

Similar countries, similar factors? Studying the decline of heavy episodic drinking in adolescents in Finland, Norway and Sweden

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ABSTRACT

Aim To (i) examine several factors associated with trends in heavy episodic drinking (HED) in Finland, Norway and Sweden, (ii) investigate similarities in these associations across the countries and (iii) analyse the contribution of these factors to the trend in HED and the differences across the countries. **Design and Setting** Observational study using five waves of the European School Survey Project on Alcohol and Other Drugs (ESPAD) from Finland, Norway and Sweden between 1999 and 2015. **Participants** A total of 18 128 male and 19 121 female 15- to 16-year-old students. **Measurements** Monthly HED, perceived access to alcohol, truancy, parental control, leisure time activities and daily smoking. The Cochran–Armitage test was used to examine linear time trends in HED. Logit regression models using the Karlson–Holm–Breen (KHB) method were fitted for each country separately, including all the independent variables together with time and adjusted for family status, parental education and gender. **Findings** In Finland, Norway and Sweden, perceived access to alcohol, truancy and daily smoking decreased significantly between 1999 and 2015 whereas risk perceptions, parental control and participation in sports increased in the same period. The confounding percentage of all the independent variables related to the trend in HED was 48.8%, 68.9% and 36.7% for Finland, Norway and Sweden, respectively. Decline in daily smoking ($P < 0.001$) and perceived access to alcohol ($P < 0.001$) were positively and increase in parental control ($P < 0.001$) negatively associated with the decline in HED in all three countries. Changes in truancy, going out with friends, and engaging in sports and other hobbies had little or no impact on the decline in HED or displayed no consistent results across the countries. **Conclusions** The decline in adolescent heavy episodic drinking in Finland, Norway and Sweden between 1999 and 2015 appears to be associated with a decline in adolescent daily smoking and perceived access to alcohol and an increase in parental control.

Keywords Adolescents, alcohol use, heavy episodic drinking, Nordic countries, school survey, trend.

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INTRODUCTION

Declining alcohol use among adolescents has been recognised as an international trend. A growing number of studies show that since the turn of the millennium, teenagers have been increasingly less likely to consume alcohol at all, to consume alcohol regularly and to engage in heavy episodic drinking (HED) [1–3]. In recent years literature examining possible explanations for this decline has

increased [4–11]. Unfortunately, these studies are mostly limited to the development in single countries. The international scope of the trend in youth drinking, however, asks for more general explanations, that is to say, factors associated with the decline in one country need to also be valid in other countries with similar developments. Consequently, comparative research across countries is needed [4,12].

In this study, we apply a new perspective by asking whether the decline in adolescent drinking in different

countries is associated with similar factors. We focus on three of the five Nordic countries: Finland, Norway and Sweden. In a comparative setting these countries may be termed 'most similar cases' [13]. Not only are the social and economic structures of these societies fairly similar, their drinking cultures also have much in common. All three countries represent a so-called dry drinking culture, characterised by a low volume of consumption, infrequent and heavy drinking, and high rates of drunkenness [14,15]. In terms of alcohol policies, these countries favour a public health perspective by maintaining restrictive control systems [16,17]. State-owned alcohol shops have the exclusive right to retail beverages stronger than 5.5% by volume in Finland (4.7% before 1st Jan. 2018), 4.7% in Norway and 3.5% in Sweden. In an overall ranking of national alcohol policies in Europe, Norway was regarded as the most restrictive country, followed by Sweden and Finland [18].

Several megatrends affecting alcohol use have coincided with the observed downward trend in youth drinking in the 2000s. First, in the last two decades, competing for education and job opportunities, and even for hobbies, from early on in one's life course has intensified. As a result, an orientation towards keeping on the straight and narrow, that is, avoiding different kinds of risk behaviour, like alcohol use and truancy from school, has possibly strengthened [19]. Second, new technologies have changed the nature of social interaction, particularly among the adolescents growing up directly with and within these technologies. This, in turn, has had implications for how teenagers interact and communicate with peers and parents and, moreover, for family dynamics and relations between generations, which may have influenced teenagers' drinking [20,21]. Third, significant changes in parenting have led to closer relationships between children and their careers [6,10,22]. Research has found parental monitoring to be associated with adolescent alcohol use [23,24]. Finally, general changes in social norms, risk awareness and risk taking among adolescents have been observed and reported to be associated with less drinking. For instance, Lewycka and colleagues [9] reported downward trends in adolescent risk-taking behaviour (including risky driving, substance use, unsafe sex, violence perpetration and injuries) in New Zealand and in most high-income countries.

The European School Survey Project on Alcohol and Other Drugs (ESPAD) provides data for cross-cultural comparisons of factors associated with these megatrends. The ESPAD data give a unique opportunity to examine the association between the decline in alcohol use among adolescents and various factors that have been hypothesised to be related with the downward trend in adolescent drinking. For instance, adolescents' perception of alcohol availability was found to be positively associated with their

alcohol consumption, and studies have shown that adolescent alcohol use decreased with decreasing perceived availability [25,26]. Nordic studies have suggested that the perception of access to alcohol has changed among youth [6]. Studies in Sweden [5,27] and Finland [28] indicate that parental provision of alcoholic beverages has dropped in recent years.

A recent review on the association between parental control and alcohol use found that shifts in parental practices gave the most robust and consistent evidence that parental monitoring is related to less (risky) alcohol consumption, that is, high monitoring protects against early initiation and heavy use [10]. More generally, a study in 31 European countries found that adolescents used substantially more tobacco, alcohol and cannabis when their parents did not know where they spent their Saturday nights [29].

There is evidence that perceiving substance use as harmful is negatively correlated with substance use [30–34]. Heavy drinking among youth has also been linked to lower school grades and truancy [35,36]. A positive correlation between truancy and alcohol use has been found among students from 32 European countries [29], and more recent studies have shown that truants engage in more substance use [37], have higher levels of binge drinking [38] and an increased risk of binge and weekly drinking [39].

Organised leisure activities, usually adult guided, are considered effective in reducing the risks of adolescents' involvement in alcohol use [40,41] while unorganised socialising with peers, often defined as going out with friends, is found to be associated with a higher prevalence of alcohol use [42–44]. In a recent study of Czech adolescents, unorganised socialising with peers had a significant effect on alcohol consumption among adolescents, that is, a decline in the frequency of going out with friends explained a major part of a decline in alcohol use [45]. However, sports activities have been shown both to increase [46] and decrease [47] adolescent drinking.

Finally, the rates of daily cigarette use among adolescents have considerably decreased in recent decades in Europe [48]. Smoking and high-risk drinking have been found to be associated, higher alcohol consumption was reported among smokers [49] and high-risk drinkers were substantially more likely to smoke [50,51].

In light of the existing evidence, the present study used ESPAD data to investigate whether these factors were similarly related to HED in three countries with comparable drinking cultures and alcohol policies: Finland, Norway and Sweden. We examined (i) whether the temporal trends in the perceived availability of alcohol, perceived risk, truancy, parental control, leisure activities and cigarette use were similar across these countries. We assessed (ii) whether these variables showed similar patterns in their

association with the decline in HED across the three countries. Finally (iii), we examined the contribution of the independent variables to the trend in HED and the differences across the countries.

METHODS

Data

Data for Finland, Norway and Sweden were taken from the ESPAD trend database (1995–2015) [1]. The ESPAD survey has been conducted every fourth year since 1995 to investigate substance use and substance-use patterns among 15- to 16-year-old students [48]. Because the decline in youth drinking started at the turn of the millennium, data for the survey years 1999, 2003, 2007, 2011 and 2015 were used. Nationally representative samples were collected by means of a self-administered pen-and-paper questionnaire, mainly during spring in the year of data collection, with students answering the questionnaires anonymously in a classroom setting. Participation was voluntary and anonymity was ensured. For details on data collection procedures see Kraus et al. [1]. An analytical sample including only individuals with valid answers to all variables of interest was created, and the final data included 18 128 male and 19 121 female students. The number of students in the original data, the response rates of students and the number of observations in the analytical sample by country and survey year are shown in Table 1.

Measures

We chose to dichotomise the independent variables for two main reasons: the categorical form of the original variables is not suited for regression analysis and the prevalence provided by dummy variables simplifies the interpretation of the results compared to the means of categorical variables. Dichotomising the independent variables, however, means

a loss of variation, which in turn could lead to model underestimation. The results should therefore be interpreted as minimum estimates.

Dependent variable

HED during the past 30 days was used as a dependent variable. HED was measured by asking 'How many times have you had six [in Finland]/five [in Norway and Sweden] or more drinks during the past 30 days?', with six response alternatives (1 = 'none', 2 = '2 times', 3 = '3 times', 4 = '3–5 times', 5 = '6–9 times', 6 = '10 or more times'). The responses were collapsed into a dichotomous variable (0 = 'no', 1 = 'yes', 'once' or 'more than once') because there were only a few responses in the upper part of the scale and the greatest part of those who drank (in general or heavily) did so 1–2 times a month.

Independent variables

Perceived access to alcohol was assessed with the question: 'How difficult would it be for you to get the following alcoholic drinks if you wanted them?' Separate questions were presented for beer, wine and spirits (1 = 'impossible', 2 = 'very difficult', 3 = 'fairly difficult', 4 = 'fairly easy', 5 = 'very easy', 6 = 'I do not know'). The variable on alcohol availability was constructed so that the beverage type (beer, wine or spirits) that was perceived as the easiest to get was used as the indicator for availability. Those responding 'I do not know' to all three items were coded as *missing*. The answers 'impossible' or 'very difficult' were coded as 1; all other responses were coded as 0.

Perceived risk related to alcohol use was measured with the question: 'How much do you think people risk harming themselves if they have five/six or more drinks on one occasion nearly every weekend?' (1 = no risk, 2 = slight risk, 3 = moderate risk, 4 = great risk', 5 = 'I do not know'). The 'I do not know' responses were coded as missing.

Table 1 Data characteristics

	1999	2003	2007	2011	2015
Finland					
Number of students in the data (<i>n</i>)	3109	3321	4988	3744	4049
Response rates of students (%)	90	92	91	90	89
Number of observations in analytical sample	2545	2767	3953	2920	3076
Norway					
Number of students in the data (<i>n</i>)	3918	3833	3482	2938	2584
Response rates of students (%)	90	87	89	88	90
Number of observations in analytical sample	2743	2634	2331	1933	1602
Sweden					
Number of students in the data (<i>n</i>)	3445	3232	3179	2569	2554
Response rates of students (%)	87	87	84	85	86
Number of observations in analytical sample	2715	2420	2181	1699	1730

Those answering 'great risk' were coded as 1; all other responses were coded as 0.

Truancy was assessed with the question: 'During the last 30 days, on how many days have you missed one or more lessons because you skipped?' (1 = 'none', 2 = '1 day', 3 = '2 days', 4 = '3–4 days', 5 = '5–6 days', 6 = '7 days or more'). Those reporting any truancy were coded as 1; those reporting 'none' were coded as 0.

Leisure activities were assessed with the question: 'How often (if at all) do you do the following things?: (i) actively participate in sports, athletics or exercising; (ii) engage in other hobbies like playing an instrument, singing, drawing, writing; (iii) go out with friends in the evening (1 = 'never', 2 = 'a few times a year', 3 = 'once or twice a month', 4 = 'at least once a week', 5 = 'almost every day'). Those answering 'almost every day' for each of the activities were coded as 1; all other responses were coded as 0.

Parental control was assessed with the question: 'Do your parents know where you spend Friday/Saturday nights?' (1 = 'know always', 2 = 'know quite often', 3 = 'know sometimes', 4 = 'usually do not know'). Those answering 'know always' were coded as 1; all other responses were coded as 0.

Daily cigarette smoking was assessed with the question: 'How frequently have you smoked cigarettes during the last 30 days?' (1 = 'not at all', 2 = 'less than 1 cigarette per week', 3 = 'less than 1 cigarette per day', 4 = '1–5 cigarettes per day', 5 = '6–10 cigarettes per day', 6 = '11–20 cigarettes per day', 7 = 'more than 20 cigarettes per day'). Those reporting smoking at least one cigarette a day were coded as 1; those reporting 'not at all' or 'less than 1 cigarette per day' were coded as 0.

Control variables

All models were adjusted for the parents' education, family type and gender. The parents' education was defined by whether or not either of the parents had had any education after primary school to the best of the respondent's knowledge. Family type was collapsed into two categories: a child living with both biological parents versus all other family types (a single-parent family, a blended family etc.) (as no statistically significant differences between these other family types with regard to HED were observed).

Statistical analyses

The Cochran–Armitage test was used to see whether there were linear time trends in HED across the five survey waves. Chi-square tests were used to examine differences in the independent variables between 1999 and 2015 in each of the countries (see Table 2). As a final step in the analysis, we fitted logit regression models for each country separately. All the independent variables of interest were included

together with time (as a continuous variable) and adjusted for family status, parental education and gender. The Karlson–Holm–Breen (KHB) method in Stata was used [52,53], allowing the decomposition of the unique association of each individual variable whilst controlling for the others. The KHB method offers a solution to the fact that, contrary to linear regression, the coefficients for the predictor(s) are not directly comparable across models in logit regression [54]. Potential changes across models with different numbers of predictors will not only capture mediation or confounding but also the 'rescaling' of the model that follows when additional predictors are included [52]. Even if variable *X* (e.g. time) is completely uncorrelated with variable *Z* (e.g. truancy), adding *Z* to the model will increase the coefficient for *X* provided that *Z* is actually related to the outcome [52]. To make the scale identical across two nested models, the KHB method proceeds by running linear regression(s) of assumed mediating or confounding variables on the predictor(s) of primary interest. The residuals from these regressions are then included in the reduced model. The coefficients can then be compared across models. In our case, the KHB command for Stata [52] provided an estimate of how much the coefficient for the time variable changed when including the predictors described above. It also shows how much each predictor accounts for this change in the coefficient for the time variable. In all models, cluster-robust standard errors (adjusting for students being nested within school classes) were used.

As a sensitivity analysis we ran a series of linear probability models (LPM), (i.e., an OLS with a binary outcome) with cluster-robust standard errors (adjusting for students being nested within school classes). In the first LPM, only time was included. The time coefficient from this model indicates how much HED has decreased for each unit increase in the independent variable, that is, per survey year. In the consecutive models, the different independent variables, together with the background variables, were adjusted for. Adjusting for the independent variables responsible for the temporal change will cause the time coefficient to decrease. That is, we considered the change in the time coefficient to be a measure for the explanatory power of the added variable in explaining the trend in HED. The results from these analyses displayed almost identical results to those obtained by the KHB method (see the Supplementary table S1). The analysis was not pre-registered and the results should be considered exploratory.

RESULTS

Trends

Figure 1 shows that the trend of HED is remarkably similar in all three countries. The decline was most pronounced in Norway where HED dropped from 49% in 1999 to 21% in 2015. The corresponding figures for Finland were 49%

Table 2 The prevalence (%) of the independent and control variables from 1999 to 2015 in Finland, Norway and Sweden

Country	1999	2003	2007	2011	2015	Chi-square test		
						DF	Value	P
Finland								
Perceived availability	1.7	3.1	6.0	6.5	10.9	4	262.92	<0.001
Risk perceptions	34.9	38.1	44.5	43.2	54.9	4	284.80	<0.001
Truancy	26.6	22.8	29.0	26.2	19.6	4	95.65	<0.001
Sports	36.2	39.8	40.8	43.1	57.1	4	314.28	<0.001
Hobbies	22.1	22.2	26.4	21.2	21.5	4	36.60	<0.001
Going out	15.9	15.2	12.9	18.0	19.1	4	62.13	<0.001
Parental control	33.0	36.9	34.5	32.7	44.2	4	122.03	<0.001
Daily smoking	27.5	24.2	20.1	20.4	11.7	4	243.55	<0.001
Family status	74.9	71.0	67.2	68.7	70.2	4	40.34	<0.001
Parental education	53.1	57.6	71.1	77.0	74.6	4	526.62	<0.001
Girls	51.3	53.5	55.3	51.8	52.5	4	12.19	0.016
Norway								
Perceived availability	1.7	2.5	4.7	7.9	10.4	4	275.10	<0.001
Risk perceptions	22.0	19.8	29.5	37.6	49.0	4	509.62	<0.001
Truancy	18.2	13.5	15.3	12.3	10.2	4	79.70	<0.001
Sports	36.1	35.0	49.3	46.5	46.6	4	176.90	<0.001
Hobbies	18.0	20.1	23.7	20.6	20.6	4	27.84	<0.001
Going out	20.4	15.1	15.8	8.4	2.0	4	333.58	<0.001
Parental control	35.0	41.3	41.1	47.7	58.6	4	264.50	<0.001
Daily smoking	22.4	17.6	10.4	4.4	1.9	4	566.88	<0.001
Family status	74.1	69.5	68.8	72.1	70.8	4	20.59	<0.001
Parental education	68.2	71.0	70.1	74.7	69.6	4	16.91	0.002
Girls	46.8	49.6	49.8	49.5	50.1	4	7.17	0.127
Sweden								
Perceived availability	1.3	1.9	3.3	4.3	6.2	4	106.48	<0.001
Risk perceptions	45.4	47.2	49.6	53.1	48.7	4	27.48	<0.001
Truancy	23.3	19.8	24.5	22.3	12.8	4	98.66	<0.001
Sports	39.7	41.0	46.9	45.0	47.4	4	44.17	<0.001
Hobbies	17.4	18.2	20.4	23.5	18.6	4	29.96	<0.001
Going out	7.0	6.2	6.0	4.0	4.8	4	21.36	<0.001
Parental control	40.4	46.4	40.2	43.3	54.1	4	103.98	<0.001
Daily smoking	12.6	10.5	10.3	11.3	6.8	4	39.71	<0.001
Family status	73.4	71.3	70.1	69.9	71.7	4	9.54	0.049
Parental education	74.7	77.1	74.3	78.2	74.5	4	13.54	0.009
Girls	51.1	51.0	52.3	50.3	51.0	4	1.73	0.785

and 25%, and for Sweden 43% and 25%. The decline in HED was statistically significant in all three countries ($P < 0.0001$).

Table 2 shows that in all three countries, perceived availability, truancy and daily smoking decreased significantly between 1999 and 2015 while risk perceptions, participation in sports and parental control increased in the same period. Participation in other hobbies than sports displayed no clear pattern whereas going out with friends increased in Finland but declined in Norway and Sweden.

The results from the multivariable models show a clear emerging pattern that is fairly consistent across

all three countries: the perceived difficulty of obtaining alcohol, a high risk related to HED, active engagement in hobbies and strict parental control were all negatively associated with HED. Truancy, active engagement in sports, actively going out with friends and daily smoking were associated with an increased likelihood of HED in all three countries (Table 3). The ranking of the different independent variables in terms of the strength of the association with HED was also remarkably similar across the countries. The strongest association with HED was observed for daily smoking, followed by perceived availability and parental control.

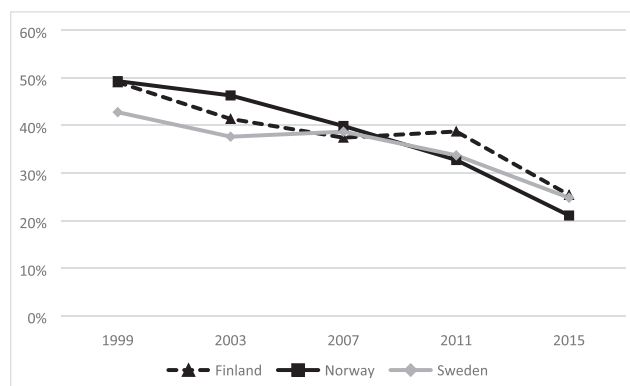


Figure 1 The proportion of adolescents drinking at least 5/6 drinks per occasion at least once a month (HED) in Finland, Norway and Sweden, 1999–2015

Table 3 The association between HED and independent variables in Finland, Norway and Sweden, 1999–2015

Country	Coefficient	P-value	95% CI	Indirect effect (%)	Confounding percentage (%)
Finland					
Perceived availability	-1.97	<0.001	[-2.33, -1.60]	29.9	14.6
Risk perceptions	-0.65	<0.001	[-0.73, -0.56]	19.3	9.4
Truancy	0.61	<0.001	[0.52, 0.70]	4.6	2.2
Sports	0.17	<0.001	[0.09, 0.25]	-4.6	-2.3
Hobbies	-0.25	<0.001	[-0.35, -0.15]	-0.9	-0.4
Going out	0.83	<0.001	[0.71, 0.94]	-5.68	-2.8
Parental control	-1.17	<0.001	[-1.26, -1.09]	16.5	8.1
Daily smoking	1.94	<0.001	[1.82, 2.05]	40.9	20.0
Norway					
Perceived availability	-1.67	<0.001	[-2.01, -1.32]	16.2	11.2
Risk perceptions	-0.54	<0.001	[-0.64, -0.44]	14.2	9.8
Truancy	0.78	<0.001	[0.65, 0.91]	6.1	4.2
Sports	0.21	<0.001	[0.12, 0.30]	-2.7	-1.8
Hobbies	-0.21	<0.001	[-0.31, -0.10]	0.7	0.5
Going out	0.68	<0.001	[0.55, 0.82]	11.2	7.7
Parental control	-0.83	<0.001	[-0.92, -0.74]	17.0	11.7
Daily smoking	1.72	<0.001	[1.56, 1.88]	37.3	25.6
Sweden					
Perceived availability	-1.51	<0.001	[-1.96, -1.05]	22.8	8.4
Risk perceptions	-0.42	<0.001	[-0.51, -0.33]	6.4	2.3
Truancy	0.73	<0.001	[0.62, 0.85]	15.2	5.6
Sports	0.19	<0.001	[0.10, 0.27]	-4.3	-1.6
Hobbies	-0.20	<0.001	[-0.30, -0.09]	2.2	0.8
Going out	0.78	<0.001	[0.59, 0.98]	5.6	2.1
Parental control	-0.97	<0.001	[-1.06, -0.87]	27.0	9.9
Daily smoking	1.70	<0.001	[1.54, 1.86]	25.0	9.2

Adjusted for family status, parental education and gender, HED = heavy episodic drinking.

The confounding percentage of all the independent variables on the trend in HED was 48.8% for Finland, 68.9% for Norway and 36.7% for Sweden. The analysis, disentangling the mediating effects of the independent variables on the trend in HED, is presented in the last two columns of Table 3. The column labelled 'Indirect effect' displays the contribution of each mediator to the indirect effect. This column by necessity adds up to 100% for all

countries. The results displayed in the column labelled 'Confounding percentage' show how much the effect of time (the survey year) is due to each mediator. The decline in daily smoking contributed substantially to the decline in HED. In Finland and Norway this was the biggest contributing factor, and it was the second biggest in Sweden. In all three countries, youth reported that access to alcohol had become more difficult and this contributed strongly

to the decline in HED. The increase in parental control also contributed to the decline in HED in all three countries. The changes observed in truancy, going out with friends, and engaging in sports and other hobbies had little or no impact on the decline in HED and displayed no consistent results across the three countries.

DISCUSSION

The present study examined whether across Finland, Norway and Sweden with comparable drinking cultures and alcohol policies the same factors (i.e. temporal trends in perceived access to alcohol, perceived risk, truancy, parental control, leisure activities and cigarette use) were similarly related to trends in heavy episodic drinking (HED). Across the three countries, HED strongly declined and the selected factors showed rather parallel trends between 1999 and 2015. The associations between the selected factors and HED pointed in the same direction and their contribution to the decline in HED was quite similar. Even though these variables accounted for a large share of the trends in HED in the study countries (between 36.7% and 68.9%), around half of it remained unexplained, indicating that other unmeasured factors may be important. The results thus indicate that in countries with similar drinking cultures and control practices, the decline in adolescent HED is, by and large, associated with the same factors.

Although the ESPAD study only touches upon some of the factors involved in this complex social phenomenon, the value of our results should not be underestimated. First, our findings show that the decrease in the perceived availability of alcohol is a key factor in the decline of adolescent HED. Perceived availability may be due both to shifts in formal policies and to changes in parents' and peers' attitudes toward drinking [26]. In our study countries, checking IDs has been tightened during the 2000s [55,56]. In addition, in Finland local preventive work has focused particularly on youth, and regulations against targeting minors in alcohol marketing have been made tighter [57]. Regarding informal control, there is evidence that parental provision of alcoholic beverages to adolescents has dropped in recent decades [27,28]. It is also likely that since peers are the most active suppliers of alcohol to underage youth [58,59], the overall devaluation of drinking in this age group reduced the (perceived) availability of alcohol [19]. This devaluation of alcohol is probably reflected in the fact that in the study countries the percentage of those responding 'don't know' in questions on perceived availability of alcohol has increased over time. It is very likely that the respondents have not yet tried alcohol or not even thought about how to get it [60].

Second, parental control, measured specifically by being aware of children's whereabouts at weekends, is considered to have very likely influenced the downward

trend in adolescent HED. Knowing about one's children's movements is not only a question of parental 'surveillance' but also an indication of new forms of interaction within families, as well as of more democratic and cooperative relationships between generations: thanks to the revolution in digital communication technologies, the possibilities of interacting and being in contact, as well as controlling and being controlled, have changed thoroughly [61,62].

Third, the decline of daily smoking as a factor associated with the decline in adolescent HED was not surprising. Public health efforts to regulate access to risky substances, legislation to reduce harmful behaviour, public health campaigns and social marketing aimed at changing societal attitudes all impact on various risk behaviours [9]. In the Nordic countries, similar measures to those in place for alcohol are in place for tobacco—such as high taxes, age limits on sales, regulation of smoking in public or banning advertisements—and these measures have tightened in recent years [63].

A study from New Zealand showed a general decline in the number of risk behaviours—including substance use, risky driving, violence perpetration or unsafe sex—indicating that alcohol use, smoking or other unhealthy behaviours are declining in parallel [9]. One may thus assume that rather than other risk factors being associated with alcohol use, risk behaviours including alcohol use are related to an underlying exogenous factor curbing these behaviours. While the present analysis found consistent associations between heavy alcohol use and the perceived availability of alcohol, the perceived risk of harm from alcohol and parental control, it failed in providing consistent evidence for parallel trends in behaviour such as truancy, outgoing behaviour and physical activities. This is supported by controversial findings in the related literature. There is, for instance, some empirical evidence that participation in physical activities such as sports are related to less alcohol use [47,64], but other research shows no such associations [6]. A closer look at this 'common factor' assumption reveals that changes are not consistent and vary greatly between countries when it comes to trends in other health-related behaviour like sugar and fat consumption or fruit and vegetable consumption, and self-rated health, health complaints and obesity [65].

Several mechanisms of the change in alcohol consumption in general and youth drinking in particular have been discussed. The most promising explanations are changes in the social position of alcohol, understood as a social reaction to the negative effects of alcohol [65], but also wide-ranging changes due to the digital revolution with the resulting extensive change in social interaction and communication between parents and children [65,66]. Although the present research contributes to the knowledge on the decline in youth drinking, the mechanisms of

change are still not fully understood and need further consideration.

Limitations

Our study is not without limitations. A cross-sectional self-report makes it hard to know if the perceived availability only mirrors drinking behaviour or if alcohol has actually become harder to get. The reciprocal relationship between drinking and smoking [67,68] could lead to an overestimation and over-interpretation of this association, and the observed downward trends can be due to unmeasured variables influencing both drinking and smoking. The results indicate, however, that engagement in risky behaviour has declined among Nordic youth. Another limitation is that the measurement of HED was different in Finland (6 + drinks) compared with Norway and Sweden (5+ drinks). However, this should not affect the results as our aim was not to compare the levels of HED between countries but the association between the trends of independent variables and HED within the countries. A strength of this study is that it has been conducted on large samples using a common instrument with high response rates, making the data representative of Finnish, Norwegian and Swedish 15- to 16-year-olds. In addition, as the data comprised five representative cross-sections of youths, it was possible to investigate the trends in HED over time, as well as trends in other areas of life and possible interrelationships between them.

CONCLUSION

With Finland, Norway and Sweden representing comparatively similar drinking cultures and alcohol policies, the decline in adolescent HED is almost equally associated with the same factors. Thus, one may conclude that these factors equally contribute to the decline in adolescent drinking in countries with strong regulating alcohol policies. However, for distinguishing the role of general and alcohol-specific factors, such as alcohol control policies, in the decline of youth drinking, further comparative studies in countries with different drinking cultures and alcohol policies are necessary [69]. If HED and the selected general factors turn out to be declining regardless of differences in drinking culture and control practices, it would imply that these factors and their underlying mechanisms played a decisive role in the decline of youth drinking.

Declaration of interest

None.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1 A comparison of the confounding effect of the KHB method and LPMs.