. (1998) The influence of alcohol drinking and alcohol use disorders on psychiatric disorders and suicidal behavior. *Alcoholism: Clinical and Experimental Research*, 22(7), 333S-345S.

- Berglund, M., Andersson, C., Johnsson, K., Öjehagen, A. (2005) Prevention av riskfylld alkoholkonsumtion hos unga vuxna. [Prevention of risky alcohol consumption in young adults.] En systematisk litteraturgenomgång inklusive metaanalyser samt förslag till åtgärder. I: Gränslös utmaning - alkoholpolitik i ny tid. Slutbetänkande från Alkoholinförelsetredningen, Stockholm. Statens Offentliga Utredningar, SOU 2005:25, pp. 525-550 + Rättelseblad p 1-4.
- Bergman, H., Källmén, H., Rydberg, U. & Sandahl, C. (1998) Tio frågor om alkohol definierar beroendeproblem [A 10-item questionnaire identifying alcohol problems was tested psychometrically at a psychiatric emergency ward]. *Läkartidningen*, 95: 4731-4737.
- Bergman, H. & Källmén, H. (2000) Befolkningens alkoholvanor enligt AUDIT-testet: en psykometrisk studie. [Alcohol use among Swedes as assessed by the Alcohol Use Disorders Identification Test (AUDIT): a psychometric study]. *Läkartidningen*, 97: 2078-2084.
- Bingham, C.R., Shope, J.T. & Tang, X. (2005) Drinking behavior from high school to young adulthood: differences by college education. *Alcoholism: Clinical and Experimental Research*, 29(12), 2170-2180.
- Bitarello do Amaral, M., Lourenço, L.M. & Ronzani, T.M. (2006) Beliefs about alcohol use among university students. *Journal of Substance Abuse Treatment*, 31, 181-185.
- Bloomfield, K., Stockwell, T., Gerhard, G. & Rehn, N. (2003) International comparisons of alcohol consumption. *Alcohol Research & Health*, 27(1), 95-109.
- Borders, T.F. & Booth, B.M. (2007) Rural, suburban and urban variations in alcohol consumption in the United States: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *National Rural Health Association*, 23(4), 314-321.
- Borsari, B. & Carey, K.B. (2000) Effects of a brief motivational intervention with college student drinkers. *Journal of Consulting and Clinical Psychology*, 68(4), 728-733.
- Brener, N.D., Hassan, S.S. & Barrios, L.C. (1999) Suicidal ideation among college students in the United States. *Journal of Consulting and Clinical Psychology*, 67(6), 1004-1008.
- Brown, S.A., Christiansen, B.A. & Goldman, M.S. (1987) The Alcohol Expectancy Questionnaire: an instrument for the assessment of adolescent and adult alcohol expectancies. *Journal of Studies on Alcohol*, 48(5), 485-91.

- Bullock, S. (2004) Alcohol, drugs and student lifestyle! A study of the attitudes, beliefs and use of alcohol and drugs among Swedish university students. SoRAD - Centre for Social Research on Alcohol and Drugs, Research Report no 21, 2004. Stockholm University, Stockholm.
- Bureau of Justice Statistics (2005) Personal crimes of violence, table 32: Percent distribution of victimizations by perceived alcohol or drug use by the offender. Available online at: <http://www.ojp.usdoj.gov/bjs/abstract/cvusst.htm> Accessed 2008-03-01.
- Burke, B.L., Arkowitz, H. & Menchola, M. (2003) The efficacy of motivational interviewing: a meta-analysis of controlled clinical trials. *Journal of Consulting and Clinical Psychology*, 71(5), 843-861.
- Caetano, R. & Babor, T.F. (2006) Diagnosis of alcohol dependence in epidemiological surveys: an epidemic of youthful alcohol dependence or a case of measurement error? *Addiction*, 101(Suppl. 1), 111-114.
- Califano, J.A. (2007) Wasting the best and the brightest: substance abuse at America's colleges and universities. The National Center on Addiction and Substance Abuse, Columbia University, NY.
- Capone, C., Wood, M.D., Borsari, B. & Laird, R.D. (2007) Fraternity and sorority involvement, social influences, and alcohol use among college students: a prospective examination. *Psychology of Addictive Behaviors*, 21(3), 316-327.
- Carey, K.B. & Correia, C.J. (1997) Drinking motives predict alcohol-related problems in college students. *Journal of Studies on Alcohol*, 58(1), 100-105.
- Carson, J., Barling, J. & Turner, N. (2007) Group alcohol climate, alcohol consumption and student performance. *Group Dynamics: Theory, Research and Practice*, 11(1), 31-41.
- Cashin, J.R., Presley, C.A. & Meilman, P. W. (1998) Alcohol use in the Greek system: follow the leader? *Journal of Studies on Alcohol*, 59, 63-70.
- Casswell, S., Pledger, M. & Pratap, S. (2002) Trajectories of drinking from 18 up to 26 years: identification and prediction. *Addiction*, 97, 1427-1437.
- Chassin, L., Pitts, S.C. & Prost, J. (2002) Binge drinking trajectories from adolescence to emerging adulthood in a high-risk sample: predictors and substance use outcomes. *Journal of Consulting and Clinical Psychology*, 70(1), 67-78.
- Christiansen, B.A., Smith, G.A., Roehling, P.V. & Goldman, M.S. (1989) Using alcohol expectancies to predict adolescent drinking behaviour after one year. *Journal of Consulting and Clinical Psychology*, 57 (1), 93-99.

- Clark, D.B., Vanyukov, M. & Cornelius, J. (2002) Childhood antisocial behavior and adolescent alcohol use disorders. *Alcohol Research and Health*, 26(2), 109-115.
- Collins, R.L., Parks, G.A. & Marlatt, G.A. (1985) Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology*, 53, 189-200.
- Cox, W.M., Gutzler, M., Denzler, M., Melfsen, S., Florin, I. & Klinger, E. (2001) Temptation, restriction, and alcohol consumption among American and German college students. *Addictive Behavior*, 25, 573-581.
- D'Alessio, M., Baiocco, R. & Laghi, F. (2006) The problem of binge drinking among Italian university students: a preliminary investigation. *Addictive Behaviors* 31, 2328-2333.
- Dawson, D.A., Grant, B.F., Stinson, F.S. & Chou, P.S. (2004) Another look at heavy episodic drinking and alcohol use disorders among college and non-college youth. *Journal of Studies on Alcohol*, 65, 477-488.
- Dawson, D.A., Grant, B.F. & Li, T.-K. (2005a) Quantifying the risks associated with exceeding recommended drinking limits. *Alcoholism: Clinical and Experimental Research*, 29(5), 902-908.
- Dawson, D.A., Grant, B.F., Stinson, F.S. & Chou, P.S. (2005b) Psychopathology associated with drinking and alcohol use disorders in the college and general adult population. *Drug and Alcohol Dependence*, 77(2), 139-50.
- Dawson, D.A., Li, T.-K. & Grant, B.F. (2008) A prospective study of risk drinking: a risk of what? *Drug and Alcohol Dependence*, 95, 62-72.
- Del Boca, F. K., Darkes, J., Goldman, M.S. & Smith, G. T. (2002) Advancing the expectancy concept via the interplay between theory and research. *Alcoholism: Clinical and Experimental Research*, 26(6), 926-935.
- Del Boca, F.K. & Darkes, J. (2003) The validity of self-reports of alcohol consumption: state of the science and challenges for research. *Addiction*, 98 (Suppl. 2), 1-12.
- Delk, E.W. & Meilman, P. W. (1996). Alcohol use among college students in Scotland compared with norms from the United States. *Journal of American College Health*, 44, 274-281.
- Derogatis, C.R., Lipman, R.S., Rickels, K., Uhlenhuth, E.H. & Covi, L. (1974) The Hopkins Symptom Checklist (HSCL). A measure of primary symptom dimensions. *Modern Problems of Pharmacopsychiatry*, 7(0), 79-110.

- Derogatis, L.R. & Melisaratos, N. (1982) The Brief Symptom Inventory: an introductory report. *Psychological Medicine*, 13(3), 595-605.
- Derogatis, L.R. & Savitz, K.L. (2000). The SCL-90-R and Brief Symptom Inventory (BSI) in primary care. In M.E. Maruish (Ed.), *Handbook of Psychological Assessment in Primary Care Settings*, pp. 297-334. Lawrence Erlbaum, Mahwah, New Jersey.
- Detels, R., McEwen, J., Beaglehole, R. & Tanaka, H. (2002) *Oxford Textbook of Public Health*, 4th ed, vol 3, pp. 1521-1531. Oxford University Press, Oxford.
- Dimeff, L.A., Baer, J.S., Kivlahan, D.R. & Marlatt, G.A. (1999) *Brief Alcohol Screening and Intervention for College Students (BASICS). A Harm Reduction Approach*. The Guildford Press, NY.
- Donovan, J.E., Jessor, R. & Jessor, L. (1983) Problem drinking in adolescence and young adulthood. A follow-up study. *Journal of Studies on Alcohol*, 44(1), 109-137.
- Drake, R.E. & Mueser, K.T. (2002) Co-occurring alcohol use disorder and schizophrenia. *Alcohol Research and Health*, 26(2), 99-102.
- Dunn, M.E., Lau, H.C. & Cruz, I.Y. (2000) Changes in activation of alcohol expectancies in memory in relation to changes in alcohol use after participation in an expectancy challenge program. *Experimental and Clinical Psychopharmacology*, 8(4), 566-575.
- Ellis, D.A., Zucker, R.A. & Fitzgerald, H.E. (1997) The role of family influences in development and risk. *Alcohol Health & Research World*, 21(3), 218-226.
- Engs, R. C., Slawinska, J. B. & Hanson, D. J. (1991). The drinking patterns of American and Polish university students: a cross-national study, *Drug and Alcohol Dependence*, 27, 167-175.
- Eriksson, A. & Olsson, B. (2004) *Alkoholvanor bland studerande. Konsumtion, konsekvenser och attityder bland högskolestuderande och övriga i åldern 19-29 år.* [Alcohol habits amongst students. Consumption, consequences and attitudes amongst college students and other in the ages 19-29 years.] SoRAD - Centre for Social Research on Alcohol and Drugs, Research Report no 19, 2004. Stockholm University, Stockholm.
- EU (2005) *Gender, culture and alcohol problems: a multi-national study. An EU – concerted action, Project Final Report, January 2005.* Bloomfield, K. (Ed). Institute for Medical Informatics, Biometrics & Epidemiology, Berlin, Germany. Available online at <http://www.genacis.org/>.
- Evans, S.M. & Levin, F.R. (2003) Response to alcohol in females with a paternal history of alcoholism. *Psychopharmacology*, 169, 10-20.

Falk, D.E., Yi, H.-Y. & Hiller-Sturmhöfel, S. (2006) An epidemiologic analysis of co-occurring alcohol and tobacco use and disorders. *Alcohol Research and Health*, 29(3), 162-171.

FHI (2005) Sammanfattning av Alkohol och Hälsa. En kunskapsöversikt om alkoholens positiva och negativa effekter på vår hälsa. Statens Folkhälsoinstitut (FHI), Östersund. Available online at: [http://www.fhi.se/upload/ar2005/rapporter/r200511alkoholhalsa\\_sammanfattn0502.pdf](http://www.fhi.se/upload/ar2005/rapporter/r200511alkoholhalsa_sammanfattn0502.pdf)

Fink, P., Jessen, J., Borgquist, L., Bredvik, J.I., Dalgard, O.S. & Sandager, I. (1995) Psychiatric morbidity in primary public health care: a Nordic multicentre investigation. *Acta Psychiatrica Scandinavica*, 92, 409-418.

Fromme, K., Stroot, E.A. & Kaplan, D. (1993) Comprehensive effects of alcohol: Development and psychometric assessment of a new expectancy questionnaire. *Psychological Assessment*, 5, 19-26.

Galanter, M. (2006) *Alcohol Problems in Adolescents and Young Adults*, chapter 2. Springer Science, NY.

Geisner, I.M., Larimer, M.E. & Neighbors, C. (2004) The relationship between alcohol use, related problems, and psychological distress: Gender as a moderator in a college sample. *Addictive Behaviors*, 29, 843-848.

Grant, B.F. (1997) Prevalance and correlates of alcohol use and DSM-IV alcohol dependence in the United States: results of the National Longitudinal Alcohol Epidemiologic Survey. *Journal of Studies on Alcohol*, 58, 464-473.

Grant, K.A., Arciniega, L.T., Tonigan, J.S., Miller, W.R. & Meyers, R.J. (1997) Are reconstructed self-reports of drinking reliable? *Addiction*, 92(5), 601-606.

Grant, B.F. & Dawson, D.A. (1998) Age of onset of drug use and its association with DSM-IV drug abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey. *Journal of Substance Abuse*, 10, 163-173.

Grant, B.F. (2000) Estimates of US children exposed to alcohol abuse and dependence in the family. *American Journal of Public Health*, 90(1), 112-115.

Grant, B.F., Stinson, F.S. & Harford, T.C. (2001) Age at onset of alcohol use and DSM-IV alcohol use and dependence: a 12-year follow-up. *Journal of Substance Abuse*, 13, 493 - 504.

Grant, J.E., Kushner, M.G. & Kim, S.W. (2002) Pathological gambling and alcohol use disorder. *Alcohol Research and Health*, 26(2), 143-150.

- Grant, B.F., Dawson, D.A., Stinson, F.S., Chou, S.P., Dufour, M.C. & Pickering, R.P. (2004a) The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991-1992 and 2001-2002. *Drug and Alcohol Dependence*, 74, 223-234.
- Grant, B.F., Stinson, F.S., Dawson, D.A., Chou, S.P., Dufour, M.C., Compton, W., Pickering, R.P. & Kaplan, K. (2004b) Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, 61(8), 807-816.
- Grant, B.F., Stinson, F.S., Dawson, D.A., Chou, S.P., Ruan, W.J. & Pickering, R.P. (2006) Co-occurrence of 12-month alcohol and drug use disorders and personality disorders in the United States. Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Research & Health*, 29(2), 121-130.
- Grant, J.D., Heath, A.C., Bucholz, K.K., Madden, P.A.F., Agrawal, A., Statham, D.J. & Martin, N.G. (2007) Spousal concordance for alcohol dependence: evidence for assortative mating or spousal interaction effects? *Alcoholism: Clinical and Experimental Research*, 31(5), 717-728.
- Greenbaum, P.E., Del Boca, F.K., Darkes, J., Wang, C-P. & Goldman, M.S. (2005) Variation in the drinking trajectories of freshmen college students. *Journal of Consulting and Clinical Psychology*, 73(2), 229-238.
- Grekin, E.R. & Sher, K.J. (2006) Alcohol dependence symptoms among college freshmen: prevalence, stability and person-environment interactions. *Experimental and Clinical Psychopharmacology*, 14(3), 329-338.
- Hanna, E.Z. & Grant, B.F. (1999) Parallels to early onset alcohol use in the relationship of early onset smoking with drug use and DSM-IV drug and depressive disorders: findings from the National Longitudinal Epidemiologic Survey. *Alcoholism: Clinical and Experimental Research*, 23(3), 513-522.
- Hansson K. (1989) Familjeklimat. En adjektivlista för familjediagnostik. [Family Climate. An adjective list for family diagnosis]. *Psykologi i tillämpning*, 7(1), 1-39.
- Hansson K. (1992) Familjen i samhället. Översättning och bearbetning av ett självförsvarsformulär konstruerat av Moos & Moos. [Family in society. Translation and work on a self-defence instrument constructed by Moos & Moos.]. Lund University, Child- and Adolescent Psychiatry, Lund.
- Hansson, H., Rundberg, J., Zetterlind, U., Johnsson, K.O. & Berglund, M. (2006) An intervention program for university students who have parents with alcohol problems: a randomized controlled trial. *Alcohol & Alcoholism*, 41(6), 655-663.



- Hansson, H., Rundberg, J., Zetterlind, U., Johnsson, K.O. & Berglund, M. (2007) Two-Year Outcome of an Intervention Program for University Students Who Have Parents With Alcohol Problems: A Randomized Controlled Trial. *Alcoholism: Clinical and Experimental Research*, 31(11), 1927-1933.
- Harford, T.C., Grant, B.F., Yi, H. & Chen, C.M. (2005) Patterns of DSM-IV alcohol abuse and dependence criteria among adolescents and adults: results from the 2001 National Household Survey on Drug Abuse. *Alcoholism: Clinical and Experimental Research*, 29(5), 810-828.
- Hartmann, S., Aradottir, S., Graf, M., Wiesbeck, G., Lesch, O., Ramskogler, K., Wolfersdorf, M., Alling, C. & Wurst, F.M. (2006) Phosphatidylethanolas a sensitive and specific biomarker – comparison with gamma-glutamyl transpeptidase, mean corpuscular volume and carbohydrate-deficient transferrin. *Addiction Biology*, 12, 81-84.
- Hasin, D. (2003) Classification of alcohol use disorders. *Alcohol Research & Health*, 27(1), 5-17.
- Hayes, J.A. (1997) What does the brief symptom inventory measure in college and university counseling center clients? *Journal of Counseling Psychology*, 44, 360-367.
- Heather, N. (1989) Psychology and brief intervention. *British Journal of Addiction*, 84, 357-370.
- Heilig, M. (2004) Biokemiska markörer.[Biochemical markers.] In *Beroendetillstånd*, pp. 71-75. Studentlitteratur, Lund.
- Helling, S. (2005) Alkohol- och narkotikamissbruk bland invandrare. [Alcohol and drug misuse among immigrants.] CAN Rapport Nr 88. Centralförbundet för alkohol- och narkotikaupplysning, Stockholm. Available online at: <http://www.can.se/documents/CAN/Rapporter/rapportserie/CAN-rapportserie-88-alkohol-och-narkotikamissbruk-bland-invandrare.pdf>
- Hemström, Ö. (2001) Per capita alcohol consumption and ischaemic heart disease mortality. *Addiction*, 96 (Suppl. 1), S93-S112.
- Hill, K.G., White, H.R., Chung, I.J., Hawkins, J.D. & Catalano, R.F. (2000). Early adult outcomes of adolescent binge drinking: person- and variable-centered analyses of binge drinking trajectories. *Alcohol: Clinical and Experimental Research*, 24(6), 892-901.
- Hingson, R., Heeren, T., Winter, M. & Wechsler, H. (2005) Magnitude of alcohol-related mortality and morbidity among US college students ages 18-24: changes from 1998 to 2001. *Annual Review of Public Health*, 26, 259-279.



Hingson, R.W., Heeren, T. & Winter, M.R. (2006) Age at drinking onset and alcohol dependence. Age of onset, duration and severity. *Archives of Pediatrics & Adolescent Medicine*, 160, 739-746.

Hjern, A. & Allebeck, P. (2004) Alcohol-related disorders in first-and second-generation immigrants in Sweden: a national cohort study. *Addiction*, 99, 229-236.

Hurlbut, S.C. & Sher, K.J. (1992) Assessing alcohol problems in college students. *Journal of American College Health*, 41, 49-58.

ICAP, International Center for Alcohol Policies (2003) ICAP Reports 14: International Drinking Guidelines. ICAP, Washington, DC. Available online at: [http://www.icap.org/portals/0/download/all\\_pdfs/ICAP\\_Reports\\_English/report14.pdf](http://www.icap.org/portals/0/download/all_pdfs/ICAP_Reports_English/report14.pdf)

Jaccard, J., Turrisi, R. & Wan, C.K. (1995) Interaction effects in multiple regression. Sage, Newbury Park, CA.

Jackson, K.M., Sher, K.J., Gotham, H.J. & Wood, P.K. (2001) Transitioning into and out of large-effect drinking in young adulthood. *Journal of Abnormal Psychology*, 110(3), 378-391.

Jarl, J., Johansson, P., Eriksson, A., Eriksson, M., Gerdtham, U.G., Hemström, Ö., Selin, K.H. & Ramstedt, M (2006) Till vilket pris? Om alkoholens kostnader och hälsoeffekter i Sverige 2002 [At what price? Regarding the costs and health effects of alcohol in Sweden 2002]. SoRAD, Forskningsrapport nr 37, Stockholm.

Jefferis, B.J.M.H., Power, C. & Manor, O. (2005) Adolescent drinking level and adult binge drinking in a national birth cohort. *Addiction*, 100, 543-549.

Johnson, A. (2006) Miljarder! Alkoholens samhällsekonomiska kostnad, en jämförelse mellan två studier. [Billions! The alcohol's cost of the society, a comparison between two studies.] IOGT-NTO, Stockholm.

Johnson, T.J., Shetts, V.L. & Kristeller, J.L. (2008) Identifying mediators of the relationship between religiousness/spirituality and alcohol use. *Journal of Studies on Alcohol and Drugs*, 69(1), 160-170.

Johnsson, K.O. & Berglund, M. (2003) Education of key personnel in student pubs leads to a decrease in alcohol consumption among the patrons: a randomized controlled trial. *Addiction*, 98(5), 627-633.

Johnsson, K.O. & Berglund, M. (2006) Comparison between a cognitive behavioural alcohol programme and post-mailed minimal intervention in high-risk drinking university freshmen: results from a randomized controlled trial. *Alcohol & Alcoholism*, 41(2), 174-180.

- Johnsson, K.O., Leifman, A. & Berglund, M. (2008) College students' drinking patterns: trajectories of AUDIT scores during the first four years at university. *European Addiction Research*, 14(1), 11-18.
- Johnston, L.D., O'Malley, P. M., Bachman, J.G. & Schulenberg, J.E. (2007). *Monitoring the Future national survey results on drug use, 1975–2006: Volume II, College students and adults ages 19–45*. National Institute on Drug Abuse. Bethesda, MD. NIH Publication No. 07-6206.
- Jones, B.T., Corbin, W. & Fromme, K. (2001) A review of expectancy theory and alcohol consumption. *Addiction*, 96, 57-72.
- Jones, S.E., Oeltmann, J., Wilson, T.W., Brener, N.D. & Hill, C.V. (2001) Binge drinking among undergraduate college students in the United States: implications for other substance use. *Journal of American College Health*, 50(1), 33-38.
- Kass, R.E. & Wasserman, L. (1995). A reference Bayesian test for nested hypotheses and its relationship to the Schwarz criterion. *Journal of American Statistical Association*, 90, 928-934.
- Kerr-Corrêa, F., Igami, T.Z., Hiroce, V & Tucci, A.M. (2007) Patterns of alcohol use between genders: a cross-cultural evaluation. *Journal of Affective Disorders*, 102, 265-275.
- Kivlahan, D.R., Marlatt, G.A., Fromme, K., Coppel, D.B. & Williams, E. (1990) Secondary prevention with college drinkers: evaluation of an alcohol skills training program. *Journal of Consulting and Clinical Psychology*, 58(6), 805-810.
- Knight, J.R., Wechsler, H., Kuo, M., Seibring, M., Weitzman, E.R. & Schuckit, M.A. (2002) Alcohol abuse and dependence among U.S. college students. *Journal of Studies on Alcohol*, 63, 263-270.
- Kypri, K., Langley, J.D., McGee, R., Saunders, J.B. & Williams, S. (2002) High prevalence, persistent hazardous drinking among New Zealand tertiary students. *Alcohol & Alcoholism*, 37(5), 457-464.
- Kypri, K., Saunders, J.B., Williams, S.M., McGee, R.O., Langley, J.D., Cashell-Smith, M.L. & Gallagher, S.J. (2004) Web-based screening and brief intervention for hazardous drinking: a double-blind randomized controlled trial. *Addiction*, 99, 1410-1417.
- Kypri, K., Langley, J.D., Saunders, J.B. & Cashell-Smith, M.L. (2006a) Assessment may conceal therapeutic benefit: findings from a randomized controlled trial for hazardous drinking. *Addiction*, 102, 62-70.

Kypri, K., Voas, R.B., Langley, J.D., Stephenson, S.C.R., Begg, D.J., Tippetts, A.S. & Davies, G.S. (2006b) Minimum purchasing age for alcohol and traffic crash injuries among 15- och 19-year olds in New Zealand. *American Journal of Public Health*, 96(1), 126-131.

Köhnke, M.D. (2008) Approach to the genetics of alcoholism: a review based on pathophysiology. *Biochemical Pharmacology*, 75, 160-177.

Larimer, M.E., Turner, A.P., Anderson, B.K., Fader, J.S., Kilmer, J.R., Palmer, R.S. & Cronce, J.M. (2001) Evaluating a brief alcohol intervention with fraternities. *Journal of Studies on Alcohol*, 62, 370-380.

Larimer, M.E. & Cronce, J.M. (2002) Identification, prevention and treatment: a review of individual-focused strategies to reduce problematic alcohol consumption by college students. *Journal on Studies of Alcohol*, 14, 148-163.

Larimer, M.E., Turner, A.P., Mallett, K.A. & Geisner, I.M. (2004) Predicting drinking behavior and alcohol-related problems among fraternity and sorority members: examining the role of descriptive and injunctive norms. *Psychology of Addictive Behaviors*, 18(3), 203-212.

Larimer, M.E. & Cronce, J.M. (2007) Identification, prevention and treatment revisited: individual-focused college drinking prevention strategies 1999-2006. *Addictive Behaviors*, 32, 2439 - 2468.

Larimer, M.E., Lee, C.M., Kilmer, J.R., Fabiano, P.M., Stark, C.B., Geisner, I.M., Mallett, K.A., Lostutter, T.W., Cronce, J.M., Feeney, M. & Neighbors, C. (2007) Personalized mailed feedback for college drinking prevention: a randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 75(2), 285-293.

Leifman, H. (2003) Vilka dricker mer alkohol i Sverige? En studie av konsumtionstrender bland män och kvinnor och i olika åldersgrupper under perioden 1990 till 2002. *Nordisk Alkohol & Narkotikatidskrift*, 20(2-3), 159-179.

Leigh, C.B. & Stacy, A.W. (2004) Alcohol expectancies and drinking in different age groups. *Addiction*, 99, 215-227.

Levy, B. & Earleywine, M. (2003) Reinforcement expectancies for studying predict drinking problems among college students: Approaching problem drinking from an expectancies choice perspective. *Addictive Behaviors*, 28, 551-559.

Lopez, A.D., Mathers, C.D., Ezzati, M., Jamison, D.T. & Murray, C.J.L. (2006) *Global burden of disease and risk factors*. Oxford University Press and The World Bank, NY.

- Marlatt, G.A., Baer, J.S. & Larimer M.E. (1995) Preventing alcohol abuse in college students: A harm-reduction approach. In Boyd, G., Howard, J. & Zucker, R. (Eds.) *Alcohol problems among adolescents*, pp. 147-172. Lawrence Earlbaum, Northvale, NJ.
- Marlatt, G.A., Baer, J.S., Kivlahan, D.R., Dimeff, L.A., Larimer, M.E., Quigley, L.A., Somers, J.M. & Williams, E. (1998) Screening and brief intervention for high-risk college student drinkers: results from a 2-year follow-up assessment. *Journal of Consulting and Clinical Psychology*, 66(4), 604-615.
- Martens, M.P., Cox, R.H. & Beck, N.C. (2003) Negative consequences of intercollegiate athlete drinking: the role of drinking motives. *Journal of Studies on Alcohol*, 64(6), 825-828.
- McCabe, S.E., Schulenberg, J.E., Johnston, L.D., O'Malley, P.M., Bachman, J.G. & Kloska, D.D. (2005) Selection and socialization effects of fraternities and sororities on US college student substance abuse: a multi-cohort national longitudinal study. *Addiction*, 100, 512-524.
- McCambridge, J. & Day, M. (2008) Randomized controlled trial of the effects of completing the Alcohol Use Disorders Identification Test questionnaire on self-reported hazardous drinking. *Addiction*, 103, 241-248.
- McCarthy, D.M. & Smith, G.T. (1996) Meta-analysis of alcohol expectancy (abstract). *Alcoholism: Clinical and Experimental Research*, Suppl., 20:42A.
- McGee, R. & Kypri, K. (2004) Alcohol-related problems experiences by university students in New Zealand. *Australian and New Zealand Journal of Public Health*, 28(4), 321-323.
- McNally, A.M., Palfai, T.P. & Kahler, C.W. (2005) Motivational interventions for heavy drinking college students: examining the role of discrepancy-related psychological processes. *Psychology of Addictive Behaviors*, 19(1), 79-87.
- Merikangas, K.R., Prusoff, B.A. & Weissman, M.M. (1988) Parental concordance for affective disorders: psychopathology in offspring. *Journal of Affective Disorders*, 15, 279-290.
- Meyers, R.J., Miller, W.R., Smith, J.E. & Tonigan, J.S. (2002) A randomized trial of two methods for engaging treatment-refusing drug users through concerned significant others. *Journal of Consulting and Clinical Psychology*, 70(5), 1182-1185.
- Michalak, L., Trocki, K. & Bond, J. (2007) Religion and alcohol in the US National Alcohol Survey: How important is religion for abstinence and drinking? *Drug and Alcohol Dependence*, 87, 268-280.

- Miles Cox, W., Hosier, S.G., Crossley, S., Kendall, B. & Roberts, K.L. (2006) Motives for drinking, alcohol consumption, and alcohol-related problems among British secondary school and university students. *Addictive Behaviors*, 31, 2147-2151.
- Miller, W.R. & Marlatt, G.A. (1987) Brief Drinker Profile. Psychological Assessment Resources, Odessa, FL.
- Miller, W.R., Tonigan, J.S. & Longabaugh, R. (1995) The Drinker Inventory of Consequences (DrInC): An Instrument for Assessing Adverse Consequences of Alcohol Abuse. Project MATCH Monograph Series, Vol. 4. National Institute on Alcohol Abuse and Alcoholism, Rockville, MD.
- Miller, W.R. (1998) Researching the spiritual dimensions of alcohol and other drug problems. *Addiction*, 93(7), 979-990.
- Miller, W.R., Meyers, R.J. & Tonigan, J.S. (1999) Engaging the unmotivated in treatment for alcohol problems: a comparison of three strategies for intervention through family members. *Journal of Consulting and Clinical Psychology*, 67(5), 688-697.
- Moos, R.H. & Moos, B. (1994) Family Environment Scale Manual: Development, Applications, Research. Third Ed. Consulting Psychologist Press, Palo Alto, CA.
- Murphy, J.G., Duchnick, J.J., Vuchinich, R.E., Davison, J.W., Karg, R.S., Olson, A.M., Smith, A.F. & Coffey, T.T. (2001) Relative efficacy of a brief motivational intervention for college student drinkers. *Psychology of Addictive Behaviors*, 15(4), 373-379.
- Murphy, J.G., Hoyme, C.K., Colby, S.M. & Borsari, B. (2006) Alcohol consumption, alcohol-related problems, and quality of life among college students. *Journal of College Student Development*, 47(1), 110-121.
- Murray, C.J.L., Salomon, J.A., Mathers, C.D. & Lopez, A.D. (eds., 2002). Summary measures of population health: concepts, ethics, measurement and applications. WHO, Geneva.
- Muthén, B.O. & Muthén, L.K. (2000) The development of heavy drinking and alcohol-related problems from ages 18 to 37 in a U.S. national sample. *Journal of Studies on Alcohol*, 61, 290-300.
- Mäkelä, P. (1999) Alcohol-related mortality as a function of socio-economic status. *Addiction*, 94(6), 867-886.
- Nagin, D. S. (1999). Analyzing developmental trajectories: a semiparametric, group-based approach. *Psychological Methods* 4(2), 139-157.
- Naimi, T.S., Brewer, R.D., Mokdad, A., Denny, C., Serdula, M.K. & Marks, J.S. (2003) Binge drinking among US adults. *JAMA*, 289(1), 70-75.

- Natarajan, M. & Kaner, E. (2007) Brief alcohol interventions in young people: evidence and applicability. In Gilvarry, E. & McCardle, P. (Eds.) *Alcohol, Drugs and Young people: Clinical Approaches* (chapter 15). *Clinics in Developmental Medicine*, no. 172, The Lavenham Press Ltd, Lavenham, Suffolk.
- Neighbors, C., Palmer, R.S. & Larimer, M.E. (2004) Interest and participation in a college student alcohol intervention study as a function of typical drinking. *Journal of Studies on Alcohol*, 65(6), 736-740.
- Neumann, T. & Spies, C. (2003) Use of biomarkers for alcohol use disorders in clinical practice. *Addiction*, 98(Suppl. 2), 81-91.
- NHTSA, National Highway Traffic Safety Administration (1994). *Computing a BAC Estimate*. Department of Transportation, National Highway Traffic Safety Administration, Washington DC.
- NHTSA, National Highway Traffic Safety Administration (2005) *Traffic Safety Facts 2005 Alcohol*, Publication No. 810616. NHTSA's Center for Statistics and Analysis, Washington DC. Available online at <http://www-nrd.nhtsa.dot.gov/Pubs/810616>.
- NIAAA, National Institute on Alcohol Abuse and Alcoholism (2002) *A call to action: changing the culture of drinking at US colleges*. Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism. Publication No. 02-5010. Available online at: <http://www.collegedrinkingprevention.gov/media/TaskForceReport.pdf>.
- NIAAA, National Institute on Alcohol Abuse and Alcoholism (2005) *Helping patients who drink too much: a clinician's guide*. Available online at: [http://pubs.niaaa.nih.gov/publications/Practitioner/CliniciansGuide2005/clinicians\\_guide.htm](http://pubs.niaaa.nih.gov/publications/Practitioner/CliniciansGuide2005/clinicians_guide.htm).
- NIAAA, National Institute on Alcohol Abuse and Alcoholism (2007) *What colleges need to know now. An update on college drinking research*. NIH Publication No. 07-5010.
- Nutt, D., King, L.A., Saulsbury, W. & Blakemore, C. (2007) Development of a rational scale to assess the harm of drugs of potential misuse. *Lancet*, 369, 1047-1053.
- O'Neill, S.E., Parra, G.R. & Sher, K.J. (2001) Clinical relevance of heavy drinking during the college years: cross-sectional and prospective studies. *Psychology of Addictive Behaviors*, 15(4), 350-359.
- Patock-Peckhan, J.A., Hutchinson, G.T., Cheong, J. & Nagoshi, C.T. (1998) Effect of religion and religiosity on alcohol use in a college student sample. *Drug and Alcohol Dependence*, 49, 81-88.
- Perkins, H.W., Meilman, P.W., Liechliter, J.S., Cashin, J.R. & Presley, C.A. (1999) Misperceptions of the norms for the frequency of alcohol and other drug use on college campuses. *Journal of American College Health*, 47(6), 253-269.

- Peugh, J.L. & Enders, C.K. (2005) Using the SPSS mixed procedure to fit cross-sectional and longitudinal multilevel models. *Educational and Psychological Measurement*, 65(5), 717-741.
- Prentice, D.A. & Miller, D.T. (1993) Pluralistic ignorance and alcohol use on campus: Some consequences of misperceiving the social norm. *Journal of Personality and Social Psychology*, 64(2), 243-256.
- Randall, C.L., Thomas, S. & Thevos, A.K. (2001) Concurrent alcoholism and social anxiety disorder: a first step toward developing effective treatments. *Alcohol Research and Health*, 26(2), 210-220.
- Rollnick, S. & Miller, W.R. (1995) What is motivational interviewing? *Behavioural and Cognitive Psychotherapy*, 23, 325-334.
- Rossow, I. & Romelsjö, A. (2006) The extent of the "prevention paradox" in alcohol problems as a function of population drinking patterns. *Addiction*, 101, 84-90.
- Rundberg, J., Lidfeldt, J., Nerbrand, C., Samsoie, G., Romelsjö, A. & Öjehagen, A. (2007) Abstinence, occasional drinking and binge drinking in middle-aged women. In: *Alcohol Use and Mental Health in Middle-aged Women. Women's Health in Lund Area, A Swedish Population-Based Study*. Rundberg, J. Doctoral thesis, Lund University, Lund.
- Salaspuro, M. (2003). Intervention against hazardous alcohol consumption – secondary prevention of alcohol problems in *Treating Alcohol and Drug Abuse, an evidence based review* (Berglund M, Thelander S, Jonsson E eds), pp. 28-29. Wiley-VCH, Germany.
- Saunders, J.B., Aasland, O.G., Babor, T.F., de la Fuente, J.R. & Grant, M. (1993) Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption--II. *Addiction*, 88(6), 791-804.
- Schröder, C.M. & Prentice, D.A. (1998) Exposing pluralistic ignorance to reduce alcohol use among college students. *Journal of Applied Social Psychology*, 28(23), 2150-2180.
- Schuckit, M.A. & Smith, T.L. (1996) An 8-year follow-up of 450 sons of alcoholic and control subjects. *Archives of General Psychiatry*, 53(3), 202-210.
- Schuckit, M.A., Smith, T.L., Kalmijn, J., Tsuang, J., Hesselbrock, V. & Bucholz, K. (2000a) Response to alcohol in daughters of alcoholics: a pilot study and a comparison with sons of alcoholics. *Alcohol & Alcoholism*, 35(3), 242-248.
- Schuckit, M.A., Smith, T.L., Radzimirski, S. & Heyneman, E.K. (2000b) Behavioral symptoms and psychiatric diagnoses among 162 children in nonalcoholic or alcoholic families. *American Journal of Psychiatry*, 157, 1881-1883.



- Schulenberg, J., Wadsworth, K.N., O'Malley, P.M., Bachman, J.G. & Johnston, L.D. (1996a) Adolescent risk factors for binge drinking during the transition to young adulthood: variable- and pattern-centered approaches to change. *Developmental Psychology*, 32(4), 659-674.
- Schulenberg, J., O'Malley, P.M., Bachman, J.G., Wadsworth, K.N. & Johnston, L.D. (1996b) Getting drunk and growing up: trajectories of frequent binge drinking during the transition to young adulthood. *Journal of Studies on Alcohol*, 57, 289-304.
- Schulenberg, J., Maggs, J.L., Long, S.W.L., Sher, K.J., Gotham, H.J., Baer, J.S., Kivlahan, D.R., Marlatt, G.A. & Zucker, R.A. (2001) The problem of college drinking: insights from a developmental perspective. *Alcoholism: Clinical and Experimental Research*, 25(3), 473-477.
- Schwarz, G. (1978). Estimating dimensions of a model. *Annals of Statistics*, 6, 461-464.
- Sechi, G. & Serra, A. (2007) Wernicke's encephalopathy: new clinical settings and recent advances in diagnosis and management. *Lancet Neurology*, 6, 442-455.
- Sher, K.J. & Gotham, H.J. (1999) Pathological alcohol involvement: a developmental disorder of young adulthood. *Development and Psychopathology*, 11, 933-956.
- Shults, R.A., Elder, R.W., Sleet, D.A., Nichols, J.L., Alao, M.O., Carande-Kulis, V.G., Zaza, S., Sosin, D.M., Thompson, R.S. (2001) Reviews of evidence regarding interventions to reduce alcohol-impaired driving. *American Journal of Preventive Medicine*, 21 (4 Suppl.), 66-88.
- Sjögren, H., Eriksson, A. & Ahlm, K. (2000) Role of alcohol in unnatural deaths: a study of all deaths in Sweden. *Alcoholism: Clinical and Experimental Research*, 24(7), 1050-1056.
- Skog, O.-J. (1999) The prevention paradox revisited. *Addiction*, 94(5), 751-757.
- Slutske, W.S. (2005) Alcohol use disorders among US college students and their non-college-attending peers. *Archives of General Psychiatry*, 62(3), 321-327.
- Smith, G.T., Goldman, M.S., Greenbaum, P.E. & Christiansen, B.A. (1995a) Expectancy for social facilitation from drinking: the divergent paths of high-expectancy and low-expectancy adolescents. *Journal of Abnormal Psychology*, 104 (1), 32-40.
- Smith, G.T., McCarthy, D.M. & Goldman, M.S. (1995b) Self-reported drinking and alcohol-related problems among early adolescents: dimensionality and validity over 24 months. *Journal on Studies of Alcohol*, 56, 383-394.



- Smith, B.H., Molina, B.S.G. & Pelham, W.E. (2002) The clinically meaningful link between alcohol use and attention deficit hyperactivity disorder. *Alcohol Research and Health*, 26(2), 122-129.
- Sonne, S.C. & Brady, K.T. (2002) Bipolar disorder and alcoholism. *Alcohol Research and Health*, 26(2), 103-108.
- SoRAD Centrum för socialvetenskaplig alkohol- och drogforskning [Centre for Social Research on Alcohol and Drugs] (2006) Alkoholkonsumtionen i Sverige fram till år 2005. Forskningsrapport nr. 39. Stockholm.
- SoRAD Centrum för socialvetenskaplig alkohol- och drogforskning [Centre for Social Research on Alcohol and Drugs] (2007) Alkoholkonsumtionen i Sverige fram till år 2006. Forskningsrapport nr 48. Stockholm.
- Statistics Sweden (2007a) Populations statistics: dads are three years older than mums. Press release from Statistics Sweden. 2007-03-15. Available online at [http://www.scb.se/templates/pressinfo\\_\\_\\_\\_196461.asp](http://www.scb.se/templates/pressinfo____196461.asp), accessed 2008-03-17.
- Statistics Sweden (2007b) Level of education by age and sex. Available online at <http://www.scb.se/statistik/UF/UF0506/2007A01/Tab9e.xls>, accessed 2008-03-17.
- Stinson, F.S., Grant, B.F., Dawson, D.A., Ruan, W.J., Huang, B. & Saha, T. (2005) Comorbidity between DSM-IV alcohol and specific drug use disorder in the United States. *Drug and Alcohol Dependence*, 80(1), 105-116.
- Söderlind, M. & Johnsson, B. (2004) Familjeklimat, en validering [Family climate, a validation]. Lund University, Lund.
- Tabachnick, B.G. & Fidell, L.S. (2007) Using multivariate statistics. Fifth ed. Pearson Education, Boston, MA.
- Tucker, J.S., Orlando, M. & Ellickson, P.L. (2003) Patterns and correlates of binge drinking trajectories from early adolescence to young adulthood. *Health Psychology*, 22(1), 79-87.
- Vaillant, G.E. (2003) A 60-year follow-up of alcoholic men. *Addiction*, 98(8), 1043-1051.
- Vägverket [Swedish Road Administration] (2007) Alkohol, droger och trafik [Alcohol, drugs and traffic], Vägverket, Borlänge. Available online at [http://publikationswebbutik.vv.se/upload/1745/88294\\_alkohol\\_droger\\_och\\_trafik\\_utg5.pdf](http://publikationswebbutik.vv.se/upload/1745/88294_alkohol_droger_och_trafik_utg5.pdf)
- Wallace, J.M.Jr., Bachman, J.G., O'Malley, P.M., Schulenberg, J.E., Cooper, S.M. & Johnston, L.D. (2003) Gender and ethnic differences in smoking, drinking and illicit drug use among American 8th, 10th and 12th grade students, 1976-2000. *Addiction*, 98(2), 225-234.

- Walters, S.T. & Neighbors, C. (2005) Feedback interventions for college alcohol misuse: what, why and for whom? *Addictive Behaviors*, 30, 1168-1182.
- Wears, R.L. (2002) Advanced statistics: statistical methods for analyzing cluster and cluster-randomized data. *Academic Emergency Medicine*, 9(4), 330-341.
- Webb, E., Ashton, C.H., Kelly, P. & Kamali, F. (1996) Alcohol and drug use in UK university students. *Lancet*, 348, 922-925.
- Wechsler, H., Lee, J.E., Kuo, M. & Lee, H. (2000) College binge drinking in the 1990s: a continuing problem. Results from the Harvard School of Public Health 1999 College Alcohol Study. *Journal of American College Health*, 48, 199-210.
- Wechsler, H., Lee, J.E., Kuo, M., Seibring, M., Nelson, T.F. & Lee, H. (2002) Trends in college binge drinking during a period of increased prevention efforts. Findings from four Harvard School of Public Health College Alcohol Study Surveys: 1993-2001. *Journal of American College Health*, 50(5), 203-217.
- White, H.R. & Labouvie, E.W. (1989) Towards the assessment of adolescent problem drinking. *Journal of Studies on Alcohol*, 50, 30-37.
- White, A.M., Kraus, C.L. & Swartzwelder, H.C. (2006) Many college freshmen drink at levels far beyond the binge threshold. *Alcoholism: Clinical and Experimental Research*, 30(6), 1006-1010.
- WHO, World Health Organization (1993). *International Statistical Classification of Diseases and Related Health Problems*. Tenth Edition. WHO, Geneva.
- WHO, World Health Organization (2003) *Environmental burden of disease series*, no. 1. Prüss-Üstün, A (ed). *Protection of the human environment*, WHO, Geneva.
- WHO, World Health Organization (2004) *Global Status Report on Alcohol*. Department of Mental Health and Substance Abuse, WHO, Geneva.
- 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, 1546-1563.
- Williams, J., Powell, L.M. & Wechsler, H. (2002) Does alcohol consumption reduce human capital accumulation? Evidence from the College Alcohol Study. *ImpacTeen*, Research Paper Series, no 18. University of Illinois, Chicago, IL.
- Windle, M. (2003) Alcohol use among adolescents and young adults. *Alcohol Research and Health*, 27(1), 79-85.
- Windle, M., Mun, E. Y. & Windle, R.C. (2005) Adolescent-to-young adulthood heavy drinking trajectories and their prospective predictors. *Journal of Studies on Alcohol*, 66, 313-322.

- Winters, K.C., Stinchfield, R.D., Henly, G.A. & Schwartz, R.H. (1990) Validity of adolescent self-report on alcohol and other drug-involvement. *International Journal of Addiction*, 25(11A), 1379-1395.
- Wood, P.K., Sher, K.J., Erickson, D.J. & DeBord K.A. (1997) Predicting academic problems in college from freshmen alcohol involvement. *Journal of Studies on Alcohol*, 58(2), 200-210.
- Wood, A.M., White, I.R. & Thompson, S.G. (2004) Are missing outcome data adequately handled? A review of published randomized controlled trials in major medical journals. *Clinical Trials*, 1(4), 368-76.
- Yu, J. & Shacket, R.W. (1998) Long-term change in underage drinking and impaired driving after the establishment of drinking age laws in New York state. *Alcoholism: Clinical and Experimental Research*, 22(7), 1443-1449.
- Yu, J. & Shacket, R.W. (2001) Alcohol use in high school: predicting students' alcohol use and alcohol problems in four-year colleges. *The American Journal of Drug and Alcohol Abuse*, 27(4), 775-793.
- Zhou, Q., King, K.M. & Chassin, L. (2006) The roles of familial alcoholism and adolescent familyharmony in young adults' substance dependence disorders: mediated and moderated relations. *Journal of Abnormal Psychology*, 115(2), 320-331.
- Zucker, R.A. (2006) Alcohol use and the alcohol use disorders: a developmental-biopsychosocial systems formulation covering the life course. In Ciccheii, D. & Cohen, D.J. (Eds.) *Developmental Psychopathology. Risk, disorder and adaptation*, vol 3. 2nd Ed, pp. 620-656. Wiley, Hoboken, NJ.
- Öjesjö, L. (2000) The recovery from alcohol problems over the life course: the Lundby longitudinal study, Sweden. *Alcohol*, 22(1), 1-5.



## ACKNOWLEDGEMENTS

To **Mats**, my supervisor. Thank you for always encouraging me and stimulating me by leaving me with a wish to do just a little bit better. It works. Thank you for letting me develop independently and to try my wings. I am very seldom impressed by people because of their knowledge. You're one of the exceptions.

To **my father**, who taught me about the importance of knowledge. I wish you could have been here.

To the rest of my family. To **my mother**, my first supporter. Thank you for infusing me with the spirit that I can do anything. To **Christian** and **Eleonora**, for keeping me down to earth. To **Gabriella**, for making me strive to be more creative. To **Mimi, Anders, Anna, Ahmed, Eddie, Nille, Niklas, Nea** and **Erik**, for making me feel safe and complete.

To **my colleagues in Malmö**, for making me feel part of the team, and for making me laugh. How boring the stays in Malmö would have been without our discussions!

To **Örjan** and **Lars**, for daring to hire me although I'm doing "something with alcohol", and for encouraging me to learn new things. To all the **Radiologists** and **staff** at the Radiology Clinic, for making me long for each new working day.

To all my **dear, dear friends**. Thank you for dragging me away from work and research and for not falling sleep when I continue talking about it. Thank you for making me happy and grateful to be me - how can you not be, with such friends?

To the persons who rarely get a mentioning, but without whom my research would have been much harder. To "my" **statisticians** (oh, what wouldn't I give to have a personal one?). To **Leslie Walke**, my British mr Gem.

To all **my fellow researchers** whom I've met throughout meetings and conferences, for all academical stimulation.

To Clinical Alcohol Research, Lund University and the Academy of Healthcare, Jönköping County Council for the financial support.

But mostly, to **Marcus**. Simply because I love you.

