



# Prevalence of youth gambling and potential influence of substance use and other risk factors throughout 33 European countries: first results from the 2015 ESPAD study

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## ABSTRACT

**Background and aims** Although generally prohibited by national regulations, underage gambling has become popular in Europe, with relevant cross-country prevalence variability. This study aimed to estimate the prevalence of underage gambling in Europe stratified by type of game and on-/off-line mode and to examine the association with individual and family characteristics and substance use. **Design** Our study used data from the 2015 European School Survey Project on Alcohol and Other Drugs (ESPAD) cross-sectional study, a survey using self-administered anonymous questionnaires. **Setting** Thirty-three European countries. **Participants** Sixteen-year-old-year-old students ( $n = 93\,875$ ;  $F = 50.8\%$ ). **Measurements** The primary outcome measure was prevalence of past-year gambling activity. Key predictors comprised individual behaviours, substance use and parenting (regulation, monitoring and caring). **Findings** A total of 22.6% of 16-year-old students in Europe gambled in the past year: 16.2% on-line, 18.5% off-line. High prevalence variability was observed throughout countries both for mode and types of game. With the exception of cannabis, substance use shows a higher association with gambling, particularly binge drinking [odds ratio (OR) = 1.46, 95% confidence interval (CI) = 1.39–1.53], life-time use of inhalants (OR = 1.57, 95% CI = 1.47–1.68) and other substances (OR = 1.78, 95% CI = 1.65–1.92)]. Among life habits, the following showed a positive association: truancy at school (OR = 1.26, 95% CI = 1.18–1.35), going out at night (OR = 1.32, 95% CI = 1.26–1.38), participating in sports (OR = 1.30, 95% CI = 1.24–1.37). A negative association was found with reading books for leisure (OR = 0.82%, 95% CI = 0.79–0.86), parents' monitoring of Saturday night activities (OR = 0.81, 95% CI = 0.77–0.86) and restrictions on money provided by parents as a gift (OR = 0.89, 95% CI = 0.84–0.94). **Conclusions** Underage gambling in Europe appears to be associated positively with alcohol, tobacco and other substance use (but not cannabis), as well as with other individual behaviours such as truancy, going out at night and active participation in sports, and is associated negatively with reading for pleasure, parental monitoring of evening activities and parental restriction of money.

**Keywords** Adolescents' youth gambling, ESPAD school survey, European countries, off-line and on-line gambling, risk behaviours, substance use.

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## INTRODUCTION

Gambling is becoming widely available to adolescents due to increasing opportunities to gamble and access to on-line gambling [1–4]. Recent studies [5] indicate that although generally prohibited by law, underage gambling has become a popular form of recreation, with a prevalence rate higher than adult gambling [6,7]. This is particularly worrying, because early exposure to gambling is associated with the subsequent development of gambling problems [8,9]. Large variations reported in adolescent gambling prevalence throughout European countries [3] might be due to different sample sizes, assessment instruments, cut-offs and time-frames adopted by the studies. According to a public health perspective of youth gambling problems [10], gambling harms need to be conceptualized as a community/social issue, addressing the individual, environmental and socio-economic determinants of gambling. Male gender, low socio-economic status and parental education, poor family cohesion and parenting, difficult peer relationships and other individual factors (e.g. unstructured leisure) have been implicated as important associates to youth gambling [5,8,11,12]. Other studies have also shown strong correlations between youth gambling and other risk behaviours (e.g. smoking, alcohol and drugs use) [13–15]. Furthermore, recent research suggests that participation in on-line gambling is associated significantly with higher rates of gambling participation among adolescents [16–18].

However, to our knowledge, no study has examined all these potential relationships from a cross-country perspective. The present study aims to fill this gap using the same methodology throughout a large number of European countries to achieve five key objectives: (i) to estimate the prevalence of underage gambling across Europe, (ii) to distinguish it by prevalence of off-line and on-line mode, (iii) to analyse the prevalence of gambling by type of game, stratified by mode, (iv) to estimate the role of individual, family characteristics, substance use and other risk behaviours and (v) to estimate potential cross-national differences.

We used data from a large sample of 16-year-old students from 33 European countries provided by the European Survey Project on Alcohol and Other Drugs (ESPAD). Some results from ESPAD 2015 have already been published on-line [19] using a different methodology, and should therefore be regarded as non-comparable with those presented here.

## METHODS

### Design

Data for the present study were drawn from the ESPAD cross-sectional survey that, since 1995, has collected comparable data among 16-year-old students to monitor

behavioural trends within and between countries. The sample ( $n = 93\ 857$ ;  $F = 50.8\%$ ) comes from 33 of the 35 countries that participated in the 2015 data collection (data for Belgium were not available and Monaco was excluded due to restrictions on the authorization on the use of data). The study methodology used national samples of randomly selected schools/classes in which the cohort of students born in 1999 completed the standardized ESPAD questionnaire. The questionnaire covers demographics, family environment, use of substances and participation in a number of behaviours, such as internet use, gaming and gambling.

Sampling and data collection methodology have been reported elsewhere [19]. The proportion of schools responding within countries ranged from 21 to 100%, with an average of 84%. The percentage of students who responded in participating schools ranged from 73 to 99%, with an average of 93%. Individual country data and sampling design within each country are reported in Supporting information, Table S1.

### Measures

A detailed list of the variables is presented in Supporting information, Table S2.

### Dependent variable

Gambling activity was assessed by asking participants how often in the last 12 months they had engaged in four different gambling activities, both off-line and on-line: playing on slot machines, playing cards or dice for money, playing lottery, betting on sports or animal races. For each type, response options were: 'I have not played these games;  $\leq$  monthly; 2–4 times/month; 2–3 times/week; 4–5 times/week;  $\geq$  6 times/week'. As response options provide a frequency interval and not punctual values, an overall index gambling activity was created dichotomizing response options (yes/no). Any response other than 'I have not played' was coded as 'yes' for each of the eight questions (Table 2). Then, any 'yes' for each of the four on-line and off-line types was coded as 'yes' for on-line/off-line (Table 1). Lastly, overall prevalence was defined as any 'yes' for either on-line or off-line (Tables 3 and 4).

The choice of these variables, instead of the direct question, 'How often (if ever) did you gamble money in the last 12 months?', used to compute the gambling prevalence in the ESPAD Report 2015 [19], is the origin of the different results reported.

### Independent variables

Family environment characteristics were assessed by measures related to the parental monitoring of evening and Saturday night activities, the feeling of being emotionally supported by parents and friends, parental rule-setting at

**Table 1** Prevalence of gambling with money stratified by country and gender, 2015.

Country	n	Gambling on-line			Gambling off-line			Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Republic of Moldova	2586	9.0	1.8	5.5	7.1	1.8	4.5	10.5	2.2	6.4
Malta	3326	11.2	4.9	8.0	13.5	6.8	10.1	16.3	8.2	12.2
Austria	3684	10.4	3.4	7.0	14.6	7.7	11.2	17.3	8.6	13.1
Netherlands	1684	10.9	3.7	7.2	14.9	6.7	10.8	18.4	8.2	13.2
Ukraine	2350	18.2	8.3	13.0	15.4	7.5	11.2	20.9	10.7	15.5
Sweden	2551	14.7	6.3	10.5	14.2	10.4	12.3	20.3	13.5	16.9
Norway	2584	13.2	5.9	9.8	14.3	12.6	13.5	19.5	14.0	16.9
Liechtenstein	316	19.6	4.1	11.1	21.0	9.9	14.9	25.2	11.0	17.5
Lithuania	2573	21.7	7.5	14.6	18.1	8.7	13.4	25.7	10.4	18.1
Czech Republic	2738	19.7	8.6	14.1	15.6	9.1	12.3	23.5	13.0	18.2
Iceland	2663	16.0	7.4	11.6	18.6	12.5	15.5	22.6	14.7	18.6
France	2714	17.4	5.2	11.3	25.9	10.4	18.2	28.1	11.4	19.8
Slovenia	3484	25.4	6.4	15.5	21.5	6.8	13.9	30.9	9.7	19.9
Slovak Republic	2208	27.4	6.8	17.1	23.0	6.6	14.8	30.4	9.6	20.0
Faroe Islands	511	25.4	4.8	15.2	24.5	9.1	16.8	32.4	9.5	21.1
Ireland	1470	20.7	7.1	14.0	24.9	9.5	17.3	30.0	11.9	21.1
Poland	11 822	21.5	10.1	15.6	20.5	13.6	16.9	27.4	15.7	21.3
Denmark	1670	25.5	6.8	15.7	21.1	9.9	15.3	32.1	11.8	21.5
Estonia	2452	22.0	8.2	15.1	18.4	13.9	16.1	27.5	16.2	21.9
Georgia	1966	27.4	7.7	18.2	20.7	6.9	14.3	31.4	11.4	22.0
Portugal	3456	15.1	6.4	10.3	21.8	18.6	20.0	25.4	19.5	22.2
Albania	2553	29.4	10.2	19.3	24.9	8.7	16.4	33.1	12.5	22.3
Hungary	2735	29.5	7.8	18.7	30.2	10.1	20.2	36.3	11.9	24.2
Latvia	1119	29.3	14.6	22.0	23.1	14.0	18.5	34.1	18.8	26.5
Romania	3500	35.6	12.3	23.7	31.2	10.6	20.6	38.9	14.6	26.5
Croatia	2558	35.3	7.3	21.9	36.4	7.4	22.5	41.6	10.0	26.5
Italy	4059	29.2	9.6	19.6	34.6	13.3	24.2	39.2	16.1	28.0
Finland	4049	23.6	6.3	14.7	37.1	15.3	25.8	41.5	16.4	28.6
FYR of Macedonia	2428	36.9	12.7	24.4	36.3	12.5	24.0	43.9	17.3	30.2
Cyprus	2098	34.2	11.0	22.1	39.6	15.5	27.0	44.7	18.3	30.9
Bulgaria	2922	35.8	14.1	24.9	35.6	18.2	26.8	41.9	20.6	31.2
Montenegro	3844	41.8	10.7	26.5	42.7	11.2	27.1	48.9	14.0	31.8
Greece	3202	39.3	18.0	28.6	58.6	27.5	42.9	61.6	31.4	46.3
Total	93 875	24.3	8.3	16.2	25.7	11.4	18.5	31.6	13.8	22.6

home and outside, easiness to obtain money from parents, parents' educational level and family structure/income.

Individual behavioural characteristics were assessed by measures related to self-reported truancy at school and engagement in leisure time activities (going around with friends just for fun; going out in the evening; participating actively in sports; reading books for enjoyment; hobbies such as playing an instrument, singing, drawing, writing).

Substance use was measured by investigating daily cigarette smoking, alcohol use and heavy episodic drinking (HED) in the past month; cannabis use in the past year; life-time use of inhalants, prescription drugs (tranquillizers or sedatives) used non-medically and other substances: amphetamines, methamphetamines, cocaine, crack, lysergic acid diethylamide (LSD), ecstasy, heroin, magic mushrooms and  $\gamma$ -hydroxybutyric acid (GHB).

The variables were coded dichotomously or in classes (Supporting information, Table S2).

#### *Gambling prevalence groups*

Based on the prevalence of last-year gambling (Table 1), participating countries were divided into tertiles (Supporting information, Fig. S1) in order to achieve three homogeneous groups: low, medium and high gambling-prevalence countries (GPC). This method was chosen to allow the predictor-gambling relationship to be estimated according to country prevalence—low GPC (12.2–19.8%) groups: Malta, Austria, Netherlands, Ukraine, Norway, Sweden, Liechtenstein, Czech Republic, Lithuania and Iceland; medium GPC groups (19.9–23.9%): Slovenia, Slovak Republic, France, Faroe Islands, Ireland, Poland, Denmark, Estonia, Georgia, Portugal and

Albania and high GPC groups (24.0–31.8%): Hungary, Romania, Croatia, Italy, Latvia, Finland, FYR of Macedonia, Cyprus, Bulgaria and Montenegro. Due to very low (6.4%) and very high (46.5%) prevalence observed, respectively, the Republic of Moldova and Greece were analysed as outliers.

### Statistical analysis

Gambling prevalence and prevalence of different types of gambling were summarized within country by using percentages; 95% confidence intervals (CIs) were given for prevalence estimates (Supporting information, Tables S3 and S4). Univariate analysis, adjusted for gender, was performed using multi-level mixed-effects logistic regression to assess relationships between gambling and each of the adolescents' characteristics across countries.

Multivariate multi-level mixed-effects logistic regression was performed including all variables to determine the independent association of the potential predictors' characteristics with youth gambling. The backward stepwise selection method was used to keep only the significant variables in the final model. In the GPC analysis, each model was fitted separately within the GPC group. All models were performed on the overall sample, modelling different countries as random effects. The relation between predictor and gambling (slope) was assumed to be the same throughout countries. The multi-level model allows the inclusion of both levels (student and country) in the same analysis, avoiding bias due to correlation between students within the same country. The collected data have a hierarchical structure where students' characteristics (level 1) are nested in the country (level 2), with the likelihood that students' gambling activity is correlated with belonging to the country where they gambled. Although a three-level model was appropriate, estimates were essentially the same with a two-level model, and this was used for simplicity. Results are reported as adjusted odds ratio (aOR) with a 95% confidence interval.

All statistical tests were two-sided, and a  $P$ -value  $\leq 0.05$  was considered to be statistically significant.

All statistical analyses were carried out with Stata version 13 (Stata Corporation, College Station, TX, USA).

## RESULTS

Throughout the analysed sample, 22.6% of respondents reported gambling activity during the past year. The prevalence observed among males (31.6%) was more than double the prevalence reported by females (13.8%). With regard to the mode, 16.2% of students gambled on-line (24.3% males; 8.3% females) and 18.5% off-line (25.7% males; 11.4% females) (Table 1).

Table 2 shows the prevalence of playing games: slot machines are the least popular, attracting 3.9% of the students on-line and 4.2% off-line, followed by card or dice games, with 7.3% for both modalities. The most popular on-line game was betting on sports or animal races (9.3 versus 9.0% off-line), whereas the most popular for the off-line mode were lotteries (9.9 versus 7.6% on-line). Differences between countries were extremely large for all types of games: slot machine gambling, both on-line and off-line, was reported least by students in Norway and reported most in Finland, playing cards was lowest in Iceland and highest in Latvia and Bulgaria (on-line and off-line, respectively), lotteries were the least popular in Moldova and reported mainly in Greece, and betting on sports or animals was lowest in Moldova and highest in Montenegro.

The highest prevalence of betting and slot machines was detected in high GPC, while gambling prevalence by playing cards or dice was higher in low GPC, and lotteries were widespread in approximately the same measure across the three groups (Supporting information, Fig. S1).

The comparison between last-year gamblers and non-gamblers according to the distribution of the social environment characteristics on both individual and family levels, as well as the main risk behaviours adopted by adolescents (Table 3), showed that gamblers were more often males (69.2 versus 43.8% non-gamblers), while non-gamblers reported higher parental monitoring on Saturday night (91.1 versus 82.7% gamblers) and lower absence from school (5.5% missed 3 or more days of school versus 11.4% gamblers). Gamblers reported higher family economic status and reported more often, other than traditional and step-families.

Students reporting gambling activities showed a higher prevalence of tobacco and psychoactive substance use: 19.8% of gamblers smoked tobacco daily, 61.1% drank alcohol in the last month and 49.4% reported episodes of HED; 19.3% smoked cannabis in the last year and 11.2% reported having tried other psychoactive substances during their life-time. Moreover, a higher proportion of students who gambled in the last year reported regularly going out at night to discos, etc. (51.3 versus 33.9% non-gamblers). Interestingly, a higher percentage of gamblers engage in sports activities (85.0 versus 79.3% non-gamblers), while a lower percentage reported reading books for enjoyment (18.1 versus 27.8% non-gamblers) and having other hobbies (40.1 versus 48.4% non-gamblers).

### Univariate analysis

Results from the univariate analysis showed that gambling activity was associated significantly with almost all the explored characteristics; however, some results were significant due to the very high sample size. Approximately

**Table 2** Prevalence of gambling with money by game played stratified by country, 2015.

	<i>Gambling on-line</i>				<i>Gambling off-line</i>			
	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
Albania	5.9	9.1	8.4	12.6	4.2	7.0	7.5	11.4
Austria	1.3	3.5	3.0	3.1	1.4	7.8	4.2	3.2
Bulgaria	8.3	13.8	16.2	14.3	7.3	14.5	18.0	13.7
Croatia	5.5	8.7	8.7	17.3	5.1	7.4	8.9	18.5
Cyprus	4.5	10.1	16.6	11.3	4.6	9.4	20.7	13.9
Czech Republic	2.1	7.0	6.4	6.4	2.1	4.2	7.4	4.3
Denmark	1.5	4.1	7.2	8.5	2.1	3.6	7.7	7.2
Estonia	2.5	7.8	6.9	5.1	2.6	7.7	9.9	3.1
Faroe Islands	3.2	4.9	4.7	9.8	3.0	6.5	8.2	7.9
Finland	9.1	3.9	5.5	6.8	19.2	7.2	11.0	6.1
France	1.2	2.9	4.9	8.1	1.9	3.2	9.1	12.7
Georgia	5.6	12.1	4.1	11.4	3.1	10.2	3.6	6.9
Greece	2.6	10.7	21.8	10.3	2.4	9.6	35.9	15.1
Hungary	2.1	5.7	9.6	12.1	1.5	4.7	11.3	12.4
Iceland	2.8	2.6	7.4	4.8	3.3	2.6	11.7	4.5
Ireland	3.2	4.6	4.4	11.6	3.9	5.6	5.6	14.0
Italy	3.6	9.0	8.7	14.3	3.7	11.5	11.3	15.4
Latvia	7.4	17.3	10.0	8.2	6.3	14.0	8.5	5.4
Liechtenstein	1.6	4.9	4.2	6.8	3.6	6.5	4.6	6.5
Lithuania	3.4	9.8	6.2	5.7	3.2	8.3	7.0	4.0
Malta	1.9	3.4	3.7	3.7	1.9	4.5	5.0	4.0
Republic of Moldova	1.4	3.6	1.3	2.6	1.3	3.0	0.8	2.4
Montenegro	8.7	11.1	11.8	21.4	8.8	8.9	12.0	22.8
Netherlands	2.3	3.3	3.0	4.2	2.8	4.5	4.9	4.0
Norway	1.0	4.2	5.0	3.9	0.9	6.4	9.5	2.4
Poland	3.8	6.9	7.1	7.8	4.4	8.6	8.4	5.7
Portugal	1.3	4.6	6.8	3.4	1.7	5.9	17.8	2.5
Romania	8.5	12.9	7.6	15.7	7.3	11.2	7.1	13.4
Slovak Republic	3.9	7.8	4.4	12.0	3.5	6.5	3.7	9.9
Slovenia	2.6	6.0	6.4	9.7	2.1	3.6	6.3	8.5
Sweden	2.6	4.9	4.6	5.8	3.7	5.1	7.1	4.3
Ukraine	1.8	7.3	4.3	5.4	1.3	6.5	3.2	4.3
FYR of Macedonia	6.3	12.8	10.9	15.9	4.7	10.8	10.3	16.2
Total	3.9	7.3	7.6	9.3	4.2	7.3	9.9	9.0

(a) Slot machines (fruit machine, new slot, etc.); (b) play cards or dice (poker, bridge, dice, etc.); (c) lotteries (scratch, bingo, keno, etc.); (d) betting on sports or animal races (horses, dogs, etc.).

70% of the variables showing a significant association with gambling also retained a significant relationship in the multivariate model (Supporting information, Fig. S2) and are described below. Among those that showed a significant association in only the univariate analysis, we found principally family environment characteristics: low perception of parental warmth and caring; lack of parental definition of rules for outside activities; and lack of monitoring of evening activities (where/with whom did they go?). The family structure also seems to be associated with youth gambling in only the first step analysis: stepfamily and other types. Interestingly, although the OR for cannabis use in the last year was approximately twice as high among gamblers, it did not prove significant in subsequent multivariate analyses.

### Multivariate analysis

As shown in Table 3 and Supporting information, Fig. S2, male gender increased the odds of gambling involvement by almost three times. Substance use characteristics associated with gambling activity were: being a daily smoker; having experienced episodes of binge drinking; having consumed alcohol in the last month; and having tried inhalants, tranquillizers or sedatives or other substances during their life-time. Among life habits, the following were associated positively with being a gambler: truancy at school, going around with friends for fun, participating in sports activities and going out at night. Reading books for enjoyment and having other hobbies were confirmed to be associated negatively.

**Table 3** Association between student characteristics and any gambling with money; adjusted odds ratios (aOR), univariate and multivariate analysis.

	Gambling last year (%)		Univariate		Multivariate	
	No	Yes	aOR (95% CI) <sup>a</sup>	P	aOR (95% CI)	P
Gender (male)	43.8	69.2			2.81 (2.70–2.92)	< 0.001
Binge drinking (HED) in the last month	31.0	49.4	2.27 (2.20–2.35)	< 0.001	1.46 (1.39–1.53)	< 0.001
Alcohol use in the last month	43.0	61.1	2.12 (2.05–2.19)	< 0.001	1.34 (1.28–1.41)	< 0.001
Life-time use of other substances	4.0	12.1	3.32 (3.13–3.52)	< 0.001	1.78 (1.65–1.92)	< 0.001
Life-time tranquilizers or sedatives use	5.4	9.7	2.24 (2.11–2.37)	< 0.001	1.35 (1.25–1.45)	< 0.001
Life-time inhalants use	6.1	12.4	2.41 (2.29–2.55)	< 0.001	1.57 (1.47–1.68)	< 0.001
Tobacco use every day in the last month	10.6	19.8	2.01 (1.92–2.10)	< 0.001	1.09 (1.03–1.16)	0.003
Cannabis use in the last year	10.6	19.3	2.08 (1.99–2.18)	< 0.001		
Use the internet for leisure activities	94.2	94.8	1.18 (1.10–1.27)	< 0.001	1.12 (1.02–1.22)	0.015
Go around with friends just for fun	58.4	68.3	1.48 (1.43–1.54)	< 0.001	1.15 (1.10–1.20)	< 0.001
Other hobbies (play an instrument, sing, draw, write)	48.4	40.1	0.84 (0.82–0.87)	< 0.001	0.86 (0.82–0.89)	< 0.001
Go out in the evening (to a disco, cafe, party, etc.)	33.9	51.3	1.86 (1.80–1.92)	< 0.001	1.32 (1.26–1.38)	< 0.001
Read books for enjoyment (do not count schoolbooks)	27.8	18.1	0.73 (0.70–0.76)	< 0.001	0.82 (0.79–0.86)	< 0.001
Actively participate in sports, athletics or exercising	79.3	85.0	1.23 (1.18–1.29)	< 0.001	1.30 (1.24–1.37)	< 0.001
3 or more days of school lessons missed	5.5	11.4	2.00 (1.89–2.12)	< 0.001	1.26 (1.18–1.35)	< 0.001
Economic status						
High	39.3	45.5	Reference		Reference	
Medium	50.7	44.6	0.81 (0.79–0.84)	< 0.001	0.88 (0.84–0.91)	< 0.001
Low	10.0	9.9	0.94 (0.88–0.99)	0.032		
Parents' monitoring of Saturday night activities	91.1	82.7	0.52 (0.50–0.55)	< 0.001	0.81 (0.77–0.86)	< 0.001
No parental monitoring of evening activities (with whom)	8.6	13.1	1.45 (1.38–1.52)	< 0.001	1.09 (1.02–1.16)	0.012
No parental monitoring of evening activities (where)	6.8	11.7	1.56 (1.48–1.65)	< 0.001		
Parents do not define rules at home	36.1	36.7	1.07 (1.04–1.11)	< 0.001	1.06 (1.02–1.10)	0.007
Parents do not define rules outside	37.8	38.8	1.06 (1.03–1.10)	< 0.001		
Scholars cannot easily obtain money as a gift from parents	19.4	16.9	0.85 (0.82–0.89)	< 0.001	0.89 (0.84–0.94)	< 0.001
Scholars cannot easily borrow money from parents	13.0	12.2	0.93 (0.88–0.97)	0.002	0.86 (0.80–0.92)	< 0.001
Scholars do not feel emotional support from parents	8.2	10.0	1.32 (1.25–1.40)	< 0.001	1.12 (1.05–1.21)	0.002
Scholars do not feel emotional support from best friend	10.3	11.4	0.99 (0.94–1.04)	0.740		
Scholars do not feel of warmth and caring from parents	6.2	8.1	1.36 (1.28–1.44)	< 0.001		
Scholars do not feel warmth and caring from best friend	10.2	11.7	1.01 (0.96–1.07)	0.634		
Father schooling high	41.0	40.7	1.09 (1.04–1.14)	< 0.001		
Mother schooling high	46.5	47.8	0.95 (0.91–0.99)	0.028		
Family structure						
Traditional family	73.8	73.9	Reference			
Single parents	15.0	13.8	1.03 (0.99–1.08)	0.153		
Stepfamily	7.2	6.7	1.12 (1.05–1.20)	< 0.001		
Other	4.1	5.5	1.46 (1.35–1.57)	< 0.001		

HED = heavy episodic drinking, i.e. drinking five or more alcoholic drinks on one occasion. Other substances: amphetamines, methamphetamines, cocaine, crack, lysergic acid diethylamide (LSD), ecstasy, heroin, magic mushrooms,  $\gamma$ -hydroxybutyric acid (GHB). Random-effects estimated variance [95% confidence interval (CI)] for the multivariate model: 0.20 (0.12–0.33). <sup>a</sup>OR adjusted for gender.

Furthermore, the multivariate analysis confirmed the association of some of the indicators describing the relationship with parents: lack of parental monitoring; lack of emotional support; and the ability to borrow money easily or receiving it as a gift from parents.

Table 4 shows the results of the multivariate analyses for the respective GP countries/country groups. Interestingly, using the internet for leisure and having smoked tobacco every day during the last month were significant only for the high GPC group. The low perception of

Table 4 Association between student characteristics and gambling with money stratified by country groups, adjusted odds ratios (aOR), multivariate analysis.

	aOR (95% CI)			
	Moldova	Low-PGC	Medium-PGC	High-PGC
Gender (male)	4.57 (2.93–7.12)	2.00 (1.84–2.18)	2.55 (2.38–2.73)	3.50 (3.28–3.75)
Binge drinking (HED) in the last month		1.37 (1.23–1.52)	1.55 (1.43–1.67)	1.52 (1.41–1.64)
Alcohol use in the last month		1.17 (1.05–1.30)	1.20 (1.11–1.30)	1.54 (1.43–1.66)
Other life-time substance use	4.27 (2.34–7.81)	1.90 (1.62–2.24)	1.80 (1.61–2.01)	1.81 (1.59–2.06)
Life-time use of tranquilizers sedatives		1.33 (1.14–1.55)	1.32 (1.19–1.47)	1.38 (1.21–1.58)
Life-time inhalants use		1.54 (1.33–1.78)	1.67 (1.51–1.84)	1.55 (1.37–1.75)
Tobacco use every day in the last month				1.14 (1.04–1.24)
Use the internet for leisure activities			1.16 (1.06–1.27)	1.29 (1.10–1.51)
Go around with friends just for fun			0.82 (0.77–0.88)	1.13 (1.05–1.21)
Other hobbies (play an instrument, sing, draw, write)		0.87 (0.80–0.94)	0.82 (0.77–0.88)	0.84 (0.79–0.90)
Go out in the evening (to a disco, cafe, party, etc.)	2.06 (1.45–2.91)	2.00 (1.41–2.83)	1.27 (1.16–1.40)	1.18 (1.09–1.27)
Read books for enjoyment (do not count schoolbooks)		0.84 (0.76–0.93)	0.87 (0.80–0.94)	0.79 (0.73–0.86)
Actively participate in sports, athletics or exercising		1.17 (1.05–1.32)	1.28 (1.17–1.41)	1.37 (1.26–1.50)
3 or more days of school lessons missed		1.36 (1.15–1.62)	1.21 (1.08–1.36)	1.30 (1.16–1.45)
Parents' monitoring of Saturday night activities		0.77 (0.68–0.88)	0.83 (0.75–0.92)	0.77 (0.70–0.85)
No parental monitoring of evening activities (with whom)	1.72 (1.11–2.68)	1.16 (1.01–1.33)	1.20 (1.06–1.36)	0.67 (0.50–0.89)
Scholars cannot easily obtain money as a gift from parents		0.86 (0.77–0.95)	0.91 (0.82–0.99)	0.89 (0.82–0.97)
Scholars cannot easily borrow money from parents	0.43 (0.26–0.73)		0.81 (0.73–0.91)	0.79 (0.64–0.98)
Scholars do not feel emotional support from parents			1.17 (1.05–1.32)	
Scholars do not feel warmth and caring from parents	2.76 (1.51–5.07)			

HED = heavy episodic drinking, i.e. drinking five or more alcoholic drinks on one occasion. Other substances: amphetamines, methamphetamines, cocaine, crack, lysergic acid diethylamide (LSD), ecstasy, heroin, magic mushrooms,  $\gamma$ -hydroxybutyric acid (GHB), PGC = prevalence gambling country; blank = dropped from model due to non-significance. Random-effects estimated variance [95% confidence interval (CI)] for the multivariate model stratified by country groups: low [problem gambling countries (PGC) = 0.062 (0.023–0.160), medium PGC = 0.003 (0.0004–0.023) and high PGC = 0.023 (0.009–0.063)].

parental emotional support was associated to gambling only for medium GPC prevalence. Only in the low GPC (going around with friends for fun did not seem to affect gambling activity. Parental monitoring of Saturday night activities, easily acquiring money as a gift from parents, truancy at school, active participation in sports, reading books for enjoyment, going out in the evening, substance use and binge drinking remained significant for all low, medium and high GPC groups.

Regarding the two outlier countries, Moldova is the only case where the lack of feeling of warmth and caring by parents is associated positively with gambling. Moldova is also the only case where illicit substance use other than cannabis and stimulants constitutes a far higher risk factor than elsewhere, while no association with alcohol use or HED is shown. Moreover, Moldova shows a higher association with going out in the evening and with the lack of parental monitoring concerning people with whom adolescents associate. Regarding Greece, with the exception of three covariates (i.e. truancy, other hobbies, life-time use of tranquilizers or sedatives), the variables that were associated significantly with gambling were the same as those observed commonly across the three GPC groups.

## DISCUSSION

Our results indicated that, on average, 22.6% of adolescents in Europe gambled during the past year. This is particularly interesting considering that legislative measures generally prohibit underage gambling [5,7].

These results differ from the 14% European youth gambling prevalence mentioned in the ESPAD Report 2015 [19]. This is due to the different methodology adopted for computing. On the basis of internal consistency tests and supporting literature [20,21], the authors are confident that this choice produces a more reliable estimation of the outcome than using a direct question asking for engagement in any gambling for money. Students might have an ambiguous self-perception of gambling, leading to an admission that they indeed engaged in gambling activities, but did not consider themselves to be gambling or to be gamblers [20]. Regarding cross-country comparisons, the reported levels of past year gambling show high variations, ranging from 6.4% (Republic of Moldova) to 46.3% (Greece).

Given this high variability, the countries were grouped to analyse the influence between positive and negative associations at personal- and family-level in countries presenting low to high prevalence of gambling.

Our results show clearly that in Europe there is no well-defined spatial distribution of youth gambling prevalence. This might suggest that, in the case of gambling, differently from other risk behaviours (i.e. alcohol use

[22], cultural factors depending on geographical proximity might play a very limited role or are outweighed by the influence of country socio-economic indicators or individual factors [5].

In Europe, the prevalence of off-line gambling was slightly higher than on-line (18.5 versus 16.2%), particularly between females (11.4 versus 8.3%). Canadian and US reporting showed that fewer than 10% reported gambling on-line during the past year [23–25].

As demonstrated by other European studies [26–29], the most popular off-line gambling activity seemed to be lotteries. Betting on sports or animal races represented both the game most played by on-line gamblers and the second most popular off-line. As noted in other papers, the highest sports betting prevalence was observed in Croatia and Romania [9,30].

Slot machines and betting were confirmed to be associated with high rates of gambling prevalence [31]: our analysis shows how the percentage of gamblers playing these types of games increases with gambling prevalence among the three country groups (Supporting information, Fig. S1).

A particular case is represented by Greece, where the dramatically high prevalence of lotteries is motivated to a large extent by its position at the extreme of the European prevalence range. Although within the range of rates observed in other European studies, the comparatively higher prevalence of adolescent lottery gaming in Greece, compared to the other ESPAD countries, may be attributed to the combined effect of the: (a) high degree of normalization of gambling, and especially lottery playing, in society overall [32], such that it is socially accepted that minors partake in parent-led routines of filling in lottery tickets and (b) by virtue of the lack of a restrictive framework, the relatively unhindered access to land-based betting facilities until the end of 2015, where minors also could play lottery games.

As the prevalence increases across country groups, the rate of students mixing both types of games and gambling modes also increases. As shown by previous works, a multi-game profile could be considered as a proxy of problematic gambling [31,33].

Overall, our work confirms the association of adolescent gambling with the main known factors [10]. More specifically, males gamble more than females in all European countries (31.6 versus 13.8%, respectively), as already widely demonstrated [7,34]. Family relationships and rules influence youth gambling prevalence: the odds of being a gambler increases with the lack of parental emotional support, defined rules at home, monitoring of Saturday nights and the reporting of evening activities. This confirms that the perception of family support may act as an incentive to refrain from gambling [35,36], even with different patterns of association in different GPCs.



Among the three GPC and in Greece, the engagement in gambling activities decreases when scholars report parental monitoring of Saturday night activities and when they cannot easily obtain money (as a gift or credit) from parents.

At an individual level, our data confirm previous findings showing that youth involved in competitive sports are at greater risk for gambling involvement [37]. Conversely, gambling involvement decreases when students read books for enjoyment and have other hobbies, such as playing an instrument, etc., thus supporting the evidence that organized and constructive leisure-time activities protect against common risky behaviours in adolescence [38], including youth gambling.

Interestingly, although only in high GPC, the odds of being gambler increases if students use the internet for leisure, possibly suggesting a relevant role for on-line gambling.

Truancy at school is also associated with youth gambling in low, medium and high GPC. Missed school lessons may also be associated with high levels of boredom, which is a risk factor for gambling [39], and with lack of sleep due to overnight prolonged use of the internet for gambling purposes [40].

Consistent with results from previous studies identifying a positive relation of gambling with alcohol use [14,41–44], our results confirm that the risk of being a gambler increases with the use of alcohol and the experience of HED in the last month. The only exception is Moldova: this may be due to the fact that for these two measures the country is above the ESPAD average with alcohol use in the last 30 days (56 versus 48%) and HED during the same time-period (41 versus 35%) [19], suggesting that alcohol use is a somewhat diffused behaviour, both among gamblers and non-gamblers.

In the same way, a positive relationship was found between gambling and the life-time use of illegal substances other than cannabis among all GPCs, as reported in other studies [25,44,45]. This is also confirmed for inhalants and for tranquilizers or sedatives without medical prescription. It is interesting to observe that in Moldova the substance use constitutes a far higher risk factor than elsewhere, with an odds double that in other country groups. In combination with other results regarding Moldova, this might suggest the existence of a specific population of adolescents at risk, subject to poor parental monitoring and caring, who are more likely to engage in different forms of risk behaviours such as substance use and gambling. In this light, in other countries, the lower association between substance use and gambling might therefore be explained by the higher prevalence of both behaviours in the whole adolescent population.

Regarding Greece, it can be observed that spending time surfing on-line for leisure does not seem to have an impact

upon the risk of adopting gambling behaviour. However, going out in the evening increases the odds of being a gambler. These observations combined suggest that adolescent gambling behaviour in Greece is associated with access to land-based rather than on-line betting facilities (as is also shown in the data of Supporting information, Fig. S1).

The fairly homogeneous results from the multivariate analysis stratified for countries/country groups deserve further investigation in future work, where the socio-economic context of each country should also be taken into account. This might contribute substantially to a clearer explanation of the between-country variability observed.

### Strengths

The most remarkable strength of the study is the use of a consistent methodology throughout 33 European countries, resulting in a very large sample of adolescents. Furthermore, samples were nationally representative, except for Cyprus (government-controlled areas only) and Moldova (Transnistria not included). Coverage of the student population was large in the majority of participating countries, with high response rates (80–84%) [19]. The students were recruited and assessed with homogeneous procedures in each European country, in terms of inclusion and exclusion criteria and outcome measures. Furthermore, to the best of our knowledge, this prevalence study on youth gambling comprises the largest geographic area reported so far.

### Limitations and future directions

With regard to limitations, it should be mentioned that in order to perform the current analysis, the frequencies of engagement in four different gambling activities (both off-line and on-line) in the last 12 months were dichotomized to create an overall index of gambling activity (yes/no). This clearly implies a loss of richness of the information provided, which we deemed could be outweighed by the clearer estimation provided by this method, instead of looking only at a generic engagement in gambling for money.

The lack of information regarding specific gambling severity among participants should also be mentioned. No screening instrument for problem gambling severity was included in the core questionnaire, although a number of countries (14) use it in optional modules. Additionally, our study focused upon individual level characteristics, but other levels (e.g. country-level) influencing at-risk and problem gambling [5] may also play a significant role. Comprehensive research estimating the impact of country level characteristics is needed in order to explain more clearly the cross-national variations observed in youth

gambling. For example, because previous studies have found that socio-economic inequality has increased in many domains of adolescent health [46] and deprived areas present more gambling opportunities (e.g. in the form of gaming machines) [47], future studies should aim to explore the link between youth gambling and socio-economic inequality at country level. In this direction, previous studies found that prevalence of at-risk problem gambling is higher for adolescents living in more disadvantaged regions in Italy [48,49]. Future studies should replicate this pattern at an international level.

Another limitation to be mentioned concerns the ESPAD methodology. All participants were 16-year-old students. Future studies should include students of different ages. ESPAD is a survey conducted only among high school students: the findings of this study may therefore be not extendable to young people not in education, who tend to report greater gambling activity and adoption of risk behaviours [50–53]. A further limitation of the study, from the perspective of having a complete picture of adolescent gambling prevalence in Europe, was constituted by the non-participation in the 2015 survey of Germany, Spain and the United Kingdom. These are countries showing a relatively high prevalence of underage gambling activity in general, and the availability of these data would have been useful to incorporate into the current analysis.

In addition to common limitations of self-reporting data (e.g. memory recall biases and social desirability biases), ESPAD being a cross-sectional study, it is clear that is not possible to establish causal relationships but only associations.

## CONCLUSION

Our study shows that 22.6% of European minors have engaged in gambling activities even though legislation restricts access. It also confirms that underage gambling can be framed as part of a broader risk profile. Engagement in gambling activities is associated with the use of alcohol, tobacco and illicit substances (other than cannabis). Individual behaviours such as truancy at school, going out in the evening and active participation in sports also increase the odds of being a gambler.

These findings could provide useful indications for policymaking at a European level: given its widespread diffusion, more prevention policies should address underage gambling, and specific focus should be given to most vulnerable categories, as research has shown that early onset into gambling activity increases the risk of developing gambling problems in adulthood [8,9]. Future social policies aimed at supporting families and promoting the participation of youth in structured and cultural leisure activities might help in counteracting the diffusion of gambling.

Individual-level characteristics and behaviours do not seem to be able to provide a comprehensive interpretation of the cross-country prevalence variability observed. Youth gambling prevalence across Europe does not seem to follow a well-defined spatial distribution, possibly suggesting that cultural patterns may only partially, or to a limited extent, explain prevalence differences. A future comprehensive analysis taking into account country-level socio-economic factors could therefore support a clearer interpretation of the distribution of patterns linking geographically distant countries.

## Declaration of interests

None.

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## References

1. Delfabbro P., King D., Derevensky J. Adolescent gambling and problem gambling: prevalence, current issues and concerns. *Curr Addict Rep* 2016; **3**: 268–74.
2. Blinn-Pike L., Worthy S. L., Jonkman J. N. Adolescent gambling: a review of an emerging field of research. *J Adolesc Health* 2010; **47**: 223–6.
3. Calado F., Alexandre J., Griffiths M. D. Prevalence of adolescent problem gambling: a systematic review of recent research. *J Gambl Stud* 2017; **33**: 397–424.
4. Romer D., Moreno M. Digital media and risks for adolescent substance abuse and problematic gambling. *Pediatrics* 2017; **140**: S102–6.
5. Molinaro S., Canale N., Vieno A., Lenzi M., Siciliano V., Gori M. *et al.* Country- and individual-level determinants of probable problematic gambling in adolescence: a multi-level cross-national comparison. *Addiction* 2014; **109**: 2089–97.
6. Gupta R., Derevensky J. L. Adolescents with gambling problems: from research to treatment. *J Gambl Stud* 2000; **16**: 315–42.

7. Volberg R. A., Gupta R., Griffiths M. D., Olason D. T., Phil D., Delfabbro P. An international perspective on youth gambling prevalence studies. *Int J Adolesc Med Health* 2010; 2: 3–38.
8. Dowling N. A., Merkouris S. S., Greenwood C. J., Oldenhof E., Toumbourou J. W., Youssef G. J. Early risk and protective factors for problem gambling: a systematic review and meta-analysis of longitudinal studies. *Clin Psychol Rev* 2017; 51: 109–24.
9. Edgerton J. D., Melnyk T. S., Roberts L. W. Problem gambling and the youth-to-adulthood transition: assessing problem gambling severity trajectories in a sample of young adults. *J Gambl Stud* 2015; 31: 1463–85.
10. Messerlian C., Derevensky J. L. Youth gambling: a public health perspective. *Health Promot Int* 2005; 20: 69–79.
11. Canale N., Vieno A., Griffiths M. D., Borraccino A., Lazzari G., Charrier L. et al. A large-scale national study of gambling severity among immigrant and non-immigrant adolescents: the role of the family. *Addict Behav* 2017; 66: 125–31.
12. Derevensky J., Gilbeau L. Adolescent gambling: twenty-five years of research. *Can J Addict* 2015; 6: 4–12.
13. Buja A., Lion C., Scioni M., Vian P., Genetti B., Vittadello F. et al. SOGS-RA gambling scores and substance use in adolescents. *J Behav Addict* 2017; 6: 425–33.
14. Weinberger A. H., Franco C. A., Hoff R. A., Pilver C., Steinberg M. A., Rugle L. et al. Cigarette smoking, problem-gambling severity, and health behaviors in high-school students. *Addict Behav Rep* 2015; 1: 40–8.
15. Hammond C. J., Pilver C. E., Rugle L., Steinberg M. A., Mayes L. C., Malison R. T. et al. An exploratory examination of marijuana use, problem-gambling severity, and health correlates among adolescents. *J Behav Addict* 2014; 3: 90–101.
16. Edgren R., Castrén S., Alho H., Salonen A. H. Gender comparison of online and land-based gamblers from a nationally representative sample: does gambling online pose elevated risk? *Comput Human Behav* 2017; 72: 46–56.
17. González-Roz A., Fernández-Hermida J. R., Weidberg S., Martínez-Loredo V., Secades-Villa R. Prevalence of problem gambling among adolescents: a comparison across modes of access, gambling activities, and levels of severity. *J Gambl Stud* 2017; 33: 371–82.
18. Baggio S., Dupuis M., Berchtold A., Spilka S., Simon O., Studer J. Is gambling involvement a confounding variable for the relationship between internet gambling and gambling problem severity? *Comput Human Behav* 2017; 71: 148–52.
19. Kraus L., Guttormsson U., Leifman H., Arpa S., Molinaro S., Monshouwer K. et al. ESPAD Report 2015. Results from the European School Survey Project on alcohol and other drugs. ESPAD and EMCDDA. Luxembourg: Publications Office of the European Union; 2016. Available at: <http://www.espad.org/report/acknowledgements> (accessed 19 March 2018) (Archived at <http://www.webcitation.org/6y1yGZOCq>).
20. Lange M. A. 'If you do not gamble, check this box': perceptions of gambling behaviors. *J Gambl Stud* 2001; 17: 247–54.
21. Lalande D. R., Bastille-Denis E., Savard C., Jacques C., Leclerc M., Giroux I. Investigating non-gamblers: another step toward identifying potential protective factors against problem gambling. *Int Gambl Stud* 2013; 13: 176–87.
22. Bendtsen P., Damsgaard M. T., Huckle T., Casswell S., Kuntsche E., Arnold P. et al. Adolescent alcohol use: a reflection of national drinking patterns and policy? *Addiction* 2014; 109: 1857–68.
23. McBride J., Derevensky J. Internet gambling and risk-taking among students: an exploratory study. *J Behav Addict* 2012; 1: 50–8.
24. Lee G. P., Martins S. S., Pas E. T., Bradshaw C. P. Examining potential school contextual influences on gambling among high school youth. *Am J Addict* 2014; 23: 510–7.
25. Barnes G. M., Welte J. W., Hoffman J. H., Tidwell M. C. Gambling, alcohol, and other substance use among youth in the United States. *J Stud Alcohol Drugs* 2009; 70: 134–42.
26. Rossow I., Molde H. Chasing the criteria: comparing SOGS-RA and the Lie/Bet screen to assess prevalence of problem gambling and 'at-risk' gambling among adolescents. *J Gambl Issues* 2006; 18: 57–71.
27. Olason D. T., Kristjansdottir E., Einarsdottir H., Haraldsson H., Bjarnason G., Derevensky J. L. Internet gambling and problem gambling among 13 to 18 year old adolescents in Iceland. *Int J Ment Health Addict* 2011; 9: 257–63.
28. Griffiths M. D. Adolescent gambling in Great Britain. *Educ Today* 2008; 58: 7–11.
29. Softić J., Brdarević M., Habibović S., Telalović M., Kasper S., Awad H. Spreading of gambling games among the secondary school students in the municipalities of Zenica and Kakanj, Bosnia and Herzegovina. *Med Glas (Zenica)* 2013; 10: 391–6.
30. Lupu V., Todirita I. R. Updates of the prevalence of problem gambling in Romanian teenagers. *J Gambl Stud* 2013; 29: 29–36.
31. Scalse M., Bastiani L., Salvadori S., Gori M., Lewis I., Jarre P. et al. Association of problem gambling with type of gambling among Italian general population. *J Gambl Stud* 2016; 32: 1017–26.
32. Malliori M., Economou M., Peppou L.E., Golna C., Souliotis K. Epidemiological survey on the prevalence of problem gambling in the adult population in Greece. Paper presented at the Lisbon Addictions Conference, 23–25 September, 2015.
33. Braverman J., LaPlante D. A., Nelson S. E., Shaffer H. J. Using crossgame behavioral markers for early identification of high-risk Internet gamblers. *Psychol Addict Behav* 2013; 27: 868–77.
34. Colasante E., Gori M., Bastiani L., Scalse M., Siciliano V., Molinaro S. Italian adolescent gambling behaviour: psychometric evaluation of the South Oaks Gambling Screen: revised for adolescents (SOGS-RA) among a sample of Italian students. *J Gambl Stud* 2014; 30: 789–801.
35. Canale N., Vieno A., Ter Bogt T., Pastore M., Siciliano V., Molinaro S. Adolescent gambling-oriented attitudes mediate the relationship between perceived parental knowledge and adolescent gambling: implications for prevention. *Prev Sci* 2016; 17: 970–80.
36. Casey D. M., Williams R. J., Mossière A. M., Schopflocher D. P., El-Guebaly N., Hodgins D. C. et al. The role of family, religiosity, and behaviour in adolescent gambling. *J Adolesc* 2011; 34: 841–51.
37. Gavriel-Fried B., Bronstein I., Sherpsky I. The link between competitive sports and gambling behaviors among youths. *Am J Addict* 2015; 24: 200–2.
38. Badura P., Sigmundova D., Sigmund E., Geckova A. M., van Dijk J. P., Reijneveld S. A. Participation in organized leisure-time activities and risk behaviors in Czech adolescents. *Int J Public Health* 2017; 62: 387–96.
39. Bonnaire C., Bungener C., Varescon I. Sensation seeking in a community sample of French gamblers: comparison between

- strategic and non-strategic gamblers. *Psychiatry Res* 2017; **250**: 1–9.
40. Gainsbury S. M., Russell A., Hing N., Wood R., Lubman D., Blaszczynski A. How the Internet is changing gambling: findings from an Australian prevalence survey. *J Gambl Stud* 2015; **31**: 1–15.
  41. Duhig A. M., Maciejewski P. K., Desai R. A., Krishnan-Sarin S., Potenza M. N. Characteristics of adolescent past-year gamblers and non-gamblers in relation to alcohol drinking. *Addict Behav* 2007; **32**: 80–9.
  42. Okunna N. C., Rodriguez-Monguio R., Smelson D. A., Poudel K. C., Volberg R. Gambling involvement indicative of underlying behavioral and mental health disorders. *Am J Addict* 2016; **25**: 160–72.
  43. Desai R. A., Maciejewski P. K., Pantalon M. V., Potenza M. N. Gender differences among recreational gamblers: association with the frequency of alcohol use. *Psychol Addict Behav* 2006; **20**: 145–53.
  44. Peters E. N., Nordeck C., Zanetti G., O'Grady K. E., Serpelloni G., Rimondo C. *et al.* Relationship of gambling with tobacco, alcohol, and illicit drug use among adolescents in the USA: review of the literature 2000–2014. *Am J Addict* 2015; **24**: 206–16.
  45. Liu T., Maciejewski P. K., Potenza M. N. The relationship between recreational gambling and substance abuse/dependence: data from a nationally representative sample. *Drug Alcohol Depend* 2009; **100**: 164–8.
  46. Elgar F. J., Pfortner T. K., Moor I., De Clercq B., Stevens G. W., Currie C. Socioeconomic inequalities in adolescent health 2002–2010: a time-series analysis of 34 countries participating in the Health Behaviour in School-aged Children study. *Lancet* 2015; **385**: 2088–95.
  47. Livingstone C. The social economy of poker machine gambling in Victoria. *Int Gambl Stud* 2001; **1**: 46–65.
  48. Canale N., Vieno A., Lenzi M., Griffiths M. D., Borraccino A., Lazzari G. *et al.* Income inequality and adolescent gambling severity: findings from a large-scale Italian representative survey. *Front Psychol* 2017; **8**: 1318.
  49. Gori M., Potente R., Pitino A., Scalese M., Bastiani L., Molinaro S. Relationship between gambling severity and attitudes in adolescents: findings from a population-based study. *J Gambl Stud* 2015; **31**: 717–40.
  50. Fergusson D. M., Horwood L. J., Beautrais A. L. Cannabis and educational achievement. *Addiction* 2003; **98**: 1681–92.
  51. Maynard B. R., Salas-Wright C. P., Vaughn M. G. High school dropouts in emerging adulthood: substance use, mental health problems, and crime. *Community Ment Health J* 2015; **51**: 289–99.
  52. Verweij K. J., Huizink A. C., Agrawal A., Martin N. G., Lynskey M. T. Is the relationship between early-onset cannabis use and educational attainment causal or due to common liability? *Drug Alcohol Depend* 2013; **133**: 580–6.
  53. Guttormsson U., Leifman H., Kraus L., Arpa S., Molinaro S., Monshouwer K. *et al.* *ESPAD 2015 methodology ESPAD and EMCDDA*. Luxembourg: Publications Office of the European Union; 2016.

### Supporting Information

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

**Table S1** Characteristics of the national samples, stratified by country, 2015.

**Table S2** Independent variables included in the model (except gender), questions and codes.

**Table S3** 95% confidence interval for prevalence of gambling with money stratified by country and gender, 2015.

**Table S4** 95% confidence interval for prevalence of gambling with money by game played stratified by country, 2015.