

## ORIGINAL ARTICLE

## Adolescent Drinking Patterns Across Countries: Associations with Alcohol Policies

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**Abstract** — Early consumption of full servings of alcohol and early experience of drunkenness have been linked with alcohol-related harmful effects in adolescence, as well as adult health and social problems. On the basis of secondary analysis of county-level prevalence data, the present study explored the current pattern of drinking and drunkenness among 15- and 16-year-old adolescents in 40 European and North American countries. Data from the 2006 Health Behavior in School Children survey and the European School Survey Project on Alcohol and other Drugs were used. The potential role of alcohol control and policy measures in explaining variance in drinking patterns across countries was also examined. Policy measures and data on adult consumption patterns were taken from the WHO Global Information System on Alcohol and Health, Eurostat and the indicator of alcohol control policy strength developed by Brand DA, Saisana M, Rynn LA *et al.* [(2007) Comparative analysis of alcohol control policies in 30 countries. *PLoS Med* 4:e151]. We found that a non-significant trend existed whereby higher prices and stronger alcohol controls were associated with a lower proportion of weekly drinking but a higher proportion of drunkenness. It is important that future research explores the causal relationships between alcohol policy measures and alcohol consumption patterns to determine whether strict policies do in fact have any beneficial effect on drinking patterns, or rather, lead to rebellion and an increased prevalence of binge drinking.

## INTRODUCTION

Alcohol consumption by adolescents and young adults is associated with a substantial burden of illness and injury (Rehm *et al.*, 2006). While low doses of alcohol consumed in a family context do not appear to be associated with health risks (Donovan *et al.*, 2008), early consumption of full servings of alcohol and early experience of drunkenness have been linked with alcohol-related harmful effects in adolescence, as well as adult health and social problems (Clapper *et al.*, 1995; Grant and Dawson, 1997). Evidence suggests that early drunkenness may be a more important predictor of later problem behaviours such as cannabis use, violence and low academic performance than early consumption *per se* (Kuntsche *et al.*, 2012).

Fuelled by differences in historical drinking culture, as well as differences in alcohol policy (e.g. purchase age, advertising restrictions, taxation and pricing), the variation in adult drinking patterns across cultures has long been a focus of interest among public health and social researchers (Jarvinen and Room, 2007; Wagenaar *et al.*, 2009). The prevalence of early drinking also varies considerably across countries, as reported in both the Health Behaviour in School-Aged Children (HBSC) survey (Currie *et al.*, 2008, 2009) and the European School Survey Project on Alcohol and other Drugs (ESPAD) (Hibell *et al.*, 2009). The data available in these large international studies provided an opportunity to explore the variance in adolescent consumption patterns across a range of cultural and policy climates.

The cultural distribution of alcohol consumption among adolescents in today's society is not clear. There is evidence to suggest that traditional patterns ('wet', wine-producing cultures, mainly in Southern Europe, where wine is often consumed with meals vs. 'drier' Northern European countries, where alcohol is traditionally consumed less frequently,

but in the context of special events and more often leading to intoxication) have not been maintained among current youth populations (Room, 2004). Kuntsche *et al.* (2011) have recently reported on an analysis of 1997/1998 and 2005/2006 HBSC data, which demonstrated both cultural and gender convergence in the frequency of drunkenness among 15-year-olds in 23 countries classified as 'Western' or 'Eastern' European. Western European countries such as Austria, Denmark and Germany saw an average 25% decrease in drunkenness over the decade, while Eastern European countries such as the Czech Republic, Russia and Lithuania saw an overall 40% increase (Kuntsche *et al.*, 2011). It has been hypothesized that these changes, and in particular the increase in overall and female drunkenness in Eastern European countries may be associated with dramatic political changes in these countries, which have led to the relaxation of social control, opening of borders for imports and increases in marketing of alcohol (Room, 2004; Kuntsche *et al.*, 2011). Jarvinen and Room (2007) have observed that while broad differences still exist in drinking patterns, there has been an overall increase in the tendency to drunkenness among adolescents across Europe. The most recent available evidence still shows large difference in repeated drunkenness among 15-year-olds in different parts of Europe (from <20% in Italy to >50% in Denmark) (Currie *et al.*, 2012).

Differing alcohol policies and approaches to taxation within countries has been demonstrated to play an important role in influencing drinking patterns (Babor *et al.*, 2003; Wagenaar *et al.*, 2009). Several studies have evaluated the impact of various policy changes on drinking patterns in both whole populations and population subgroups. Wagenaar *et al.* (2009) considered 112 studies of alcohol tax or price and reported an inverse relationship to drinking, with effects stronger than those achieved by other measures. Meier *et al.* (2010) conducted a thorough review of alcohol price

regulations and drinking reported from UK population surveys, and found that policies had differential effectiveness on different population sub-groups. Young (18–24-year old) hazardous drinkers appear to be less affected by minimum pricing policies than drinkers overall, and some policy options were in fact, counter-productive. Increasing the price of off-trade alcohol does not produce consumption decreases among young hazardous drinkers. In contrast, on-trade price increases had impacts upon this group of drinkers, but were less effective for moderate drinkers (Meier *et al.*, 2010). Paschall *et al.* (2009) have presented evidence to suggest that stringent alcohol policies that limit the availability of alcohol may have an inverse association with past 30-day alcohol use among young people, which is sustained when controlling for adult per capita consumption. In that study, only alcohol advertising control (not other alcohol policy indicators) was also inversely related to the prevalence of past 30-day heavy drinking.

HBSC and ESPAD data provide a unique opportunity to explore the relationships between alcohol control measures and alcohol consumption patterns among adolescents in 40 countries. Exploration at this broad, international level has not been previously conducted for adolescents. While alcohol policies can include a range of measures, we chose to use the minimum purchase age and relative price because of their particular relevance to young people. Also, the composite 'Policy Control Measure' published by Brand *et al.* (2007) was used as it provides a single summary indicator encompassing measures relating to alcohol availability, drinking context, price indexes, advertising and motor vehicle laws such as drink driving. We expect that countries with stricter alcohol control measures will have a lower prevalence of adolescent drinking.

## METHODS

The reports of two large cross-cultural studies (HBSC and ESPAD) were used as data sources. The 2006 HBSC international report (Currie *et al.*, 2008, 2009) includes proportions of drinking frequency and drunkenness among 15-year-olds in 40 countries, including European, North American and Middle Eastern countries. The 2007 ESPAD Report (Hibell *et al.*, 2009) includes students whose 16th birthday falls in the calendar year of the survey (currently aged 15 or 16) from 37 countries. The list of countries included in each survey and the number of valid surveys collected in each country can be found in Table 1. Both surveys collect data on the basis of anonymous self-report questionnaires distributed in the classroom. International research protocols are stipulated and followed in each country to guarantee best possible cross-national comparability, consistency in survey instruments, data collection and processing procedures. Each participating country obtained approval to conduct the surveys from the relevant ethics review board or equivalent regulatory institution.

### Measures

#### Alcohol use among adolescents

Differences between survey questions and between data presented in published reports meant that identical items were

not available. The most equivalent items were chosen from each report.

### Frequency of drinking

The drinking frequency item for the HBSC data was taken from the question asking children how often they drink anything alcoholic. The percentage that reported drinking any alcohol at least every week in each country was used in the analysis. The ESPAD survey asked students on how many occasions in the last 30 days they had consumed an alcoholic beverage. The percentage of students in each country who reported drinking on three or more occasions in the previous 30 days was used in the analysis.

### Drunkenness

The HBSC survey asked students whether they had ever had so much alcohol that they were 'really drunk'. The percentage that reported being drunk twice or more in their lifetime in each country was used in the analysis.

The ESPAD survey asked students on how many occasions in their lifetime they had been intoxicated from drinking alcoholic beverages. The percentage of students in each country who reported having been intoxicated on three or more occasions in their lifetime was used for analysis.

### Explanatory variables

Additional country-level variables were generated to encompass key measures of alcohol policy and adult drinking patterns.

### Minimum purchase age

The minimum alcohol purchase age (MPA) was drawn from information compiled by the WHO Global Information System on Alcohol and Health (GISAH) International Center for Alcohol Policies (WHO, 2011). Where MPA varies across states/regions, or for different types of alcohol, the lowest MPA was taken for each country.

### Relative price

A measure of the relative price of alcohol in European Union countries was taken from an estimate published by Eurostat, giving the price in each country as a percentage of the EU average (Kurkowiak, 2010). Thirty-one of the HBSC and ESPAD countries were included in this study. The UK measure was used (after checking against other sources) for England, Wales, Scotland and the Isle of Man and the France estimate was used for Monaco. Values for the price of various beverages were available in GISAH for four of the remaining countries, and these data were used to calculate a single relative price measure for those countries. Prices for three countries remained unavailable through these sources, so internet searches were performed and relative prices calculated by directly comparing the data obtained from the sources mentioned earlier and those available through travel websites and discussion forums. The prices obtained from internet sources matched well with the aforementioned for the available countries, so these sources were regarded as reasonably reliable for the missing countries.

Table 1. Countries included in the HBSC and ESPAD surveys, the number of valid surveys from each country, and the percentages reported for drinking frequency and drunkenness measures from each survey

Included countries	HBSC			ESPAD		
	<i>n</i>	% weekly drinking	% drunkenness $\geq 2$ occasions in lifetime	<i>n</i>	% $\geq 3$ drinking occasions last 30 days	% intoxicated $\geq 3$ occasions
Armenia				4055	13	3
Austria	4775	38	39	2571	64	40
Belgium (Flemish)	4311	30	28	1889	46	15
Belgium (French)	4476	29	26			
Bulgaria	4854	39	46	2353	40	30
Canada	5787	17	35			
Croatia	4965	36	38	3008	40	31
Cyprus				6340	36	8
Czech Republic	4775	33	34	3901	45	31
Denmark	5682	31	57	877	53	60
England	4768	22	47			
Estonia	4477	10	50	2372	28	24
Faroe Islands				552		28
Finland	5193	21	45	4988	16	34
France	7141	20	24	2916	40	23
Germany	7224	32	29	5011	52	35
Greece	3690	12	19	3060	41	12
Greenland	1358	29	44			
Hungary	3498	13	36	2817	29	30
Iceland	9476	16	32	3510	11	
Ireland	4840	39	34	2221	33	35
Isle of Man				740	51	45
Israel	5350	28	15			
Italy	3920	22	20	9981	40	17
Latvia	4221	25	44	2275	32	31
Lithuania	5632	45	54	2411	33	32
Luxembourg	4300	37	24			
Malta	1389	12	17	3668	52	23
Monaco				393	30	19
Netherlands	4228	13	26	2091	52	22
Norway	4697	17	28	3482	14	27
Poland	5489	24	34	2120	29	22
Portugal	3919	26	21	3141	37	13
Romania	4684	28	29	2289	25	14
Russia	8232	12	35	3939	26	29
Scotland	6145	22	45			
Slovakia	3877	22	35	2468	37	34
Slovenia	5119	53	35	3085	36	29
<sup>a</sup> Spain	8891	40	31	6816	36	37
Sweden	4392	19	26	3179	17	26
Switzerland	4579	10	23	2499	39	25
TFYR Macedonia	5271	34	18			
Ukraine	5069	25	35	2447	31	20
UK				2179	46	47
<sup>a</sup> USA	9892	13	20	16,398	17	25
Wales	4396	40	53			

<sup>a</sup>Spain and the USA are non-ESPAD countries but data were included in the 2007 ESPAD report from separate national surveys.

### Policy control measures

Brand *et al.* (2007) recently published a comparative analysis of alcohol control policies using a composite indicator of the strength of a country's policies. An index was used to generate a score for policies relating to the physical availability of alcohol, drinking context, alcohol price indexes, alcohol advertising and motor vehicles. A score was generated for 30 Organisation for Economic Cooperation and Development countries, 27 of which are countries included in the present analysis and for which the control policy score was included as a variable.

### Pattern of adult drinking

The pattern of drinking score published on the GISAH (WHO, 2011) was used as a surrogate measure of the adult

drinking pattern in each country. The pattern of drinking score reflects the alcohol-attributable burden of disease of a country, given the same level of alcohol consumption, on a scale of 1 (least risky drinking pattern) to 5 (most risky drinking pattern). This score is based on three different dimensions: four different aspects of heavy drinking occasions, drinking with meals and drinking in public places (WHO, 2011). Scaling methods were used based on surveys in each country as described by Rehm *et al.* (2003).

### Analysis

Correlations between the drinking frequency and drunkenness variables and between the data sets were performed. To explore possible explanations for the patterns of drinking,

Table 2. Correlations between drinking frequency and drunkenness variables within and across data sets

Pearson coefficient, <i>P</i> -value ( <i>n</i> )	HBSC		ESPAD % ≥3 drinking occasions last 30 days
	% weekly drinking	% drunkenness ≥2 occasions in lifetime	
HBSC			
% weekly drinking			
% drunkenness ≥2 occasions in lifetime	0.17, 0.295 (40)		
ESPAD			
% ≥3 drinking occasions last 30 days	0.65, <0.0001 (31)	-0.01, 0.983 (31)	
% intoxicated ≥3 occasions	0.02, 0.910 (30)	0.66, <0.0001 (30)	0.39, 0.021 (35)

country-level covariates of adolescent alcohol consumption were correlated with measures of alcohol control policy, and adult drinking pattern. Pearson correlations were performed at the univariate level between adolescent weekly drinking and drunkenness separately with these potential explanatory variables (Table 3). Non-parametric Spearman correlations were also performed for comparison, given the non-normal distribution of variables. Intercorrelations between explanatory variables were also explored. Owing to the small sample size of only 40 countries, consistency of results across variables is considered as providing evidence over and above statistical significance levels (Kuntsche *et al.*, 2006). All comparisons were performed separately using HBSC and ESPAD data.

## RESULTS

Pearson correlations between the drinking variables showed that while drinking frequency and drunkenness variables within data sets were only marginally correlated, the frequency and drunkenness measures were statistically significantly similar across data sets (Table 2).

Pearson correlations between weekly drinking and frequency of drunkenness taken from the HBSC report, and the policy and adult consumption variables resulted in a consistent pattern of association across the countries (Table 3). The results were not affected when non-parametric Spearman

correlations were performed. Greater relative price, greater alcohol control scores and a higher risk score on the WHO pattern of drinking scale all tended towards negative associations with the prevalence of weekly drinking, but positive ones with the prevalence of drunkenness. The negative association with weekly drinking and positive one with drunkenness also existed in data taken from the ESPAD report, for alcohol price and the WHO pattern of drinking score. As might be expected, there was intercorrelation between the explanatory variables. In particular, the alcohol control score was highly correlated with the average price ( $r=0.48$ ,  $P=0.013$ ) and the pattern of drinking score ( $r=0.63$ ,  $P<0.0001$ ).

A tendency exists whereby the higher the price in a country, the lower the prevalence of weekly drinking but the higher the prevalence of drunkenness (e.g. in Norway and Greenland). The reverse is also demonstrated with low price and high weekly drinking in countries such as Ukraine and Bulgaria. Similarly, there was a trend whereby the higher the policy control score, the lower the prevalence of weekly drinking but the higher the prevalence of drunkenness (e.g. in Poland, Finland, Norway and Iceland). The reverse trend was seen in Austria and Switzerland.

## DISCUSSION

The aim of the present study was to explore the relationship between alcohol policies and adolescent drinking patterns across 40 countries. Results revealed that a relationship exists between adolescent drinking patterns and different measures of alcohol policy across countries. The results suggest that higher price and a higher alcohol control score (stronger policy measures) may be associated with a lower prevalence of weekly drinking, but had no effect on drunkenness, or if anything were associated with a higher rate of drunkenness.

Trends were largely consistent between the HBSC and ESPAD data. The use of both the data sets and consistency between them strengthens the findings and reinforces the public health relevance of these trends. The main difference between the data sets was the very slightly negative association between the alcohol control score and drunkenness as published in the ESPAD report, contrasting with the slightly positive association with the HBSC drunkenness measure. It is important to note that the negative association with

Table 3. Correlations of adolescent drinking variables with policy variables and adult pattern of drinking

Measure [ <i>n</i> , mean (SD)]	Weekly drinking		Drunkenness	
	Pearson coefficient	<i>P</i> -value	Pearson coefficient	<i>P</i> -value
Minimum purchase age—HBSC [39, 17.3 (1.2)]	-0.39	0.013	-0.02	0.914
ESPAD [33, 17.4 (1.2)]	-0.73	<0.0001	-0.13	0.469
Alcohol price as % of EU average (Kurkowiak, 2010)				
HBSC [38, 114.1 (38.9)]	-0.47	0.003	0.12	0.469
ESPAD [32, 114.1 (39.4)]	-0.48	0.005	0.21	0.258
Alcohol control score (Brand <i>et al.</i> , 2007)				
HBSC [27, 40.9 (14.8)]	-0.48	0.012	0.11	0.575
ESPAD [22, 41.3 (15.3)]	-0.77	<0.0001	-0.07	0.776
Pattern of drinking score—HBSC [39, 2.2 (1.0)]	-0.11	0.526	0.45	0.004
ESPAD [32, 2.2 (1.0)]	-0.52	0.002	0.16	0.385

Non-shaded rows represent HBSC data and shaded rows represent ESPAD data.

ESPAD data is very small and not statistically significant. It would therefore be best described as no effect, in line with the very small positive (or no) effects for the relative price and pattern of drinking score.

The opposing trends in drinking prevalence and drunkenness associated with policy measures raise questions as to the potential unwanted public health impact of the measures adopted internationally. These trends suggest that with higher alcohol prices, adolescents may be less inclined to drink frequently, but more inclined to drink at risky levels when they do drink. An alternative explanation for the findings is that the correlations between strict alcohol policies and increased prevalence of drunkenness may in fact reflect the underlying drinking culture. It is possible that the stricter policies represent the responses of international governments to the patterns of drinking observed among adolescents.

It is possible that adolescents may be more inclined to 'rebel' against stricter alcohol policies and the social norm and etiquette put in place by older generations (Zimmerman, 2008), thus perpetuating the major risk among adolescents, which is binge drinking. This is supported by evidence from qualitative research across 50 countries, in which university students commonly reported drinking as an act of defiance against parents (Russell-Bennett *et al.*, 2010). Alternatively, or perhaps in conjunction with this, with a limited budget, adolescents may be more inclined to drink more on a single occasion rather than partaking in drinking more frequently in the context of high alcohol prices (Bellis *et al.*, 2009). This is consistent with the differential effect of off-trade and on-trade price increases on alcohol consumption levels among young drinkers in the UK (Meier *et al.*, 2010). Further, in consort with our results is previous evidence of the differential effectiveness of policy measures according to the level of consumption (Paschall *et al.*, 2009; Meier, 2011).

The correlation between drunkenness among adolescents and the drinking pattern among the adult population, as captured by the pattern of drinking score suggests that the drinking pattern adopted by adolescents is influenced, to some extent, by that of the population overall. It is possible that adult consumption patterns mediate the relationship between adolescent patterns and alcohol pricing, with the availability of alcohol in the home, and general access to alcohol is likely to impact upon adolescent behaviours (Ryan *et al.*, 2010). Suggestions have been made, however, that despite some confounding, alcohol policies can act independently of adult consumption to influence adolescent consumption patterns (Paschall *et al.*, 2009). The convergence of youth drinking patterns may be a reflection of a convergence that is also taking place among adults. This notion is supported by the examination of GISAH and ESPAD data by Fuhr and Gmel (2011), who reported a linear relationship between adult and adolescent per capita consumption.

This aggregated data analysis suggests that there may be a global trend towards decreased drinking frequency, but increased prevalence of binge drinking among adolescents. This is consistent with a reported cultural convergence of adolescent drunkenness (Jarvinen and Room, 2007; Kuntsche *et al.*, 2011) and the popularity among young people of 'playful drinking' involving some level of loss of control (Demant and Torronen, 2011). Across 50 countries, young

people consistently report heavy drinking as a social norm among peer groups, and in some cases, as a requirement for group membership (Russell-Bennett *et al.*, 2010). Particularly among young people, this situation is likely to be highly problematic, with binge drinking associated with an array of short- and long-term harmful effects such as negative social consequences, violence, intentional and unintentional injury, risky sexual behaviour and neuropsychiatric conditions (Anderson, 2007).

### Limitations

It should be noted that this analysis represents a simple manipulation of existing aggregate-level data only. We have not explored the statistical power of the analyses performed, and present for some countries incomplete data on policy and drinking pattern variables. Further, it should be noted that the prevalence data used relate to the percentage of individuals drinking at the indicated levels among the entire sample. Thus, the relationship between drinking frequency and drunkenness frequency is highly correlated. Examination of the prevalence of drunkenness among drinkers only may give a better indication of the degree of harmful drinking in each country.

A cut-off of two or more occasions of drunkenness was used to capture the majority of young people who had begun to drink in a manner associated with drunkenness. The measure of drunkenness is itself problematic, with the amount of alcohol required to feel 'really drunk', as well as the perception of the level of intoxication described by this term, likely to vary between individuals as well as between cultural contexts. Nevertheless, while not all relationships are statistically significant, a clear trend has been identified here, which warrants further exploration and consideration in decision-making regarding alcohol policies impacting upon young people.

## CONCLUSIONS

Among all the 40 countries in the present analysis, a non-significant trend was observed, whereby higher prices, higher drinking age and stronger alcohol controls were associated with a lower weekly drinking frequency, but a potentially higher frequency of binge drinking. It is important that future research explores the causal relationships between alcohol policy measures and alcohol consumption patterns to determine whether strict policies do in fact have any beneficial effect on drinking patterns, or lead to rebellion and an increased prevalence of binge drinking. While measures may indicate an overall decrease in adolescent consumption, this may mask an increase or at least a persistent high rate of binge drinking which is likely to be associated with alcohol-related harmful effects. Alcohol control policies that take into consideration the potential harmful effects of binge drinking and adopt specific measures to discourage this type of drinking may have significant public health value.

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