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**ALCOHOL CONSUMPTION AND  
ALCOHOL-RELATED HARM  
AMONG YOUNG PEOPLE:  
STUDIES OF THE RECENT  
EXPERIENCE IN SWEDEN**

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## ABSTRACT

**Background:** The starting point for this thesis was the unexpected development in recent trends in youth drinking and harm in Sweden which seemed to question some basic assumptions of the total consumption model. For example, rapidly falling youth consumption and rising non-drinking rates were seen despite higher availability and increasing population drinking. Furthermore, although drinking declined among young people, there were some indications that alcohol-related harm increased, at least in terms of alcohol-related hospitalisations.

**Objective:** The overall aim of the thesis is to examine changes in alcohol consumption and harm among young people in Sweden with a focus on experiences during the last decades. In particular, the thesis has focus on the following main topics; (I) the association between consumption of illegal alcohol and alcohol-related harm (hospitalisations) among young people, (II) the association between population drinking, adolescents' binge drinking and harm (violence), (III) the degree of collectivity of drinking among youth and (IV) determinants of non-drinking among young people in Sweden in a European comparative perspective.

**Method:** The thesis is based on four articles. Articles I and II use aggregate time series analysis (ARIMA-modeling) to assess the association between consumption of illegal alcohol and alcohol-related hospitalizations (article I) and the association between binge drinking and violence among youth as well as the association between binge drinking and population drinking (article II). In the third article the respondents are divided into seven drinking groups based on their relative ranking on consumption to examine whether the decline in consumption was mirrored in all drinking groups during the period 2000-2012. In article IV logistic regression models were used to examine the association between non-drinking and demographic and social factors among six European countries.

**Results:** No significant effect was found between consumption of smuggled alcohol and alcohol-related hospitalizations when the model was adjusted for average consumption (article I). This indicates that the amount of alcohol matters more for the risk of harm than where the alcohol comes from. In article II there was evidence for an association between binge drinking and violence among young people during a confined study period (1971-2000) but most of these estimates became non-significant during the full study period (1971-2009). Similar results were found for the association between per capita consumption and binge drinking among young people. In article III support for collectivity of drinking behavior among Swedish youth during the period 2000-2012 was found since the decline in consumption was mirrored in all seven drinking groups examined. Furthermore, there was a marked relation between overall consumption on the one hand and mean consumption and heavy episodic drinking on the other in each of the seven drinking groups. In article IV no clear pattern of national differences could be found with respect to which factors were associated with non-drinking among youth. However, having non-drinking friends was an important factor in all countries.

**Discussion and conclusion:** A main conclusion of the thesis is that the total consumption model is in general a useful perspective for understanding aggregate level changes in youth drinking and harm in Sweden. Per capita consumption among young people was related to alcohol-related hospitalizations and there was strong evidence for

collectivity in changes in drinking among Swedish youth during the recent decade. However, all results did not support the notion of collectivity; for instance, the aggregate link between alcohol and violence seems to have become weaker, suggesting that the assumptions of the model do not apply universally.

## LIST OF PUBLICATIONS

- I. Svensson, J. (2012) Alcohol consumption and harm among adolescents in Sweden: Is smuggled alcohol more harmful? *Journal of Child & Adolescent Substance Abuse*, 21, 167–180.
- II. Svensson, J. & Landberg, J. (2013) Is youth violence temporally related to alcohol? A time-series analysis of binge drinking, youth violence and total alcohol consumption in Sweden, *Alcohol and Alcoholism*, 48(5), 598–604.
- III. Norström, T. & Svensson, J. (2013) The declining trend in Swedish youth drinking: Collectivity or polarization? Submitted manuscript.
- IV. Svensson, J., Ramstedt, M., Skärstrand, E. (2013) Determinants of non-drinking among European adolescents: A cross-cultural comparison. Manuscript.

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## LIST OF ABBREVIATIONS

ARIMA	Autoregressive Integrated Moving Average
BAC	Blood Alcohol Concentration
BRÅ	Swedish National Council for Crime Prevention
CAN	Swedish Council for Information on Alcohol and Other Drugs
EFE	European Family Empowerment Project
ESPAD	European School Survey Project on Alcohol and Other Drugs
EU	European Union
FAS	Swedish Council for Working Life and Social Research
ICD	International Classification of Diseases
HED	Heavy Episodic Drinking
QF	Quantity–Frequency scale
RBS	Responsible Beverage Service
SCB	Statistics Sweden
SoRAD	Centre for Social Research on Alcohol and Drugs
STAD	Stockholm Prevents Alcohol and Drug Problems
WHO	World Health Organization
ULF	Living Conditions Survey
ViF	Variance inflation factor





# 1 INTRODUCTION

Swedish society has long been concerned about alcohol consumption and alcohol-related harms among young people. For example, the 1944 sobriety committee already paid particular attention to the youth's alcohol habits, and it can be argued that young people have since been a key target group of Swedish alcohol policy (Johansson, 2008). However, the cause for concern at the time was the increasing consumption among youth compared to the older cohorts rather than the risk of harm as is the case today. In contemporary society, alcohol use and abuse among youth is viewed as a public health problem with far-reaching implications for the adolescents themselves as well as for society in general (Spoth *et al.*, 2002). Early onset of drinking has been shown to be associated with both short-term implications (such as accidents, violence and suicide (Gruber *et al.*, 1996; Rossow and Kuntsche, 2013) and long-term effects (such as greater risk of use and abuse of other drugs, early abuse of and dependence on alcohol and psychopathology in adulthood (Grant and Dawson, 1997; Pitkänen *et al.*, 2005).

Recent trends in youth drinking and harm in Sweden display an unexpected pattern that raises several questions to be addressed in this thesis. Since the year 2000, most indicators of alcohol consumption among Swedish youth point in the same direction. According to the annual school surveys of the Swedish Council for Information on Alcohol and Other Drugs (CAN), alcohol consumption among 15-year-olds fell for boys from 5.4 litres to 2.3 and from 2.9 to 1.6 litres for girls between 2000 and 2012. Abstinence rates among both boys and girls increased from about 20% to 58% among girls and to 54% among boys, while heavy episodic drinking (at least on one occasion per month) decreased from 33% to 16% among boys and from 23% to 17% among girls (Leifman, 2012). Similar trends have also been observed among students aged 17, however 2004 was the first year that this age group was surveyed by CAN and the decline started in 2006 (Leifman, 2012).

The declining trend in alcohol consumption among Swedish youths is unexpected for several reasons. First, both economic and physical availability of alcohol have increased and this would rather have pushed drinking up according to comprehensive research evidence (Babor *et al.*, 2010). In fact, most changes in availability in Sweden have been in a more liberal direction during this period. A starting point was the Swedish EU membership in 1995 when all state monopolies but one, the retail sales monopoly on alcohol, were rescinded (Norström and Ramstedt, 2006), followed by gradually increased quotas for private import, which were subsequently and practically abolished in 2004. This is expected to have increased availability of alcohol to young people, as it allowed private persons to bring in large volumes of alcohol (for private use), which opened up for an illegal alcohol market targeting young people (Svensson and Hradilova Selin, 2007). In addition, advertisements for alcoholic beverages below 15% by volume were allowed in newspapers and magazines in 2003 and have since proliferated. As many studies show, young people are affected by exposure to advertisements (Smith and Foxcroft, 2009), which is also expected to have contributed to increasing youth consumption. Furthermore, the opening hours for the stores of the retail monopoly, Systembolaget, were extended to include Saturdays in 2001, expanding the possibilities for resale alcohol purchased at the retail monopoly. This is

relevant, as Systembolaget sales account for the major part of the alcohol consumed by young people (Leifman, 2012). Given these policy changes, which presumably led to more available and affordable alcohol to youth, the expected scenario would rather have been an increase in youth drinking.

Another unexpected recent development is that some indicators of alcohol-related harm among young people are more prevalent despite the declining trend in youth consumption. The most mentioned finding here is that hospitalisations due to alcohol poisonings have increased during the same period as there has been a decrease in alcohol consumption among youth (Socialstyrelsen, 2012).

From a theoretical point of view, these recent developments do not accord with the assumptions behind the so-called total consumption model, which has been and still is very influential in the formulation of the Swedish alcohol policy. The key message of the model is that increasing per capita alcohol consumption in a population is associated with increasing alcohol-related harm and that most population sub-groups are affected, including different age groups. Although a wide range of international research supports this basic idea – for an overview, see Norström and Ramstedt (2006) – few studies, to my knowledge, have assessed if per capita consumption is related to drinking and alcohol-related problems among young people. Furthermore, as far as I know, no study has used aggregate-level data to examine whether there is a temporal link between per capita consumption among adolescents and various forms of alcohol-related harm in this age group.

These recent Swedish experiences and the questions they raise have been the point of departure for this thesis. More specifically, the thesis is based on four papers addressing the following research questions:

- Is there an association between consumption of illegal alcohol and harm among young people? (article I)
- Is there a temporal relationship between binge drinking and violence among youth, and between per capita consumption and binge drinking among youth? (article II)
- Is the decline in youth consumption characterised by collectivity or polarisation? (article III)
- What factors are associated with non-drinking among youth and do they differ between countries? (article IV)

I will start this introduction by presenting in more detail the theoretical starting point of the thesis, that is, the background and main assumptions behind the total consumption model. In the subsequent sections I will argue for why it is relevant to test this model for youth and will follow this with an outline of the specific aims of the thesis and the data and methods applied. The main findings will be summarised and discussed in the last section.

## 1.1 THEORETICAL BACKGROUND

### 1.1.1 The total consumption model

The total consumption model or what is sometimes called the new public health approach to alcohol-related problems, was developed in the 1970s. It was to some extent a reaction against the prevailing view that regarded alcoholism or heavy drinkers as the main source of alcohol-related problems. This view, the medical model or the alcoholism school of thought, was individualistic and tended to view all alcohol-related problems as a symptom of one underlying cause, alcoholism. The model implied that to reduce alcohol-related problems, there was a need to modify the problematic individuals' drinking behaviour. However, the new public health approach, emerging in the 1970s, took a wider perspective on alcohol-related problems. It emphasised that alcohol-related problems were found not only among heavy drinkers or alcoholics, but existed, to a varying degree, in the entire drinking population. The new approach thus resulted in a fundamental shift in focus from a more individual-level perspective to the distribution of alcohol-related problems in the population as a whole.

The WHO report *Alcohol Control Policies in Public Health Perspective* (Bruun *et al.*, 1975) was a first comprehensive overview of this approach. The authors, an international research group led by the Finnish sociologist Kettil Bruun, put forth the basic assumption that the total alcohol consumption in a society is positively related to alcohol-related problems in the population as a whole. Accordingly, to prevent alcohol-related problems, instruments are needed that reduce the total consumption, in particular policies affecting price and availability of alcohol. In addition to the basic epidemiological assumption of a close link between population drinking and harm, then, the total consumption model also included a clear idea of what policy measures were necessary to reduce alcohol-related harm.

The main critique that was subsequently directed at this conclusion maintained that it was too focused on volume of consumption and therefore ignored the role of drinking patterns as a source of alcohol-related problems (Stockwell *et al.*, 1997; Lemmens, 2001). This criticism has not altered the main message of the model, although nowadays it is recognised that the effect on alcohol-related harm from a given volume of consumption varies from one society to another at least partly because of drinking patterns (Norström and Ramstedt, 2005; Babor *et al.*, 2010). As to the policy message, regulating price and availability of alcohol are still regarded as the most effective means of decreasing alcohol consumption and negative outcomes in a society (Room *et al.*, 2005; Wall and Casswell, 2013).

The model's implicit assumption of an association between the prevalence of heavy drinkers and per capita consumption in a population was not an idea first formulated by Bruun *et al.* (1975). This notion came from the French demographer Sully Ledermann (1915–1967), who in the 1950s published several reports on trends and regional variations in alcohol consumption, relying on data from France and other countries. Ledermann found an association between per capita consumption and heavy drinkers in different regions and during different periods, which would indicate a fixed relationship

between average consumption and prevalence of heavy drinkers within populations. He also proposed that the distribution of alcohol consumption in a population can be approximated by log-normal distribution: meaning that the distribution is heavily skewed with most of the consumers at the lower end (Ledermann, 1956). Ledermann's idea goes under the name of single distribution theory and has been heavily debated over the years; for an overview, see Lemmens (1995).

One of the limitations of the single distribution theory was its poor theoretical underpinning (Skog, 1985). Skog maintains that theories on the distribution of alcohol consumption should be based on factors influencing human drinking behaviour. Hence, he proposed a theory of the collectivity of drinking behaviour in which he considers two major assumptions of the influences on people's drinking behaviour. The first assumption is that factors influencing individual drinking behaviour appear to combine and operate multiplicatively. Second, he hypothesised that there was a strong element of collectivity in regulating drinking behaviour. Individual drinking habits are influenced by the drinking habits of friends and social networks, both directly through interpersonal relations and indirectly as expressed by social control. According to Skog, the process of direct and indirect influences at the individual level aggregates up to group level and societal level, resulting in a strong collective component of drinking behaviour in a society. The outcome of the collectivity component in drinking habits is that we would expect drinking habits in a group or society to move up or down the consumption scale synchronically in different drinking groups. As empirical tests for these ideas, Skog drew on survey data from several countries to show a strong relationship between overall mean consumption in a population and the consumption level of different drinking groups in the same population, including heavy drinkers. Critics have pointed out that his empirical evidence for collectivity is not convincing, since cross-sectional survey data from 21 countries do not allow for testing a theory about change. Furthermore, there are several examples of changes in overall consumption which have not been mirrored in all segments of society (Gmel and Rehm, 2000). Skog acknowledges some of the empirical shortcomings but points out that exceptions from this general rule are bound to exist since his is not a one-factor theory. The predictions from the model are that certain social mechanisms pull in a certain direction and that these mechanisms produce overall patterns (Skog, 2001).

The total consumption model has been very influential in the formulation of Swedish alcohol policy since the late 1970s (Sutton, 1998). One reason for its popularity was that it actually provided scientific legitimacy to existing control policies in Sweden, including high alcohol taxes and the retail monopoly. Another reason, claims Johansson (2008), was that these ideas coincided with a public debate in Sweden which tackled the reintroducing of a rational system of alcohol as well as alcohol misuse and youth intoxications.

Because the total consumption model was based on empirical observations for the whole population, it is natural that its application has rather been restricted to the population as a whole. However, the relevance of the general ideas of the model for sub-populations is indeed an interesting question. For instance, is per capita consumption within one certain age group related to harm within this particular group and are changes in drinking within sub-populations collective? Starting from this, a

major question in my thesis is to explore whether the general assumptions of the total consumption model are applicable to a youth population.

### **1.1.2 Relevance of the total consumption model among youth**

The dominating tradition in epidemiological research about drinking and harm among young people is to study risk factors on the basis on individual-level data. Some examples include early onset of drinking (Pitkänen *et al.*, 2005; Berg *et al.*, 2013; Rossow and Kuntsche, 2013); family situation (Bergmark and Andersson, 1999; Barrett and Turner, 2006); parental monitoring and strategies (see Ryan *et al.* (2010) for an overview); peer drinking (Van Der Vorst *et al.*, 2009); school factors such as school performance (Pitkänen *et al.*, 2005); and bullying (Luk *et al.*, 2010).

The lack of studies at the aggregate level may partly be down to lack of data. While general population studies can use sales statistics as an indicator of alcohol consumption, this approach is not applicable in sub-populations such as youth, for sales data are not age-specific. Furthermore, age restrictions for purchase of alcohol also complicate the use of these data for the purpose of monitoring drinking among young people.

It is surprising that aggregate-level analyses of alcohol consumption among youth in Sweden have been rare, as unique long time-series data do exist. The CAN has conducted annual drinking surveys on a representative sample of Swedish students aged 15 since 1972 (Henriksson and Leifman, 2011). Moreover, as a part of mandatory military service in Sweden, data on alcohol consumption by military conscripts aged 18 was collected between 1971 and 2006 (Guttormsson, 2007). Below the main elements of the total consumption model are discussed from a youth perspective.

### **1.1.3 Availability and price**

Availability and price are two of the most effective strategies in reducing consumption at the population level (Anderson *et al.*, 2009), but these have been less studied in relation to the impact on young people. One reason is perhaps that most countries have age restrictions on alcohol purchases, implying that availability is low and at a fixed level. Existing studies on the link between availability and young peoples' drinking have thus to a large extent examined changes in the legal drinking age, suggesting that increasing the legal drinking age is in general an effective means to reduce drinking and drinking problems among youths (Babor *et al.*, 2010). The most recent example from a Nordic context is a study of the introduction of an age limit (of 15 years) for off-premise purchase in Denmark, which shows an obvious reduction in drinking among those below 15 (Moller, 2002).

There is also some evidence that availability in more general terms influences youth drinking. For instance, a cross-country comparison of 26 countries with the aim of examining the relationship of alcohol control policies and adolescent alcohol use found that policies affecting availability were particularly associated with lower frequency and prevalence rates of drinking as well as age of onset (Paschall *et al.*, 2009). Restricting access to alcohol has been found to have an effect on heavy episodic drinking and alcohol-related hospital admissions (emergencies) among 10–15-year-olds

(Gmel *et al.*, 2010). In line with this reasoning, greater access to alcohol has been shown to increase the odds for heavy episodic drinking, drunkenness and being in a higher consumption trajectory (Bränström *et al.*, 2008; Danielsson *et al.*, 2010).

Still, given that young people in general are not allowed to buy alcohol themselves, availability to young people has other dimensions that differ from those of relevance to adults. In Sweden, for instance, it is clear that most young people drink alcohol despite the age limits, and that the sources are of many different kinds, including parents, siblings, friends or illegal acquisitions from an unknown person. Thus, availability of alcohol for young people is influenced by the willingness of parents and other adults to provide alcohol as well as the willingness among friends and siblings. Furthermore, the existence of black markets that lack any kind of regulation may also influence the degree to which alcohol is available to young people. Here, it may be noted that in the Swedish context a recurrent issue is whether the increasing availability, either of homemade spirits (in the late 1990s) or privately imported alcohol (during the mid- and late 2000s), might increase alcohol consumption and alcohol-related harm among vulnerable groups in particular, such as young people (Tryggvesson and Olsson, 2002; Johansson, 2008).

Availability can be reduced in several ways. Limiting the opening hours (Rossow and Norström, 2012) has been shown to decrease violence. Responsible Beverage Service (RBS) is an educational programme that has reduced violent crime (Wallin *et al.*, 2003; Trollidal *et al.*, 2013). While youth is not the specific target group in these studies, it nevertheless seems plausible that these results pertain to young people, as young people are prone to visit bars and as the legal age in Sweden for on-premise use is lower than for off-premise use.

In general, alcohol consumers respond to pricing of alcohol as consumers do to most other consumer products. An increase in price is usually followed by a decrease in consumption and in many cases also in alcohol-related harm. The association between alcohol consumption and price also seems to pertain to young people. In a review of 112 studies, Wagenaar *et al.* (2010) found that pricing not only affects adults but also adolescents in terms of problem drinking. In econometrics, the question is not only if price has an effect on consumption but also that of price elasticity, that is, whether some groups are more affected by price than others. Among youth, Coate and Grossman (1988) conclude that youth beer consumption is inversely related to the price and the minimum legal age. Moreover, they found that frequent drinkers were more sensitive to price compared to infrequent drinkers.

#### **1.1.4 Collectivity of drinking**

Skog's theory of the collectivity of drinking cultures bears a resemblance to one of the main ideas in prevention of youth drinking, the notion of peer pressure. In traditional social influence programmes applied in preventive school programmes, the assumption is that adolescents are in general negatively predisposed towards alcohol use but when confronted, these beliefs are easily undermined. As a result, the social influence programmes have sought to impregnate young people to resist such challenges by instilling resistance to social pressure (Babor, 2010). Furthermore, friends' drinking has

been shown to be a potent precursor of drinking (Brown *et al.*, 2008; Little *et al.*, 2012), which accords with the suggested mechanisms behind collectivity of drinking behaviour.

However, the collectivity of drinking behaviour is not a law of nature, and sub-groups may develop in different ways when there are barriers to the diffusion process or when there are significant changes in formal or informal control of drinking (Skog, 2001). Age may be such a barrier, mostly because age restrictions seem a plausible barrier of the diffusion process. There is, however, little aggregate-level research on youth drinking behaviour in relation to adult drinking which would allow for empirically addressing this question. An exception is a study by Fuhr and Gmel (2011), which (with data for 68 countries) found a link between per capita consumption in the whole population and current drinking and smoking among adolescents.

Recent developments in Sweden, from around the year 2000, with a decrease in youth consumption and an increase in hospitalisations among youths have given rise to the notion of polarised drinking among young people. A plausible explanation between the mismatch of the trends is that the overall decrease in consumption has masked an increase in consumption among the groups that drink the most and this in turn would explain the increase in hospitalisations. It should be recognised that this hypothesis challenges the collectivity of drinking theory as proposed by Skog. Hallgren *et al.* (2012) found support for the polarisation hypothesis in the Stockholm area, so that per capita consumption declined over a ten-year period while the dispersion increased. Furthermore, they found that for most groups the consumption decreased, while the heaviest drinkers increased their consumption. This was the case among both girls and boys in grade 11 (18–19-year-olds) and among boys in grade 9 (15–16-year-olds). An exception to this general pattern was found among girls in grade 9. As a potential explanation to the polarisation, scholars have discussed polarisation trends in other areas between 1994 and 2005, such as work and employment, economic resources and health among Swedish youth, and mental health in particular (Fritzell *et al.*, 2007). True as this may be, it does not seem convincing from the standpoint of collectivity of drinking that these changes would serve as barriers to the diffusion process within this age group. To begin with, these all are students and this explanation does not give a reason for why the youngest women should be an exception to such polarisation. Still, the results of Hallgren *et al.* are noteworthy and give a reasonable explanation to the mismatch between consumption and hospitalisation trends in Sweden during the last decade.

It should be noted that a mismatch between trends in drinking and harm among youth has also been observed in other countries. In the United Kingdom (Meier, 2010), for example, a period of decreased consumption among 16–24-year-olds was not accompanied by a similar decrease in alcohol-related hospitalisations.

Another complication in the research about polarisation is the very concept: it is far from rigorous and refers to slightly different things in different studies. For instance, Hallgren splits the data in percentiles whereas Meier has a more explorative approach in investigation overall trends. Furthermore, Bjarnason (2006) uses the concept of

polarisation to describe a possible effect of prevention policies among youths in Iceland.

### **1.1.5 Youth drinking and harm: the case of violence**

The core idea of the total consumption model is that there is an association between average consumption and harm within a given population but whether this should also apply within a youth population is not clearly stated. However, there are many reasons to assume that this should be the case. First, it is well established that youth drinking is related to a wide range of harms such as injuries, accidents, sexual risk taking, violence, aggression, social conflicts and symptoms of dependence (Little *et al.*, 2012). Since it is beyond the aim of this introduction to discuss all these harms, I will focus on the association between drinking and violence to illustrate the relevance of the total consumption model for youth.

Alcohol consumption is often portrayed as the main cause of violence among youth. Numerous studies confirm this association. From a societal point of view, violence is a major concern, among young men in particular, partly because they are more at risk compared to the adult population (Estrada, 2008).

However, the association between alcohol and violence is complex and often the debate between scholars refers to the concept of causation (Room and Rossow, 2001). On the one hand, this debate is semantic, as some argue that causation should only apply to human agency and the use of formulations like “alcohol causes violence” diverts responsibility from the perpetrator, especially when used in the context of domestic violence. Others argue that the relationship between alcohol and violence is spurious. For instance, in a review of survey research, White *et al.* (1993) conclude that the association between alcohol and violence among youth is not causal, as the same set of factors, individual and environmental, predicts both behaviours. In a similar vein, (Gottfredson, 1990) suggested that there was a common cause factor between heavy drinking, violence and other deviant behaviour such as weak self-control among youth. Furthermore, the fact that only a small number of drinking occasions is followed by violence is another reason for questioning the causal relationship between alcohol and violence. Still, as suggested by Norström and Pape (2010), controlled experiments provide some evidence of a causal relationship, for it has been shown that drinking increases the risk of aggressiveness, although laboratory settings are not the same as the real world.

Given this complexity in the association, it is crucial to acknowledge the understanding of why some drinking occasions lead to violence and others do not. Here, the social context of drinking and the regulation of social control of drinking are important factors in our appreciation of the relationship between violence and alcohol (Ramstedt, 2011). For instance, Ramstedt (2011) found that the estimated effect of per capita consumption on the total homicide rates was the highest in northern Europe compared to central, southern and eastern Europe, and Australia. However, the same effect was found in Australia as in the whole of western Europe. There was nevertheless a limitation with these comparisons in that the study period was not identical in the comparisons over the regions.



Among youth, the perception of what is violence may be interpreted in different ways. For instance, in childhood, physical fighting may be understood as a part of normal play, especially among boys. However, this will gradually change in transition from childhood into adolescence and will be accepted only in exceptional circumstances in adulthood. However, when it comes to drinking, the transition rather happens in the opposite direction. Drinking is rare in childhood, but becomes a common behaviour among adults (Rossow *et al.*, 1999). The complexity of the association between alcohol and violence is perhaps even more obvious among youth compared to adults, since adolescence is a period characterised by transition.

Still, many studies confirm the association between violence and drinking among youth. For instance, Rossow *et al.* (1999) found a small direct effect of alcohol on violence after controlling for several relevant factors. Furthermore, in an attempt to capture the impact of personality traits among youths, Norström and Pape (2010) found that the effect of alcohol on violent behaviour was confined to those who were prone to suppress their angry feelings. Moreover, a highly interesting question is whether the impact on the association between alcohol and violence is relative to the level of consumption among youths. As mean consumption varies over time we might expect that deviant behaviour among youth, such as violent behaviour, becomes less deviant in periods when alcohol consumption is particularly high. A study by Bye and Rossow (2008) lent credence to this idea, and their conclusion was that the impact of alcohol on violence among youth was relative to the wetness of the society. In other words, during a period of low mean consumption the impact of alcohol on violence was stronger compared to a period of high mean consumption among youth.

## 2 AIM

The overall aim of the thesis is to examine changes in alcohol consumption and harm among young people in Sweden with a focus on experiences during the last decades. In particular, I will focus on the following main topics; (a) the association between consumption of illegal alcohol and harm among young people, (b) the association between population drinking, adolescents' binge drinking and harm, (c) the degree of collectivity of drinking among youth and (d) determinants of non-drinking among young people in Sweden in a European comparative perspective.

Brief descriptions of the research themes addressed in the four papers of the study are presented below:

Article I: A topical issue in Sweden is whether the increasing availability of unrecorded alcohol has paved the way for increasing alcohol-related harm among young people despite the general decline in drinking. In particular, smuggled alcohol has in the public debate been pointed out as one factor that might increase alcohol-related harm among more vulnerable groups of young people. Whether the use of smuggled alcohol among adolescents is related to various harm indicators (such as hospitalisations) is the main research question to be addressed in article I.

Article II: Against the background of recent diverging trends in youth drinking, harm and per capita consumption in Sweden, a more systematic analysis is warranted of these associations over a longer time period. This analysis will shed light on the degree to which the theory of collectivity of drinking cultures is applicable and has also important policy implications. The two main research questions in article II are thus: (1) to investigate the temporal association between binge drinking and harm (violence) among Swedish youth, and (2) to investigate the association between population drinking and binge drinking among youths.

Article III: One possible explanation for the divergent trends between drinking and harm among adolescents in Sweden is that some groups have increased their drinking whereas others drink less, which would be concealed by a per capita measure. Such a development among young people has been found by a recent study in the Stockholm area and in other European countries, including the UK and Iceland. These counteracting trends have been described by the concept of "polarisation" of drinking patterns. In article III, we will explore the following research questions: (1) Has there been a polarisation of drinking among Swedish youth, and (2) is the theory of collectivity of drinking cultures applicable to young people's drinking in Sweden?

Article IV: An important factor in explaining the declining trend of average alcohol consumption among Swedish youth is the increasing rate of non-drinkers. The proportion of non-drinkers among 15-year-olds in Sweden has increased from about 20 per cent in 2000 to 40 per cent in 2012. What constitutes these groups in terms of family situation, friends, parental attitudes and leisure time activities has been little studied. The research questions of study IV are as follows: (1) What predicts abstention

in adolescence in six different European countries, and (2) Are the predictors of abstinence similar in these European drinking cultures?

Figure 1 gives an overview of the research domains, key research questions and the design of the studies included in the thesis.

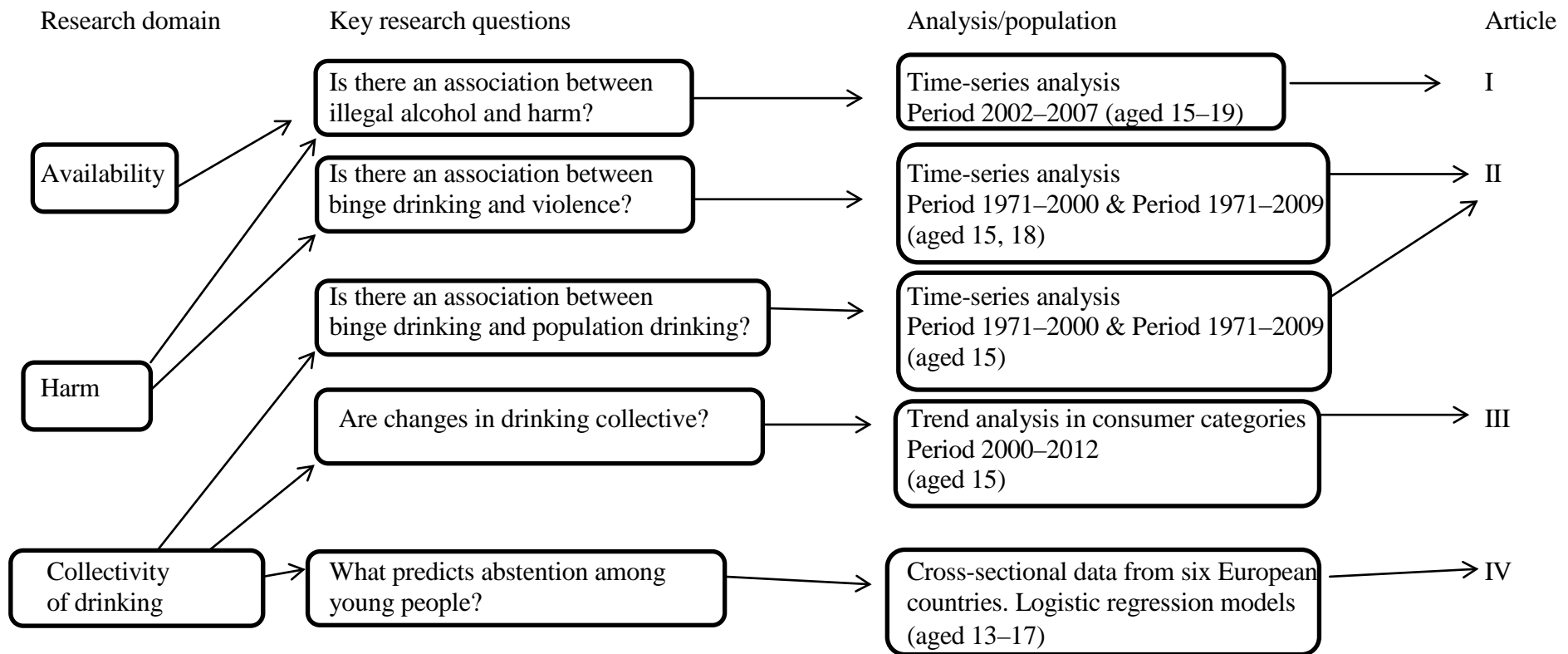


Figure 1. Overview of research questions and study design.

## 3 METHODS AND DATA

### 3.1 AGGREGATE TIME-SERIES ANALYSIS

Two papers in this thesis are based on time-series analysis, more specifically ARIMA (Autoregressive Integrated Moving Average) analysis. This is a widely used methodological approach for assessing aggregate alcohol–harm relationships. It has been used for both comparative purposes (Norström, 2002; Landberg, 2009) and in assessing the alcohol harm association within populations (Bye, 2007; Ramstedt, 2008). The method is described in more detail in article I and II, but some basic features of the method will be mentioned here.

The starting point of ARIMA modelling is the obvious fact that analysis of time-series data entails a large risk of spurious associations. For instance, two variables, say aggregate per capita consumption and rates of violence, may develop in the same direction over time without being causally related to each other. A simple calculation of the correlation would thus only reflect a spurious relationship. To reduce this risk, a differencing procedure is therefore applied in ARIMA modelling, implying that changes in the data are correlated instead.

Another advantage of using aggregated time-series analysis is that the problem of self-selection does not apply and furthermore, that aggregated analysis also provides policy-relevant information such as: if any effect, then how much, on a societal level (Norström and Ramstedt, 2005). This is also precisely the crucial question in studies testing the relevance of the total consumption model. Additionally, a major concern in epidemiology is the possible presence of confounders or factors not considered which are nevertheless related to the outcome as well as the independent variable. An example is the complex association between alcohol and violence. Here, the numerous potential confounder factors are not easily controlled for on the individual level, for instance: interactions between alcohol consumption of perpetrator and victim, and environmental and individual factors. However, one way of overcoming these problems is to apply time-series analysis on an aggregate level (Rossow and Norström, 2013).

### 3.2 INDICATORS OF AGGREGATE ALCOHOL CONSUMPTION

The most widely used indicator of overall consumption is per capita consumption, usually based on sales data and expressed in litres of alcohol (100% ethanol) per capita aged 15 and older (Babor *et al.*, 2010). The limitation with sales statistics is that they do not cover sources of unrecorded alcohol consumption but also that they do not allow for assessing drinking in sub-groups of the population. For obvious reasons, sales data is of little use in monitoring youth consumption, and here it is necessary to rely on survey data to capture changes and trends in alcohol consumption. From an international perspective, Sweden has unique data sources of youth drinking. The CAN has conducted annual surveys on representative samples of Swedish students aged 15 since 1972 (Henriksson and Leifman, 2011) and data on alcohol consumption among military conscripts was collected between 1971 and 2006 (Guttormsson, 2007). There are well-known limitations with survey data in the general population, such as biased sampling

(heavy drinkers tend to be overrepresented among non-responders) and underreporting (deviant drinking behaviour tends to be denied). However, to what extent these problems are equally crucial in surveys of youth is not known.

The annual school survey and the military conscript survey have been used in article II and III. In article I, the indicator of alcohol consumption is obtained from The Monitoring Project and in article IV the data comes from The European Family Empowerment Project. The CAN school survey, completed during March and April every year, is a representative sample of schools in Sweden. The number of respondents has varied, but has for most years been around 5,000. The response rate has been fairly consistent at around 85% throughout the period 1972–2009 (Henriksson and Leifman, 2011). Alcohol consumption in terms of volume of drinking in this survey is measured by beverage-specific quantity and frequency items summarised into a measure of overall drinking in litres of 100% alcohol per year. Binge drinking is measured by a question of how often the respondent has drunk at least an amount of alcohol that is equivalent to a bottle of wine, on the same occasion. These two measurements are used in article II and III.

The survey to the military conscripts was voluntary and performed during the theoretical testing of the conscripts. The number of respondents among the military conscripts has varied from the lowest of about 28,000 (in 1992) to the highest of 59,000 in 1972/73 (Guttormsson, 2007). The conscript data covered only men, mainly at the age of 18 years. Sweden had a mandatory military system for all male Swedish citizens at the age of 18, until 2010. Changes in the conscription routines at the end of 2006 led to the abolition of the alcohol and drug survey in this group. From this survey, a binge question has been used, referring to the subjective feeling of being intoxicated. It may be noted that this differs from the binge question in the CAN survey, where a specific volume is asked for. In article II, both binge questions were aggregated into yearly estimates of binge drinking in terms of the proportion of binge drinking at least once a month among the two studied groups.

The Monitoring Project is an on-going project for continuous measurement of alcohol habits in the general Swedish population (Ramstedt, 2010). The project began in 2001 with the main aim of estimating the total alcohol consumption in Sweden with special emphasis given to questions about unrecorded alcohol consumption such as travellers' import and purchase of smuggled alcohol. The data are collected by means of monthly telephone interviews with 1,500 respondents aged 16–80. In article I, I used questions from this survey on binge drinking, volume of drinking and consumption of smuggled alcohol. The volume of alcohol consumption is measured with a question of beverage-specific quantity frequency, while binge drinking is assessed with a question of how often the respondents have drunk the equivalent amount of alcohol to a bottle of wine during the last month. Whether the respondents have consumed smuggled alcohol is a question that starts with an introduction of what is meant by smuggled alcohol, followed by questions of if, how often and how much smuggled alcohol has been consumed.

### **3.3 INDICATORS OF ALCOHOL-RELATED HARM**

Two papers in this thesis explore associations between alcohol consumption and alcohol-related harm (articles I and II). The harm indicator used in article I comes from the National Board of Health and Welfare and consists of all hospital admissions with the diagnosis of acute intoxication (ICD-code F10.0) or toxic effect of alcohol (ICD-code T51). Hospitalisation data has some limitations in that changes may be due to other factors than changes in the prevalence of harm. For example, changes may arise from changing access to inpatient treatment. On the other hand, the number of cases is usually high enough to obtain stable statistics also for younger age groups in contrast to mortality data, for instance (Norström and Ramstedt, 2005). Furthermore, validity tests of the Swedish inpatient registry show that it is overall of high quality when it comes to main diagnoses on the national level (Socialstyrelsen, 2013).

In article II, the harm indicators are of two kinds, both estimating violence. The first comes from the Swedish National Council for Crime Prevention (BRÅ) and includes convictions of assaults, while the second is self-reported experience of violence from the Living Conditions Surveys (ULF) collected by Statistics Sweden (SCB). This is an annual survey conducted since 1975, and the sample size has ranged between about 5,000 and 14,000 respondents, with a response rate varying from 75 to 86%. To measure experiences of violence, a question was used of whether the respondent had been exposed to violence leading to visible marks on the body or bodily harm during the past year.

#### **3.3.1 Ethical considerations**

This thesis builds on numerous respondents who have voluntarily answered surveys on their alcohol consumption but also on other matters such as violence. The first three papers in this thesis have ethical approval from the regional ethics committee in the Stockholm region (Protocol: 2012/5:3). The fourth paper also has approval from the regional ethics committee in the Stockholm region (Protocol: 2010/5:12).

## 4 RESULTS

The results of the four studies included in the thesis are fully presented in articles I–IV. Below follows a brief summary of each article.

### 4.1 ARTICLE 1. ALCOHOL CONSUMPTION AND HARM AMONG ADOLESCENTS IN SWEDEN: IS SMUGGLED ALCOHOL MORE HARMFUL?

As a consequence of Sweden's joining the European Union, traveller quotas were gradually increased and in practice abolished in 2004. It has thus been legal since 2004 to bring in large amounts of alcohol for private use from another EU country under the condition that the person bringing the alcohol is over 20 years old and is transporting the alcohol by her/himself. The abolishment of traveller quotas entailed not only that Swedes bought more alcohol from abroad for private use, but it also paved the way for an illegal alcohol market, in which privately imported alcohol was sold illegally. One implication of this type of illegal alcohol, also referred to as smuggled alcohol, is that alcohol becomes more available to underage drinkers. In the Swedish debate, smuggled alcohol has been identified as a youth problem.

The aim of this article was to examine the relationship between consumption of smuggled alcohol and alcohol-related harm among adolescents in Sweden. Data on consumption of smuggled alcohol were obtained from a monthly survey among respondents aged 16–19, and data on harm among 15–19-year-olds was provided by the National Board of Health and Welfare. The analysis was made by means of time-series analysis (ARIMA models) based on quarterly data for the period 2002–2007.

**Results:** In a bivariate analysis, consumption of smuggled alcohol, binge drinking and average consumption were associated with alcohol-related hospitalisations, overall and among boys. However, no significant effect was found among girls. The multivariate analysis revealed that when controlling for mean consumption, no significant effect was found for consumption of smuggled alcohol. A significant effect of average consumption was nevertheless found when controlling for binge drinking.

**Conclusion:** Despite an increase in availability of smuggled alcohol no association was found between consumption of this type of alcohol and hospitalisations, when controlling for average consumption. The results indicate that it is the alcohol consumed that matters and not where it comes from.



## **4.2 ARTICLE 2. IS YOUTH VIOLENCE TEMPORALLY RELATED TO ALCOHOL? A TIME-SERIES ANALYSIS OF BINGE DRINKING, YOUTH VIOLENCE AND TOTAL ALCOHOL CONSUMPTION IN SWEDEN**

Young people in Sweden are more at risk than the general population of becoming victims of violence, and the evidence that alcohol consumption is associated with violent behaviour is persuasive. Individual-level studies have shown that the volume of consumption and, in particular, drinking to intoxication are associated with an increased risk of alcohol-related aggression among adolescents. Furthermore, numerous population-level studies using time series of aggregated data have shown that changes in population drinking are related to changes in rates of various forms of violence, such as homicide, suicide and assaults. Many population-level studies have used per capita consumption as an input and have for this reason not been able to investigate the temporal association between alcohol and violence in different population sub-groups or to test the significance of changes in the prevalence of intoxication. Furthermore and in a broader context, it also seems plausible that the level of drinking in the general population may influence drinking behaviour among young people and, subsequently, the level of alcohol-related violence among youth. This line of reasoning stems from Skog's (1985) theory of "the collectivity of drinking cultures".

The purpose of this study was to investigate the temporal association between violence and binge drinking among Swedish youth. Two time periods are analysed, the first one representing the full observation period 1971–2009 and the second representing a confined period in 1971–2000. Furthermore, the association between population drinking and binge drinking among youths is also investigated during the two time periods. Methods: ARIMA modelling was applied in order to estimate these associations.

Results: Based on the confined time period (1971–2000), analysis revealed that four out of six estimates of the association between binge drinking and violence (self-reported as well as convictions for assaults) were positive and statistically significant. However, most estimates became non-significant when the full study period (1971–2009) was analysed. The analysis of the relationship between total consumption and youth binge drinking revealed that binge drinking among military conscripts and boys was associated with changes in total consumption during the shorter study period. These associations became non-significant when the full study period was analysed.

Conclusions: (i) there was a positive relationship between violence and binge drinking among Swedish youth at the aggregated level, but mainly with regards to the shorter study period, (ii) changes in per capita alcohol consumption were associated with binge drinking among young men, which was more evident for the shorter study period, and (iii) there was empirical evidence for the idea that these associations became weaker or non-existent after the year 2000.

### **4.3 ARTICLE 3. THE DECLINING TREND IN SWEDISH YOUTH DRINKING: COLLECTIVITY OR POLARIZATION**

Like many other countries, Sweden has observed a declining trend in alcohol consumption. Most indicators on alcohol consumption among Swedish 15-year-olds from the year 2000 to 2011 point in the same direction. According to school surveys conducted by CAN (Swedish Council for Information on Alcohol and Other Drugs), alcohol consumption among 15-year-olds fell from 5.3 litres to 2.2 litres for boys and from 2.9 to 1.8 litres for girls between 2000 and 2011. Abstention rates among boys increased from 33% to 56% and among girls from 32% to 51%, while heavy episodic drinking (at least on one occasion a month) decreased from 34% to 18% among boys and from 24% to 20% among girls. This scenario is unexpected, as the expected outcome would rather have been an increase in alcohol consumption as a result of Sweden's joining the EU in 1995 and the ensuing deregulation. Furthermore, the decline in consumption has not been accompanied by a decline in alcohol-related harm (such as hospitalisations). One explanation between the mismatch of the trends has been the notion of a more polarised drinking: while overall consumption has decreased, it may mask heterogeneity in drinking trajectories in sub-groups. This notion of polarised drinking challenges the highly influential theory of the collectivity of drinking behaviour as proposed by Skog.

The study had the following research questions: (i) How is the decrease in drinking distributed across consumption categories? (ii) Is the pattern of change in consumption consistent with Skog's theory of collectivity of drinking behaviour? (iii) Is the decline in consumption also reflected in heavy episodic drinking?

The analysed data came from the annual school survey of alcohol and drug habits among Swedish ninth-grade students in 2000–2012 ( $N \approx 5,000$ /year). Respondents were divided into seven drinking groups based on their relative ranking on consumption, which was measured by beverage-specific quantity and frequency items summarised into a measure of overall drinking in litres of 100% alcohol per year. In addition, the mean number of heavy episodic drinking occasions (HED) was computed for each drinking group.

Results: The decline in consumption among Swedish youth was mirrored in all seven drinking groups, although the relative decrease was smaller for heavy drinkers (top 5%) than for light drinkers (below the median). Among the top 5%, the average annual decrease was 2% (among both boys and girls), while the corresponding figures for light drinkers were 33% for boys and 25% for girls. The reverse pattern was true in terms of the absolute decrease. The decrease among the top 5% accounted for a fifth of the decrease in mean consumption during the study period, whereas the light drinkers accounted for 2.6% for boys and 4.3% for girls. There was a marked relation between overall consumption on the one hand and mean consumption HED on the other in each of the seven drinking groups. Conclusion: The marked decrease in youth drinking in Sweden during the period 2000–2012 is echoed in decreased drinking – whether indicated by volume or heavy episodic drinking – in all drinking groups from light to

heavy drinkers. The findings are consistent with Skog's theory of collectivity of drinking behaviour.

#### **4.4 ARTICLE 4. DETERMINANTS OF NON-DRINKING AMONG EUROPEAN ADOLESCENTS: A CROSS-CULTURAL COMPARISON**

Abstinence has increased among young people in many European countries in recent years. In Sweden, the proportion of non-drinkers aged 15 years increased from about 20 per cent in 2000 to 40 per cent in 2012. Non-drinking appears to be a key factor in explaining overall trends in youth drinking. Factors suggested to explain this increase include more restrictive parental attitudes and increasing use of computer games. Factors predicting abstinence among European adolescents have not been widely studied, nor have cross-cultural differences in the determinants of non-drinking.

The aim of this article was to assess and compare the determinants of non-drinking among adolescents in six European countries with a focus on parental, school, peer and individual student characteristics.

Data was obtained from a comparative survey conducted in Sweden, The UK, The Czech Republic, Slovenia, Spain and Portugal in 2010. Participants included approximately 6,000 adolescents aged 13-17 years. Bivariate logistic regression models were initially conducted to explore associations between non-drinking and various potential predictors. Next a multivariate logistic regression model was estimated to determine the most important factors.

Bivariate analyses revealed a significant association in all countries between non-drinking and age, having non-drinking parents, good school functioning and having non-drinking friends. In at least three countries abstinence was also associated with high parental control, high self-esteem and frequent computer gaming. In multivariate models, the majority of these estimates became non-significant and only non-drinking among friends remained significant in all countries.

Having non-drinking friends was a common predictor of non-drinking in all countries and highlights the influence of peer behavior on youth drinking. The diverse effects of school and parental influence should be considered before implementing school and parental prevention programs developed in other settings.

## 5 DISCUSSION

The starting point for this thesis was the unexpected development in recent trends in youth drinking and harm in Sweden which seemed to contradict or at least question some basic assumptions of the total consumption model. The unforeseen Swedish experience entailed rapidly falling youth consumption and rising non-drinking rates despite higher availability and increasing population drinking. Furthermore, although drinking declined among young people, there were some indications that alcohol-related harm increased, at least in terms of alcohol-related hospitalisations.

### 5.1 MAIN FINDINGS

The research question in article I was to examine if consumption of smuggled alcohol among youth was associated with alcohol-related hospitalisations with control for level of drinking and binge drinking. Bivariate analysis found significant associations between alcohol-related hospitalisations and all three drinking measures overall and among boys, but not among girls. The multivariate analysis revealed, however, that when controlling for average drinking, no significant effect was found for consumption of smuggled alcohol. The effect of average consumption remained significant, which suggests that the amount of alcohol consumed is more important for the risk of harm than whether it is from legal or illegal sources.

The aim of article II was to examine the temporal association between violence and binge drinking among Swedish youth and also to address the importance of population drinking during the period 1971–2009. There was evidence for an association between binge drinking and violence (self-reported as well as convictions for assaults) among young people during a confined study period (1971–2000), but most of these estimates became non-significant during the full study period (1971–2009). Moreover, we found an association between per capita consumption and the prevalence of binge drinking among young people, but it was again more evident for the shorter study period. A main finding was thus that these associations appear to have become weaker or non-existent after the year 2000.

In article III, support was found for collectivity in drinking behaviour among Swedish youth during the period 2000–2012. The decline in consumption was mirrored in all seven drinking groups, but the relative decrease was smaller for heavy drinkers (top 5%) than for light drinkers (below the median). Among the top 5%, the average annual decrease was 2% (among both boys and girls), while the corresponding figures for light drinkers were 33% for boys and 25% for girls. The reverse pattern was true for an absolute decrease. Furthermore, there was a marked relation between overall consumption on the one hand and mean consumption and heavy episodic drinking on the other in each of the seven drinking groups. The findings are consistent with Skog's theory of the collectivity of drinking behaviour.

In article IV, the determinants of non-drinking among young people in six European countries with different drinking cultures were examined by logistic regression modelling. The main finding of the study was that no clear pattern of national differences emerged with respect to which factors were associated with non-drinking

among youth and that having non-drinking friends was the most important factor in all countries.

### **5.1.1 Availability**

The starting point for study 1 was the Swedish entry to the European Union in 1995 and the increasing travelling quotas that followed; these were gradually increased and in practice abolished in 2004. This meant that after 2004 it was legal to bring in alcohol for private use from another EU country under the condition that the person bringing the alcohol was over 20 years old and transporting the alcohol by her/himself, with no upper limit. The abolition of the traveller quotas was expected to affect youth consumption since it would open up for an illegal alcohol market, thus increasing availability of alcohol to young people. In addition, a governmental report (Alkoholinförelutredningen, 2005) suggested a tax cut on spirits (40%) and on wine and beer (30%) in order to counteract the privately imported alcohol and the expected illegal alcohol market directed towards youth. These proposals did not gain support in the parliament. However, the alcohol industry in Sweden uses this line of reasoning as a main argument for decreasing taxes on alcohol in order to minimise the illegal alcohol market.

While previous studies have shown that youth alcohol consumption and harm depend to a great extent on availability (Moller, 2002; Babor *et al.*, 2010), most research has focused on policy changes, such as decreasing or increasing the legal age of purchase and not on the illegal alcohol market, which is in focus of study 1. The findings from article I suggest that there is no association between consumption of illegal alcohol and harms when controlling for average consumption. This suggests that there is no simple association between an increase in availability of a specific source of alcohol, in this case illegal alcohol, and alcohol-related harm. From the perspective of the total consumption model, this result challenges the idea that an increase in availability is associated with an increase in consumption and harm. On the other hand, support for the model was also found: there was an association between average consumption and harm.

#### *5.1.1.1 Implications*

The results of study 1 may first be seen in light of media attention and media discourse. The topic of illegal alcohol and the associations to harm have enjoyed large media coverage after Sweden joined the EU. The alcohol industry calls for lower alcohol taxes in order to make the illegal alcohol market less profitable, stressing the origins of alcohol instead of how much is being consumed. The implications for practitioners in alcohol prevention is to balance interventions on topics that are popular in media and goals that are more long-term, such as level of consumption, which does not get the same media attention. One implication of these results for future research is that it highlights a need to further analyse the question of how different forms of availability influence overall drinking of underage adolescents. These include availability from legal sources and propensity of friends, parents and other, unknown sources to supply youth with alcohol. This knowledge has the potential of further improving prevention programmes by pointing in which sources of alcohol to youth to intervene if gains are to be had. Furthermore, it would allow for an additional distinction of the adolescent

consumer, based on where the alcohol comes from and not only a distinction based on volume or pattern of drinking.

### **5.1.2 Harm**

Article I and II showed an association between alcohol consumption and harm among young people. More specifically, a significant association was found in study 1 between average consumption and alcohol-related hospitalisations which is in accordance with the assumption of the total consumption model. An association between binge drinking and violence was found in study 2 for the period 1971–2000, but not when the full study period (1971–2009) was included in the analysis. This result thus only partly confirms the total consumption model. The association between binge drinking and harm is nevertheless not as easily compatible with the model, which rather emphasises the volume of drinking and not the pattern. In addition, the result that no association was found between binge drinking and violence during the full study period raises several questions. At least two factors may be important to the understanding of the most recent development. First, other factors besides alcohol may have affected the association between alcohol and violence in the latter part of the period. There are some indications of this, such as that alcohol involvement in crime with a deadly outcome has decreased from 1990–1999 to 2002–2008 (Granath, 2011). Second, alcohol consumption among youths aged 15 has decreased considerably from the year 2000, while rates of abstainers have increased considerably (from about 18–19% among both boys and girls in the year 2000 to 39% among boys and 32% among girls in 2010 (Henriksson and Leifman, 2011). This development implies that binge drinking has gone down, partly as a result of a declining proportion of young people who drink alcohol. Another implication of these results is that they do not confirm the idea that the impact of alcohol on violence is relative to the wetness of a society, that is, the higher the overall drinking level, the weaker the link between alcohol and violence (Bye and Rossow, 2008). Rather, findings suggest that when binge drinking and mean consumption decrease, most of the estimates on the association to violence become weaker and even non-significant.

#### *5.1.2.1 Implications*

As the results of article I and II are not clear-cut with respect to the aggregate level association between alcohol consumption and harm among youth, it is difficult to draw any definite conclusions about policy implications. On the one hand, the findings in article I support the idea that measures that reduce youth drinking will most likely lead to fewer alcohol-related hospitalizations among youth. On the other hand, the findings in article II suggest that the effect on another form of alcohol-related harm among youth, violence, seems to have become weaker or non-significant during the same period. More research using other data and methods is needed to establish the aggregate level association between alcohol and different forms of alcohol-related harm, and also how the relationship may vary over time.

### **5.1.3 Collectivity of drinking**

Article II, III and IV showed support for a collectivity in drinking among adolescents in Sweden. More specifically, article II showed an association between changes in per capita consumption (the adult population) and binge drinking among adolescents,

although the association was more apparent during the confined study period (1972–2000). According to article III, the decrease in per capita consumption among youth from the year 2000 to 2012 was reflected in all consumer groups. Furthermore, the decrease in consumption was also reflected in a collective decrease in frequency of binge drinking in all drinking categories. The importance of friends' drinking behaviour was also observed in study 4 but here with a focus on predictors of non-drinking: having non-drinking friends was a significant factor in six rather different European countries. These findings underline the social component in young people's approach to alcohol and the influence of both peers and the population at large. These results support Skog's theory of collectivity of drinking cultures and this aspect of the total consumption model. Furthermore, on the basis of these results, the hypothesis of a more polarised drinking as an explanation to the divergent trends between alcohol-related hospitalisations and alcohol consumption among Swedish youths seems unlikely.

It should be noted, however, that some results did not support collectivity, or more specifically, article II showed no association between per capita consumption and binge drinking (among youth) over the period 1971–2009.

#### *5.1.3.1 Implications*

One implication of the results of article II, III and IV is that preventive efforts aiming at reducing overall drinking among youth are important. Given that the overall consumption among youth decreases we can expect, from these findings that most drinking groups will follow including those drinking the most, which are at the highest risk of harm. In addition, the findings suggest that a reduction in the frequency of heavy episodic drinking is also likely to follow. Moreover, reducing population drinking may also contribute to a decline in youth drinking; this appears to be the case historically between 1972 and 2000. A lesson that may be drawn from a policy point of view may be that a decrease in alcohol consumption among youth was possible at the same time as the pricing of alcohol was about at the same level as before the Swedish EU-membership. There were many actors who suggested significant decreases in alcohol taxes as a mean to uphold the legitimacy of the retail monopoly (Systembolaget) and to protect vulnerable groups, such as young people, from buying cheaper alcohol on an illegal market. An important future research question to be addressed on the basis on these results is for instance whether a similar clear collectivity in consumption is found in times when consumption is rising or if other factors are more important in times of increasing drinking? Another issue worth looking at is whether changes in alcohol-related problems among youth also display a collective pattern of change?

The result of article II, III and IV implies that preventive efforts should mainly aim at reducing overall drinking among youth. Given that the overall consumption decreases we can expect, from these findings, that most drinking groups will follow and also a reduction in the frequency of heavy episodic drinking.

#### **5.1.4 Strengths and contribution**

This thesis is the first to test the relevance of the total consumption model for young people, a sub-group of the population, which is regarded as an important target group in prevention. The study thus uses an innovative perspective and has contributed with some new results to this topic. In particular, the studies have yielded more knowledge of young people's use of illegal alcohol and youth drinking and violence, the degree of conformity in youth drinking and on predictors of non-drinking among youth in European countries.

#### **5.1.5 Limitations and methodological issues**

The four studies in this thesis are mainly based on survey data, which limitations are well known in studies of general population, such as a as biased sampling (heavy drinkers tend to be overrepresented among non-responders), underreporting (deviant drinking behaviour tends to be denied) and the fact that respondents tend to underreport the amount of alcohol which will lead to an underestimation of the actual level of consumption. However, to what extent these problems are equally crucial in surveys of youth is not known. A common question concerning alcohol surveys conducted in schools is whether the adolescents responds according to their actual alcohol habits and to what extent some students do not take the survey seriously. For this reason it is important to note that data from the CAN have undergone a series of controls in an effort to ensure data quality. Before 2000 this was done both before data coding and after coding (Andersson, 1999). Before data coding each survey was manually inspected in an effort to ensure that replies were serious and after data coding checks were done to detect unrealistic amount of alcohol consumption. After the year 2000 a series of filters are used to detect unrealistic estimates (Leifman, 2012). However, one of the most important means to ensure valid self-reported data is to stress confidentiality. The CAN survey is anonymous and the other surveys used in this thesis have stressed confidentiality. In spite of the weaknesses of self-reported data, as pointed out above, several reviews (Midanik, 1982; Del Boca and Noll, 2000) concludes that such data are reliable enough in most research contexts, provided that the interview situation has been organized to minimize bias.

It should be acknowledged that defining and estimating smuggled alcohol, (article I), is a difficult task. This may be more difficult among adolescents compared to adults since the legal age of buying alcohol at Systembolaget is 20, and hence all alcohol bought for off-premise consumption in this age group is illegal. A limitation in this study is also that the independent variables (smuggled alcohol, average consumption and binge drinking) originate from a survey and using these data on an aggregated level is problematic when the actual numbers of respondents vary from 178 to 250 each quarter. Indeed, it is also uncertain to what degree the respondents that are reached in this telephone survey representative for all adolescents in Sweden.

A weakness in article II concerns the binge drinking measurements. In this article we had only access to a rough measure, the prevalence of binge drinking (at least once a month) and not the frequency of binge drinking which would have been able to capture more subtle changes within those who binge drink over time. Furthermore, we have used convictions of assaults as one of the two indicators of youth violence. In this



context it must be noted that changes in convictions of assault do not necessarily indicate changes in violent events, but also changes in willingness to report such events or changes in policies. It was therefore reassuring that the analysis of the other indicator of violence used in this study, which was based on self-reports, gave similar results.

The limitations of article III have been covered above, since this paper solely is based on CAN-data.

One of the main shortcomings in article IV is the fact that some of the main factors that have a potential influence on non-drinking in this young age group were not included in the analyses, such as ethnicity and religious belief. The relatively small country-specific sample sizes are another important limitation. A larger sample may have resulted in more statistically significant estimates. This warrants caution in drawing conclusions on estimates that are close to statistical significance. We also acknowledge that the samples are not nationally representative, but rather, have been drawn from specific regions in these countries.

### **5.1.6 Conclusion**

A main conclusion of the thesis is that the total consumption model is in general a useful perspective for understanding aggregate level changes in youth drinking and harm in Sweden. Per capita consumption among young people was related to alcohol-related hospitalizations and there was strong evidence for collectivity in changes in drinking among Swedish youth during the recent decade. However, all results did not support the notion of collectivity; for instance, the aggregate link between alcohol and violence seems to have become weaker, suggesting that the assumptions of the model do not apply universally.

## 6 ACKNOWLEDGMENTS

As most people know, who have written a thesis, it is not solely an effort from one person, at least it was not the case with this thesis. As a PhD student I have been dependent on many people, most of the time for good reasons. At other times the feelings of dependency or rather finding my way in the maze of the higher education system has been like being a character in Greek mythology – you are in the hands of the gods and there is absolutely nothing you can do about it. Do not get me wrong, I enjoy the ups and downs of life and my life as a PhD-student has been a privileged one. Especially, since I have had the good fortune of having Mats Ramstedt, Sven Andréasson and Thor Norström as my supervisors. Mats, my main supervisor has given me support and guidance throughout the many stages of this thesis. Above his knowledge, research skills and the generosity of sharing this he has another talent, which I really appreciate, and that is a good proportion of subtle humor. In times of setbacks it has not taken long before we both have had a really good laugh at the situation. And trust me, we have had many laughs. Sven has guided me into the maze of Karolinska Institutet and has also been very supportive when I have been in need. Thor is a very generous person both in terms of sharing his knowledge and support but also when it comes to matters in life that make a difference, such as the best and most efficient way to prepare a poached egg and what to grow in meager soil. My sincere thanks to all of you for all the support and generosity you have given me.

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This period of life is coming to an end and what can be better suited than to end with a quote that sums up some of my interests, science and food from the French lawyer, epicure and gastronome Jean Anthelme Brillat-Savarin (1755-1826): *La découverte d'un mêt nouveau fait plus pour le bonheur du genre humain que la découverte d'une étoile.*

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