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Drinking Patterns among Finnish Fourteen Year-olds from 1977 to 1999

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ACADEMIC DISSERTATION

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Contents

List of Original publications

This dissertation is based on the following original publications, which are referred to by Roman numerals in the text.

I Lintonen TP, Rimpelä MK (2001): 'The validity of the concept of "self-perceived drunkenness" in adolescent health surveys'. Journal of Substance Use 6:145-150.

II Lintonen TP, Rimpelä MK, Ahlström S, Rimpelä AH, Vikat A (2000): Trends in drinking habits among Finnish adolescents from 1977 to 1999. Addiction 95:1255-1263.

III Lintonen TP, Rimpelä MK, Vikat A, Rimpelä AH (2000): The effect of societal changes on drunkenness trends in early adolescence. Health Education Research 15:261-269.

IV Lintonen TP, Konu AI, Rimpelä MK (2001): Identifying potential heavy drinkers in early adolescence. Health Education 101:159-168.

V Lintonen TP, Konu AI (2001): Drunkenness-related alcoholic beverage choices among adolescents. Journal of Substance Use 6:16-21.

Abbreviations

AHLS	Adolescent Health and Lifestyle Survey
BAC	blood alcohol concentration
ESPAD	European School Survey Programme on Alcohol and Other Drugs
CI	confidence interval
HBSC	Health Behaviour of School-aged Children
OR	odds ratio
SHPS	School Health Promotion Survey
WHO	World Health Organisation

Introduction

The long-term alcohol policy aim in Finland, as well as in many other countries, has been to keep the children sober. Abstinence has been the only legal relationship an under-aged person may have with alcoholic beverages. In Finland, this line of thought was again highlighted in the spring of 1997 when the parliament discussed the government's proposal for changing paragraph 16 of the Alcohol Law (Vuorinen 1998). Appropriate age limit for beverages containing 1.2% or more alcohol appeared as the central issue dividing the parliamentarians more according to their personal alcohol-specific prejudices than political commitments. After much debate, the law change was passed with the age limit of eighteen years – the ideal of abstinence in childhood was again reinforced.

Since the 1950s, adolescent alcohol research in Finland has continued to produce evidence that the under-aged persons indeed do drink – a fact anyone can also recall from his or her own adolescence. In fact, the late 1980s seemed to witness the appearance of not only more widespread drinking, but also a drinking pattern not common previously: namely drunkenness. As the economic boom settled and turned to depression at the turn of the 1980s to 1990s, population level alcohol consumption decreased and the issue of adolescent drinking gave way to more topical societal problems like unemployment.

Under-aged drinking made the headlines again in the mid-1990s. The media keenly reported under-aged drinking. During six months in 1996-97, the three leading newspapers and two tabloid newspapers published 69 news stories concerning under-aged alcohol drinking, more than a third of them reporting under-aged drunkenness (Torkkola 1998). Furthermore, the under-aged seemed to have established their own drinking-related festivities, e.g. the school's out –outdoor party in the end of May (Konradsdal 1998), in addition to the traditional ones like Midsummer or 1st of May.

Adolescent alcohol research has for decades kept track of what has been happening in the prevalence of drinking among the under-aged. The Adolescent Health and Lifestyle Survey has to be acknowledged for systematically providing information on this issue since the late 1970s. Other surveillance systems like the WHO Health Behaviour in School-Aged Children and, more recently, the European School Survey Project on Alcohol and Other Drugs have contributed to our knowledge on under-

aged drinking. These quantitative efforts have mostly kept to reporting the prevalences of drinking patterns and rather crude analysis. Recently, interesting qualitative studies, e.g. Stories of Innocence (Jaatinen 2000), have opened up new viewpoints to under-aged drinking. However, it was felt that the wealth of quantitative data already available could also be analysed in more detail.

This study was initiated in the spring of 1998 to exploit the Adolescent Health and Lifestyle Survey (AHLS) data on adolescent alcohol drinking collected every other year since 1977. The prevalence trends had mostly been reported previously in Finnish language report series (e.g. Rimpelä et al. 1999), and the aim here was to go beyond the crude figures using more sophisticated statistical tools and research questions. The Survey concerns many aspects of health and lifestyle, and the number of questions on alcohol had been rather limited for practical reasons. Therefore, many questions are obviously better answered using alcohol specific research material. This said, the Survey has its strong points also in the field of alcohol research. First, with many local studies and three large school surveys, it is the only directly nationally representative survey in Finland. It provides us with an unbroken biennial series of comparable data from the year 1977 onwards. Finally, like most large data sets, the AHLS data have been under-utilised.

The overall aim of this study was to draw a picture of the drinking patterns among the under-aged at the turn of the millennium. While some of the original studies addressed drinking in the age groups twelve to eighteen, this publication concentrates on the age group of fourteen year-olds; a group under-aged by any definition. The other age groups served mostly as reference and provided a developmental viewpoint on the subject. The trends from 1977 to 1999 were examined in detail. The last survey round of the 20th century was used in methodological analysis and studies dealing with the problem of identifying potential heavy drinkers at the age of fourteen and the issue of beverage choices related to heavy drinking.

Study background

Finnish alcohol policy and adolescent drinking

Policy efforts at prevention

In the summer of 1992, the Ministry of Social Affairs and Health appointed a working group with the task of assessing the extent of alcohol and other drug use among adolescents and to propose measures to strengthen preventive efforts (Sosiaali- ja terveysministeriö 1992). In its first report, the group explicated the observation that the means for controlling adolescent substance use in Finland were diminishing with increasing internationalisation. They also noted that alcohol remained the number one psychoactive substance despite adolescents' increasing involvement with illegal drugs. The group strongly criticised existing preventive efforts for being too focused on the individual, and that the issue of drinking had been separated from the societal context. They proposed that adolescent alcohol and other drug use prevention should shift its perspective from the current moment towards the turn of the millennium (Sosiaali- ja terveysministeriö 1993). Along the eighteen proposed action points were e.g. the acknowledgement of the adolescents' right to build their own future, the development of their knowledge and practical skills in social situations along with the development of both curriculum-based and informal health education in schools. The proposals aimed at delaying the onset of smoking, drinking and other drug use to a later age and a reduction in adolescent smoking and drinking frequency and drunkenness among those who had already begun drinking.

Based on the work of the group, the ministry initiated a three-year programme to strengthen the prevention of alcohol and other drug use among adolescents. The programme was executed largely as a joint effort of the ministry, the local administrative bodies from the education, and social- and health sectors. In an evaluation paper Risku (1998) points out the successes of the effort: adolescent drinking and illegal drug use situation became better known both in the administration and in the public, new partners were found in the arena of prevention and new prevention methods were taken into use. However, he goes on to state that the simultaneous liberalisation of the alcohol policy in general clearly worked against the programme aims. Also, the worsening economic situation in Finland decreased the

amount of resources available for prevention work at the local level. All in all, the programme was seen as a success although decreases in adolescent drinking and drug use could not be seen.

Successive responsibility for adolescent substance use prevention in Finland was handed out to the National Research and Development Centre for Welfare and Health on the one hand and the Finnish Centre for Health Promotion on the other. The foci were the development of drug education, the strengthening of third sector effort and the multiprofessional co-operation among those working with adolescents. In a paper from the year 2000, Risku (2000) states that the surveys on adolescent drinking and other drug use show that the preventive efforts have not succeeded very well. Despite other working methods, the main one has persistently been the offering of information to the adolescents on psychoactive substances, especially illegal drugs. However, drunkenness-related drinking is still seen as the most topical issue in adolescent substance use. Continued surveillance of the trends in adolescent drinking and other drug use is crucial for any efforts aimed at prevention. Furthermore, Risku goes on to point out that even in the future success will not be likely, if the drinking habits of the adult population are not addressed. (Ministry of Social Affairs and Health internal documents and Veli-Matti Risku personal communication)

The alcohol legislation

In 1994-95, the monopolistic alcohol control system that had been in force since 1932, the end of Prohibition, was revised (Intoxicants statistical yearbook 1999). The current Finnish Alcohol Law (Law No. 1143/1994) implies that beverages containing alcohol more than 2.8 percent by volume should not be accessible by adolescents under the age of eighteen. Paragraph 16 on retail sales states that alcohol beverages shall not be sold to persons under 20 years of age; mild beverages containing less than 22 percent ethyl alcohol by volume may, however, be sold to those eighteen years old or older. Paragraph 24 prohibits the serving of alcohol to minors. In paragraph 31, the passing on of alcohol beverages is prohibited. Even the possession or carrying of alcohol beverages is prohibited.

Thus the law has obviously been passed to prohibit the use of alcohol beverages under the age of eighteen, and allow the use of strong alcohol beverages such as spirits only for those aged twenty or older. This view has been shared by the vast majority of

adults; in fact there has been more in favour of increasing the age limits than there have been those regarding them too high (Ahlström and Österberg 1997). Seventy percent of the adults in 1996 also regarded the purchase of alcohol to under-aged persons a serious crime (Ahlström and Österberg 1997).

Adolescent drinking as a problem

While the lay people often refer to the alcohol law and argue that any under-age drinking is by definition misuse, the alcohol researchers tend to differentiate between moderate drinking and problem-causing patterns such as drunkenness (Anderson 1995, Ferrence 1995, Midanik 1995). Among adults, control over drinking frequency and adverse physical, psychological or social consequences are considered determinants of sensible versus problematic use of alcohol (Cahalan 1970, Heather and Robertson 1997). For adolescents, such criteria have not been widely established. Especially, the role of addiction has been viewed critically as is reflected by the fact that the concept of alcoholism is rarely, if ever, used when dealing with alcohol problems in early adolescence (Heather and Robertson 1997). Still, late adolescence and early adulthood are the life periods of particularly high dominance of drunkenness as a style of alcohol drinking (Plant et al. 1984, Simpura 1987). Adolescent alcohol drinking is often uncontrolled, dominated by infrequent consumption of high quantities (Harford and Spiegler 1983), and they are more likely than adults to drink to the point of intoxication (Temple and Fillmore 1985, Holder 1994). At a given level of consumption, adolescents experience more adverse short-term consequences such as accidental injury and alcohol poisoning than adults (Mäkelä 1978).

Early alcohol debut predicts an increased risk of alcohol related problems in late adolescence and adult life (Chou and Pickering 1992). Also, there seems to be a substantial stability of drinking patterns over time, although conflicting evidence has been shown (Grant et al. 1987, Pape and Hammer 1996). In their study of youth transiting into adulthood, Pape and Hammer (1996) concluded that people tend to maintain their relative drinking position over time, although their absolute intake and frequency of drinking may vary. Heather and Robertson (1997) argue that alcoholism (in adulthood) is a learned behavioural disorder. This learning process is initiated in adolescence and is influenced by the social and cultural context. Drinking alcohol may jeopardize a person's physical, mental, and social development during this period

and thereby endanger the successful transition from adolescence to adulthood (Newcomb and Bentler 1988).

The consensus on alcohol-related problems among adolescents seems to be that the major adverse effects in the case of youth are of social nature (e.g. Smart 1980). Holder (1994) strongly criticised the extension of traditional alcohol research focus on alcohol dependency towards the studies on alcohol problems in adolescence. Still, alcohol use prevalence studies and alcoholism antecedent studies remain the two main bodies of adolescent alcohol drinking research.

Adolescent drinking as a research topic

Concern over adolescent drinking seems to have evolved quite recently. Although mankind has known and drunk alcohol throughout the recorded history, drinking among the youth has not been an issue. This does not necessarily mean that adolescent drinking did not exist. In fact, historic documents from the 19th century and the beginning of the 20th century paint a picture of widespread drinking among adolescents (Kiær 1909 ref. Bruun and Hauge 1963, Hawker 1978, Keller 1980, Ahlström et al. 1995), who were, at the time, an important part of the workforce in agriculture, industry and services. Even the temperance movement at the turn of the century was not concerned about adolescent drinking, but rather the fact that adolescents could buy alcoholic beverages to take home to their father (Smart 1980 ref. Hayler 1897).

Adolescent drinking became a topic for academic research during and after the Second World War (Filstead and Mayer 1980, Smart 1980). The early issues were the role of drinking in adolescent antisocial behaviour (Filstead and Mayer 1980). After this orientation with problem-related drinking, the scope was gradually widened to the study of drinking habits in the whole adolescent population. The 1950s saw a rise of scientific literature on the prevalence of drinking among schoolchildren and college students. Studying the consequences related to drinking among adolescents and the reasons leading adolescents to drink (e.g. Jessor and Jessor 1977) further established the status of adolescent drinking as an acknowledged field of research.

In Finland, the first quantitative study that provided information on adolescent drinking was published by Pekka Kuusi in 1956. Kuusi (1956) used data collected

from 15 to 59 year-olds in certain municipalities to evaluate the effect of a beer- or wine-store on alcohol consumption and related issues. In 1963, Kettil Bruun and Ragnar Hauge (Bruun and Hauge, 1963) published the first alcohol study to concentrate on adolescents aged 14, 16 and 18 years. The study was an international one reporting the drinking habits of boys living in the Nordic capitals. More than a decade passed before the first nationally representative study on Finnish adolescents was published by Salme Ahlström-Laakso (1975). In addition to reporting the prevalence of drinking, this study, entitled 'Changing drinking habits among Finnish Youth', reported the preferred beverage types, amount of ethanol consumed and the drinking place on the latest drinking occasion as well as the source of alcohol. In 1977, Ahlstöm-Laakso was part of the core team establishing the Adolescent Health and Lifestyle Survey used even today, in 2001, for monitoring adolescent drinking.

The study of adolescent drinking has evolved into a multidisciplinary and multi-methodological field of research. The core disciplines seem sociology, psychology and public health. However, health education research has played an important role from the beginning; the concern over adolescent drinking has continued to create demand for ways to educate adolescents not to drink. Medical science has explored the effects of alcohol on the adolescent physiology. Within the health research, the topic has flourished as a question for public health research.

Methodologically, interviews and questionnaires have dominated the scene. Analysis has overwhelmingly been quantitative. Although longitudinal settings have been conducted since the 1970s, cross-sectional surveys have been the norm. Recently, qualitative methods have emerged to fill the void in knowledge on the role of drinking in adolescence (e.g. Kumpulainen 1995, Jaatinen 2000).

Factors in adolescent drinking

Aside from arguing about what constitutes problematic drinking, researchers have been keen to formulate theoretical models bringing together knowledge from findings accumulated throughout the years. As noted above, the main emphasis seems to have been on finding antecedents of adult alcoholism in adolescence. Drinking patterns emerging in adolescence have been seen to reflect the influence of a variety of factors ranging from genetics through individual psychological and social influences on macro-level social forces.

Physiological factors

Family history of alcoholism has been acknowledged as a strong factor predicting alcohol problems (e.g. Cotton 1979, Cloninger et al. 1981, Merikangas 1990, Pihl et al. 1990). Alcoholism seems to run in families, but the origin of this association is debated, in particular, the role of genetics (e.g. Peele 1986, Searles 1988). In the field of twin studies, one of the classics is a study by Partanen et al. (1966) which reported substantial heritability estimates for several alcohol-related factors. Kaprio et al. (1987) supported this view of alcohol use heritability. Adoption studies such as the ones in Sweden by Cloninger et al. (1981) and Bohman et al. (1981) have found continuities of alcoholism from biological parents to their offspring even when the child has been adopted into a non-alcohol abusing family. Heath and others (1997) note that although several twin studies yield substantial heritability estimates (30% to 70%) for alcohol use disorders, the confidence intervals are also substantial. Definitive statements on the heritability of drinking patterns still seem to be in waiting.

Genetic marker studies have concentrated on two genetic susceptibility loci: the aldehyde dehydrogenase ALDH locus and D2 dopamine receptor locus. Polymorfism at the ALDH2 locus is involved in the primary metabolic pathway leading to the elimination of ethanol in liver (Agarwal and Goedde 1989). The genetic susceptibility in some Asian populations resulting in an unpleasant flushing response to alcohol is thought to be related to reduced alcohol use (Thomasson et al. 1993). McGue (1995) summarised the findings on the ALDH2 studies with the conclusion that despite ALDH2 alleles being similar in several Asian populations, the prevalence of alcoholism in these same populations was quite diverse, and concluded that the influence of cultural factors was still much more significant. Blum et al. (1990) studied the allele of the D2 dopamine receptor and reported substantially higher A1 allele frequencies among alcoholics compared with controls. However, this finding has been later seen as a statistical artifact associated with failure to control for ethnicity and other factors (McGue 1994, Heath et al. 1997).

Considering the available evidence on the role of genetics in alcoholism, McGue (1994) considered the biological-genetic study an important part of alcohol abuse studies. In his review, he concluded that male, but not female, alcoholism is heritable. Family rearing appears important, but most adoption studies have failed to present

evidence on rearing family transmission of alcoholism. McGue (1994) suggested that more progress would be made if the biological knowledge was combined with existing psychosocial models in the field. The social models of 'inheritance' of alcohol use will be discussed in the following chapter. To summarise his review on the genetics studies, Windle (1999) forecast the research on susceptibility loci to flourish in the coming years, and expected alcohol problem trait markers identifiable in adolescence to lead the way to more successful preventive interventions.

Explanations for the higher prevalence of alcohol use disorders among those with a family history of alcoholism have also been sought in their hypothetically different functional responses to alcohol. In a summary of this line of research in 1990 by Newlin and Thomson, several studies were found both in support and against the hypothesis. After years of more research into the different individual responses to both the rising and falling blood alcohol levels, Newlin (1994) stated that the etiological mechanisms are still poorly understood, and suggested the broadening of view from alcohol to other drugs of abuse.

Psychosocial factors

Jessor and Jessor (1977) were the first to introduce a model presenting adolescent alcohol abuse as part of a wider deviance syndrome, later developed in e.g. Donovan and Jessor (1985) and Newcomb and Bentler (1988). The Problem Behaviour Theory (Jessor and Jessor 1977, p. 33) defines problem behaviour as "behaviour that is socially defined as a problem, a source of concern, or as undesirable by the norms of conventional society". The deviance syndrome is characterised by a multitude of problem behaviours such as aggressiveness, substance abuse and criminal activities (Jessor and Jessor 1977, Fauber et al. 1990).

Childhood behaviour problems have been linked to alcohol use in early adolescence since the McCord and McCord study in 1960 (McCord and McCord 1960). Physical aggression and other symptoms of disruptive disorders have been noted as components of a syndrome containing alcohol and other drug use (Zucker and Gomberg 1986, Dobkin et al. 1995, Brown et al. 1996). Although anxiety and depressive disorders have been implicated for comorbidity among adult alcohol abusers (Helzer and Pryzbeck 1988), this area has only recently raised interest in

adolescence. Depressive symptoms were implicated as a risk factor for problem drinking (Scheier et al. 1997, Torikka et al. in print).

Rising from the Social Learning Theory (Bandura 1969), individual expectancies related to alcohol have been shown to be significant predictors of subsequent alcohol use in adolescence (Christiansen et al. 1982). An alternative view on the development of alcohol expectancies was based on the role of brain serotonin chemistry (Deckel et al. 1995).

In studying different coping strategies, Windle and Windle (1996) noted that adolescents who were inclined to respond directly and in a resolute manner to stressful situations were less likely to drink alcohol and have fewer related problems. Adolescents reacting more emotionally either with self-blame or avoidance have been found to present significantly more drinking problems (Myers and Brown 1990, Windle and Windle 1996). Higher occurrence of alcohol-related problems has also been linked with tendencies to utilise drinking to avoid adverse conditions (Cooper 1994). Social motives for drinking (e.g. celebration), on the other hand, have been found to be associated with a high level of drinking, but not with drinking problems (Cooper 1994, Windle and Windle 1996). The same relationships were found to be the case with social conformity motives (Cooper 1994), i.e. drinking to be accepted in a group. Finally, using drinking as a way to enhance positive affects has been implicated both for increased drinking and heavy drinking (Windle and Barnes 1988, Cooper 1994).

Sher (1994) presented a psychosocial model of adolescent alcohol abuse aiming at bringing together the knowledge on individual level risk factors of problem drinking. This model combines three different pathways for what the author calls 'pathological alcohol involvement': (1) the enhanced reinforcement pathway, (2) the deviance proneness pathway, and (3) the negative affect pathway. The reinforcement pathway focusing on individual differences in the pharmacological effects of ethanol essentially rests on the ground that family history of alcoholism is known (e.g. Merikangas 1990, Pihl et al. 1990) to be related to the development of alcohol problems. Other components in the pathway include temperament/personality (Levenson et al. 1987), cognitive dysfunction (Pihl et al. 1990), and ethanol sensitivity (Newlin and Thomson 1990). The deviance proneness pathway concentrates on deficient socialisation. Building on the enhanced reinforcement

pathway, cognitive deficits are a risk factor of school failure (Hinshaw 1992), which in turn is posited to lead to association with deviant peers (Kaplan 1975). The third pathway, the negative affect pathway, describes the associations of proneness to experience negative affective states to alcohol abuse. Life stress has been implicated a consequence of parents' alcoholism (Roosa et al. 1988). Impaired coping abilities seem also on the pathway (Sher 1991, Cooper et al. 1992).

Sher (1994) goes on to state that the division of the risk factors for various pathways is ultimately arbitrary, and that there are no clear-cut boundaries between the pathways. As a result, he draws a rather complex web of paths leading to problem drinking (Sher 1994, p. 100). He concludes that a multifactorial model is both necessary and useful in understanding individual level influences related to alcohol abuse.

In addition to the hypothetical genetic influences of the parents towards adolescent alcohol use presented above, the family can also be studied as a social environment in childhood. Non-normative family structure has been implicated as a factor associated with increased drinking (Barnes 1990, Norton et al. 1998). The class, or socio-economic status, effect noted among adults (e.g. Bucholz and Robins 1989) has not been decisively confirmed to exist among adolescents (Kandel 1980, Newcomb and Bentler 1989). However, resemblance has been found between adolescents' and their parents' drinking patterns (Barnes 1990, Webb and Baer 1995). It has been found that children's learning about alcohol takes place very early in childhood (Noll et al. 1990), a period when the parents' influence is particularly strong. Parents can exert a direct, drinking specific pressure on their child, most often through role modelling (Zucker 1979, Webster et al. 1989, Barnes 1990, Gerrard et al. 1999). Newcomb and Bentler (1988) drew attention to the quality of relationships between the parents and interaction within the family as powerful influences on child alcohol and other drug use. Adolescent drinking seems closely linked with marital conflicts and disrupted or inadequate parenting (Jessor and Jessor 1977, Stice et al. 1998). In a review by Barnes (1990), four major categories of family influence were identified: parental nurturance (emotional support), monitoring rules of conduct, time spent together and quality of parent-child communication.

Siblings, especially older siblings, have been found to have an effect on an adolescent's drinking habits. While Brook et al. (1990) suggested a rather direct effect

of the older siblings through identification and modelling, Rowe and Gulley (1992) opted for an indirect effect via common peers, especially in the case of the adolescent having older siblings. In an adoption study, McGue and others (1996) reported a significant sibling influence, but no parental or family functioning effect, on adoptee drinking.

Lack of parental control and communication, dating and close communication with peers may all be indicators of involvement with what Gerrard et al. (1999) called a drinking-conducive peer environment as opposed to a family-oriented lifestyle. A rich social life was found to predict drunkenness in Sweden (Bergmark and Andersson 1999), especially among girls. The function of drinking as a performance for others has been discussed recently (Room 1994, Ahlström 2000, Jaatinen 2000). Peer pressure to drink has been a popular explanation for adolescents' drinking among the lay public. It has, however, been shown that the peer effect does not necessarily work strait through coercive pressure, but rather through more complex mechanisms such as peer selection and reciprocal socialisation (Kandel 1980, Reed and Rountree 1997). Rejection by conventional peer groups has been noted a key element in the development of antisocial behaviour including alcohol abuse (Dishion et al. 1991, Jacob and Leonard 1994). Rejected adolescents have been noted to form deviant groups further enhancing the adoption of problematic drinking practices, for instance; this development seems to start rather early in childhood (Dishion et al. 1991). In groups of deviant adolescents, modelling and imitation, and increased availability of and access to alcohol are as important factors promoting alcohol use as are value transmission and social enforcement (Kandel 1985, Kandel and Andrews 1987). The classic work by Bruun (1959) showed that in a group a member was only permitted to drink more, not less than the other members of the group. The number of drinking friends has been shown to be probably the most significant predictor of adolescents' drinking (Wills et al. 1998). It has also been noted (Clayton and Ritter 1985, Newcomb and Bentler 1989, Newcomb 1994) that alcohol use within groups of deviant adolescents is often only a part of experimentation and use of a wide variety of psychoactive substances such as marijuana and cocaine. While alcohol use is 'only' an age-status offence, the use of other drugs exhibits a tendency towards more serious criminal activities.

In a review by Windle (1999) the immediate social environment influences were ranked in the following manner: peer influences were the most powerful ones, sibling effects next, and parental influences the least important. He noted, however, that the effects are likely to be age-dependent; e.g. parental monitoring is probably a stronger influence among younger adolescents. The need for more comprehensive studies involving all three social influences and several outcome indicators (onset of drinking, heavy drinking, drinking problems) was urgently called for.

Alcohol beverage types and adolescents

Overall, public health and alcohol policies have been influenced by the assumption that alcoholic beverages differ in their health effects. This can be seen in e.g. heavier taxes, bans on advertising and higher age-limits on sales for beverage types with a higher ethanol content. From alcohol research point of view, this has been grounded in laboratory findings, which indicate that spirits have a greater intoxicating potency (Smart 1996). It has been shown that spirits are absorbed more quickly from the gastrointestinal tract than wine or beer (Olson 1979). However, in a controlled laboratory setting, O'Neill et al. (O'Neill et al. 1983) found notable between-individual variation in maximum Blood Alcohol Concentration, but no beverage-specific effect.

Beverage-specific somatic health effects have been shown (Richman and Warren 1985) but contrary evidence also exists (Klatsky et al. 1990, Laforge et al. 1990). Aside from the biological and chemical paradigm, cultural and lifestyle differences between individuals may give rise to different preferences for beverage types and to differential health outcomes both in the short and long-term. Although multiple beverage use is common, different groups do tend to show a preference for specific beverage types (Klatsky et al. 1990, Hansell et al. 1999). Furthermore, beverage preference has shown significant longitudinal stability, even among adolescents (Hansell et al 1999). Smart (1996) presented several beverage specific associations; these findings were attributed to psychosocial rather than physiological effects. Drinkers of beer and multiple beverage users have been found to be heavier drinkers, while wine has appeared as the beverage of moderation (Smart 1996). Furthermore, it has been suggested that beer and spirits are associated with a more rebellious and deviant lifestyle (Smart and Walsh 1995).

Although Klein and Pittman (1993) reported associations between beverage types and emotional states, they concluded that alcohol beverage preference is much less tied to specific emotional states than postulated previously. They concluded that it is the psychosocial situation as a whole that has a crucial impact on the choice of beverage (Snortum et al. 1987). Beverage preferences seem culturally determined. The preferences of excessive drinkers generally reflect the prevailing drinking habits in their sociocultural milieu (de Lint, 1977). In a study on adolescents in the USA, heavy drinkers were found to favour beer and spirits (Smart and Walsh 1995).

In Finland, the mid-1980s witnessed the change from spirit- to beer-dominated consumption. Since then, beer has been found to be the most important source of intoxication for all population groups except those over 50, for whom it is spirits (Simpura et al. 1996). Beverage types used by Finnish adolescents have been studied in the European School Survey Project on Alcohol and Other Drugs (ESPAD) in 1995 and 1999 (Hibell et al. 1997, Ahlström et al. 1997, Ahlström et al. 1999). In 1995, 15-16 year-old boys were reported to have consumed over 51% of their ethanol intake at the latest occasion of alcohol use in beer, 33% in spirits and 16% in wine (Ahlström et al. 1997). The corresponding figures for girls were 32%, 44% and 24%. In 1999, the three commonest alcohol beverages among boys were beer, spirits and cider (Ahlström et al. 1999). For girls, cider emerged as the most common type of beverage, followed by spirits and beer.

Measurement of adolescent drinking and drunkenness

Measurement of alcohol use has been found to be a rather tricky process (Feinstein 1988). While information on the current level of alcohol in the bloodstream is accurately measurable, longer-term drinking habits defy an objective method. Analysis of liver enzymes is probably the best long-term biochemical marker of alcohol use. Although the measures are objective, their interpretation is not simple. One possibility is to observe people drinking. This method may give an unbiased view of what and how much a person or a group of people drank, but its use is limited to single episodes of drinking. More long-term drinking patterns are not easily observable.

The most common approach to investigating alcohol use is to ask people about their drinking habits. This can be done utilising self-report questionnaires or interviews. A

common observation concerning the use of self-reports on alcohol use is that people generally seem to 'forget' around half of the alcohol purchased. It must be noted, however, that this holds true only on the level of the total population; this finding cannot necessarily be generalised to adolescents. Jaatinen (2000) noted that in group interviews, the early adolescents were both willing and able to inform the researcher about their drinking. The validity of self-reports has been studied using biological tests (Campanelli et al. 1987, Kokkevi and Stefanis 1991) and collateral and diary reports (Smith et al. 1995). Overall, the use of self-reports seems the most viable alternative available for assessing drinking habits at the population level.

The age at initiation of alcohol drinking has been one of the key issues in adolescent drinking research. However, as drinking has become more widespread, the emphasis has shifted towards recurring drinking, and drunkenness in particular. The concept of 'drunkenness' refers to 'deprivation of proper control of oneself by alcoholic liquor' (The Oxford Dictionary 1991). Studies of drunkenness have concentrated on using two concepts: self-reported experienced drunkenness and binge drinking. Binge drinking refers to the drinking of a rather large (five, sometimes six 'standard' drinks) amount of alcohol within a short period of time (Wechsler and Isaac 1992, Ellickson et al. 1996, Johnston et al. 2000, Ahlström et al. 2001). In addition to these two concepts, a closely related concept of Blood alcohol concentration (BAC) must enter the discussion. The BAC is the proportion of the compound C_2H_5OH in a person's bloodstream (e.g. Olson 1979). The study of drunkenness may thus be approached along at least three lines: heavy drinking behaviour, experience of drunkenness, and blood alcohol concentration.

No ethyl alcohol normally circulates in the bloodstream. When a person drinks a beverage containing alcohol, the substance quickly shows up in the blood. It is widely agreed that the way drinking alcoholic beverages affects the physical and psychical condition of the drinker is mediated through the proportion of ethyl alcohol in blood, BAC. Blood alcohol concentrations ranging from 0 to 0.05% are usually reported to be related to positive experiences e.g. of relaxation, while increasing loss of muscular and cognitive function may eventually lead to a lethal condition (BAC exceeding 0.5%) (Thorley 1982). In contrast with experienced drunkenness and binge drinking, BAC can only be measured using biochemical methods. This property makes it virtually non-usable in large population studies.

The question of the amount of alcoholic beverages is relevant from the heavy drinking perspective. As stated before, there seems to be agreement that the drinking of four to six drinks constitutes something called a binge. It is agreed that such amounts of alcohol may be related to drunkenness as 'deprivation of proper control…', which in turn may be linked with socially unwanted behaviour (e.g. crime) or other problems discussed previously. Also, most western societies, including Finland, limit the accessibility of beverages containing alcohol to adolescents. The accessibility of large amounts of alcohol seems to suggest non-functioning of these restrictions. Experienced drunkenness, on the other hand, refers to the individual and social conditions related to drinking. It is a way of looking at drunkenness more as a subjective phenomenon best evaluated by the person her/himself. Although obviously connected with drunkenness as 'deprivation of proper control…' with the associated problems, the emphasis seems more on the social or personal experiences related to drinking. The criticism against the measuring of experienced drunkenness stems from the absence of an 'objective', i.e. unbiased, definition of drunkenness (Conrod et al. 1997).

The Finnish country report on the most recent ESPAD survey (Ahlström et al. 2001) showed large variations in the numbers of 'standard drinks' the 15 to 16 year-olds needed to get drunk. This variation probably consists of at least three components: variation in the amount of ethanol yielding certain blood alcohol concentration (O'Neill et al. 1983), variation in drunkenness experience related to a certain BAC, and variation in the self-report of the drunkenness experience. It is fair to say that the knowledge about the relationships between the three indicators (number of drinks, BAC, experienced drunkenness) is fairly thin.

Monitoring adolescent drinking

From the public health viewpoint, the drinking of an individual is not the key interest area. Group or population levels are the primary levels of investigation. Furthermore, monitoring the developments in time of health and related factors are of crucial importance; in fact it has been stated that 'Public health surveillance is the epidemiological foundation of modern public health' (Berkelman et al. 1997, p. 735). The Dictionary of Epidemiology (Last 1995, p. 107) defines monitoring in the following way: 'The performance and analysis of routine measurements, aimed at

detecting changes in the environment or health status of populations.' Originally, health monitoring systems were established as a part of efforts to control infectious diseases (Last 1998). As the scope of public health widened, monitoring systems were developed to include information on disease risk factors and health related behaviours in general. Today, monitoring systems are in use in many areas where there exists or is likely to occur a public health problem. As a part of health related behaviours, alcohol drinking is one such area.

The two main methods in monitoring alcohol drinking are the recording of alcohol consumption (sales) on the one hand and the surveying of people's drinking on the other. In Finland, comparable data on total alcohol sales have been available at least since the 1930s; it generally increased in a slow but steady manner until 1968 (Intoxicants statistical yearbook 1999). In 1969, in conjunction with the alcohol law liberalisation, the total alcohol consumption increased dramatically re-establishing in the late 1970s on a level almost three times the amount of 100% alcohol consumed in the early 1960s. Population drinking habit surveys have been conducted since 1968 every four years. Study of this data has revealed important information on the patterns of drinking, e.g. the persistence of drunkenness-related drinking among the adult population (Simpura 1987, Metso and Simpura 1997). With the exceptions of the impact of the alcohol law change in 1968 and the strong economic growth and liberalisation in the late 1980s, the changes in total consumption of alcohol have been rather slow to take place.

Surveys have been the dominant method in monitoring adolescent alcohol drinking. In 1971, Sweden was the first country to establish a system for monitoring the drinking Andersson and Hibell 1995) followed by the United States of America in 1975 (Johnston et al. 1995). Both of the monitoring systems were school surveys conducted every year on certain grades. Finland chose a different method; the Adolescent Health and Lifestyle Survey has been conducted every other year since 1977 using mailed surveys to 12, 14, 16 and 18 year-olds (Rimpelä et al. 1997, Rimpelä et al. 1999). Started in 1995, the School Health Promotion Survey (http://www.stakes.fi/kouluterveys/) has also monitored adolescent drinking, together with a multitude of other health related issues, through nationwide utilising school surveys. Although the surveys have been carried out every year, the pupils in the same schools are surveyed every other year. Multinational monitoring systems were

initiated in 1984, when the Health Behaviour in School-aged Children (HBSC) was started (Aarø et al. 1986); the survey has been conducted every four years since. Likewise, the European School Survey Project on Alcohol and Other Drugs (ESPAD) adopted a four-year interval monitoring system starting in 1995 (Hibell et al. 2000).

The monitoring systems mentioned above all use different methodology in assessing adolescent drinking (e.g. different age groups and questions). Therefore, comparison of data across surveys in different monitoring systems is difficult. However, the findings of this present study will be compared with data from all the other nationally representative monitoring systems further on in this paper. One point worth raising already is the frequency of measurement. While the changes in population level consumption patterns have been rather slow, changes in adolescent drinking patterns seem to have been somewhat faster in taking place. As it will be demonstrated later in chapter *Discussion - Trustworthiness of the methods - Self-reports on drinking - Drinking frequency*, the picture of trends may be affected by infrequent data collection. From this viewpoint, the early Swedish and USA monitoring systems opting for frequent measurements seem to have been wise choices.

Prevalence and trends in adolescent drinking

In Finland

Although several investigations of alcohol drinking were carried out in Finland after the 1939-1944 war, the first study to specifically assess average teenager's drinking in Finland appeared as late as 1963 (Bruun and Hauge 1963). The study was an cross-national one investigating 'the wild habits' (Bruun and Hauge 1963, p. 88) of male teenagers in the Northern capitals, and conducted in 1960. Using an interview method, data was collected from 14, 16 and 18 year-old unmarried males who had lived in Helsinki for at least two years. At that time, 59% of the fourteen year-old boys reported having drunk alcohol. The favourite beverages, indicated by the consumption during the most recent drinking occasion, were beer and wine. Bruun and Hauge (1963) also noted that even the fourteen year-olds often drank more than one beverage type on the same occasion; a phenomenon that was dominant in the older groups. Most fourteen year-old boys, however, had drunk only very small amounts – four fifths had drunk less than two centilitres of pure alcohol. In over half of the drinking situations an adult, usually his parent, had been present and the drinking had taken

place in the subject's own home. In their conclusions, the authors describe the teenage boys' drinking as widespread but moderate. The drinking was usually sporadic, and thus the talk about 'drinking habits' in the case of Finnish teenagers was, in their opinion, not justified. Obviously in favour of judging the drinking of youth as non-problematic, Bruun and Hauge state that the concern is in order '…only if drinking is generally considered to be unsuitable for teenage boys …' (Bruun and Hauge 1963, p. 89).

A nationally representative adolescent population study in Finland was conducted in 1973 in such a way that the results concerning Helsinki were comparable with the Bruun and Hauge study (Ahlström-Laakso 1975). A sharp increase in alcohol drinking among boys living in the Finnish capital Helsinki was observed to have taken place between these studies. The proportion of fourteen year-old drinkers had increased from 59% in 1960 to 83% in 1973. In fact, the Helsinki fourteen year-olds in 1973 drank more often than the eighteen year-olds thirteen years previously. The alcoholic beverage preference had shifted towards wine and the amount drank on the most recent occasion had more than tripled; the mean amount corresponded to around half a bottle of wine. One explanation offered by the author was that the drinking context had changed dramatically. Whereas the fourteen year-olds in 1960 drank mostly in the presence of their parents, in 1973 a peer-group centred drinking style had been adopted. The first prevalence estimates in 1973 for the adolescents in Finland indicated that the proportion of drinkers among fourteen year-old boys was 73% and 72% among girls. The prevalence of recurring drinking, i.e. drinking at least once a month, was 31% among boys and 33% among girls (Ahlström 1979a).

The Adolescent Health and Lifestyle Survey (AHLS) was initiated in 1977 to monitor adolescent smoking and alcohol use, as well as adolescent health, health habits and lifestyle in general (Ahlström et al. 1979). Ahlström (1979a, 1979c) noted that compared with her findings in 1973, fourteen year-olds' drinking had substantially decreased coming to the year 1977. The proportion of drinkers in the whole country had come down to 53% among boys and 56% among girls. A similar decrease was noted in the proportion of monthly drinkers, where 24% of boys and 18% of girls reported drinking at least once a month. Since the start in 1977, the AHLS has yielded biennial data on adolescent drinking habits reported both nationally (e.g. Ahlström 1982, Ahlström 1983, Ahlström 1985, Ahlström et al. 1989, Ahlström 1995) and

internationally (e.g. Ahlström 1979b, Ahlström 1984, Rahkonen and Ahlström 1989, Ahlström and Rimpelä 1991).

In the Nordic countries

Although youth drinking had been studied rather early in Norway and Sweden, a landmark in the study of adolescent drinking was the Bruun and Hauge (1963) study of Nordic capitals mentioned earlier. The authors emphasised the similarities in the drinking between the boys in the four capital cities. Not only were the proportions of drinkers largely equal; the quantities, the drinking places and the company in which the drinking generally took place were also very similar. The finding that adolescent drinking was most prevalent in Copenhagen and least prevalent in Helsinki were attributed to the formal alcohol controls being most rigorous in Helsinki and mildest in Copenhagen.

In her review of adolescent drinking in the Nordic countries (Ahlström-Laakso 1975) noted that the proportion of adolescent drinkers had dramatically increased in every country from 1947 to 1968. According to the study in Nordic capitals in 1960 (Bruun and Hauge 1963), around 60% of the fourteen year-old boys had drunk alcoholic beverages in each city. It seemed that the increase in drinking had taken place before the year 1960.

In Denmark, the prevalence of drinking among boys had increased significantly from 1960 to 1974 (Ahlström-Laakso 1975). Whereas the similar development in Finland was attributed to the rise of a new peer-group oriented drinking context, the proportion of family-centred drinking remained high in Denmark. More recently, Skretting (1995) reported that adolescent drunkenness had been on the increase in Oslo at least since 1971. A similar observation on increased drinking was reported by Gudmundsdóttir (1994) concerning Icelandic adolescents at the turn of the 1990s.

Annual school surveys on adolescent alcohol drinking and other drug use habits in Sweden have been conducted since 1971 (Andersson and Hibell 1995). The proportion of grade nine students (aged fourteen to fifteen years) classified as alcohol users stayed relatively level at around 90% from 1971 to 1978, followed by ten years' steady decline to under 80% in 1988. From then on, the only significant change took place in the mid-1990s when drinking became more prevalent among the girls. The heavy drinking (drinking at least four bottles of strong beer or equivalent on a single

occasion at least once a month) trend is largely similar except that in the 1990s the proportion of heavy drinkers has steadily increased. The proportion of heavy drinkers among boys (around 30% in 1999) has been greater than among girls (around 23% in 1999) throughout the study period. The authors used several responses from the survey to estimate the mean yearly consumption of pure alcohol. This figure showed a strong downward trend until 1981, followed by a slighter diminishing trend until 1988, after which the consumption had generally been on an increase. Girls have reported smaller quantities throughout the period, and this gender difference had increased. Among boys, beer accounted for more than a half of the estimated yearly consumption whereas spirits appeared dominant among girls. (Andersson and Hibell 1995, Andersson and Hibell 1999, Andersson et al. 2000)

The Nordic countries have also taken part in the Health Behaviour in School-Aged Children Study (HBSC), which is a collaborative project between an international network of researchers in now over thirty countries, and the European Regional Office of WHO (see web-site *www.hbsc.org* for further details) (Aarø et al. 1986, Currie et al. 2000). Likewise, all Nordic countries have participated in the Council of Europe (Hibell et al. 1997, Hibell et al. 2000) project entitled European School Survey Project on Alcohol and Other Drugs (ESPAD) to investigate adolescents' drinking habits. In 1994, according to the HBSC survey, the proportions of 15 year-old boys and girls reporting to have been drunk at least twice were 66% in Denmark, 51% in Finland, 30% in Norway and 25% in Sweden (King et al. 1996). In the next HBSC survey, conducted four years later, the corresponding figures were 67% (Denmark), 55% (Finland), 39% (Norway) and 40% in Sweden (Gabhainn and François 2000). Hibell et al. (1997) published the proportions of students aged 15 to 16 years who reported to have been drunk at least ten times during the last twelve months as follows: 32% in Denmark, 28% in Finland, 21% in Iceland, 18% in Sweden and 11% in Norway. Again four years later, the corresponding figures were 39% (Denmark), 29% (Finland), 19% (Iceland), 18% (Sweden) and 16% in Norway (Hibell et al. 2000). Owing to the cluster sampling methods used, none of the studies were able to report confidence intervals for the prevalence estimates nor the statistical significance of the changes. Generally it could be noted that the gender differences were rather small; a slightly larger proportion of boys was drinkers. As a summary of these studies, Denmark seems to have remained the country with adolescent drinking most

prevalent, while Finland seems to be the country at the second place, at least in drunkenness-oriented drinking. As to the trends in drinking prevalence, the only definite statement is that drinking seems not to have decreased significantly in prevalence in any of the Nordic countries.

In European and North American countries

European School Survey Project on Alcohol and Other Drugs (ESPAD) referred to above was conducted in 1995 among 15-16 year-olds in 26 European countries (Hibell et al. 1997). In 1999, the number was increased to include 30 European countries and the USA (Hibell et al. 2000). Methodological studies have been conducted as part of the project (Johnston et al. 1994), but still the effect of the different cultural contexts continue to diminish the validity of the cross-national comparisons. This shortcoming has been acknowledged by the team, and their stated long-term goal is to compare *trends* between countries (Hibell et al. 2000); this same statement appeared also in the early document of the WHO HBSC study (Aarø et al. 1986).

Denmark appeared as the country with most adolescent drinking in Europe with half of the fifteen to sixteen year-olds having drunk alcoholic beverages at least 20 times and around 40% having been drunk at least ten times during the previous twelve months. Other countries high both on drinking and drunkenness were Ireland and the U.K. A large proportion of adolescents in e.g. Greece and Malta had drunk alcohol, but not so much as to become drunk. Adolescents in Iceland and Greenland, on the other hand, seemed to favour drunkenness, but were places with a low prevalence of drinking in general. The adolescents' drinking habits in Europe appeared to roughly follow the perception of frequent drinking of smaller amounts in the south and drunkenness being the dominant habit in the North. Finland, for example, appeared near the median with respect to drinking in general, but was number three on the list for drunkenness. Discussing the differences in prevalence between 1995 and 1999, the ESPAD authors comment that the prevalence of drunkenness has changed little. Slight increases in prevalence were generally observed, but in some countries drunkenness seemed to have somewhat decreased. (Hibell et al. 2000)

The Health Behaviour in School-aged Children (HBSC) was started in 1982 as a research project to gather comparable international data on health-related behaviour

among schoolchildren (Aarø et al. 1986). The HBSC surveyed, among other things, the drinking habits of eleven, thirteen and fifteen year-olds in 28 participating countries (Settertobulte et al. 2001). Among the thirteen and fifteen year-olds, Italy Wales and England were the countries with the highest prevalence (almost 50% among the 15 y.) of weekly drinking of any alcoholic beverage, while in the Nordic countries rather few adolescents (around 10% among the 15 y.) reported this type of drinking (Currie et al. 2000). Perceived drunkenness at least twice during the lifetime appeared most prevalent (almost two-thirds) among the British and Nordic adolescents, while being relatively rare in Southern Europe. The proportion of regular drinkers was observed to be smaller in 1998 than four years previously, but drunkenness seemed to have gained popularity (Settertobulte et al. 2001).

Interestingly, notable differences in the relationship between family socio-economic status and adolescent drinking showed up; adolescents from financially better off families in e.g. Britain, Denmark and Finland were found to drink more frequently whereas the opposite was evident e.g. in the USA, Slovakia and Ireland (Currie et al. 2000, Settertobulte et al. 2001).

In addition to these cross-national surveys, adolescent drinking trends are seldom reported internationally. At the beginning of the year 2001, the writer of this present study sent an e-mail to the researchers in charge of the ESPAD survey in their own countries to inquire about any nationally published trend data on adolescent drinking. A trend study was required to contain data from at least three comparable nationally representative surveys. Replies were obtained from more than half of the countries, but only four could provide the data requested. The Swiss report by Jacquat et al. (2001) seems to be a national report drawing on the HBSC data. The study showed a clear increasing trend in perceived drunkenness among fifteen year-olds, some increase among thirteen year-olds and no change among eleven year-olds. Earlier, Müller (1987) had reported decreasing drinking and drunkenness in Switzerland between 1978 and 1986. In France, de Peretti and Leselbaum (1999) restricted the reporting of three time-point trends to the proportion of abstainers, because the questionnaire had been changed so that comparisons were misleading. The prevalence of drinking among the Parisian high school students had been unchanged from 1983 to 1991 and had decreased in prevalence coming to 1998.

The two North American countries of Canada and the United States of America took part in the 1998 HBSC, and the USA also in the 1999 ESPAD. In both cross-national surveys, the USA falls slightly below the median in drunkenness prevalence while Canada appears a country with above European median prevalence. While 67% of the Danish and 55% of Finnish fifteen year-olds had been drunk at least twice in a lifetime, the prevalence figure was considerably lower, 31%, in the USA.

Although devoting much effort into investigating illegal drug use, alcohol is still acknowledged as the number one substance among the adolescent in the USA (Johnston et al. 2000). A nationally representative survey series called 'Monitoring the Future' has been conducted annually since 1975, but comparable data on 8th and 10th graders is only available since 1991. Among these younger adolescents, binge drinking (drinking at least an equivalent of five 'standard drinks' in a row within two weeks) showed a slight increasing trend in the beginning of the 1990s followed by two years of decline from 1996 to 1998. In 1999, this type of drinking again gained popularity. Looking at the binge drinking trends among the 12th graders, peak popularity with more the 40% reporting bingeing during last two weeks was in the year 1979. The downward trend again turned to an increase in 1993 and reached the prevalence of 33% in the year 1999. The authors note that no support is found for the popular hypothesis of a 'displacement effect' between alcohol and marijuana; the prevalence trends of these psychoactive substances parallel one another. (Johnston et al. 1995, Schulenberg et al. 1996, Johnston et al. 2000). Starting from 1991, the National Centre for Chronic Disease Prevention and Health Promotion have run a biennial adolescent and school health survey programme called the Youth Risk Behaviour Surveillance System (YRBSS, Kolbe et al. 1993, see also http://www.cdc.gov/nccdphp/dash/yrbs/) The trends for episodic heavy drinking (drank > 5 drinks of alcohol on at least one occasion on > 1 of the 30 days preceding the survey) among high school students indicated a slight increase in prevalence whereas no increase was seen in current alcohol drinking.

Societal factors in explaining adolescent drinking trends

Social effects on adolescents drinking are not always confined to the immediate social environment such as those presented above. A number of societal, community and

cultural influences are in play at the time an adolescent forms his or her relationship with alcohol.

When studying the effect of the area of residence, adolescent drinking has been noted to be less prevalent in rural compared with urban areas (Kandel 1980, Ahlström et al. 1994). Pulkkinen (1983), however, noted that adolescent drinking problems seemed more related to frequent moves than urban residence *per se*.

The overall population level of alcohol consumption and the culture-specific drinking patterns are known to exert a strong influence on adults' drinking habits (Bruun et al. 1975, Edwards et al. 1994). Europe is the continent with the highest alcohol consumption (Settertobulte et al. 2001), and consumption increased during the second half of the 20th century. In Finland, a three-fold rise in the total consumption of alcohol took place from the 1960s to the early 1970s. Mid-1970s to mid-1980s was a period of modest increase. In the second half of the 1980s, the increase was strong, 19% from 1985 to the year 1990. The recession in the beginning of the 1990s stopped this growth at least temporarily (Ahlström and Österberg 1997).

Mäkelä (1975) differentiated the single distribution model presented by Ledermann in 1956 (Bruun et al. 1975) emphasising formal control from informal, or cultural, controls of drinking. Informal influences on societal expectations around the transition from childhood to adulthood may be a crucial element during the initiation of drinking behaviour (Jessor and Jessor 1977, Johnstone 1994). Drunkenness oriented drinking style (excessive but episodic) has traditionally prevailed among the adult population in Finland and the other Nordic countries (Simpura and Ahlström 1994). A slow increase in continental type of consumption with more frequent use of lesser quantities has been added to the traditional drunkenness-oriented consumption style (Simpura and Ahlström 1994).

Rowe and Rodgers (1991) studied the use of epidemic process models developed to describe the spread of contagious diseases in the population on the spread of social behaviours among adolescents. They assumed that the spread of drinking among adolescents depended on the number of adequate contacts (ones that result in 'transmission') between drinkers and non-drinkers. In their two independent data sets from US adolescents aged twelve to seventeen, the epidemic model corresponded well with the observations. The inclusion of an 'immune' class of individuals did not

improve the fit as it did in the case of smoking. In a theoretical sense Rowe and Rodgers (1991) interpret their results as emphasising the reward value of drinking; they see peer influence as an opportunity rather than pressure.

Access to alcohol, and legal and social sanctions are thought to be a powerful control of adolescent drinking (Single 1994). Finland, together with most other Nordic countries, has traditionally conducted a restrictive alcohol policy with a state alcohol monopoly and high alcohol taxation. A gradual change for a more liberal approach has taken place during the past few decades. Despite the fact that no legislative changes were made in the 1980s, the implementation changed. In the 1995 Alcohol Act, the law was changed to allow the sales of medium beer in kiosks, and a change in interpretation allowed sales in service stations. As a result, the number of locations licensed to sell or serve at least medium beer has increased from 13,213 in 1981 to 15,624 in 1994, and to 17,626 in 1997 (Alcohol Statistical Yearbook 1981, Juhani Hakala personal communication). After these changes, the age limits were also not as easy to control compared with the prior strong position of state alcohol monopoly stores. The restrictions on drinking in public were eased, with the result of drinking, also adolescent drinking, becoming more visible.

Another eminent way of controlling the availability of alcohol is price policy (Edwards et al. 1994). Österberg (1995) showed that the consumption of alcohol beverages in Finland was responsive to incremental changes in pricing. This regulatory effect has been shown later elsewhere as well (e.g. Grossman 1989). Pricing may act as an even more effective inhibitor of drinking among adolescent due to smaller 'income'; Lintonen (1999) showed a strong relationship between adolescents' allowance and heavy drinking. In Finland, the alcohol retail price has gradually been decreased and the import regulations of tax-free alcohol have been eased (Metso and Simpura 1997). These changes have been reflections of stronger positive attitudes towards the use of alcohol among citizens and the public opinion demanding liberalisation (Ahlström and Österberg 1992). In Finland, it has been suggested that the increased adolescent drunkenness from 1973 to 1987 was connected with increased overall alcohol consumption, increased availability and liberalised alcohol policy in general (Rahkonen and Ahlström 1989).

In addition to affecting brand preferences, alcohol beverage advertising has often been implicated for changes in the total level of consumption (Smart 1988). In his review,

Smart found only mixed support for these claims, possibly owing to methodological limitations. Atkin (1990) studied the impact of alcohol beverage commercials shown on television and showed a modest increase in teenagers' drinking and drunk driving.

Despite widespread legal restrictions of selling alcohol to adolescents (Settertobulte et al. 2001), adolescents' access to alcohol seems almost unrestricted in practice (Ahlström et al. 1994, Johnston et al. 2000). Whereas the adult population's support for drinking restrictions in Finland is quite consistent (Ahlström and Österberg 1997), the focus on illicit substance use in the USA seems to have led to a lax view on the enforcement of alcohol laws in the case of adolescents (Windle 1999).

Summarising the current state of research supporting the control of alcohol availability, Single (1994) presented three well-established hypotheses:

1) alcohol availability is positively related to population mean level of consumption

2) population mean level of consumption is closely associated with prevalence of heavy drinking

3) heavy drinking is related to adverse health and social consequences

Despite growing evidence of societal level influences on adolescent drinking habits, Johnstone (1994) noted with disappointment that so far satisfactory theoretically based macro level models have not been developed. He called for multilevel models to integrate the knowledge of individual level influences and the aggregate level factors on the developmental patterns in adolescent drinking behaviour.

Study setting and the aims of the study

This study utilised an extensive series of cross-sectional adolescent health and lifestyle surveys conducted in Finland biennially from 1977 to 1999 with the overarching purpose of increasing our knowledge of the population level trends in drinking habits among early adolescents. Previous studies (e.g. Ahlström et al. 1994, King et al. 1996, Currie et al. 2000) have indicated that drinking among eleven-twelve year-olds is rare and has changed little during the past two decades (Rimpelä et al. 1997, Rimpelä et al. 1999). Therefore, the focus of this present study was the age group of fourteen year-olds.

First, the review of literature indicated that methodological work on assessing drinking, especially drunkenness, in early adolescence is thin. Established methods for measuring alcohol drinking as such do exist, but ways of measuring drunkenness or heavy drinking seem less clear. Therefore, an effort was made to clarify the issue of validity of the use of self-reported drunkenness derived from a mailed survey. Alcohol drinking patterns among adolescents seem to have changed in most western countries where data were available. However, actual trend data with several comparable measurements were scarce. Outlining the trends in drinking patterns among Finnish adolescents was judged to serve both national aims of surveillance and health promotion, but also be of cross-national interest since growing concern over drinking among adolescents has been explicated in the literature.

In empirical studies, adolescent drinking has mostly been studied from the viewpoint of being a phenomenon closely tied with an individual person. The societal explanations introduced in the literature mostly present ecological evidence such as trends moving in the same or opposite directions. In this present work, an effort was made to empirically relate the trends related to selected societal developments to changes in adolescent drunkenness. However, a contribution was also made to understanding drinking and related characteristics on the individual level. The specific aim was to identify characteristics of target groups to be selected for more intense interventions to reduce drinking.

Literature on adolescent alcohol beverage preferences is almost non-existent. As the accessibility of different beverages, e.g. beer and spirits, is notably varied, it was deemed necessary to survey the beverage types preferred among the adolescents,

especially the ones preferred by those drinking heavily. This knowledge might be of use in the development of alcohol sales legislation both nationally and internationally.

The study was published as a series of articles in scientific journals each with a more specific aim to:

Study the validity of self-perceived state of drunkenness as an indicator of heavy drinking (Paper I).

Outline the trends in drinking habits from 1977 to 1999 with special attention to the drinking style and onset of drunkenness (Paper II).

Investigate the role of societal level changes in relation to drinking trends from 1981 to 1997 (Paper III).

Make an effort to identify fourteen year-olds' characteristics related to heavy drinking (Paper IV).

Describe the alcoholic beverage preferences of fourteen year-olds with emphasis on drunkenness-oriented drinking (Paper V).

Material and methods

Study population and data collection

The data used in this study were collected as a part of a nationwide monitoring system of adolescent health and health behaviours, the Adolescent Health and Lifestyle Survey. The Survey was first initiated in 1977 to monitor the impact of the Tobacco Act on adolescent smoking (NTTT 1979, Rimpelä et al. 1983, Rimpelä et al. 1988). At the time, no valid data on changes in adolescents' smoking were available. In 1976 the National Board of Health made the decision to finance the Survey project led by Matti Rimpelä. Later, the Survey grew into a biennial repeated cross-sectional adolescent health behaviour monitoring system with a wider interest in youth health and health related behaviours financed by the Ministry of Social Affairs and Health. (Rimpelä et al. 1988)

The study population was comprised of 12, 14, 16 and 18 year-old Finnish adolescents. The questionnaire was available only in the Finnish language, and adolescents from the Swedish-speaking province of Åland located between Finland and Sweden were excluded. The questionnaires were mailed to representative samples with two re-inquiries to non-respondents. Responding to the self-administered structured questionnaire was voluntary and the purpose of the study was explained in the covering letter. The timing of the study, sampling and data collection method were similar throughout the study period.

The samples were obtained from the Population Register Centre and were based on particular dates of birth, so that all Finns born on sample days were included (Rimpelä et al. 1999). In the first study in 1977, the sample days were the 20th to 23rd July 1958, 1960, 1962 and 1964. In 1979-1985 and 1989 there were six sample days in each age group, extended in 1987 and in 1991-1997 to 18 birth dates each. Due to a smaller cohort size, the sample among fourteen year-olds in 1999 was further extended to 19 dates. The sample days were selected so that age variation was smaller in younger age groups and average age of respondents was the same in each survey (12.6, 14.6, 16.6 and 18.6 years). Data were collected in February-April every second year.

The numbers of respondents ranged from 2832 in 1977 to 8390 in 1997, and 8219 in 1999 (Table 1). The overall response rate declined from 88 % in 1977 to 76 % in

1999. The Finns were exceptionally active in responding to mailed questionnaires in the 1970s. Since then a decline towards rates typical of most other Western nations has been observed in many such surveys, including the AHLS. However, girls' response rate was higher than 80 % in all the age groups throughout the study period. Boys' response decreased more sharply over the years, but the downward trend was halted in 1997. The response rates among fourteen year-olds, the main focus of this study, decreased from 91% in 1977 to 77% in 1997, but increased in 1999 to 80%.

Table 1. Numbers of respondents and response rates (%) by age, sex and study year.

Sex and age	Year											
	1977	1979	1981	1983	1985	1987	1989	1991	1993	1995	1997	1999
Number of respondents												
BOYS												
12	369	491	483	450	353	414	406	426	399	395	427	442
14	345	565	488	429	395	1128	361	1196	1203	1177	1168	1187
16	386	528	535	413	452	1183	362	1008	1168	1232	1126	1110
18	347	523	519	489	401	1134	328	893	1029	1071	1088	1112
Total	1447	2107	2025	1781	1601	3859	1457	3523	3799	3875	3809	3851
GIRLS												
12	341	540	514	440	359	367	430	399	437	424	440	407
14	367	535	548	482	433	1202	431	1337	1299	1301	1347	1313
16	347	579	529	509	497	1284	380	1272	1389	1469	1379	1333
18	330	512	524	509	463	1401	407	1103	1265	1313	1415	1315
Total	1385	2166	2115	1940	1752	4254	1648	4111	4390	4507	4581	4368
Both genders												
Total	2832	4273	4140	3721	3353	8113	3105	7634	8189	8382	8390	8219
Response rate												
BOYS												
12	90	88	88	85	80	81	76	77	73	78	76	79
14	88	86	87	78	74	81	75	74	74	75	69	74
16	85	83	85	75	76	77	70	68	70	72	68	68
18	83	78	81	75	68	69	63	61	66	67	60	63
Total	86	83	85	78	74	76	71	69	70	72	67	69
GIRLS												
12	91	90	92	91	84	83	82	82	84	86	87	85
14	94	91	92	86	88	90	90	86	86	85	84	85
16	89	91	91	91	87	89	82	86	87	88	87	85
18	88	85	88	87	83	84	80	82	83	86	83	80
Total	91	89	91	89	86	87	84	84	85	86	85	83
Both genders												
Total	88	86	88	83	80	81	77	77	78	79	76	76

The entire data set from 1977 to 1999 for 12, 14, 16 and 18 year-olds was used in paper II. Paper III concentrated on fourteen year-olds from 1981 to 1997. Papers I and V utilised the data collected from 12, 14, 16 and 18 year-olds in 1999, and paper IV analysed the responses from fourteen year-olds in 1999.

Drinking measurements

Drinking frequency

The questions on alcohol drinking were designed to measure current pattern of use. Drinking was investigated with the question: 'How often do you use alcohol? Try to include even those occasions when you only consumed small amounts of alcohol.' The alternatives were: 'daily', 'a few times a week', 'once a week', 'a few times a month', 'about once a month', 'about once in two months', '3-4 times a year', 'once a year or less frequently', 'I do not use alcohol'. Drunkenness was measured using the question: 'How often do you use alcohol until you are really drunk?' The alternatives were: 'once a week or more often', 'once or twice a month', 'less frequently', 'never'.

Latest drinking occasion

In 1999, subjective perceptions of drunkenness resulting from the latest drinking occasion were investigated with the question: 'In your opinion, the last time you drank alcohol, were you: 'completely sober', 'slightly drunk', 'really drunk', 'so drunk that I passed out'. In the same questionnaire, the qualities and quantities of alcoholic beverages consumed on this most recent drinking occasion were inquired with an open-ended question adopted from the ESPAD study (Hibell et al. 1997): 'Think back on your last drinking occasion and describe in your own words as accurately as you can what you drank and how much? (If you shared drinks with other people please try to tell us how much you personally drank)'.

Indicator reliability

The willingness to report drinking throughout 1977 to 1999 was good; the missing data rate for drunkenness was 1.2% (1981-1999) and drinking 1.6%. From 1981 to 1999, the logical consistency between alcohol drinking and drunkenness answers were found to be good with only 0.2% inconsistent answers, i.e. persons reporting more frequent drunkenness than alcohol drinking (Table 2).

Table 2. The response (N) to the questions on alcohol drinking and drunkenness frequency in 1981-1999 with inconsistent answers shaded.

	Drunkenness					
	weekly	1-2 times a month	less often	never	missing	TOTAL
Drinking						
daily	128	56	22	6	1	213
twice a week	1019	1224	631	101	5	2980
once a week	672	2920	2172	412	14	6190
twice a month	**23**	3311	6236	1506	25	11101
once a month		707	4234	1575	13	6529
once in two months	**2**	**92**	3914	2361	22	6391
3-4 times a year	**1**	**10**	2242	4058	38	6349
less often		**4**	435	3807	42	4288
doesn't drink					18154	18154
missing	9	76	152	246	568	1031
TOTAL	1854	8400	20038	14072	18882	63246

A random sub-sample was drawn to investigate the reliability of the answers in 1997. The same questionnaire was sent again four weeks after the receipt of the first response to 305 subjects from the fourteen year-olds. The retest response rate was 70% (N=215) with no gender difference. The reported frequencies were generally slightly lower in the retest than in the first response (Table 3, Table 4). 66% reported exactly the same frequency of alcohol drinking and in 87% of the cases the frequency of alcohol drinking reported on the retest was the same or in an adjacent category to that of the first response. The corresponding figures for drunkenness were 79% and 92%. The test-retest reliability among the fourteen year-olds was found to be good with Cohen's kappa coefficients (Cohen 1960, Fleiss 1981) of 0.59 (girls) and 0.61 (boys) on the frequency of alcohol drinking. Corresponding figures for the frequency of drunkenness were higher, 0.81 (girls) and 0.67 (boys). These figures indicate good repeatability, particularly bearing in mind that the respondents were in an experimental stage of drinking.

Table 3. Test-retest consistency of the alcohol use measure in the 1997 reliability study.

	Alcohol use frequency								
					Retest				
Girls	daily	twice a week	once a week	twice a month	once a month	once in two months	3-4 times a year	less often	doesn't drink	TOTAL
Test										
daily										
twice a week		3								3
once a week			5	5						10
twice a month			2	14	7	2				25
once a month			1	3	4	3	3			14
once in two months			2	1	1	6	3			13
3-4 times a year					2	1	10	1	1	15
less often						1	1	6	1	9
doesn't drink								2	36	38
TOTAL		3	10	23	14	13	17	9	38	127

					Retest				
Boys	daily	twice a week	once a week	twice a month	once a month	once in two months	3-4 times a year	less often	doesn't drink	TOTAL
Test										
daily										
twice a week		1								1
once a week			2							2
twice a month			1	4	1		2			8
once a month				5			1			6
once in two months					2	5				7
3-4 times a year					1	1	9			11
less often			2		1	1	1	5	4	14
doesn't drink							1	1	32	34
TOTAL		1	5	9	5	7	14	6	36	83

Table 4. Test-retest consistency of the drunkenness measure in the 1997 reliability study.

	Drunkenness					
			Retest			
Girls	weekly	1-2 times a month	less often	never	doesn't drink	TOTAL
Test						
weekly	4					4
1-2 times a month		13	3			16
less often		2	31	4	1	38
never			5	25	2	32
doesn't drink				1	34	35
TOTAL	4	15	39	30	37	125

			Retest			
Boys	weekly	1-2 times a month	less often	never	doesn't drink	TOTAL
Test						
weekly	1					1
1-2 times a month	1	2				3
less often		2	13	2		17
never		2	8	16	2	28
doesn't drink				2	31	33
TOTAL	2	6	21	20	33	82

Other measurements

All measurements with the exception of residence urbanisation were obtained from adolescent self-reports in the questionnaire. The structure of respondent's family was dichotomised by whether the respondent's parents lived together with him/her at the time of survey. Family socio-economic status was determined from respondent's report on his/her father's or guardian's highest attained level of education. Urbanisation was determined from the information on the respondent's address and

his/her own report on the degree of urbanisation. The responses were encoded into five categories: metropolitan area, cities, towns, rural centres and rural areas. Koivusilta (2000) reported the test-retest reliabilities (kappa) of these variables in 1997 for fourteen year-olds; they were .96 for urbanisation, .93 for family structure and .68 for socio-economic status. The weekly allowance was obtained from an eight or nine category self-report, that was further re-coded (details in Paper III) into three categories (kappa=.65). The self-reports on the age at first menstruation (kappa=.89) or ejaculation (kappa=.60) (both three category indicators) were used as indicators of the timing of biological maturation.

Missing data rates in the question used as explanatory variables in the analysis ranged from less than half a percent (e.g. self-reported health and parental smoking) to around three percent (e.g. parental level of education and age at biological maturation). The only questions with a significant gender difference in missing data rates were the ones assessing the age at first ejaculation or menstruation. Among the fourteen year olds, the age at menstruation was reported by around 99.5 percent while the data on the age at first ejaculation was missing from around 6 percent.

Analysis methods

Percentages and cross-tabulations were used in describing alcohol drinking and drunkenness. Most analysis were done separately for boys and girls since gender differences were known to be significant, and were one of the foci of the study. Statistical significances in two-by-two tables and regression models were tested using Pearson X^2 test with $p<0.05$ as the significance criterion. Since the outcome measures were categorical in nature, logistic regression was used as the main statistical tool in modelling drinking. Both binary and polychotomous logistic regression (Hosmer and Lemeshow 1989, Moran et al. 1990) were used. Analysis was performed using SPSS 7.5, SPSS 9.0 (SPSS 1999) and BMDP version 1990 for UNIX (Brown et al. 1990).

Logistic regression modelling is a widely used tool in health behaviour research, partly because it allows for categorical variables as outcome variables. In case of the binary response, when the predicted proportion of ‘occurrences’ (e.g. drunkenness) per total sample is denoted by P, the model can be written as

$$P = \frac{e^{b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_p X_p}}{1 + e^{b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_p X_p}}$$

where X_i are explanatory variables and b_i their corresponding coefficients. Unlike regression analysis for continuous response variables, logistic regression uses an iterative method for finding parameter estimates best fitting the data. The iterative procedures will attempt to estimate the ratio of occurrence probability P to non-occurance probability 1-P, also called the *odds* of an event:

$$\ln(odds) = b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_p X_p$$

Odds ratio (OR) for the occurrence is defined as

$$OR_i = \frac{\frac{p_i}{1 - p_i}}{\frac{p_o}{1 - p_0}}$$

where p_i is the probability of the occurrence in independent variable category i, p_0 signifying the probability of the occurrence in the reference category. The modelling results are presented as odds ratios together with their corresponding 95% confidence intervals.

Logistic regression modelling for nominal responses extends the corresponding binary response model. For response variable y, an estimate for the proportion of occurrence j is assumed to be

$$P[y = j] = \frac{e^{b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_p X_p}}{1 + \sum_{j=1}^{J-1} e^{b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_p X_p}}$$

when j=1,2,…,(J-1). For j=J, the corresponding proportion is

$$P[y = J] = 1 - \sum_{j=1}^{J-1} P[y = j]$$

Paper IV presents results obtained using BMDP PR procedure modelling drinking style, a four-category response variable. In this case, the reference category is labelled ‘abstinence’ and the odds ratios thus represent the ratios of odds between occasional alcohol drinking and abstinence, recurring drinking and abstinence, and recurring drunkenness and abstinence.

Results

Two of the original publications (papers III and IV) concentrate on fourteen year-olds. The remaining three (papers I, II and V) assess adolescent alcohol drinking among 12, 14, 16 and 18 year-olds. Here, the focus will be on the fourteen year-olds, with the results concerning the other age groups serving mainly as reference information.

Validity of self-reported drunkenness (Paper I)

Self-report of drunkenness has been used as an indicator of heavy drinking in numerous surveys. In an attempt to explore the validity of this measure, the aim of this study was to clarify the relationship between self-perceived drunkenness and an estimate of Blood Alcohol Concentration (BAC).

The estimate of Blood Alcohol Concentration was derived from an open question assessing the qualities and quantities of alcoholic beverages on the latest drinking occasion. The total volume of 100% ethanol was computed based on this quantity/quality data. This figure was further transformed into a measure of Maximum Theoretical Blood Alcohol Concentration (MTBAC) by relating the volume of ethanol to the person's total liquid volume using self-reported weight and a coefficient for the proportion of liquid in the human body (0.75 for males and 0.66 for females).

44% of the fourteen year-old boys and 33% of the girls had perceived themselves completely sober; their corresponding MTBACs were .04±.05% and .05±.05% respectively. The MTBACs among those reporting having been slightly drunk were .16±.10% among both genders. Those really drunk according to their own assessment corresponded to .26±.11% (boys) and .27±.12% (girls) MTBACs. Among those 31 persons that had been so drunk as to pass out, the figures were marginally higher. Although the group means were significantly different from one another, notable individual variation was observed (Paper I, Figure 1).

The correlations between perceived drunkenness and estimated BAC among fourteen year-olds were .73 among boys and .71 among girls; these figures were slightly higher than in the other age groups. The gender and age differences among the 14, 16 and 18 year-olds in the relations between estimated BACs and perceived drunkenness were negligible. As a group, fourteen year-olds seemed to be able to rather accurately

estimate their state of drunkenness in relation to their estimated Blood Alcohol Concentration.

Trends in drinking habits from 1977 to 1999 (Paper II)

Prevalence trends of drinking and drunkenness

Alcohol drinking among fourteen year-olds increased from 1977 to 1999 (trend significance p<.01). However, among girls from 1977 through 1985 drinking actually became less prevalent (p for trend <.03) and among boys there was no change. From 1985 on the prevalence rates began to rise (Paper II Figure 1). The increase was most notable until 1991 with the prevalence of monthly drinking rising from 16% in 1985 to 23% in 1991 among boys and 18% in 1985 to 32% in 1991 among girls. From 1977 to 1989 drinking was as common among the genders, but in the 1990s (except year 1993) more girls than boys drank alcohol (in 1991, -95, -97 and –99 gender difference X^2 p<.01). Through 1977 to 1999, drinking prevalence increased more among fourteen year-old girls than boys (p<.01). In 1999, on average, 9% of the boys drank at least once a week, 30% at least once a month and 64% drank alcohol at least sometimes. The corresponding figures for the girls were 11% (weekly), 37% (at least monthly) and 70% (at least sometimes). Among girls, the prevalence rates in 1999 were slightly lower than in 1997, indicating a possible change in the otherwise increasing trend.

Drunkenness trends in fourteen year-olds were largely similar to the ones in their drinking in general. The increases from 1985 on were, however, more notable (Paper II Figure 2, Table 5). From 1981 to 1989 drunkenness was as common among the genders, but in the 1990s (except year 1993) more girls than boys drank until drunkenness (in 1991, -95, -97 and –99 gender difference X^2 p<.01). The proportion of boys drinking until drunkenness at least once a month rose from 3% in 1981 to 11% in 1999 (p for trend <.01). Among girls, the corresponding increase was 4% in 1981 to 16% in 1999 (p for trend <.01). The gender difference in trend was statistically significant (p<.05). In 1999, 2% of the boys drank until drunkenness at least once a week, 11% at least once a month and 32% drank until drunkenness at least sometimes. The corresponding figures for the girls were 2% (weekly), 16% (at least monthly) and 41% (at least sometimes).

Table 5. Drunkenness prevalence (%) trends among fourteen year-olds from 1981 to 1999.

	Drunkenness									
	1981	1983	1985	1987	1989	1991	1993	1995	1997	1999
Boys										
weekly	0	0	0	1	2	1	2	1	2	2
monthly	3	3	3	5	7	6	9	6	8	9
sometimes	15	18	13	19	23	20	21	20	22	21
never	82	79	84	76	69	73	68	72	68	68
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Girls										
weekly	1	0	1	1	0	2	1	1	2	2
monthly	3	4	4	6	7	9	10	10	14	14
sometimes	14	16	13	20	18	22	23	26	28	25
never	82	79	82	74	74	68	66	62	56	59
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

The test-retest study in 1997 was used to estimate the effect of non-response on the prevalence figures. Estimates based on non-response to the retest yielded +0.1 to +0.9 percentage point corrections to the observed prevalence rates of monthly drunkenness. The differences between the estimates and observed rates were higher among boys and increased with time (Paper II, Table 2).

Drinking style

As a drinking style, drunkenness-oriented drinking among fourteen year-olds increased throughout the period (Paper II Figure 3, Figure D.2). From 1981, the proportion of boys drinking until drunkenness among those drinking alcohol at least once a month rose from 18% to 35% in 1999 (p for trend <.01). Among girls, the proportion increased from 26% in 1981 to 41% in 1999 (p for trend <.01). Drunkenness-oriented drinking increased more among boys than among girls (p<.01). Among boys, drinking style became more drunkenness-oriented with age, but the opposite was true among girls. Among girls, alcohol drinking not reaching the state of drunkenness increased more rapidly with age than did drinking until drunkenness.

Onset of drunkenness

The changes in time of the onset of drunkenness were studied by comparing the increases of monthly drunkenness prevalence rates in consecutive birth cohorts. This investigation showed that the onset moved towards earlier age (Paper II, Figure 4).

The pattern of onset was different for the genders. Among boys the drunkenness habit gained popularity with age rectilinearly, while a significant 'tapering off' pattern was observed among girls from 14 to 18 years of age.

Societal change and fourteen year-olds' drunkenness (Paper III)

This study sought to find out to what extent societal level changes contributed to the increase in fourteen year-olds' drunkenness from 1981 to 1997. The societal level effects were analysed using indicators of residence urbanisation, family structure, father's or guardian's education, allowance and biological maturation. In a logistic model of monthly drunkenness, all these factors were significant in relation to drunkenness among girls, and all but father's or guardian's education among boys.

The onset of biological maturation moved towards younger age throughout the study period. When this development was adjusted for in a logistic model, a significant reduction in estimated drunkenness trend was observed (Paper III, Figure 1). Among boys, the observed OR for drunkenness in 1997 compared with 1981 was 3.4. When adjusted for the change in maturation, the estimated OR in 1997 was reduced to 2.1. The corresponding figures for girls were 4.4 (observed) and 4.1 (estimated).

During the study period, the fourteen year-olds' average weekly allowance was highest in 1989. With the increase in allowance from 1981 to 1989 adjusted for, the OR for monthly drunkenness among boys was down to 1.9 from the observed 2.9 (Table 6). The estimated OR for girls in 1989 was 1.4 and the observed 1.9. Other factors related to the societal level changes did not produce statistically significant changes in the drunkenness prevalence trends.

Table 6. Odds Ratios for fourteen year-olds' drunkenness prevalence compared with prevalence in the year 1981.

	Year								
	1981	1983	1985	1987	1989	1991	1993	1995	1997
Boys									
Unadjusted	1.0	1.2	0.9	1.9	2.9	2.5	3.7	2.5	3.4
Adj. for allowance	1.0	1.3	0.9	1.5	1.9	2.1	3.2	2.1	2.8
Adj. for maturation	1.0	1.1	0.9	1.7	2.2	2.0	2.7	1.7	2.5
Adj. for full model	1.0	1.3	1.0	1.5	1.6	1.7	2.7	1.7	2.1
Girls									
Unadjusted	1.0	1.1	1.1	1.6	1.9	2.8	3.0	2.9	4.4
Adj. for allowance	1.0	1.1	1.0	1.3	1.4	2.3	2.6	2.5	3.8
Adj. for maturation	1.0	1.1	1.1	1.6	1.8	2.7	2.8	2.7	4.1
Adj. for full model	1.0	1.1	0.9	1.2	1.4	2.4	2.5	2.6	3.7

As a summary, the age at onset of menstruation/ejaculation and the weekly allowance were the most significant factors associated with increased drunkenness, and secular changes within biological maturation and weekly allowances accounted for a substantial proportion of the change in drinking.

Identifying drinking patterns at the age of fourteen (Paper IV)

The fourteen year-olds' responses to the 1999 Adolescent Health and Lifestyle Survey were used in an effort to characterise drinkers at this early age. The characteristics differentiating heavy drinkers from more controlled drinkers were a particular focus. With regard to drinking style, 36% of the boys and 30% of the girls were abstainers, 30% of the boys and 37% of the girls were classified as recurrent drinkers (drinking at least once a month) and the remaining 34% of the boys and 33% of the girls as occasional drinkers. Ten percentage points of the recurrent drinkers among boys were deemed to practice recurrent drunkenness with the corresponding proportion among girls being 15 percentage points. This four-tiered scale was used as the outcome variable in the analysis.

Of the 24 variables selected from the Survey, fifteen remained in the final logistic model after exclusions based on statistical significances in bi-variate cross-tabulations and stepwise polychotomous logistic regression modelling (Figure 1). Nagelkerke's Pseudo R^2 for boys was .40 and for girls .55. The analysis revealed a stratified nature of fourteen year-old drinking: the majority of the independent variables in the models were related to all drinking styles with the ORs increasing with increased frequency

and intensity of drinking. Thus e.g. the ORs for a female smoker to drink occasionally was 3.6, recurringly 14.0 and 45.0 to drink recurringly until drunkenness.

The strongest associations in the model among boys were between drinking style and smoking (OR for recurring drunkenness versus abstinence 13.0), parental knowledge of what their child did in the evenings (OR 5.7), biological maturity (OR 5.0), weekly allowance (OR 3.5) and the existence of drug using acquaintances (OR 6.0). The corresponding list of variables among girls was: smoking (OR 44.0), parental knowledge of what their child did in the evenings (OR 15.0), weekly allowance (OR 6.3) and dating (OR 26.0).

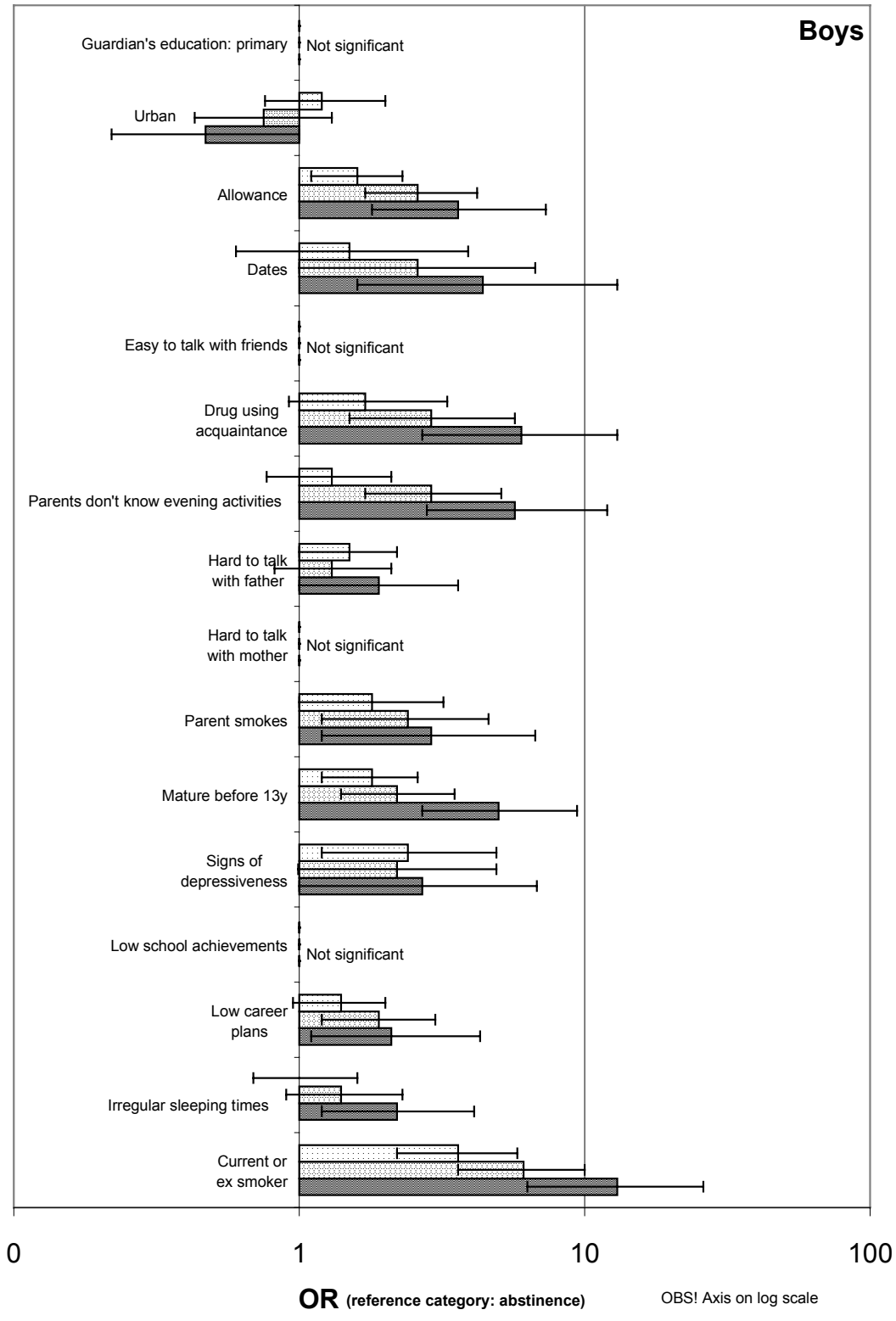


Figure 1a Polychotomous regression Odds Ratios (OR) and their 95% Confidence Intervals (CI) among fourteen year old boys' model of drinking style.

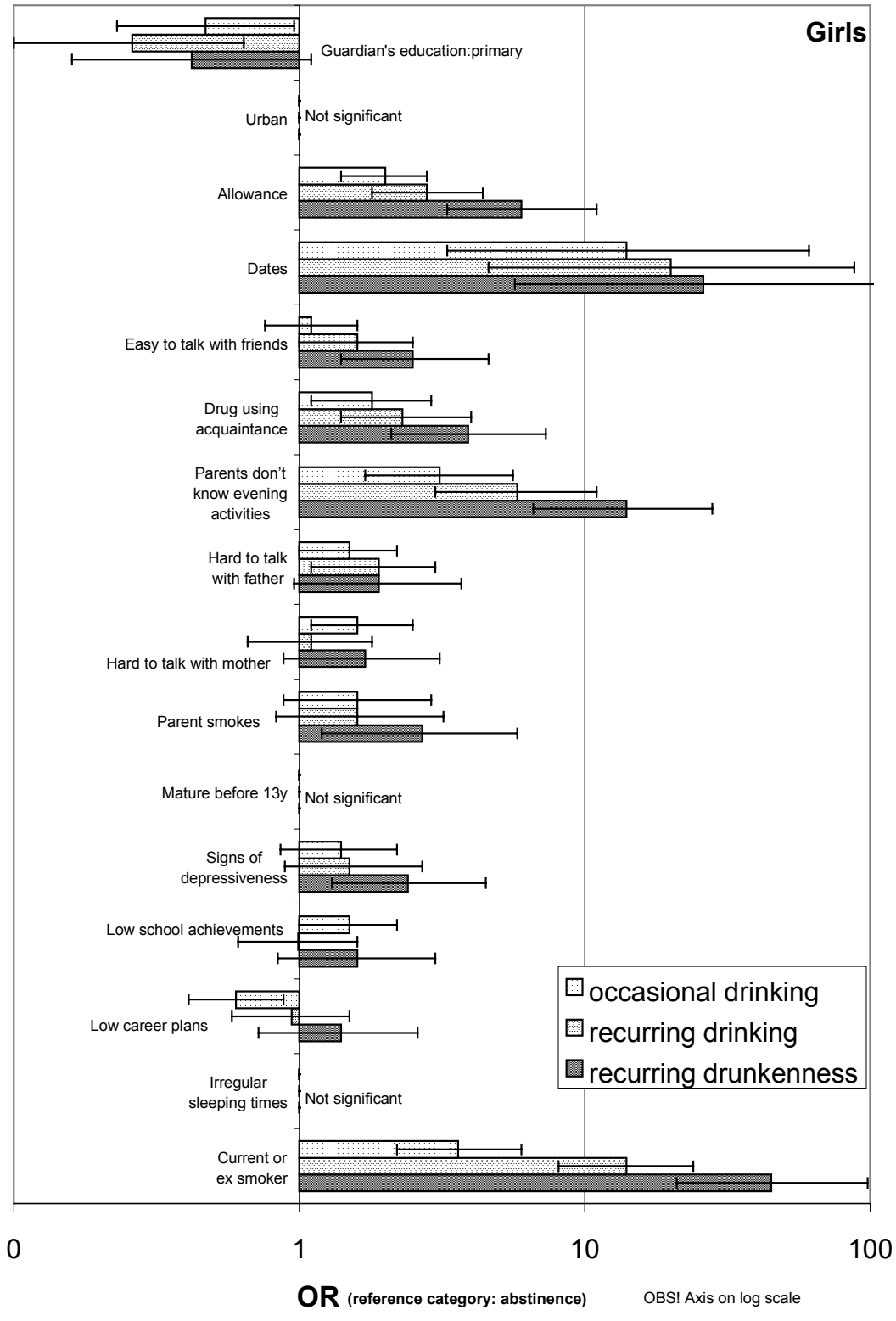


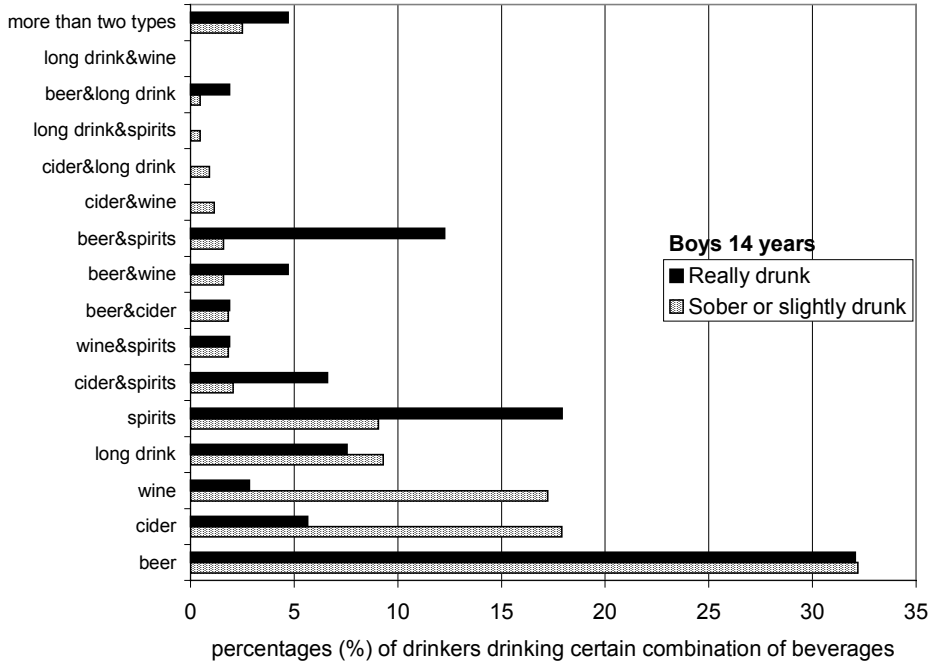
Figure 1b Polychotomous regression Odds Ratios (OR) and their 95% Confidence Intervals (CI) among fourteen year old girls' model of drinking style.

Adolescent alcohol beverage preferences (Paper V)

An open-ended question on the beverage types and quantities consumed on the latest drinking occasion were analysed in relation to corresponding self-report on the level of drunkenness experienced. The aim was to describe which alcoholic beverages are favoured by adolescents, especially the ones preferred by those drinking to drunkenness. Paper V mostly presents the results corresponding to ages 14, 16 and 18 pooled together. As the focus of this work is on the fourteen year-olds, some of the findings concerning this particular age are looked into in more detail.

The unrivalled favourite of the fourteen year-old boys accounting for 38% of the ethanol consumed was beer (Paper V, Table 1). Spirits accounted for 24%, cider 16%, long drinks 11% and wines 10% of the ethanol. Girls' preference was not as clear with both cider and spirits accounting for 25% of the ethanol each, and beer 21%, wines 19% and long drinks 11%, respectively. Beer further gained popularity with increasing age among boys, and cider with girls. As an interesting detail, two favourite spirits emerged prominently from the data: Koskenkorva and Leijonaviina, the latter being especially favoured by the girls.

On average, the 14, 16 and 18 year-olds reported having drunk 1.4 different beverage types on their latest drinking occasion; those who had been really drunk or passed out had more often drunk several beverages. Figure 2 shows the popularity of the combinations of two beverage types as well as the proportions of single beverages. Among the sober or only slightly drunk fourteen year-old boys, the commonest three beverages were beer, cider and wine. In contrast, the fourteen-year-old boys who had reached drunkenness had drunk beer, spirits, or both. These patterns were the same among the older two age groups with the exception of wine yielding its position to spirits among the older 'sobers'. The 'sober' fourteen year-old girls had drunk cider, wine or beer while the top three among those really drunk was spirits, beer and wine. The preferences of the fourteen-year-old girls that had been really drunk differ from those of the older girls; their preference is more divided between spirits, beer, cider and combinations of beverages.



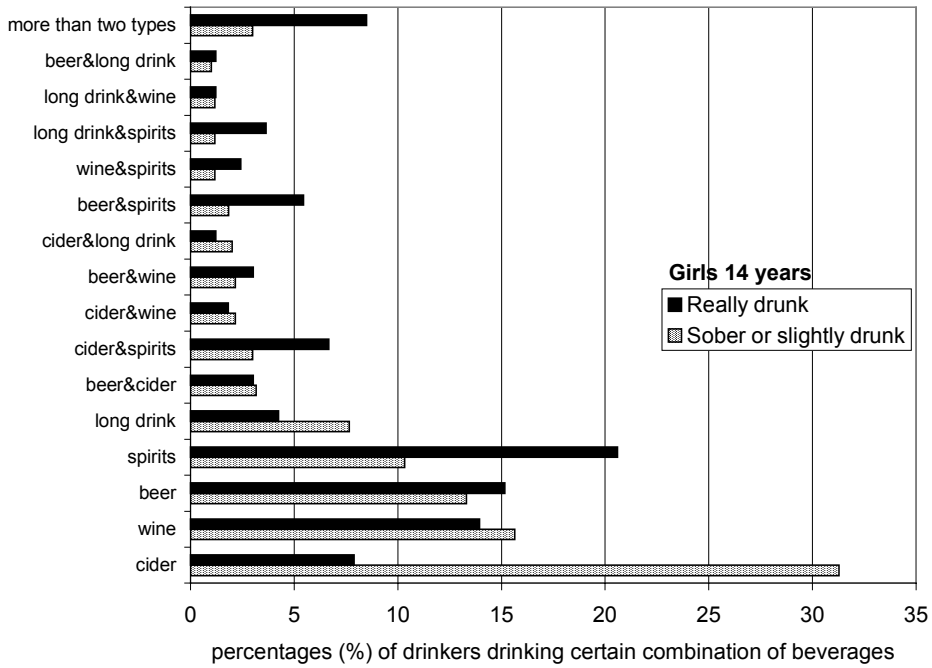


Figure 2. Distribution of 14 year-old drinkers by beverage type combinations consumed on the latest drinking occasion. The percentages are presented separately for those reported being really drunk (black) and those who reported being only slightly drunk or completely sober (raster).

Discussion

This thesis set out to increase our knowledge of the population level trends and developments in drinking patterns among early adolescents. The first task was to review and assess methodological questions on measuring drunkenness, the drinking pattern of most acute interest in this study. Two original articles assessed the questions of trends in drinking patterns, the second of which made an effort to find plausible societal level explanations for the trends. In the fourth article, individual characteristics related to drinking were explored while the fifth article touched on the subject of alcoholic beverage preferences among the adolescents.

First, the results of the studies published separately will be briefly outlined. The methods used in the empirical part of this thesis will then be discussed to establish a view on the trustworthiness of the results. The section entitled 'The trends in fourteen year-olds' drinking patterns' will relate the results to previous knowledge on adolescent drinking trends, also in our close neighbour Sweden. The section will end with a speculative theoretical view on the societal connectedness of the adolescent drinking trends observed and studied in this thesis. Some possible policy implications following this view will also be outlined together with suggestions for future studies.

Overview of results

Early adolescents seemed competent to estimate their drinking

This validity study related the self-perceived state of drunkenness on the latest drinking occasion to an estimate of Blood Alcohol Concentration derived from self-reported amount of alcoholic beverages consumed. On a three-tiered scale (*sober* versus *slightly drunk* versus *really drunk or passed out*), each group showed distinct estimated Blood Alcohol Concentrations. Also, correlations between perceived drunkenness and estimated BAC were strong. The findings suggest that, considered as a single group, fourteen year-olds well understood the concept of 'being drunk'. While it may be questionable to rely on subjective perceptions when studying individuals, it is a useful approach for purposes of assessing the population- or group-level prevalence of heavy drinking among fourteen year-olds.

Fourteen year-olds' drinking increased

Alcohol drinking became more prevalent among fourteen year-old Finns from 1977 to 1999. Not only did more fourteen year-olds drink beverages containing alcohol but the prevalence of drunkenness increased even more rapidly. As a consequence, the proportion of drinkers drinking until drunkenness increased. This seems to indicate that the patterns of fourteen year-olds' drinking shifted towards drunkenness-orientation. From the beginning of the study in 1977 until 1989, drinking was as common among fourteen year-old boys and girls. In the 1990s (except year 1993), drinking was more common among girls than boys. Girls seemed to develop a less drunkenness-oriented style with age while drunkenness-orientation increased with age among boys. The increased popularity of drunkenness-oriented drinking pattern as opposed to drinking alcohol *per se* seems the phenomenon calling for attention.

Societal change contributed to the increase

The increase in drunkenness-oriented drinking among fourteen year-olds from 1981 to 1997 was notably related to their increased disposable allowances and earlier biological maturation. Other background factors including family structure, socio-economic status and residence urbanisation were associated with drunkenness, but the changes in time within them were not associated with the drunkenness-oriented drinking trends among fourteen year-old Finns. A considerable part of the increased adolescent drunkenness has been associated with societal changes outside the scope of alcohol-specific policy measures.

Drinking habits at age fourteen were not segregated

In 1999, two-thirds of Finnish fourteen year-olds drank alcohol at least occasionally, and half of the drinkers reported drinking at least once a month. Drinking among fourteen year-olds seemed a normative behaviour. 'Risk factors' specific to drunkenness as a drinking style could not be identified. Factors such as smoking, lack of parental control and high weekly allowance showed a strong correlation with drinking. However, none appeared to be related only to heavy drinking, but to the whole spectrum of drinking. Fourteen year-olds could not be slotted into distinct categories (e.g. based on particular psychosocial characteristics) in terms of their relationships to alcohol, but rather they had reached different stages of getting

acquainted with alcohol. No specific 'risk factors' such as smoking, family SES or residence urbanisation appeared to exist at the age of fourteen.

Mild alcoholic beverages were the primary source of intoxication

Beer appeared as the favourite alcoholic beverage in 1999 among fourteen year-old boys, and cider among girls. Contrary to beliefs about the central role of spirits in drunkenness, low-alcohol beverages accounted for the majority of the total amount of ethanol consumed even among those who had been really drunk. However, the results suggest that spirits were often consumed in addition to the more familiar drinks of beer and cider when the subject had become really drunk.

Trustworthiness of methods

Questionnaire design

The study was based on a series of biennial cross-sectional mailed surveys conducted in Finland since 1977. Comparability between the rounds of measurement has been a key priority. The measurements were made in February-April each study year. The timing being identical each year eliminated the effects of seasonal fluctuation. Furthermore, this particular time of year avoided the major festivities known to be associated with heavier than usual population level alcohol drinking such as Christmas, 1st of May and Midsummer Eve. Sampling was performed based on birth dates with the average age kept constant and the age variation as small as possible. The core questions, including the ones for alcohol drinking and drunkenness, were kept unchanged to enhance comparability over time.

In order for a survey to be representative of the population, high response rates are crucial. For this purpose, the questionnaire has been kept relatively short, twelve pages. Also, two re-inquiries were mailed to non-respondents to increase the response. The timing of the data collection, mid-winter, has also been thought to aid in getting a better response. As a result, the response rates among fourteen year-olds have been rather good: 84%-92% among girls and 69%-87% among boys. Boys were consistently more reluctant to respond than girls; the effect on the results was in part controlled by analysing and presenting them separately for the genders.

The response rates have decreased along time. The effect of this development on alcohol drinking prevalence rates was looked into in an analysis described in detail in Paper II. The main conclusion was that the observed drinking prevalence rates slightly underestimated the true rates.

Another issue affecting representativeness concerns the Swedish-speaking minority in Finland. The questionnaire was only available in the Finnish language. Although the majority of the native Swedish speakers were able to complete the survey, the language issue may have affected their willingness to respond. Therefore, it is highly likely that the native Swedish-speakers are over-represented among the non-respondents. Since drinking and drunkenness have been found to be more common among Swedish-speaking adolescents (Kannas et al. 1995), the observed prevalence rates probably further underestimate the true prevalences. Yet another fact to remember is the geographical coverage of the survey: the Swedish-speaking archipelago province of Åland was excluded from the sample. Thus the survey is representative of mainland Finland.

The questionnaires were mailed to the respondents' home addresses. This means that the parents and siblings were likely to be aware of the study. If the respondents wanted to show the questionnaire to their parents, they were instructed to do so before filling it. It was stressed that it is highly important that the study subjects fill out the questionnaire independently. However, it is still possible that parents and elder brothers and sisters may have influenced the response of the fourteen year-olds. The effect on the drinking prevalence rates may only be speculated upon; it may just as likely cause under than overestimation. One final point is that we have no reason to assume that the possible effect of family members has changed in time, which in turn would affect the reliability of the trends.

The frequency of measurements in a surveillance system is a compromise between laborious frequent and precarious infrequent measurements. The Monitoring the Future -survey series (Johnston et al. 2000) and the school surveys conducted by Cenralförbundet for alkohol- och narkotikaupplysningen (Andersson et al. 1999) have opted for yearly measurements. The Adolescent Health and Lifestyle Survey has settled for a measurement every other year. At least three measurements are needed to establish a trend, so in the AHLS a trend is established in four years. In some studies, e.g. WHO Health Behaviour in School-Aged Children (Currie et al. 2000) and

ESPAD (Hibell et al. 1997) measurements are made every four years, which means that eight years will pass before a trend can be seen.

An important limitation of the study has to be kept in mind when making deductions from the results concerning relationships observed between e.g. drinking and indicators of adolescent lifestyle. The AHLS is a series of cross-sectional surveys. This means that individuals have not been followed over time to establish the temporal sequence of observations, e.g. drinking and dating. Furthermore, claiming causal relationships between phenomena requires still other requisites (Cook and Campbell, pp. 30-36).

Finally, all the data, with the exception of the place of residence, were self-reports. Although many of the questions were concerned with information of factual nature, their reporting is nonetheless subjective. The reports may have been affected by e.g. perceived social desirability of the behaviour in question. At the age of fourteen, this is likely to be influenced by the peer group. The observed strong relationship between smoking and drunkenness, for instance, may partly be explained by the group of smokers emphasising drunkenness as a sign of maturity.

However, self-administered surveys are probably the dominant data collection method in adolescent health behaviour research. Studies have shown self-reports of behaviours acceptably reliable and valid (e.g. O'Malley et al. 1983, Barnea et al. 1987, Brener et al. 1995, Torsheim et al. 1997). Torsheim et al. (1997) noted, however, that early adolescents in particular are in the phase of rapid development, which may greatly affect the stability of the behaviours. Since the start in 1977 of the Adolescent Health and Lifestyle Survey programme, the issues of reliability and validity have been studied and reported, e.g. in Ahlström et al. 1979, Rimpelä et al. 1997, Karvonen 1997, and Koivusilta 2000. Some of the indicators (dating, parental knowledge of their child's evening activities, signs of depressiveness) were new in 1999 and have not yet been tested for reliability. However, the questions assessing depressiveness have been tested among adults (Whooley et al. 1998) and found to be valid in comparison to other established depression scales. The other measures used in this present study have been found to present good to excellent reliability.

Self-reports on drinking

Drinking frequency

Plant et al. (1985) argued that the overwhelming majority of adolescents were able to provide alcohol drinking data without undue difficulties. In a qualitative study using group interviews in Finland, Jaatinen (2000) noted that the early adolescents were both willing and, in her judgement, honest when telling about their drinking. In some studies, biological tests have been used to study the validity of substance use in school surveys (Campanelli et al. 1987, Kokkevi and Stefanis 1991, Wagenaar et al. 1993, Bailey 1999). Self-reports have also been validated using collateral and diary reports; correlations on questions concerning drunkenness have been found to be strong (Smith et al. 1995). Harrison (1997) concluded that self-administrated questionnaires tend to produce more valid data than interviews where the respondents must speak their responses aloud. In this present study, the test-retest reliability of alcohol questions has been found to be good to excellent (criteria by Fleiss 1981) with simple κ (kappa) coefficients ranging from 0.67 to 0.81. Paper I showed that, on a group level, the estimated BAC corresponded well with self-reports on the experienced level of drunkenness. However, probably the main factor limiting the reliability and validity of the study is still the uncertainty of the adolescents' perception of their state of drunkenness. Also, the possible changes in time in adolescents' interpretations of their drunkenness are unknown.

An increasing proportion of those reporting to have been 'really drunk' may partly be due to their interpreting a milder intoxication as such. Increased social desirability of alcohol drinking in the society (Ahlström and Österberg 1997) and among the adolescents themselves (Rimpelä et al. 1999) may have increased the likelihood of over-reporting drinking. However, the social acceptance of recurring drunkenness among adolescents seems not to have increased (Ahlström et al. 1994). Also, the analysis in Paper I revealed substantial estimated Blood Alcohol Concentrations among those reporting drunkenness. There is also a strong candidate for causing increased underestimation of the prevalence figures: the response rate. The analysis in Paper II showed that drunkenness was likely to be more prevalent among the non-respondents. In addition, the response rates declined in time, especially among boys, probably leading to increased underestimation of drunkenness prevalence.

Alcohol drinking is notably related to age. Interpolating from the onset figure in Paper II (Figure 4), it can be shown that one month's difference in the average age between fourteen and sixteen years of age would, among boys, yield a difference of 1.5 percentage points in monthly drunkenness prevalence. One of the strengths of the AHLS design is that the respondents' average age, 14.6 years, has been kept exactly the same throughout the years. Biological 'age', however, has changed, with a notable effect on the drunkenness prevalence trend (Paper III).

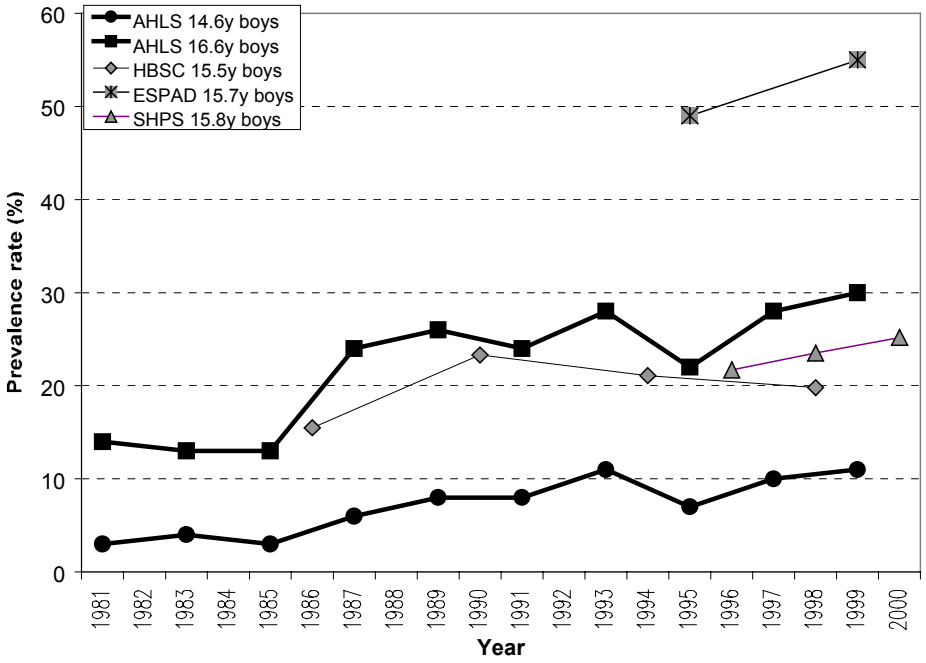
The concept of validity in the case of a monitoring system like the AHLS is perhaps best seen through agreement with other studies aimed at measuring the same phenomenon, in this case, drinking. At the national level, three other survey programmes estimating drinking prevalence have been carried out during the study period (Figure 3).

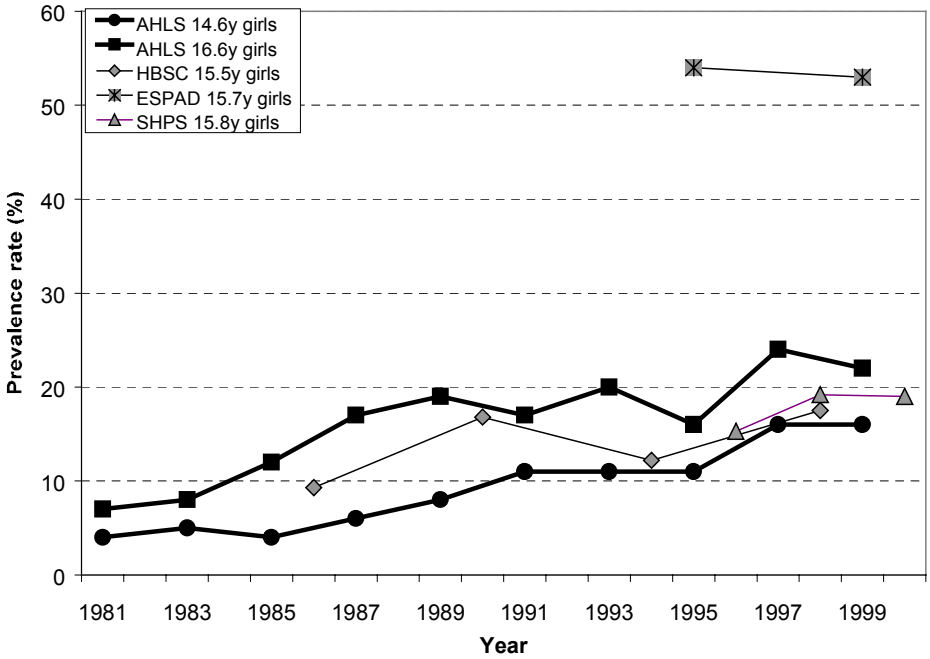
In contrast with the Adolescent Health and Lifestyle Survey, all the others have been school surveys. World Health Organisation's Health Behaviour of School-aged Children (HBSC) has carried out four measurements every four years from 1986 on. The trends in the indicator of lifetime drunkenness among seventh-graders (average age 13.5 years) were generally similar to ones observed in the AHLS. The slight decline in boys' drunkenness displayed in the HBSC was not statistically significant. As shown in the AHLS, a similar 'decrease' in the 1990s would be observed if we chose to look only at the measurements from the years 1989, 1991 and 1995. However, the results of this present study indicate that even though the increases among both genders were smaller in the 1990s compared to the end of 1980s, a statistically significant increasing trend was still observed.

The School Health Promotion Survey (SHPS) is the only other survey using the same question for measuring the frequency of drunkenness. The estimates for monthly drunkenness in 1999 and 2000 among 8th graders (average age 14.8 years) are somewhat higher, 22% among boys and 20% among girls, than in the AHLS (average age 14.6 years). The higher estimates could partly be due to age (average and variation), but the most likely explanations have to do with different measurement methodology; the SHPS is a school survey whereas the AHLS is a mailed survey. In the school context, the peer-group pressure may influence the self-reports in a way leading to higher population estimates. The degree of agreement between SHPS and HBSC in lifetime drunkenness is high.

The ESPAD respondents were 9th graders (average age 15.7 years). The prevalence figures for 'being drunk during past 30 days' seem high compared with all the other national estimates (AHLS, SHPS, HBSC). In addition to differences resulting from different methodology and indicator, this might result from the respondents reporting experiences of milder drunkenness. As pointed out in Paper I, the concept of drunkenness is interpreted quite widely among the adolescents. On group level, the differences in estimated BAC between those reportedly 'slightly drunk' and 'really drunk' were, in fact, statistically significantly different from one another. This implies that the rather wide wording in the ESPAD questionnaire ('drunk') may be the main source of disagreement with the AHLS ('really drunk'). In the AHLS, the proportions of those 'non-sober' at the latest drinking occasion were 56% for boys and 67% for girls (Paper I). These figures are notably closer to the corresponding ESPAD estimates. Also, it must be noted that the data collection time, last week in March, results in the inclusion of school winter holidays within the 30 day recall period in much of the country. These holidays are likely to offer the adolescents more opportunities for drinking.

Overall, the findings are in reasonably good agreement with the other studies. Considering the points discussed above, the picture drawn in this study is probably reasonably accurate, at least on the trends in early adolescents' drinking during the 1980s and 1990s.





AHLS: Really drunk at least once a month
HBSC: Really drunk ten times or more often in lifetime [Kannas and Tynjälä personal communication]
ESPAD: Drunk during past 30 days [Ahlström et al. 1999]
SHPS: Really drunk ten times or more often in lifetime [http://www.stakes.fi/kouluterveys/]

Figure 3. Drunkenness prevalence rate trends according to this present study (AHLS) and three other nationally representative surveys from 1981 to 1999. NOTE: the indicators, respondent ages and survey methods are different.

Latest drinking occasion

The first notable study on adolescents' drinking habits in Finland (Bruun and Hauge 1963) utilised information on the latest drinking occasion to estimate the prevalence of drinking. In this present study, the latest drinking occasion was studied using a four-tiered scale on the experienced degree of drunkenness and an open-ended question on beverage types and quantities consumed. The latter question was adopted to the AHLS from the ESPAD (Hibell et al. 1997) project. The data was used for two sub-studies: the validity study investigating the correspondence between the experienced drunkenness and estimated BAC (Paper I) and in charting the preferred alcoholic beverages (Paper V). In addition to getting information on which beverages people drink, analysis of a single drinking occasion has also been used in, for instance studying relationships between beverage preferences and emotional states (Klein and Pittman 1993), and beverage type and aggression (Murdoch et al. 1988).

In the validity study (Paper I), the proportion of drunkenness-related latest drinking occasions seemed high, but among the 16 and 18 year-olds, it was in line with a Finnish population interview survey (Simpura et al. 1996). Information on the length of the drinking period was not available so only the upper limit of BAC could be estimated. However, given the predominant tendency in Finland to drink to inebriation (Simpura et al. 1995), it is reasonable to assume that the alcohol may well have been consumed within a rather short space of time. The meticulous manner in which beverage types were reported gives a strong impression of sincerity and the respondents were generally very precise on the bottle/can/drink sizes as well. However, at times assumptions affecting the amount of ethanol were obviously made.

In the alcoholic beverage type study (Paper V), the reported quantities of different beverages consumed on the latest drinking occasion compare well with the results of the ESPAD study (Ahlström et al. 1997, Hibell et al. 1997, Ahlström et al. 1999) as well as with data on the proportion of consumption occurring in connection with drunkenness among 15-19 year-olds (Simpura et al. 1996). However, it must be born in mind that the beverage or combination of beverages used on this one occasion does not necessarily reflect a more permanent beverage preference.

Trends in fourteen year-olds' drinking patterns

This study has shown alcohol drinking to be a statistically normative behaviour in early adolescence with around two-thirds of the fourteen year-olds drinking at least occasionally at the end of the 20th century. Even drinking to the point of drunkenness is widespread with more than a third of the age group drunk at times. The first question is, of course: is this really true? If so, how has the situation evolved?

As pointed out in the previous chapter, the validity of self-reports on drinking behaviour is indeed often questioned. However, the factors inducing uncertainty to the measurements do not necessarily cause overestimation. One such factor was empirically assessed in this study (Paper II); it turned out that the drinking prevalence estimates obtained from the AHLS slightly underestimated the true drinking prevalence because heavier drinkers were more likely not to respond to the survey. The question of adolescents' ability to judge the severity of their drinking was also studied empirically (Paper I). As a group, the fourteen year-olds seemed not only able to distinguish between sobriety and levels of drunkenness, but do so practically identically with young adults, the eighteen year-olds. While it may well be that the intoxicating effect of alcoholic beverages sometimes causes surprises for the inexperienced drinker (Smart 1980), they seem to note and recall the effect much the same way as do adults.

Historic trends in early adolescent drinking habits can generally only be studied from rather free-form documents and notes. Ahlström et al. (1995) presented a picture of widespread drinking in Europe among children and adolescents at the beginning of the 20th century. Keller (1980) drew a similar picture of the time in the USA with adolescents' drinking gradually diminishing as the 20th century progressed. In Finland, the first empirical inquiries by today's standards are the ones published by Kuusi in 1956 and Kettil Bruun and Ragnar Hauge in 1963. In those times, adolescent boys' drinking was a recognised phenomenon, but girls' drinking was not mentioned. Ahlström-Laakso (1975), Ahlström (1979a, 1979c) first published data also on girls' drinking habits; drinking among 14 year-old girls was noted to be slightly more prevalent than among boys. The data of this present study showed a decreasing trend in fourteen year-olds' drinking from the beginning of the AHLS survey series in 1977 until 1985. Since then, alcohol drinking among fourteen year-olds became significantly more common, and their drinking became more drunkenness-oriented.

As discussed in the previous chapter, this increase from the mid-1980s to the end of the century has been confirmed in other surveys in Finland.

Schoolchildren's drinking patterns have been monitored also in our close neighbour, Sweden. The trends in fourteen to fifteen year-olds' drinking patterns are remarkably similar between the two countries as illustrated in Figures 4 and 5. The study settings and methods are different, so direct comparisons of prevalence rates are not in order.

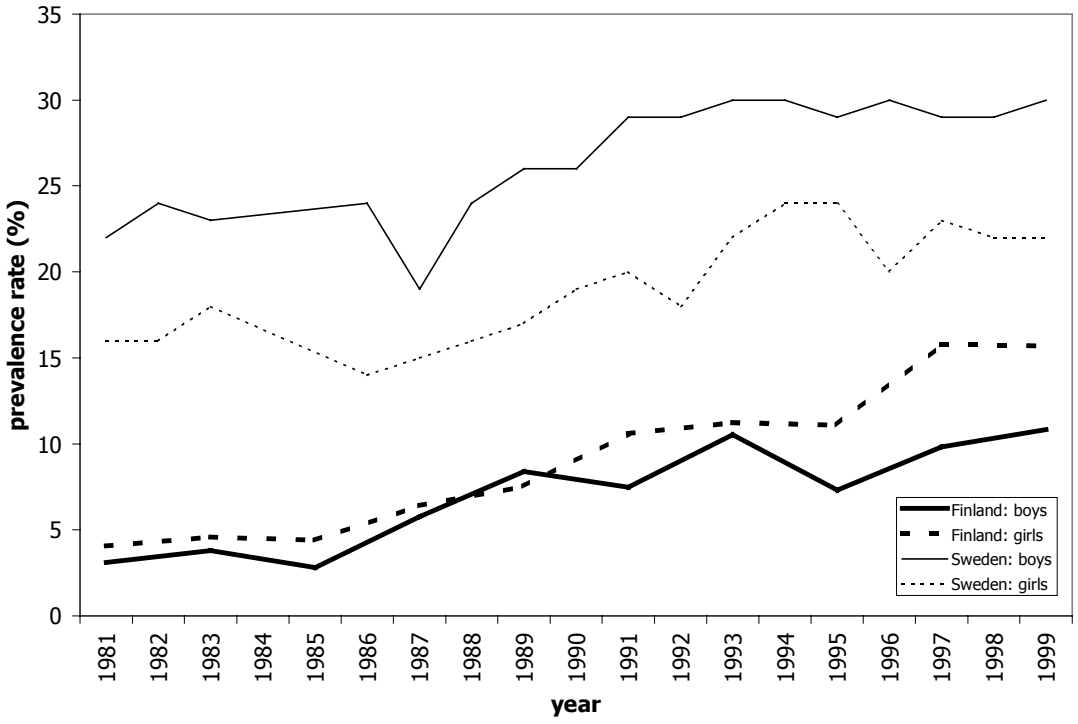


Figure 4. Proportions of fourteen year-old Finnish adolescents drinking until drunkenness at least once a month (Paper II) and fourteen to fifteen year-old Swedish adolescents drinking at least an equivalent of five units of alcohol at least once a month (Andersson et al. 2000).

As noted already in the case of Finland, the increasing trend seems to have begun in the mid-1980s also in Sweden. Among the Swedes and the Finnish boys, the increase slowed down during the 1990s. Among Finnish girls, however, the increase continued to be notable to the end of the century. It remains to be seen in the 2001 Adolescent Health and Lifestyle Survey, whether this increase has come to a halt also among girls.

It is interesting to note the difference in the gender pattern between the countries. In Finland, about an equal proportion of both genders drank until drunkenness in the 1980s, but since then girls established a clear margin with an around 50% higher

prevalence. In Sweden, compared to girls, roughly 40% more boys have constantly drunk rather large amounts of alcohol at a time. This difference between the two countries could, of course, result from the fact that the Swedish sample was somewhat older. Among Finnish sixteen year olds drunkenness is also more common among boys compared to girls. Also, it is possible that the Swedes are somewhat ahead in their biological and 'social' maturation at this age.

The developments in time of the drinking styles in Finland and Sweden are likewise similar (Figure 5). In the 1990s, the proportion of drinkers drinking usually until drunkenness has been established between 35-40 percent in both countries among both genders. This observation speaks for the continuation of the Nordic tradition of drinking to get drunk.

Figure 5. Proportions of fourteen year-old Finnish adolescents (Paper II) and fourteen to fifteen year-old Swedish adolescents (Andersson et al. 2000) usually drinking until drunkenness.

The increased adolescent drinking can be seen as a part of the population level increase in drinking. Also, it is likely that the increased availability of alcohol in general, as indicated by the number of points-of-sale discussed earlier, has contributed to increased adolescent drinking. Although the trends in adolescent alcohol drinking

point in the opposite direction compared with the alcohol policy aims and actions, we can, of course, speculate that the increase might have been more rapid without these adolescent-specific efforts.

Another view on the trends in adolescent drinking would be to emphasise the role of macro-level changes affecting the Nordic countries and perhaps post-industrialised countries in general. Drinking, and heavy drinking in particular, seems to have increased in most countries of the western world where data is available. In some countries such as the United States of America, the increase has been even more notable in the use of illegal drugs (Johnston et al. 2000). As discussed in more detail in Paper III, the increase of drunkenness among Finnish fourteen year-olds indeed seemed related to rather general developments in the society, e.g. changes in disposable income of families (Statistical Yearbook of Finland 1998, 1999) and the division of consumption spending within families (Hermanson et al. 1998). The effect of the trends in biological maturation was also noted to be significant (Paper III). This trend in maturation witnessed also in other European countries (Wyshak and Frisch 1982), in turn, has been seen to result from long-time macroeconomic trends affecting mothers' and children's nutrition.

The whole picture of adolescent drinking seems to have evolved rather gradually towards more drinking during the 1980s and 1990s (Paper II); more towards the way young adults drink (Simpura 1993, Simpura et al.1995). At the brink of adulthood, the age of eighteen, very few adolescents were abstainers, and the proportion of those who reported getting drunk at least occasionally has risen to about four-fifths of the cohort (Paper II). Rather surprisingly, drinking among the twelve year-olds changed little over the years (Paper II). As a result, the development of drinking patterns *accelerated* in adolescence. This conclusion, combined with the observation of earlier biological maturation and increased disposable money among adolescents leads to a speculative suggestion of *accelerated social maturation*, i.e. adolescents adopting adult social roles faster than previously. This development may also have connections to changes concerning the family institution: the increased trend of family break-ups (Statistics Finland 1989, Statistics Finland 1996) and the signs of decreased trend of being together (Hermanson et al. 1998).

Drinking and drunkenness gained popularity in early adolescence in Finland during the last two decades of the 20th century. This increase in drinking seems part of a

wider development of adolescence, more related to societal changes than alcohol-specific policies and actions.

Policy implications

If we take the concept of *accelerated social maturation* presented above seriously, the policy basis must be reconsidered rather widely. The current alcohol law (Alkoholilaki 1143/1994) expresses society's message that alcohol drinking generally should not take place before the age of eighteen. The majority of the adult population supports this view (Ahlström and Österberg 1993, Ahlström and Österberg 1997) in general although many seem to make an exception in the case of their own children (Ahlström 1991, Ahlström et al. 1996). The society has promoted efforts aimed at curbing under-aged drinking; these actions have been based on the premise that alcohol does not belong to the lives of adolescents (Sosiaali- ja terveysministeriö 1992, 1998). This view is in contrast with the reality where alcohol indeed plays a considerable role in adolescents' social maturation (Smart 1980), social life (Jaatinen 2000), and is, in fact, the norm as shown in this study.

If the alcohol and social policies concerning adolescents are to remain on the traditional basis, the developments related to the suggested accelerated social maturation should be targeted with the overarching principle of protecting the children from being forced into adulthood ever earlier. Reversing this development can even be seen as an obligation based on the United Nations Convention on the Rights of the Child (UN 1989):

"…the child, by reason of his physical and mental immaturity, needs special safeguards and care…" [the Preamble]

In this context, the concept of 'child' refers to a person under eighteen years of age. More particularly, the Convention addresses the issue of children and psychotropic substances such as alcohol in the following way:

Article 33:

States Parties shall take all appropriate measures, including legislative, administrative, social and educational measures, to protect children from the illicit use of narcotic drugs and psychotropic substances as defined in the relevant international treaties and to prevent the use of children in the illicit production and trafficking of such substances.

Concrete actions might include both alcohol-related ones (e.g. law enforcement) and more general changes e.g. in the schooling system.

An alternative view would be to fully recognise alcohol drinking in adolescence as a wide-ranging phenomenon inevitably belonging to our culture and society. The roots of the phenomenon are, as pointed out by emeritus editor Mark Keller (1980) of the Journal of Studies on Alcohol, in the way adults drink alcohol. He further predicted that '…our adolescents will drink, and not drink, the way adults drink and not drink.' (Keller 1980, p. 255). Drinking is an adult activity, the adolescents wish to become adults, and the society acts in ways to promote the adolescents' growth into adulthood.

Regardless of the chosen policy basis, alcohol-related harm among adolescents does and probably will exist. The dominant thesis in alcohol policy has been the strong relationship between total alcohol consumption in the society and the level of related harm (Edwards et al. 1994). The aim here is not to question the validity of this consensus. However, many of the problems related to drinking in adulthood, e.g. chronic physiological conditions such as liver damage or neuropathy, and mental and social problems under the concept of alcoholism, are not particularly relevant when the focus is on the drinkers beginning to get acquainted with alcohol. The focus among adolescents seems to be the harm related to periodic heavy drinking (Ahlström 2000). Research into harm related to drinking in adolescence is relatively scarce and methodologically inadequate. With better knowledge of harms related to drinking both from the society's and adolescents' points of view, new *harm reduction strategies* for adolescent drinking could start to develop. One possible line of development would be to strengthen the professional social and health services for adolescents now partly taken care of by voluntary organisations. Also, the so far ineffective alcohol related health education (Edwards et al., 1994, Bergmark and Andersson 1999) based on the prohibition ideology ('Just say NO') might gain both credibility among adolescents and effectiveness in preventing harm by focusing on problems taken from the world of the adolescents. In addition, a particular issue might be the relationship between freedom and responsibility; on the individual, group and societal levels.

Challenges for future studies

The trends in drinking habits continue to be a phenomenon of societal interest, both among the adults and the adolescents. In addition to providing information on a social and health issue concerning nearly all of the population, it offers a fruitful starting point for studying wider societal issues, as pointed out by a distinguished Finnish alcohol researcher Klaus Mäkelä on his 60th anniversary (Aamulehti 21.8.1999, p. 22). Also, it is reasonable to assume that the extent of alcohol related harm in the society corresponds to the prevalence of drinking as well as drinking styles. Continued monitoring of the trends among adolescents is in order.

The work on beverage preferences and their relations to drinking style opened up an interesting line of investigation. It is particularly relevant from two different viewpoints: alcohol accessibility and drinking subcultures. The accessibility implications of the results presented in Paper V would emphasise the importance of mild alcoholic beverages such as beer and cider in relation to drunkenness. This issue could be looked into further to make deductions towards the development of the role of the alcohol monopolies in Finland and other Nordic countries. Drinking subculture studies might provide insight into reasons for different drinking patterns involving different alcoholic beverages. These, in turn, might be of use in preventing harm related to some drinking patterns compared with others.

The actual problems related to drinking have received relatively little attention. Among adolescents, drinking has been connected to the losses of belongings and money, as well as doing something regrettable (Andersson and Hibell 2000, Ahlström 1984, Ahlström et al. 1994). Many problems caused by adolescent drinking to the society have been implicated, e.g. crime, disorder, accidents, loss of schoolwork, taking sexual health risks (e.g. Smart 1980, Blanken 1993). However, these arguments are mostly based on correlation data (e.g. drinking and driving) with little other research backing them up. In order to build relevant harm reduction strategies for adolescent drinking, more knowledge is necessary on these issues. From public health viewpoint, both direct and indirect health consequences are in the focus. Also, questions labelled as social seem never far from the public health understanding of health.

Summary

The Adolescent Health and Lifestyle Survey data was utilised in five original articles with the overarching purpose of increasing our knowledge on the drinking patterns among the under-aged at the turn of the millennium. Three of the original papers studied alcohol drinking issues among twelve, fourteen, sixteen and eighteen year-olds while the remaining two concentrated on the age group of fourteen year-olds; the focus of this summary as well.

The material for the study was gathered by mail every other year since 1977; the most recent round took place in the spring of 1999. The respondents were picked from the Population Registry based on particular birth dates. Responding to the self-administered structured questionnaire was voluntary. The response rates were high, especially in the age group in focus. The response diminished throughout the years, but the effect of this trend on measuring fourteen year-olds' drinking patterns appeared negligible. Many important details such as the survey sampling and timing, together with question wordings, were kept unchanged to utilise comparability over the years. After conducting methodological analysis (Papers I and II), the AHLS was judged to form a reasonably reliable basis for the study of adolescent drinking patterns through the last two decades of the millennium.

Two phases in fourteen year-olds' drinking pattern trends were identified: a decreasing trend from the beginning of the AHLS in 1977 until 1985 and an increasing trend since then until the turn of the century. The second half of the 1980s seemed to witness a change towards more drunkenness-oriented drinking patterns. Similar trends have also been reported in Sweden. Altogether, the adolescent drinking patterns in these two neighbouring countries seem largely similar.

Two important factors, both with societal connections, were identified behind the increase in fourteen year-olds' drunkenness. Increased allowances, or disposable money, seemed to account for a notable part of the trend. Lack of money may have acted as an important inhibitor of alcohol drinking, especially drinking of large amounts of alcohol. The developments in the macroeconomy and division of consumption spending within the family seem to have resulted in more money available to adolescents, a part of which is spent in alcohol beverages. On the other hand, the trend in earlier biological maturation also appeared to be strongly related to

fourteen year-olds' drunkenness. Moreover, this trend has been associated with the expanding macroeconomy e.g. through improved mothers' and children's nutrition. Altogether, the trends in drinking patterns among fourteen year-olds seemed to be a part of a larger societal development where adolescents adopt adult social roles and behaviours ever earlier.

Alcohol drinking among fourteen year-olds at the end of the 20th century is common with around two-thirds drinking at least occasionally. Eleven percent of the boys and sixteen percent of the girls report monthly drinking until drunkenness. Several factors appeared associated with drinking, e.g. smoking, lack of parental control and dating, but none with drunkenness only. With drinking being a widespread phenomenon and factors common for all drinking patterns, the prevention strategy of picking out 'risk individuals' is not feasible. With biological maturation strongly connected with the individual drinking pattern, the fourteen year-olds may just be in different developmental stages in getting acquainted with alcohol.

It is commonly believed that drunkenness is connected with drinking certain types of alcoholic beverages, i.e. spirits. In this study, the central role of mild alcoholic beverages such as beer and cider in adolescent drinking was highlighted. Spirits seem, however, involved in drunkenness as an add-on to the mild alcoholic beverages. If current alcohol laws are to be more strongly enforced, the almost unobstructed availability of beer and cider to the under-aged is an obvious target for action.

The traditional basis for alcohol and social policy towards the early adolescents, i.e. prohibition, needs to adjust to the accelerating social maturation. Action could be taken to counteract the adoption of adult social roles and behaviours ever earlier. Another option towards this end would be stronger enforcement of the current laws; this would probably have to rely more on the co-operation of the retail sales points. However, it has been suggested that for as long as the adults drink and get drunk on alcohol, the adolescents wishing to become adults will do likewise. A society acknowledging this state of affairs might also decide to concentrate on the harms induced by drinking at an early age. With more research on the actual harms connected with drinking in adolescence, new harm reduction strategies could start to develop.

Acknowledgements

First I would like to acknowledge the contributions of those 100.000 adolescents whose responses to the AHLS questionnaires formed the empirical basis of this thesis. Without their active participation my work would not have been possible. It is notable that these adolescents did not get any direct benefit for their contribution whereas most of the other people involved have been working for a pay in the field of public health. Moreover, many participants must have realised that the results of the survey may be used to make it harder for them to drink alcohol before the legal age of eighteen. Whatever your motives were, thank you all.

This summary work was scientifically reviewed by Candace Currie and Erkki Vartiainen – I wish to thank both sincerely for their devotion in making this book a better piece of science. Many of the editors and reviewers of the journals helped me identify shortcomings in my work, but they also gave encouraging remarks which I appreciated.

I would like to thank the initiators of the AHLS, particularly Matti and Arja Rimpelä, whose continued work on the Survey from the late 1970's on was crucial for the present study. The alcohol section of the questionnaire was originally designed by Salme Ahlström; I sincerely thank her for her knowledgeable formulation of the questions and guidance in their analysis in the role of my supervisor, not to mention her contribution to the key paper of this thesis: 'Trends in drinking habits among Finnish adolescents from 1977 to 1999'.

In the summer of 1997, Arja and Matti Rimpelä made a rather courageous decision to employ a physicist as a researcher to dig into the question of drinking patterns among the under-aged. A year later, I was ready to file in a research plan for a doctorate in public health. The constant pressure from both Arja and especially Matti (as he was my supervisor) was one of the key factors that kept the thesis work in the proposed schedule of three years. I am also grateful for their corresponding contributions to the original research papers.

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that she is probably the person most familiar with this thesis after endless talks and re-readings of both the original papers and this summary work.

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