

BMJ Open Adolescent alcohol use in Estonia compared with Latvia, Lithuania, Finland and Sweden: results from cross-sectional surveys, 2003–2015

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ABSTRACT

Objectives The aims of the study were (1) to describe trends in the prevalence of monthly alcohol use from 2003 to 2015 and (2) to analyse the associations between alcohol use and family-related and school-related factors, risk behaviours and perceived alcohol availability in Estonia compared with Latvia, Lithuania, Finland and Sweden.

Methods The study used nationally representative data of 15–16-year-old adolescents from the European School Survey Project on Alcohol and Other Drugs. Data from Estonia, Latvia, Lithuania, Finland and Sweden collected in 2003, 2007, 2011 and 2015 were utilised (n=57 779). The prevalence of monthly alcohol use including light and strong alcohol use was calculated for each study year. A χ^2 test for trend was used to evaluate statistically significant changes in alcohol use over the study period. A multilevel logistic regression analysis was used for assessing the association between alcohol use and explanatory factors. Marginal ORs with 95% CIs for each country were calculated.

Results Monthly alcohol use decreased significantly among boys and girls in all countries from 2003 to 2015. In 2015, the prevalence of monthly alcohol use among boys was 36.1% in Estonia, 44.3% in Latvia, 32.4% in Lithuania, 32.3% in Finland and 22.4% in Sweden. Among girls, it was 39.1%, 45.9%, 35.6%, 31.8% and 29.1%, respectively. In all countries, higher odds of monthly alcohol use were observed among adolescents who skipped school, smoked cigarettes, used cannabis, perceived alcohol to be easy to access and had parents who did not know always/often about their child's whereabouts on Saturday nights. Compared with Estonia, associations between alcohol use and explanatory factors were similar in Latvia and Lithuania but different in Finland and Sweden.

Conclusion Results of cross-national comparison of alcohol use and explanatory factors could be effectively used to further decrease alcohol use among adolescents.

BACKGROUND

The harmful use of alcohol is a causal factor for more than 200 diseases and injury conditions, making it one of the leading risk factors for morbidity and mortality worldwide.¹ Although the harmful effects

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Validated survey instruments, standardised methodologies and large sample size offered unique opportunity to analyse trends of alcohol use and associations between adolescent alcohol use and different factors in five countries.
- ⇒ The study provided important insight into alcohol use among adolescents in Estonia in a comparative setting with other Baltic countries and the Nordic countries over many study years.
- ⇒ Due to the cross-sectional study design, no causal inferences could be made.
- ⇒ Self-reported measures may have resulted in reporting bias and the potential under-reporting of sensitive health-related data.

of alcohol occur mostly during adulthood, the patterns of alcohol use start often developing during adolescence which is a period when behavioural patterns such as high levels of risk-taking and exploration are common.² Adolescent alcohol use has been associated with a higher likelihood of alcohol problems in adulthood.³ Therefore, reducing alcohol use among adolescents could effectively prevent harmful effects of alcohol in adulthood.⁴

In the European region, decreasing rates of adolescent alcohol use have been observed since the beginning of mid-2000s.^{5–7} According to the European School Survey Project on Alcohol and Other Drugs (ESPAD), the average lifetime and monthly (last 30-day) use of alcohol increased in Europe from 1995 to 2003 (from 89% to 90% and from 56% to 63%, respectively) and thereafter decreased to 81% and 47% in 2015, respectively. While the ESPAD average lifetime alcohol use prevalence was almost equal across genders from 1995 to 2015, the prevalence of monthly alcohol use was higher among boys than girls.⁷ Similar findings have been

reported by the Health Behaviour in School-aged Children study, showing that alcohol use has decreased among 11-year, 13-year and 15-year-old adolescents since 2002 in Northern, Western and Southern European countries and since 2006 in Eastern European countries⁵ and alcohol use was more common among boys than girls.⁸ However, differences occur between countries in prevalence as well as in trends of alcohol use.^{5 7}

Extensive research has been conducted to identify risk factors associated with adolescent alcohol use and associations with several school-related, family-related and risk behavioural factors has been found. According to current evidence, risk factors for adolescent alcohol use include low academic achievement or low involvement in school,⁹ permissive attitudes^{9–13} and alcohol use by parents and peers,^{9–14} living in non-intact families,^{9 15} perceived availability of alcohol¹⁴ and engagement in other risk behaviours like smoking and illicit drug use.^{9 10} On the contrary, good relations with family^{9–11 13} and parental monitoring and discipline^{10 13} are considered as protective factors for alcohol use. However, several inconsistencies occur regarding factors associated with adolescent alcohol use. For example, some studies indicate that high socioeconomic status (SES) was related to greater alcohol use, some that low SES was related to greater alcohol use and some studies have found no relationship between adolescent alcohol use and family SES.¹⁶ Furthermore, cross-cultural differences may exist in the strength of the relationship between adolescent alcohol use and associated factors.^{11 17} For example, in a comparative study between Israel, the USA and France, differences were found between alcohol use and the relative influence of parents and peers.¹⁷ In order to implement specific and evidence-based policies to decrease adolescent alcohol use and harmful effects of alcohol, up to date and culture-specific analyses should be carried out to detect factors associated with adolescent alcohol use.

The Baltic countries Estonia, Latvia and Lithuania are geographically and historically considered as Eastern European countries, which are generally known for high prevalence of adolescent alcohol use.^{18 19} The Nordic countries like Finland and Sweden, however, are traditionally among the countries with low prevalence of adolescent alcohol use.⁷ The current study gives an opportunity to take an insight into the developments of adolescent alcohol use in Estonia and neighbouring Baltic and Nordic countries with different history and patterns of adolescent alcohol use.

The aims of this study were (1) to describe trends in the prevalence of monthly alcohol use from 2003 to 2015 and (2) to analyse the associations between alcohol use and family-related and school-related factors, other risk behaviours and perceived alcohol availability in Estonia compared with Latvia, Lithuania, Finland and Sweden.

METHODS

Setting and sampling

This study used individual-level data of 15–16-year-old adolescents from the ESPAD, which is a cross-sectional survey that has been performed every fourth year since 1995 in European countries. The results of the surveys are comparable between different countries, as the target population, questionnaires, data collection process and data entry are standardised.⁷ In all countries, sampling was based on the school class as the final sampling unit. A cluster sampling design was used to sample the target populations. Questionnaires were anonymous and completed by schoolchildren in a classroom, except for Latvia, where students answered a web-based questionnaire in 2015.⁷

The present study utilised secondary data from Estonia, Latvia, Lithuania, Finland and Sweden from 2003, 2007, 2011 and 2015 as comparable questionnaires and data for each country were available for these study years. All data were nationally representative,^{7 20–22} however, the school participation rate in Latvia was low in 2015 (49% compared with the ESPAD average of 84%), resulting in low number of participating students (1119 students compared with the ESPAD quality criterion of 2400 students).⁷

Measures

Alcohol-related variables

Alcohol use was measured by the question ‘On how many occasions (if any) have you had any alcoholic beverage to drink during the last 30 days?’ The response options were ‘0’, ‘1–2’, ‘3–5’, ‘6–9’, ‘10–19’, ‘20–39’ and ‘40+’. Based on the responses to this question, two groups were formed: (1) adolescents who did not consume alcohol (no) and (2) adolescents who consumed alcohol (yes).

Light alcohol use was measured based on the following question that was asked separately for four different types of light alcoholic beverages: ‘Think back to last 30 days. On how many occasions (if any) have you had any of the following to drink: beer, cider, alcopops, wine?’ Two groups were formed: (1) adolescents who did not drink any type of light alcohol during the last 30 days (no) and (2) adolescents who consumed at least one type of light alcohol during the last 30 days (yes). As no comparable data on light alcohol use were available for 2003, only the results from 2007 to 2015 were used.

Strong alcohol use was measured by the following question: ‘Think back to last 30 days. On how many occasions (if any) have you had any of the following to drink: spirits?’ Based on this question, two groups were formed: (1) adolescents who did not consume strong alcohol (no) and (2) adolescents who consumed strong alcohol (yes).

School-related factors

Skipping school measured whether an adolescent had missed one or more lessons because of skipping or ‘cutting’ school during the last 30 days. Two groups were formed: (1) adolescents who had not missed lessons (no)

and (2) adolescents who had missed one or more lessons (yes).

Risk behaviour

Smoking referred to whether an adolescent had smoked cigarettes during the last 30 days. Two groups were formed: (1) adolescents who had not smoked (no) and (2) adolescents who had smoked one or more times (yes).

Cannabis use measured whether an adolescent had used marijuana or hashish (cannabis) during the last 30 days. Two groups were formed: (1) adolescents who had not used cannabis (no) and (2) adolescents who had used cannabis one or more times (yes).

Perceived alcohol availability

Perceived alcohol availability was calculated based on five separate questions measuring how difficult an adolescent thought it would be to obtain beer, cider, alcopops, wine and spirits if they wanted. Answers were divided into three groups: (1) easy, which indicated that the respondent thought it would be easy to obtain at least one of the alcoholic beverages; (2) difficult, which indicated that the respondent thought it would be difficult to obtain all alcohol beverages and (3) do not know, which indicated that the respondent did not know how difficult it would be to obtain any of the alcohol beverages.

Family-related factors

Family SES was measured based on how adolescents rated their families' wealth compared with that of other families in their country. Answers were grouped into three categories: (1) better, (2) the same and (3) worse than that of other families in adolescents' home country.

Family structure referred to completeness of the family. Based on the answers, three groups were formed: (1) living with biological mother and father, (2) living with one biological parent and (3) living without biological parents.

Rules outside of home indicated how often parents set definite rules about what adolescents are or are not allowed to do outside the home. Answers were grouped into three categories: (1) always/often, (2) sometimes and (3) seldom/never.

Regarding *parents' knowledge about children's whereabouts on Saturday nights*, three categories were formed: (1) always/often know, (2) sometimes know and (3) usually do not know.

Study year

The study year referred to the year when the ESPAD survey was conducted: 2003, 2007, 2011 and 2015.

Statistical analysis

The prevalence of alcohol use, strong alcohol use and light alcohol use with 95% CIs was calculated for every study year in all countries. A χ^2 test for trend was used to evaluate statistically significant changes in alcohol use over the study period.

The multilevel logistic regression analysis, with students at the first level and schools at the second level, was used for assessing the association between alcohol use and several explanatory individual-level factors. Country and study year were added into the model as the second-level variables. Two models were built. First, the null model (empty model without any explanatory variables) was the reference and gave evidence of the existence of alcohol use variation between schools (school-level variance component was 0.052, 95% CI 0.0390 to 0.069). Second, the model with cross-level interactions of country and the individual explanatory factors was used (school-level variance component was 0.020, 95% CI 0.012 to 0.032). In order to study the associations between alcohol use and several explanatory factors, marginal ORs averaged over students of all schools and 95% CIs intervals for each country were calculated. The multilevel model with marginal ORs for five countries is presented in the main text, whereas the results of the same model with cross-level interaction terms are presented in online supplemental appendix A. Even though the intraclass correlation of the model was low (0.009; 95% CI 0.006 to 0.014), indicating a small amount of variance attributable to the school level, multilevel modelling was used not to ignore the design of the ESPAD study.

The questionnaires of respondents who did not provide answers to questions about the monthly alcohol use were excluded from the analysis (n=767). The final study sample consisted of 57 779 15–16-year-old adolescents (49% boys, 51% girls) from Estonia (n=9559), Latvia (n=8672), Lithuania (n=12378), Finland (n=15 889) and Sweden (n=11 281). The questionnaires of respondents who did not provide answers to questions on light or strong alcohol use were excluded from the calculation of the prevalence of light or strong alcohol use (n=417). The questionnaires of respondents who did not provide answers to questions on family-related, school-related, risk behaviour and perceived alcohol availability questions over the study period were excluded from the multilevel modelling analysis (n=6391). Missing responses were below 3% across explanatory factors, with the exception of *Skipping school*, where in total 5.4% (Lithuania) to 9.5% (Sweden) students did not provide any answer. Additional analysis of missing data is provided in online supplemental appendix B.

Statistical analysis was conducted with Stata V.14.²³

Patient and public involvement

No patient involved.

RESULTS

Table 1 summarises the distribution of explanatory factors among adolescents in Estonia, Latvia, Lithuania, Finland and Sweden.

Prevalence of alcohol use

In 2003, the prevalence of monthly alcohol use was the highest in Lithuania (78.3% among boys and 75.9%

**Table 1** Distribution of explanatory factors among 15–16-year-old adolescents in Estonia, Latvia, Lithuania, Finland and Sweden based on data from the ESPAD study, 2003–2015

Variables	Estonia (n=9559) %	Latvia (n=8672) %	Lithuania (n=12378) %	Finland (n=15889) %	Sweden (n=11281) %
Year					
2003	24.9	31.7	40.6	20.2	27.8
2007	24.4	25.8	19.1	31.1	27.4
2011	25.4	29.8	19.8	23.4	22.4
2015	25.3	12.6	20.5	25.4	22.4
Gender					
Boys	49.8	49.3	49.8	47.4	49.4
Girls	50.2	50.7	50.2	52.6	50.6
Missing	–	–	–	–	–
Skipping school					
No	63.8	57.2	55.2	72.0	72.7
Yes	28.7	33.3	39.4	22.0	17.8
Missing	7.6	9.5	5.4	6.0	9.5
Smoking					
No	70.9	60.7	64.6	69.6	80.3
Yes	28.8	39.2	35.2	30.2	19.5
Missing	0.3	0.1	0.2	0.2	0.3
Cannabis use					
No	92.6	94.4	94.2	97.2	97.3
Yes	6.4	4.6	5.0	2.5	2.1
Missing	1.1	1.0	0.8	0.3	0.5
Perceived alcohol availability					
Difficult	12.7	11.8	11.4	12.6	8.5
Easy	81.4	84.7	83.9	79.4	84.8
Do not know	5.7	3.4	4.6	7.9	6.5
Missing	0.3	0.1	0.1	0.1	0.3
Family SES compared with that of other families in the country					
Better	44.2	45.1	30.4	26.0	52.1
Same	44.1	43.6	53.7	62.9	39.7
Worse	10.9	9.4	15.1	9.8	5.2
Missing	0.9	2.0	0.8	1.3	3.0
Family structure					
Mother and father	60.0	58.0	68.6	70.4	74.5
Mother or father	35.5	32.3	25.3	27.8	20.7
Neither mother nor father	3.9	7.9	5.5	1.2	2.3
Missing	0.6	1.8	0.6	0.6	2.5
Rules outside of the home					
Always/often	18.6	29.3	29.0	45.2	31.2
Sometimes	23.4	26.3	25.3	31.1	28.5
Seldom/never	56.7	42.2	45.0	22.9	37.8
Missing	1.4	2.2	0.8	0.9	2.5
Parents knowledge about child's whereabouts on Saturday nights					
Always/often know	74.2	78.0	80.0	81.6	85.2
Sometimes know	18.4	15.1	13.9	12.9	9.5
Usually do not know	6.3	5.4	5.6	4.6	3.1
Missing	1.2	1.5	0.5	0.9	2.2

ESPAD, European School Survey Project on Alcohol and Other Drugs; SES, socioeconomic status.

Table 2 Prevalence of monthly alcohol use among 15–16-year-old boys and girls in Estonia, Latvia, Lithuania, Finland and Sweden based on data from the ESPAD study, 2003–2015

Country	2003	2007	2011	2015
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Boys				
Estonia	60.0 (57.3 to 62.8)	57.9 (55.1 to 60.7)	57.0 (54.2 to 59.8)	36.1 (33.4 to 38.8)
Latvia	59.8 (57.1 to 62.4)	65.0 (62.2 to 67.8)	62.9 (60.3 to 65.6)	44.3 (40.1 to 48.5)
Lithuania	78.3 (76.7 to 79.9)	65.0 (62.2 to 67.7)	62.7 (60.0 to 65.4)	32.4 (29.9 to 35.0)
Finland	52.1 (49.5 to 54.6)	46.2 (49.5 to 54.6)	46.0 (43.7 to 48.3)	32.3 (30.2 to 34.4)
Sweden	51.5 (49.0 to 54.0)	41.3 (38.8 to 43.8)	34.1 (31.5 to 36.7)	22.4 (20.1 to 24.7)
Girls				
Estonia	60.7 (57.9 to 63.4)	61.8 (59.1 to 64.6)	60.4 (57.7 to 63.1)	39.1 (36.3 to 41.8)
Latvia	60.2 (57.7 to 62.8)	64.8 (62.0 to 67.6)	67.8 (65.2 to 70.4)	45.9 (41.8 to 50.1)
Lithuania	75.9 (74.3 to 77.6)	65.3 (62.6 to 67.9)	63.7 (61.0 to 66.3)	35.6 (32.9 to 38.3)
Finland	55.0 (52.7 to 57.4)	49.3 (47.4 to 51.2)	49.5 (47.3 to 51.8)	31.8 (29.8 to 33.8)
Sweden	48.5 (46.0 to 50.9)	46.7 (44.3 to 49.2)	41.2 (38.4 to 43.9)	29.1 (26.6 to 31.6)

ESPAD, European School Survey Project on Alcohol and Other Drugs.

among girls) and the lowest in Sweden (51.5% among boys and 48.5% among girls). In 2015, the prevalence of monthly alcohol use was the highest in Latvia (44.3% among boys and 45.9% among girls) and the lowest in Sweden (22.4% among boys and 29.1% among girls). (table 2)

From 2003 to 2015, the prevalence of monthly alcohol use decreased significantly among boys and girls in Estonia, Latvia, Lithuania, Finland and Sweden (figure 1).

In all countries, the prevalence of light alcohol use was higher than the prevalence of strong alcohol use. The prevalence of light alcohol use decreased significantly among boys and girls in all countries from 2007

to 2015. The prevalence of strong alcohol use decreased significantly among boys and girls in Estonia, Lithuania, Finland and Sweden but increased significantly among Latvian boys from 2003 to 2015 (figure 2).

Associations of monthly alcohol use with family-related factors, school-related factors, risk behavioural factors and perceived alcohol availability

The adjusted multilevel model showed that in all countries, monthly alcohol use among adolescents was associated with skipping school, smoking, cannabis use, perceived easy alcohol availability and parents' lower knowledge about children's whereabouts on Saturday

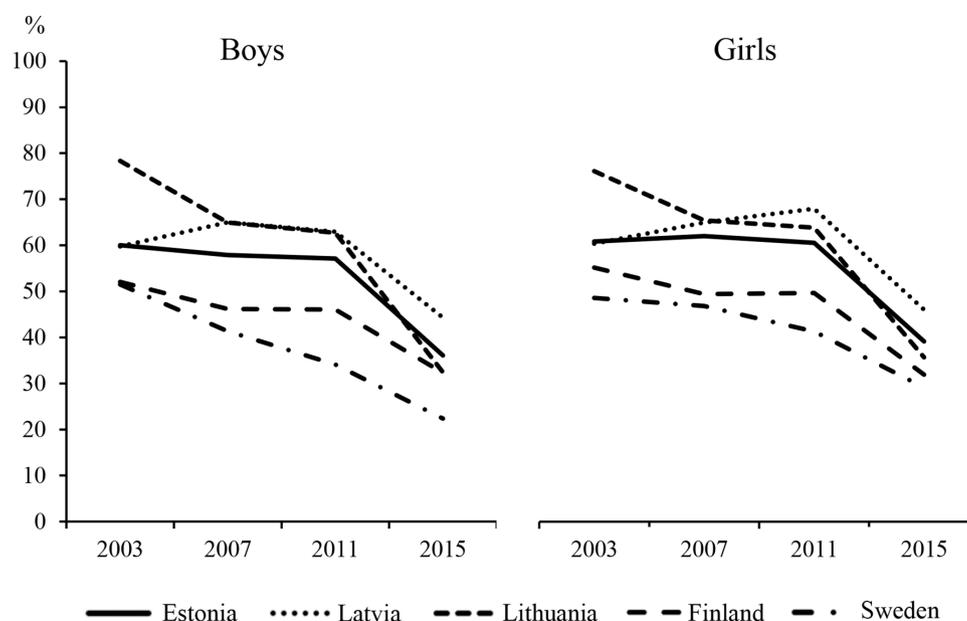


Figure 1 Prevalence of monthly alcohol use among 15–16-year-old boys and girls in Estonia, Latvia, Lithuania, Finland and Sweden. All trends were statistically significant ($p < 0.001$; Latvian girls, $p = 0.022$).

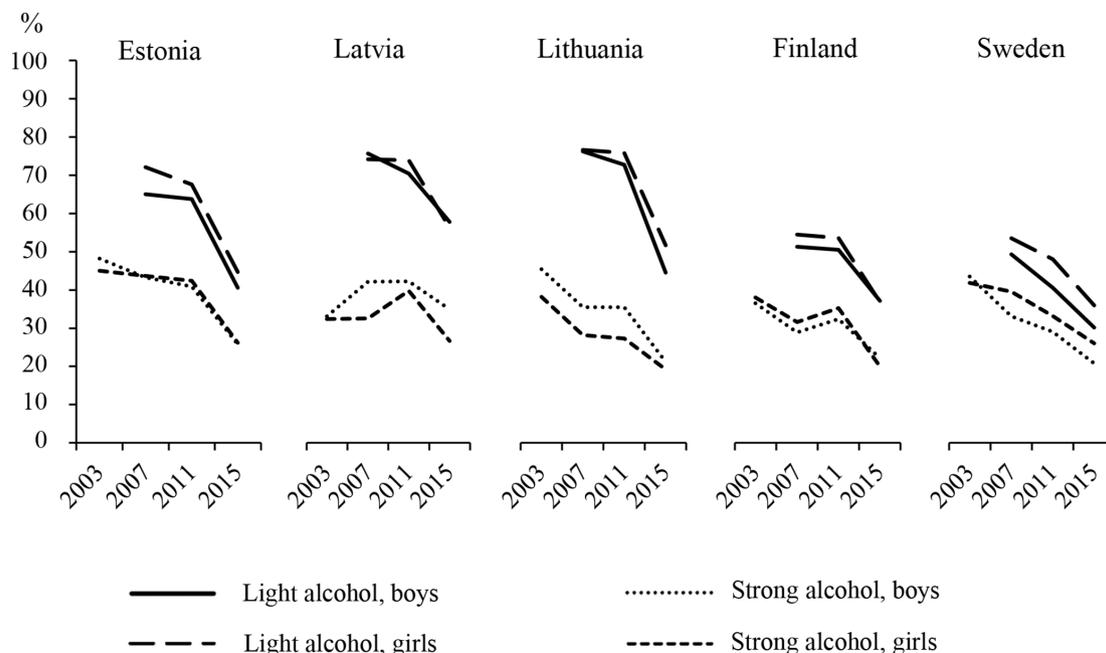


Figure 2 Prevalence of monthly light (beer, cider, alcopops and wine) and strong (spirits) alcohol use among 15–16-year-old boys and girls in Estonia, Latvia, Lithuania, Finland and Sweden. ESPAD 2003–2015. All changes in light alcohol use from 2007 to 2015 were statistically significant ($p < 0.001$). Changes in strong alcohol use from 2003 to 2015 were statistically significant among boys and girls in Estonia, Lithuania, Finland and Sweden ($p < 0.001$) and among boys in Latvia ($p = 0.013$). ESPAD, European School Survey Project on Alcohol and Other Drugs

nights. In Estonia, Latvia, Lithuania and Sweden, girls had significantly higher odds of monthly alcohol use than boys. In Estonia and Latvia, adolescents with worse family SES as other families in their countries (vs better family SES) had lower odds of alcohol use. In Finland and Sweden, adolescents with worse and the same family SES as other families in their countries (vs better family SES) had lower odds of alcohol use. In Finland and Sweden, adolescents living with one biological parent (vs two biological parents) had higher odds of alcohol use. In Estonia and Lithuania, adolescents living without any biological parents (vs two biological parents) had lower odds of alcohol use. In Latvia, adolescents whose parents sometimes set rules outside of the home (vs always/often) had higher odds of alcohol use. In Latvia and Lithuania, adolescents whose parents set seldom/never rules outside of the home (vs always/often) had higher odds of alcohol use (table 3).

The associations between alcohol use and explanatory factors in Latvia and Lithuania did not differ significantly from the associations in Estonia, except for skipping school in Latvia and smoking in Lithuania. Compared with Estonia, the associations between alcohol use and explanatory factors in Finland and Sweden were statistically significantly different regarding gender, perceived alcohol availability, family structure and parents' knowledge about child's whereabouts on Saturday night. In addition, statistically significantly different associations were found between alcohol use and cannabis use in Finland versus Estonia and alcohol use and smoking in Sweden versus Estonia (table 3)

DISCUSSION

This study focused on adolescent alcohol use and related factors in Estonia compared with that in Latvia, Lithuania, Finland and Sweden from 2003 to 2015.

Trends of monthly alcohol use

From 2003 to 2015, the prevalence of alcohol use decreased significantly among 15–16-year-old boys and girls in Estonia as well as in Latvia, Lithuania, Finland and Sweden. Although the direction of the trends was similar in all analysed countries, differences existed in the shape of trends and extent of decrease. Prevalence of adolescent alcohol use decreased the most among boys and girls in Lithuania and boys in Sweden, among whom monthly alcohol use showed a more than twofold decline. Estonia showed a similar decrease as Finland with 1.6–1.7 times change among boys and girls. The results of the current study imply that the decrease in monthly adolescent alcohol use in Estonia, Lithuania, Finland and Sweden was higher than on average across Europe, where 1.3 times change was observed among boys and girls from 2003 to 2015.⁷ In Estonia, Lithuania and Sweden, decline in adolescent alcohol use was higher among boys than girls.

Previous literature has analysed adolescent alcohol use in Europe in the context of four⁵ or five⁶ regions, considering the Baltic countries as Eastern European countries and the Nordic countries as Northern European countries. The results of the present study suggest that considerable differences in trends of alcohol use occur even within smaller regions with similar historical background, such

Table 3 Multilevel modelling results for association between monthly alcohol use and explanatory factors among adolescents in Estonia, Latvia, Lithuania, Finland and Sweden. Marginal odds ratios (OR*) and 95% CI for each country with respect to the school random effects are presented

Variables	Estonia	Latvia	Lithuania	Finland	Sweden
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender					
Boys	1	1	1	1	1
Girls	1.31 (1.19 to 1.45)	1.23 (1.10 to 1.37)	1.27 (1.16 to 1.39)	1.04 (0.96 to 1.12)†	1.11 (1.00 to 1.22)†
Skipping school					
No	1	1	1	1	1
Yes	1.71 (1.52 to 1.91)	1.43 (1.27 to 1.60)†	1.64 (1.50 to 1.81)	1.67 (1.51 to 1.84)	1.75 (1.54 to 1.99)
Smoking					
No	1	1	1	1	1
Yes	4.97 (4.36 to 5.66)	4.89 (4.33 to 5.54)	3.77 (3.38 to 4.20)†	5.81 (5.28 to 6.39)	7.09 (6.14 to 8.18)†
Cannabis use					
No	1	1	1	1	1
Yes	2.22 (1.70 to 2.89)	3.18 (2.12 to 4.77)	2.22 (1.63 to 3.02)	3.87 (2.45 to 6.1)†	2.28 (1.44 to 3.62)
Perceived alcohol availability					
Difficult	1	1	1	1	1
Easy	3.42 (2.91 to 4.01)	3.47 (2.92 to 4.12)	2.94 (2.56 to 3.36)	5.24 (4.49 to 6.11)†	5.40 (4.20 to 6.94)†
Do not know	0.70 (0.52 to 0.94)	0.99 (0.71 to 1.39)	0.66 (0.51 to 0.86)	0.47 (0.35 to 0.64)	0.58 (0.37 to 0.91)
Family SES compared with that of other families in the country					
Better	1	1	1	1	1
Same	0.91 (0.82 to 1.01)	0.91 (0.82 to 1.02)	0.92 (0.84 to 1.02)	0.89 (0.81 to 0.98)	0.87 (0.79 to 0.97)
Worse	0.83 (0.70 to 0.98)	0.75 (0.62 to 0.91)	0.94 (0.82 to 1.08)	0.83 (0.71 to 0.97)	0.74 (0.59 to 0.93)
Family structure					
Mother and father	1	1	1	1	1
Mother or father	1.03 (0.92 to 1.14)	1.08 (0.96 to 1.22)	0.91 (0.82 to 1.01)	1.25 (1.14 to 1.37)†	1.19 (1.05 to 1.34)
Neither mother nor father	0.75 (0.57 to 0.97)	0.84 (0.69 to 1.04)	0.73 (0.61 to 0.89)	1.46 (0.98 to 2.16)†	1.18 (0.85 to 1.63)†
Rules outside of the home					
Always/often	1	1	1	1	1
Sometimes	1.07 (0.92 to 1.25)	1.17 (1.02 to 1.34)	1.09 (0.97 to 1.23)	1.01 (0.92 to 1.11)	0.98 (0.87 to 1.11)
Seldom/never	1.03 (0.90 to 1.18)	1.22 (1.07 to 1.38)	1.12 (1.01 to 1.25)	0.97 (0.87 to 1.07)	0.99 (0.88 to 1.12)
Parents know about child's whereabouts on Saturday nights					
Always/often	1	1	1	1	1
Sometimes	1.66 (1.46 to 1.90)	1.69 (1.43 to 1.98)	1.87 (1.62 to 2.17)	2.75 (2.42 to 3.13)†	2.60 (2.19 to 3.08)†
Usually not	1.93 (1.52 to 2.44)	1.49 (1.15 to 1.94)	1.74 (1.38 to 2.19)	2.92 (2.33 to 3.65)†	2.14 (1.58 to 2.90)

*Adjusted for all variables in the table and the study year.
 †Statistically significantly difference ($p < 0.05$) from Estonia.
 SES, socioeconomic status.

as the Baltic countries. Different from Estonia and Lithuania, adolescent alcohol use increased among boys and girls in Latvia from 2003 to 2011 and decreased considerably between 2011 and 2015. Differences between countries were particularly visible regarding strong alcohol use, where upward trend among boys in Latvia was found over the study period. Furthermore, between 2007 and 2011, increase in strong alcohol use occurred among girls in Latvia as well as among boys and girls in Finland. The

prevalence of light alcohol use decreased in all analysed countries, most considerably between 2011 and 2015.

The findings of decreasing rates of adolescent alcohol use are consistent with the existing evidence.⁵⁻⁷ The reasons behind the decrease in adolescent alcohol use are considered to be an increased awareness of the harmful effects of alcohol; effective use of alcohol prevention programmes targeting adolescents and a shift in social norms, attitudes and the social environment.^{5 24}



Furthermore, the beginning of the 21st century has been associated with a general shift towards a decline in risk behaviour, including smoking and sexual risk behaviour.⁵ Illicit drug use has, however, been generally stable over the past decades.⁷ As adolescent alcohol use is associated with national policy measures such as pricing, availability and marketing,²⁵ changes in national policy measures could have an effect on adolescent alcohol use.

In the context of alcohol policy, the Baltic countries have implemented various policy mechanisms since the 1990s to reduce alcohol availability,²⁶ however, between 2003 and 2015, alcohol policy in the Baltic countries remained more liberal compared with the Nordic countries Finland and Sweden, which are known for their strictly regulated alcohol markets.^{27 28} In 2015, the prevalence of monthly alcohol use among boys and girls in Estonia was lower than that in Latvia, similar to Lithuania but higher than in Sweden. Compared with Estonia, the prevalence of monthly alcohol use in Finland was similar among boys but lower among girls. The findings of the study suggest that from 2003 to 2011, the Baltic countries had significantly higher prevalence of alcohol use than the Nordic countries Finland and Sweden, however, a convergence has appeared between 2011 and 2015, with Estonia and Lithuania reporting similar prevalence rates as Finland in 2015. In the context of Europe, monthly alcohol use was in each analysed country lower than the ESPAD average in 2015 (49% among boys and 46% among girls),⁷ with an exception of Latvian girls where the prevalence was equal to the average prevalence in Europe.

Several studies have suggested a closure of gender gap in adolescent alcohol use,^{6 29} however, the European average prevalence of current (monthly and/or weekly) alcohol use has so far remained higher among boys than girls.^{5 6 29} In Estonia, Latvia, Lithuania and Sweden in 2015, the prevalence of monthly alcohol use was higher among girls than boys, although the difference was statistically significant only in Sweden. In the context of Europe, these results are remarkable because they not only support a closure of gender gap but suggest that prevalence of monthly alcohol use among girls has already passed the alcohol use among boys in some countries.

This shift could be a consequence of a generational change in the development of female gender identity.^{30 31} A study conducted among Finnish and Swedish women found that younger generations perceive alcohol to have less negative influence on female identity than older women.³¹ It is suggested that one of the reasons for increasing alcohol use among women may be the need to feel equal to men by adopting risk behaviours including alcohol use.³⁰

In all analysed countries, the prevalence of light alcohol use was higher than the prevalence of strong alcohol use. Interestingly, different patterns were found between countries based on alcohol type. Among boys and girls in Latvia and Lithuania, the prevalence of monthly light alcohol use in 2015 was more than two times higher than the prevalence of strong alcohol use, whereas in Estonia,

Finland and Sweden, the difference between the prevalence of light and strong alcohol use was less than 1.7 times. Therefore, the findings suggest that adolescents in Latvia and Lithuania prefer light alcohol over strong alcohol more than adolescents in Estonia, Finland and Sweden. However, a more in-depth analysis should be carried out to draw further conclusions.

Associations of monthly alcohol use with different factors

A multilevel model confirmed a statistically significant association between gender and alcohol use in Estonia, Latvia, Lithuania and Sweden, suggesting that girls had higher odds of alcohol use than boys even when adjusted for variables related to alcohol use. In Finland, the association showed similar direction but remained non-significant. Evidence confirms that there are both common and unique risk factors affecting boys' and girls' alcohol use which tend to change in time.³² Therefore, further research should assess the significance of interaction terms between risk factors and gender to be associated with alcohol use among adolescents in order to address them in contemporary approaches to the prevention.

In Latvia and Lithuania, the association between adolescent alcohol use and gender did not differ significantly from Estonia. However, gender was more predictive of adolescent alcohol use in Estonia than in Finland and Sweden. As girls are more vulnerable to negative consequences of alcohol use than boys,^{33 34} prevention methods in the analysed countries could particularly focus on reducing alcohol use among girls.

Based on the existing literature, school misbehaviour is a correlate of adolescent alcohol use,³⁵ and the current study showed a significant association between alcohol use and skipping school in all countries. Furthermore, the current study showed strong associations between alcohol use and other risk behaviours, such as smoking and cannabis use. Although current evidence suggests that adolescents who are heavy cannabis users may use alcohol and cannabis concurrently,³⁶ the prevalence of the simultaneous use of alcohol and cannabis is common among adolescents³⁶ as well as adults.³⁷ Therefore, prevention methods could simultaneously target alcohol and cannabis use as well as smoking to reduce risky behaviour among adolescents.

In all analysed countries, more than two-third of adolescents perceived alcohol easily available. Interestingly, in 2015, the percentage was the highest in Sweden, where, based on the national alcohol policy measures, physical availability of alcohol was more limited than in the Baltic countries.^{27 28} Alcohol use was strongly related to perceived alcohol availability in all countries, which is also supported by existing literature.^{11 14} Compared with Estonia, the association between alcohol use and perceived alcohol availability was higher in Finland and Sweden, suggesting that perceiving alcohol easily accessible is more predictive of adolescent alcohol use in the Nordic countries compared with that in Estonia.

Regarding family-related factors, adolescents in Estonia, Latvia, Finland and Sweden with worse family SES had lower odds of alcohol use than adolescents with better family SES. Although inconsistent results have been found in existing literature,¹⁶ prevention methods in Estonia and neighbouring countries could particularly focus on reducing alcohol use among adolescents from families with high SES. However, studies have found that the direction of the association between alcohol use and family SES may vary depending on the measure used to assess family SES.¹⁶

In Finland and Sweden, adolescents living in non-intact families had higher odds for alcohol use compared with adolescents who lived in intact families. This finding is supported by existing literature,³⁸ as adolescents living in non-intact families may experience weaker family attachment, exposure to stress, time limitations by single parents and therefore engage more commonly in risky behaviour.^{39 40} Interestingly, in Estonia and Lithuania, adolescents living without any biological parents had significantly lower odds of alcohol use than adolescents living with two biological parents. Although inconsistent with common evidence,^{38 41} similar finding has been observed among American Indian adolescents among whom living in family with no parents was protective for alcohol use problems compared with living in non-intact family.⁴² The association was explained by the reasoning that the circumstances of living in non-parent family are already highly stressful and may result in less likely involvement in problems related to alcohol use.⁴² However, more in-depth analysis is needed to test this hypothesis.

Adolescent alcohol use has been associated with parental control and rules.^{11 14 43} In the current study, all countries showed a significant association between alcohol use and parents' knowledge about children's whereabouts on Saturday nights, whereas in the Nordic countries, the association was significantly stronger than Estonia. Association between alcohol use and parents who set clear rules outside of the home was found only in Latvia and Lithuania. Therefore, the study found that parental rules and control are predictive for lower alcohol use among adolescents.

Compared with Estonia, the associations between alcohol use and explanatory factors in Latvia and Lithuania were similar across all variables, except for skipping school in Latvia and smoking in Lithuania. Comparison of Estonia with Finland and Sweden, however, showed that the strength of the association between alcohol use and gender was weaker in the Nordic countries compared with Estonia. The strength of the associations between alcohol use and perceived easy alcohol availability, living in non-intact families and parents' lower knowledge about child's whereabouts on Saturday night, smoking (in Finland) and cannabis use (in Sweden) were stronger in the Nordic countries compared with Estonia.

Some limitations of this study deserve special mention. The ESPAD survey is a cross-sectional survey, so no causal inferences could be made. Furthermore, the findings

were based on self-reported measures, which may have resulted in reporting bias and the potential underreporting of sensitive health-related data.⁴⁴ This study did not include other factors potentially associated with alcohol use (eg, peer-related factors, school performance, family attachment), as there were minor differences between questions included in different countries in each study year. Despite the limitations, this study effectively compared alcohol use over decade across different countries, as similar methodologies were used in all countries in each study year in ESPAD survey. Furthermore, the study provided important insight into understudied countries, as adolescent alcohol use in the Baltic countries has so far not been profoundly analysed in a comparative setting to the Nordic countries.

CONCLUSION

In conclusion, monthly alcohol use decreased significantly among 15–16-year-old boys and girls in Estonia as well as in Latvia, Lithuania, Finland and Sweden from 2003 to 2015. Whereas monthly light alcohol use decreased among boys and girls in all countries, monthly strong alcohol use decreased in all countries except Latvia, where it increased among boys. In 2015, the prevalence of monthly alcohol use among boys and girls in Estonia was lower than in Latvia, similar to Lithuania and higher than in Sweden. Compared with Estonia, the prevalence of monthly alcohol use in Finland was similar among boys but lower among girls.

The directions of the associations between alcohol use and risk factors were similar in overall across the countries. In all countries, higher monthly alcohol use was observed among adolescents who skipped school, smoked cigarettes, used cannabis, perceived alcohol to be easy to access and had parents who did not know always/often about their child's whereabouts on Saturday nights. Monthly alcohol use was higher among girls than boys in Estonia, Latvia, Lithuania and Sweden, but not in Finland. The strength of the associations between adolescent alcohol use and explanatory factors in Estonia were more similar to other Baltic countries than to the Nordic countries.

The results of the study could be effectively used to enhance health promotion and alcohol policy interventions to decrease and prevent alcohol use among adolescents. For example, prevention methods could particularly target reducing alcohol use among girls who show higher prevalence of alcohol use than boys but are at the same time more vulnerable to negative consequences of alcohol use. Furthermore, public health interventions could use strategies that prevent simultaneous use of alcohol and other risk behaviour such as smoking and cannabis use. Prevention strategies of countries showing a low prevalence of alcohol use (ie, Sweden) or a particularly significant decrease in alcohol use (ie, Lithuania) could be explored and adapted as the associations

between alcohol use and risk factors were generally similar across the analysed countries.

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Patient consent for publication Not required.

Ethics approval The research was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. In the framework of the ESPAD study, it is the responsibility of each national ESPAD research team to comply with all national laws, regulations and guidelines concerning research ethics. Following the national ethical rules, permission from the ethics committee was not necessary for most of the countries and study years. Permission from the ethics committee was obtained in Estonia in 2015, in Finland in 2011 and 2015 and in Latvia in 2015. In accordance with the national ethical guidelines, no written informed consent was required from the participants. In Estonia, Latvia, Lithuania and Finland, passive consent from parents was obtained. The ESPAD guidelines emphasise that ESPAD surveys are confidential and anonymous. The students are informed that answering the questionnaire is voluntary. In this study, secondary and fully anonymised data from Estonia, Latvia, Lithuania, Finland and Sweden were used. Additional approval for this use of the study data set was not necessary. More detailed information can be found here: <http://www.espad.org/report/detailed-methodology/ethical-aspects>

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Data availability statement Data are available upon reasonable request. Data may be obtained from a third party and are not publicly available. The datasets for Estonia Latvia, Lithuania, Finland and Sweden analyzed in this study are available from the international coordinator of the ESPAD on reasonable request.

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