ORIGINAL ARTICLES

Countries, national alcohol limits and risk behaviours: results from the TEN D by Night project

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ABSTRACT

BACKGROUND: this paper re-analysed data from the international cross-sectional TEN-D survey to investigate the association between country or national alcohol limits and risk behaviours.

METHODS: data were collected on subjects aged 16-35 years owning a driving license and attending recreational sites during weekend nights in Belgium/Netherlands, Bulgaria, Italy, Poland and Spain. Each participant was administered a: questionnaire, driving simulation, breath alcohol concentration (BAC) and illegal drugs detection tests. Random-effect regression was used to identify independent predictors of 3 outcomes: high BAC (≥ 0.5 g/L); negative driving behaviours; self-reported illegal drug consumption.

RESULTS: the survey included 4 534 subjects (mean age 23.1 ± 4.2 years; males 68.3%). Alcohol misuse was highest in Poland (65.1%) and Spain (83.7%), which also showed the highest frequency of negative driving behaviours (39.0%) and illegal drugs consumption (55.6%). Multivariate analysis confirmed country as a predictor of all outcomes, whereas no association was found with national alcohol limits.

CONCLUSIONS: the absence of association between national alcohol limits and alcohol misuse or negative driving behaviours suggests that cultural factors might be predominant in explaining the differences across countries. Our findings are preliminary and further research is needed.

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INTRODUCTION

Over 195 000 alcohol-related deaths have been estimated in Europe each year and in similar way illegal drug consumption has been associated with a considerable excess of mortality and of social costs [1]. Accordingly, the European Union included alcohol and drug use reduction among its priorities [2, 3].

This phenomenon hits increasingly younger generations and citizens of developing countries [4, 5], and several studies have evaluated alcohol and drug consumption patterns and frequency among students and young people

in different countries [6-8]. In addition to some major predictors of substance abuse such as male gender, higher socioeconomic status, higher family education and alcohol use by family or peers, these studies suggested that consumption frequency and pattern could be influenced by country-specific factors, such as culture, the availability/access of illegal drugs or alcohol, and community norms penalizing/punishing substance use [9, 10].

The relative contribution of single country-specific factors, however, remains uncertain. Also, published studies were often focused on adolescents or college students [6, 9, 11-14], or compared the pattern of consumption among different continents or countries using data provided by national surveys, which adopted different and non-standardized tools and objectives [10, 15-18]. As an example, Kuntsche et al. [12] made a comparison of cannabis use among 31 countries, but only 15-year old students were included; McBride et al. [10] compared the prevalence of substance use between USA and Australia using data from national surveys that were conducted with different instruments and in diverse years.

We are here reporting the results of a re-analysis of the data from the "Ten D (Dark, Dance, Disco, Dose, Drugs, Drive, Danger, Damage, Disability, Death) by Night" field study, with the aim of investigating the frequency and potential country-specific predictors of selected behaviours at risk (large alcohol or illegal drug consumption, and driving after psychoactive substance use) in a large sample of young individuals from six European countries.

METHODS

Study design and population

The methodology of the study protocol has been described in detail previously [19]. In summary, the TEN-D by Night was a multicenter, international, cross-sectional survey, supported by the European Commission Public Health Executive Agency. In six European countries (Italy, Belgium/Netherlands, Bulgaria, Poland and Spain), data were collected on subjects aged 16-35 years that owned a driving license and attended recreational sites during the weekend nights.

Recreational sites were selected through the official regional lists and on a voluntary basis.

Both at the entry and exit from the recreational sites, young people were requested to:
- compile a structured questionnaire (gathering information on demographic and socio-economic status, consumption of drugs, consumption of alcohol and illegal drugs, driving habits and, the exit only, on alcohol and illegal drug consumption during the stay, intention to drive, and opinion about the intervention);
- participate to a driving simulation [using SimuNomad3 Ecrans (Simucar Driving Simulator website)] to evaluate their reaction time (as a proxy of driving performance, defined as the latency to apply the brake after appearance of a barrier) [20];
- perform a test to assess breath alcohol concentration (using Drager Alcoltest 6510) [21];
- undergo a saliva test on several illegal drug use (cannabis, cocaine, metamphetamine/MDMA, amphetamine, opiates), using Oratect III Oral Fluid Drug Screen Device [22]. This test was made at the exit from the recreational site only;
- provide a signed informed consent.

Both entrance and exit questionnaires were based upon validated questionnaires [23, 24], which were translated into the national language of each participating country. The survey staff was composed by six investigators at each night and was previously trained.

Alcohol policies

The traffic and alcohol and drug related regulations in each participating countries (at the time of the survey) were retrieved from the official and ministerial websites and from official traffic regulations (Belgium, Bulgaria, Italy, Poland, Spain) [25-29]. All investigators were also requested to supervise the results of the initial search.

Data analysis

The results of the analyses on the predictors on reaction time have been published previously [30]. In brief, we re-analysed the same database but varied the outcome of the analysis and excluded one level of cluster. We previously

used a mixed regression model with reaction time as the dependent variable and country and subject identification code as cluster levels [30]. In the present analysis, we used random-effect logistic regression with a single cluster level (subject id, as again both entry and exit data were used) to permit the inclusion of country as dummy variable among the covariates of the model, and we fit three separate models with different dependent variables: (1) large consumption of alcohol (dichotomized in breath alcohol concentration ≥0.5 g/L or lower); (2) self-reported driving after heavy drinking or having had penalties, car crashes, or license revocation when drunk in the last year (yes or no); (3) self-reported illegal drug use at least once in the last year (yes or no). The main aim of the present analysis was indeed to evaluate the potential association between the above three negative behaviours and country or national alcohol limits. No obvious reference category existed for country, so we arbitrarily selected Italy as it was the country with the lowest prevalence of large alcohol consumption. Belgium and The Netherlands were associated in the analyses since the interventions were performed for both countries by the same staff in an area near the border, where the nightlife is often characterized by the exceeding of the national boundaries.

For model building, we used the same approach previously described: in addition to country and national alcohol limit (in the two models predicting alcohol-related variables), all recorded covariates were included into the model a priori, except for those variables related to past use of alcohol or drug and driving history, which were included only if significant at the 0.10 level. With this criterion, all models were adjusted for age, gender, educational level, living arrangement, occupation and driving license years. A few other covariates were included in some models and they have been detailed in table footnotes. Age and educational level were included as continuous variables rather than ordinal ones based upon the Wald test results. Collinearity, interaction and higher power terms were tested for all covariates, and only those achieving significance were retained. Outlier analysis for all models were based upon studentized residuals and DFITS and Cook's D influence measures. Finally, missing data were less than 5% for all covariates and no missing imputation technique was adopted.

A two-tailed p-value of 0.05 was considered significant for all analyses, which were carried out using Stata 10.1 (Stata Corp., College Station, TX, USA, 2007).

RESULTS

The main characteristics of the sample have been reported for each country in Table 1. Overall, 4 534 subjects compiled the first questionnaire, performed the first alcohol test and had their reaction time measured. Their mean age was 23.1 years (SD=4.2), and it was similar in all countries. In contrast, the proportion of males (68.3% overall) differed substantially across countries, being highest in Italy (82.2%) and lowest in Spain (56.1%). Excluding Belgium/Netherlands, most participants attended high school and lived with parents.

Alcohol and drug use patterns and perceptions have been reported in Table 2, along with national alcohol limits for driving. Despite all countries showed a high proportion (>80%) of subjects declaring that alcohol use could be very dangerous, the percentage of young people with elevated breath alcohol concentration (≥0.5 g/L) was very high in some countries (83.7% in Spain; 65.1% in Poland). Spanish subjects, in particular, showed the highest frequency of negative driving behaviours (39.0%), of driving after drinking (30.9%), of illegal drug consumption in the last year (55.6%), finally the highest proportion of individuals perceiving a low or medium danger from cannabis use (50.0%). Interestingly, the prevalence of subjects who drove after drinking or had negative driving behaviours was lowest (6.2% and 9.8%, respectively) in the country with the lowest national alcohol limits (Poland; 0.2 g/L).

The results of the three multivariate regression models are reported in Table 3. Even when main confounding factors were controlled for, Polish and Spanish subjects were significantly more likely to show a high breath alcohol level as compared with Italian subjects (both p<0.001). By contrast, when the analysis was adjusted for country, national alcohol limits were not significantly associated with high breath alcohol concentration.

As compared to Italy, self-reported driving after heavy drinking or having had penalties, car crashes, or license revocation when drunk in the last year was more frequent in Spain and

TABLE 1

CHARACTERISTICS OF THE SAMPLE ACCORDING TO COUNTRY					
	ITALY (N = 874)	BELGIUM / NETHERLANDS (N = 799)	BULGARIA (N = 974)	POLAND (N = 973)	SPAIN (N = 914)
	%	%	%	%	%
Male Gender	82.2	66.8	75.8	61.5	56.1
Age class, years					
- 16-20	10.8	18.4	31.4	11.2	22.4
- 21-24	44.1	53.7	41.5	56.7	53.2
- 25-29	27.5	18.7	19.5	25.2	19.9
- 30-34	17.6	9.2	7.6	6.9	4.4
Educational level					
- None	0.6	19.1	0.0	0.2	1.4
- Middle School	18.9	38.1	2.8	3.4	13.0
- High School	61.2	25.2	74.4	57.1	36.8
- Academic	19.3	17.6	22.8	39.2	48.8
Living arrangement					
- Alone	17.8	16.8	21.0	22.4	6.9
- With parents	69.8	61.2	52.1	46.5	78.3
- With friends/ colleagues	2.6	2.9	10.1	13.2	4.6
- With partner	8.7	18.0	13.3	14.0	7.5
- Other	1.1	1.1	3.5	3.9	2.7
Occupation					
- Student	30.7	35.5	41.6	62.3	50.4
- Employed	63.2	59.5	42.6	33.2	39.3
- Looking for employment	6.1	5.0	15.8	4.5	10.3
Driving license years					
<4	28.5	44.0	65.1	27.4	49.2
4-10	52.1	46.8	30.1	61.6	44.7
>10	19.4	9.2	4.8	11.0	6.1
Driving frequency					
- Never	2.1	4.2	5.4	13.6	8.3
- Less than once a week	4.3	4.0	22.2	11.1	8.0
- Several times a week	15.6	12.9	17.7	21.7	15.6
- Every day	78.0	78.9	54.7	53.7	68.1
Mean age in years (SD)	24.6 (4.3)	23.0 (3.8)	22.5 (4.0)	23.4 (3.5)	22.0 (3.6)

TABLE 2

ALCOHOL AND ILLEGAL DRUG USE PATTERN AND PERCEPTIONS, AND NATIONAL ALCOHOL LIMITS FOR DRIVING, ACCORDING TO COUNTRY					
	ITALY (N = 874)	**BELGIUM / NETHERLANDS (N = 799)**	**BULGARIA (N = 974)**	**POLAND (N = 973)**	**SPAIN (N = 914)**
	%	%	%	%	%
National alcohol limit, mg/dL	0.5 / 0.2 [a]	0.5	0.5	0.2	0.5 / 0.3 [a]
Breath alcohol concentration ≥0.5 g/L	36.5	41.3	39.0	65.1	83.7
Negative driving behaviors [b]	28.7	32.8	21.8	9.8	39.0
Alcohol consumption last month: - Never - Once a month - Once a week - 3-4 Times a week - Every day	5.8 17.1 44.1 23.8 9.4	12.1 23.8 34.5 19.4 10.2	11.0 20.5 31.5 25.1 11.9	5.9 24.4 36.8 26.4 6.5	7.3 25.4 47.8 14.9 4.6
Driving after drinking in the last month	24.6	29.3	18.6	6.2	30.9
Perceived danger of alcohol use - Low - Medium - High - Very High	2.0 12.7 35.7 49.6	2.5 13.4 29.8 54.3	1.7 3.9 17.3 77.1	3.0 6.5 16.7 73.8	6.1 10.9 25.7 57.3
Self-reported illegal drug use, last year	25.9	33.5	21.8	36.2	55.6
Illegal drug saliva test positive	2.4	10.6	2.4	5.5	5.8
Perceived danger of cannabis use - Low - Medium - High - Very High	8.7 21.5 26.8 43.0	6.8 16.1 24.4 52.7	5.5 5.8 14.5 74.2	10.5 17.9 21.2 50.4	21.0 29.0 22.8 27.2
Perceived danger of cocaine use - Low - Medium - High - Very High	4.0 5.9 12.4 77.7	3.5 5.5 11.9 79.1	2.8 2.6 6.0 88.6	5.8 6.3 14.1 73.8	6.8 11.2 17.4 64.6

[a] For those who granted the driving license within three years. [b] Self-reported driving after heavy drinking or having had penalties, car crashes, or license revocation when drunk in the last year (yes or no)

Belgium/Netherlands (both p<0.01), whereas it was less frequent in Poland (adjusted odds ratio=0.23; p<0.001). Again, national alcohol limits did not show a significant relationship with negative driving behaviours when country was included in the multivariate model.

Finally, confirming univariate analysis, at multivariate analysis the subjects living in Belgium/Netherlands, Poland and especially Spain showed a significantly higher likelihood of self-reported drug use in the last year, as compared to Italian people (all adjusted p<0.01).

TABLE 3

ASSOCIATION BETWEEN RISK BEHAVIORS AND COUNTRY: RANDOM-EFFECT LOGISTIC REGRESSION						
	CRUDE OR	(95% CI)	P	ADJUSTED OR	(95% CI)	P
BREATH ALCOHOL CONCENTRATION ≥0.5 g/L [a]						
COUNTRY						
ITALY	1	--	--	1	--	--
BELGIUM/NETHERLANDS	1.22	(0.95 - 1.57)	0.12	1.43	(1.05 -1.94)	0.021
BULGARIA	1.11	(0.88 - 1.41)	0.4	1.21	(0.65 - 2.24)	0.5
POLAND	3.25	(2.59 - 4.06)	<0.001	4.36	(3.24 - 5.87)	<0.001
SPAIN	8.95	(6.63 - 12.1)	<0.001	13.0	(8.48 - 19.8)	<0.001
NATIONAL ALCOHOL LIMIT FOR DRIVERS						
0.5 g/L	1	--	--	1	--	--
0.3 g/L	2.16	(1.57 - 2.96)	<0.001	1.15	(0.73 - 1.80)	0.5
0.2 g/L	1.00	(0.84 - 1.18)	0.9	0.92	(0.52 - 1.64)	0.8
NEGATIVE DRIVING BEHAVIORS [b]						
COUNTRY						
ITALY	1	--	--	1	--	--
BELGIUM/NETHERLANDS	1.21	(0.95 - 1.53)	0.12	1.50	(1.12 - 2.03)	0.007
BULGARIA	0.69	(0.53 - 0.89)	0.004	0.96	(0.60 - 1.53)	0.9
POLAND	0.27	(0.21 - 0.35)	<0.001	0.23	(0.16 - 0.33)	<0.001
SPAIN	1.59	(1.30 - 1.94)	<0.001	2.22	(1.65 -2.98)	<0.001
NATIONAL ALCOHOL LIMIT FOR DRIVERS						
0.5 g/L	1	--	--	1	--	--
0.3 g/L	0.32	(0.21 - 0.49)	<0.001	1.61	(0.95 - 2.72)	0.078
0.2 g/L	0.92	(0.79 - 1.09)	0.4	0.94	(0.64 - 1.40)	0.8
SELF-REPORTED DRUG USE (LAST YEAR) [c]						
COUNTRY						
ITALY	1	--	--	1	--	--
BELGIUM/NETHERLANDS	1.44	(1.14 - 1.83)	0.003	1.65	(1.28 - 2.13)	<0.001
BULGARIA	0.80	(0.62 - 1.03)	0.082	1.08	(0.74 - 1.59)	0.7
POLAND	1.62	(1.32 - 2.00)	<0.001	2.07	(1.62 - 2.63)	<0.001
SPAIN	3.59	(2.93 - 4.39)	<0.001	4.65	(3.61 - 5.99)	<0.001
NATIONAL ALCOHOL LIMIT FOR DRIVERS						
0.5 g/L	1	--	--	1	--	--
0.3 g/L	1.00	(0.76-1.33)	0.9	0.90	(0.64-1.28)	0.6
0.2 g/L	0.99	(0.85-1.16)	0.9	0.84	(0.62-1.12)	0.2

[a] Adjusted for age, gender, living arrangement, education, employment, driving license years, perceived danger of alcohol use, alcohol consumption in the last month.
[b] Self-reported driving after heavy drinking or having had penalties, car crashes, or license revocation when drunk in the last year (yes or no). Adjusted for age, gender, living arrangement, education, employment, driving license years, driving frequency, alcohol consumption in the last month, illegal drug use in the last year.
[c] Adjusted for age, gender, living arrangement, education, employment, driving license years, perceived danger of alcohol.

DISCUSSION

In this large sample of young adults from six European countries, we observed large differences across countries in the frequency of heavy alcohol consumption and negative driving behaviours. When we tried to estimate, for the first time to our knowledge, whether such differences might be related, at least in part, to the national alcohol limits, we found no evidence of an independent association with alcohol use patterns, suggesting that cultural factors might be predominant in explaining the observed differences across countries.

Indeed, this finding supports previous analyses documenting an association between country-specific socio-cultural factors (including ethnic group, social roles and relationships) and psychoactive substances misuse [7, 8, 14, 31]. Also, our results add to existing knowledge [32-34] suggesting that the historical distinction between "wet" and "dry" culture Countries [34] is no longer convincing, as the highest prevalence of alcohol misuse was observed into a Mediterranean country (Spain). Further analyses are needed to reveal whether Spain should be considered just an exception or more Mediterranean countries may are showing consumption habits that are approaching (or even overcoming) those of the Nordic Countries. Notably, although the frequency of alcohol misuse was lowest in Italy, it was comparable to that of people from Belgium/Netherlands.

Illegal drug use frequency also varied largely across countries, with people from Belgium/Netherlands, Poland and Spain being significantly more likely to report drug consumption at least once in the last year, as compared to Italian people (but also Bulgarian, data not shown). It is well known that the national legislation of the Netherlands may clearly favour the use of cannabis, as it has been previously documented [12], whereas the result of Polish and especially Spanish people definitely deserve further investigation of the potential reasons. It is possible that part of the above finding could be explained by the fact that Spain and Poland have a prominent role within Europe as producers of synthetic drugs and "transit-country" for recreational and smuggling drugs from North Africa and Eastern Europe [35]. However, this hypothesis is merely speculative and requires confirmation from further analyses.

Our study has some strengths compared to other surveys on the same topic. Most studies examining alcohol consumption among young people in the nightlife context used only self-reported measures [36, 37]. The few times when the an objective measure of alcohol level was taken, samples were small or come from very specific settings [36-40]. In contrast, our survey combined self-reported alcohol and drug use with the objective testing, reducing the potential for bias.

This study has also some limitations that must be discussed. First, given the cross-sectional design, we were able to document only associations between variables, not the presence of a causal relationship. Second, because the sampling procedure was voluntarily, the results could not be generalized to the whole population of young adults. However, this was the only possible way to collect data from a real life setting. In any case, such a bias may influence the results on alcohol and drug use prevalence and their association with country, therefore our results might only be considered preliminary and should be interpreted with caution, as they require confirmation from studies with a specifically designed multistage sampling technique.

CONCLUSIONS

In conclusion, this large multi-centric field study confirms that large differences exist among European countries in the frequency and pattern of alcohol and illegal drug use. No evidence was found of an influence of the various national limits for driving after drinking on the frequency of alcohol misuse and negative driving behaviours, suggesting that cultural factors may be predominant in explaining the observed differences across countries. Taking into account the limitations of the study, and given that in some countries the alcohol limits have been introduced only recently, our findings must be interpreted with caution and more research is strongly needed on this topic in the next future, in order to assist policy-makers in legislating to prevent alcohol and drug related road accidents.

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