

# Individual and contextual factors related to binge drinking among adolescents in Spain: a multilevel approach

## *Factores individuales y contextuales relacionados con el binge drinking en adolescentes españoles: un enfoque multinivel*

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### Abstract

The aim of this study was to estimate the prevalence of binge drinking by regions in Spain and assess the effect of individual and contextual factors related to this drinking pattern in adolescents. A cross-sectional study was performed with data from the 2014 Spanish School Survey on Drug Use (ESTUDES) in students aged 14-18 years (N = 34,259). The outcome was binge drinking in adolescents during the last 30 days. Individual independent variables were socioeconomic variables and variables related to access to alcohol and its availability. Contextual variables consisted of adult alcohol consumption, public policies on alcohol, and socioeconomic factors. Multilevel Poisson regression models with robust variance were estimated, obtaining prevalence ratios (PR) and their 95% confidence intervals.

The results showed that the prevalence of youth binge drinking by region of residence was similar for both sexes ( $r = 0.72$ ). At the individual level, binge drinking was mainly associated with the perception of easy access to alcohol (PR: 1.38; 95% CI: 1.23-1.55), consumption in open areas [(PR: 3.82; 95% CI: 3.44-4.24) < once a month and (PR: 6.57; 95% CI: 5.85-7.37)  $\geq$  once a month], at least one parent allowing alcohol consumption (PR: 1.42; 95% CI: 1.37-1.47), and receiving >30 euros weekly (PR: 1.51; 95% CI: 1.37-1.67). Contextual variables were not associated with youth binge drinking when individual variables were considered. In conclusion, youth binge drinking was associated with individual variables related to high alcohol accessibility and availability, regardless of contextual variables. These variables explained the variability in binge drinking among Spanish regions.

**Keywords:** Alcohol; Underage drinking; Binge drinking; Adolescents; Alcohol accessibility.

### Resumen

El objetivo de este estudio era estimar la prevalencia de *binge drinking* por provincias en España y estimar el efecto de variables individuales y contextuales relacionadas con dicho consumo en adolescentes españoles. Se realizó un estudio transversal con datos de la Encuesta sobre uso de drogas en Enseñanzas Secundarias en España (ESTUDES 2014) a estudiantes de 14 a 18 años (N = 34.259). La variable dependiente fue *binge drinking* en adolescentes durante los últimos 30 días. Las variables independientes individuales fueron variables socioeconómicas y variables relacionadas con el acceso y la disponibilidad de alcohol. Las variables contextuales fueron el consumo de alcohol en adultos, políticas públicas relacionadas con el alcohol y factores socioeconómicos. Se ajustaron modelos de regresión de Poisson multinivel con variancia robusta, obteniendo razones de prevalencia (RP) y sus intervalos de confianza al 95%.

Los resultados muestran que la prevalencia de *binge drinking* en estudiantes españoles en función de la provincia era similar para ambos sexos ( $r = 0,72$ ). A nivel individual, el *binge drinking* se asociaba principalmente a una percepción de acceso fácil al alcohol (RP: 1,38; IC 95%: 1,23-1,55), a su consumo en zonas abiertas [(RP: 3,82; IC 95%: 3,44-4,24) < una vez al mes y (RP: 6,57; IC 95%: 5,85-7,37)  $\geq$  una vez al mes], a tener uno de los dos padres que permite beber (RP: 1,42; IC 95%: 1,37-1,47), y a disponer de más de 30 euros semanales (RP: 1,51; IC 95%: 1,37-1,67). Las variables contextuales no se asociaban al *binge drinking* cuando se consideraban las variables individuales. En conclusión, el *binge drinking* se asociaba con variables individuales relacionadas con una alta accesibilidad y disponibilidad de alcohol independientemente de las variables contextuales. Estas variables explicaban la variabilidad de el *binge drinking* entre las provincias.

**Palabras clave:** Alcohol; Consumo intensivo; Adolescentes; Accesibilidad al alcohol.

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**A**lcohol consumption is one of the leading risk factors for mortality and disease worldwide (Rehm et al., 2009; Shield et al., 2013; WHO, 2014). Although it can affect all age groups, adolescents and young people are especially vulnerable (CNAPA, 2014; Zeigler et al., 2005). Adolescence is a period in which many risk behaviors, including alcohol intake, are initiated (Pitkänen, Lyyra, & Pulkkinen, 2005; Plan Nacional Sobre Drogas, 2016). The most common risky drinking pattern among adolescents is binge drinking. Binge drinking can be defined as drinking at least 60 grams or more of pure alcohol on at least one occasion in the past 30 days (CNAPA, 2014) or to drink 5 or more alcoholic drinks on a single occasion, i.e. an approximate interval of two hours (Plan Nacional Sobre Drogas, 2016). Prevalence rates of monthly binge drinking among European adolescents vary from 13% to 56% (in Spain 32.2%) (Hibell et al., 2012; Plan Nacional Sobre Drogas, 2016). At this age, binge drinking is associated with other risky behaviors, such as alcohol-impaired driving, risky sexual or violent behaviors (CNAPA, 2014; Font-Ribera et al., 2013; Kuntsche et al., 2013). There is also evidence that alcohol use in adolescence seems to be a risk factor for high alcohol consumption and problem drinking in adulthood (Pitkänen, et al, 2005; Pitkänen, Kokko, Lyyra, & Pulkkinen, 2008).

Several studies have reported that binge drinking in adolescence is associated with individual variables such as age, gender, family socioeconomic position, family structure, family and friends' habits and attitudes related to alcohol, parental permissiveness, parental supervision or control, and the amount of money for personal needs (Heimisdottir, Vilhjalmsón, Kristjansdóttir, & Meyrowitsch, 2010; Llorens, Barrio, Sánchez, Suelves, & ESTUDES Working Group, 2011). Adult influence could be another factor as adults are a model for young people (Bendtsen et al., 2014; Heimisdottir et al., 2010). Adults can tolerate or promote family or environmental conditions that facilitate youth drinking (Foley, Altman, Durant, & Wolfson, 2004; Heimisdottir et al., 2010; Reimuller, Shadur, & Hussong, 2011; van der Vorst, Engels, Meeus, Deković, & Van Leeuwe, 2005) or even directly offer or provide alcohol to young people (Foley et al., 2004; Jones-Webb et al., 1997; Pettigrew, Pescud, Jarvis, & Webb, 2013). In Spain, the phenomenon called "botellón", consisting of groups drinking in open-air public spaces such as squares or parks, has become a widespread practice among adolescents in many regions and has also been associated with binge drinking (Cortés, Espejo, Martín del Río, & Gómez, 2010; Romo-Avilés, Marcos-Marcos, Marquina-Márquez, & Gil-García, 2016). However, alcohol use and alcohol-related problems in adolescents can be explained by other contextual variables: (1) public alcohol policies, such as alcohol access restriction, alcohol tax, traffic safety

policies, or alcohol advertising regulation (Bendtsen et al., 2014; Nelson et al., 2013, 2005; Paschall, Grube, & Kypri, 2009; WHO, 2014; Xuan et al., 2013, 2015); (2) socioeconomic and demographic factors such as changes in per capita income or the unemployment rate (Krieg & Kuhl, 2016; Pedersen, Bakken, & von Soest, 2015); and (3) adult drinking at the population level (Bendtsen et al., 2014; Nelson, Naimi, Brewer, & Nelson, 2009; Nelson, Naimi, Brewer, & Wechsler, 2005; Xuan et al., 2013).

Although both individual and contextual variables have been associated with alcohol consumption, most studies on youth drinking have focused on individual adolescent characteristics (Nelson et al., 2005) or have explored the relationship between youth and adult consumption at the family level (Rossow, Keating, Felix, & McCambridge, 2015). Studies exploring adolescent drinking that include individual and contextual variables related to socioeconomic or demographic factors and to the accessibility and availability of alcohol, are lacking. Given this background, it is important to assess the effect of some contextual variables on binge drinking in a country like Spain, where this phenomenon has increased significantly in recent years (Galán, González, & Valencia-Martín, 2014) and which has also been immersed in a deep economic crisis since 2008 accompanied by high unemployment levels.

Thus, the aim of this study was to estimate the prevalence of binge drinking and assess the effect of individual and contextual factors on this drinking pattern in Spanish adolescents.

## Methods

### Data sources

Cross-sectional study with individual data drawn from the 2014 Spanish ESTUDES survey (Spanish acronym for School Survey on Drug Use), carried out within the framework of the National Plan on Drugs. The sample consisted of 34,259 students aged 14–18 years (17,498 girls; 16,761 boys) who attended secondary school in all regions of Spain, including urban and rural, public and private schools. The student sample represented approximately 70% of all youths of this age range in Spain. Two-stage cluster sampling was used, by randomly selecting schools as first-stage units and classrooms as second-stage units. A detailed description of the sample has been published elsewhere (Plan Nacional Sobre Drogas, 2016). Students with missing values for country of birth (0.1%), alcohol consumption in open public spaces (4.7%), parental behavioral control (3%) or binge drinking occurrence (1.2%) were excluded. Conversely, missing values for the parents' educational attainment (14.7%), pocket money received weekly (8.2%), parental permissiveness toward drinking alcohol (16.9%), and perceived access to alcohol

(13.8%) were included in an “unknown” category because of their high percentage. For all other independent variables, no missing values were found. Contextual or aggregated data measured at the Spanish region level were drawn from various sources, such as the 2011 and 2013 Spanish EDADES surveys (Spanish acronym for “Household Survey on Alcohol and Drugs”), which gathers information on adult per capita alcohol consumption and policies limiting outdoor alcohol consumption; ESTUDES survey, which collects data on policies preventing alcohol sales to minors; and the 2011 Spanish EPA survey (Spanish acronym for “Labor Force Survey”), which provides information on the unemployment rate.

## Variables

### **Dependent variable**

The outcome was the occurrence of current binge drinking in students aged 14-18 years, defined as drinking five or more standard drink units in a 2-hour interval at least once in the last 30 days for both sexes. Students’ binge drinking was considered when it occurred at least once in the last 30 days, not being possible to know if it was a maintained pattern over time.

### **Socioeconomic variables at the individual level**

Individual socioeconomic variables were socioeconomic position, age (entered as continuous variable), sex, country of birth (immigrants being defined as individuals born outside Spain) and Spanish region of residence (52 regions; Palencia being the region with the lowest number of students [n=50] and Madrid with the highest number [n=4,634]). Socioeconomic position was measured by educational attainment (highest degree of education completed by father or mother) (Krieger, Williams, & Moss, 1997).

### **Alcohol access and availability variables at the individual level**

Independent variables related to individual access to alcohol and its availability were perceived access to alcohol, alcohol consumption in open areas, weekly pocket money, parental permissiveness toward drinking alcohol, and parental behavioral control. Youth perceived access to alcohol was obtained through the question “What difficulty do you think you would have to get alcoholic drinks?”, collapsing the four possible response options into two categories (difficult, easy). Information on alcohol consumption in open areas, known in Spain as “botellón”, was obtained through the question “How often have you participated in “botellón” in the last 12 months?”, with the seven possible response options being collapsed into three categories ( $\geq$ once/month, < once/month, never). Weekly pocket money was gathered through an open question and

it was classified into 4 categories (0 euros, <10 euros, between 10-30 euros and >30 euros). Parental permissiveness toward drinking alcohol was obtained through the question “If you want to drink alcoholic beverages, would your parents allow you?”, considering parental permissiveness when at least one parent allowed drinking alcohol inside or outside home. Parental behavioral control referred to how often the parents knew with whom and where the student went out in the evenings, with the five possible response options being collapsed into three categories (often, sometimes, rarely).

### **Socioeconomic and alcohol-related variables at the contextual level**

Contextual independent variables measured at the Spanish region level were adult per capita alcohol consumption, indicators of regional public alcohol policies, and socioeconomic factors. Adult per capita alcohol consumption was estimated as the average grams of pure alcohol consumed daily in the population aged 25-64 years living in each region, from quantity-frequency questions in EDADES, which refer to the last 30 days. Grams of pure alcohol were obtained by multiplying the intake of alcoholic beverages in volume by the proportion alcohol-by-volume for each beverage category and by 0.79 (or alcohol density in g/ml). Regarding regional public alcohol policies, the prevalence of students who perceived easy access to alcohol, adding individualized results in ESTUDES in each region, was entered as a proxy of the effectiveness of regional policies on regulations and interventions preventing alcohol sales to minors. The prevalence of alcohol consumption in open areas, “botellón”, was entered as a proxy of the effectiveness of regional policies on regulations and interventions limiting outdoor alcohol consumption. It was considered any episode of “botellón” among the Spanish population aged 15-30 years in the last 12 months in EDADES survey. The selected socioeconomic factor was the unemployment rate among the economically active population aged 16-64 years, as an average of the four quarters of 2011 in each region, in 2011 Spanish EPA survey.

### **Statistical analysis**

The results of the survey were weighted by region, school ownership, and type of studies to correct the imbalance of the sample with respect to the sampling frame. Firstly, a description of the sample was performed, separately for girls and boys, to estimate the prevalence of binge drinking according to the individualized covariates with their respective 95% confidence intervals (95%CI). To determine the binge drinking distribution in the different Spanish regions, two maps based on sex were constructed, allowing the different regions to be classified according to the quartile to which they belonged. To explore the

association between youth binge drinking and contextual factors, simple linear correlations according to region were performed with their respective scatter charts. Finally, to identify the effect of both individual and contextual factors on adolescent binge drinking, Poisson multilevel regression models with robust variance were fitted, obtaining prevalence ratios (PR) with 95%CI (Espelt, Mari-Dell'Olmo, Penelo, & Bosque-Prous, 2017). The first model (model 0) included only youth binge drinking to calculate its variability between the different Spanish regions. Next, the association of individual or contextual variables with binge drinking was estimated, building a multilevel model with the individual socioeconomic variables (model 1), another with the individual alcohol access and availability variables (model 2), another with all the individual variables together (model 3), and another model including all the contextual variables only (model 4). Finally, a last multivariate model was fitted (model 5) to estimate the conjoint effect of individual and contextual factors on youth binge drinking, assuming that the intersection had a random effect. All the models were constructed jointly for girls and boys because of the limited sample size in some regions and the similarity of binge drinking distribution by the independent variables for both sexes. Analyses were performed using STATA software version 14.

## Results

In the study sample, 89% of girls and 90% of boys were born in Spain and around half had parents with secondary education or less (53% of girls; 49% of boys) and more than 90% were younger than 18 years. The total prevalence of youth binge drinking in the last month was around 33%. For both girls and boys, the prevalence of binge drinking increased with age, and although the prevalence was generally higher in boys, sex differences were only significant from 17 years and above. For both sexes, the prevalence of binge drinking was higher among natives than immigrants (32% vs 28% in girls and 34% vs 32% in boys), among those whose parents had secondary education or less compared to university education (34% vs 30% in girls and 37% vs 33% in boys) and among those with at least one parent who allowed drinking in contrast to those whose parents did not allow drinking (49% vs 19% in girls and 53% vs 19% in boys). Regarding parental behavioral control, when parents knew with whom and where their adolescents went out in the evening, the prevalence of binge drinking was lower in both sexes. Moreover, binge drinking in the last 30 days was reported by more than 40% of adolescents who had more than 30 euros of weekly pocket money, more than 35% of those who perceived easy alcohol access and more than 65% of those who had drunk alcohol in open public areas during the last month (Table 1).

Figure 1 shows the distribution of binge drinking, separately for girls and boys, by region of residence. A between-sex correlation coefficient of 0.72 was obtained. Regions in central Spain showed a higher prevalence of binge drinking, the exception being Madrid, because it was placed in the lowest quartile for both girls and boys.

All individual variables showed a significant effect on the risk of binge drinking among adolescents, regardless of whether their effects were measured alone or together with those of contextual variables. In relation to individual socioeconomic variables, being a girl (PR 0.95; 95%CI 0.91-0.99) and having parents with university studies vs. secondary or less (PR 0.95; 95%CI 0.91-0.99) had a negative effect, while being older had a positive effect (PR 1.35; 95%CI 1.31-1.40). On the other hand, when individual socioeconomic variables were analyzed alone, country of birth was negatively associated with binge drinking (PR 0.88; 95%CI 0.82-0.95), but when other variables were added to the model, whether they were individual or contextual, this association became positive (PR 1.13; 95%CI 1.08-1.18). Regarding individual alcohol-related variables, a positive effect (increased risk) was found on binge drinking for easy alcohol access (PR 1.40; 95%CI 1.25-1.58), alcohol consumption in open areas (PR 6.77; 95%CI 6.01-7.63 at least once a month), parental permissiveness (PR 1.52; 95%CI 1.45-1.59), parental behavioral control (PR 1.17; 95%CI 1.12-1.22 when parents rarely knew with whom the student went out in the evenings and PR 1.14; 95%CI 1.07-1.20 when parents rarely knew where the student went out in the evenings), and weekly pocket money (PR 1.56; 95%CI 1.42-1.73 of more than 30 euros). Moreover, there was a gradient in the strength of the association in the latter three variables (Table 2).

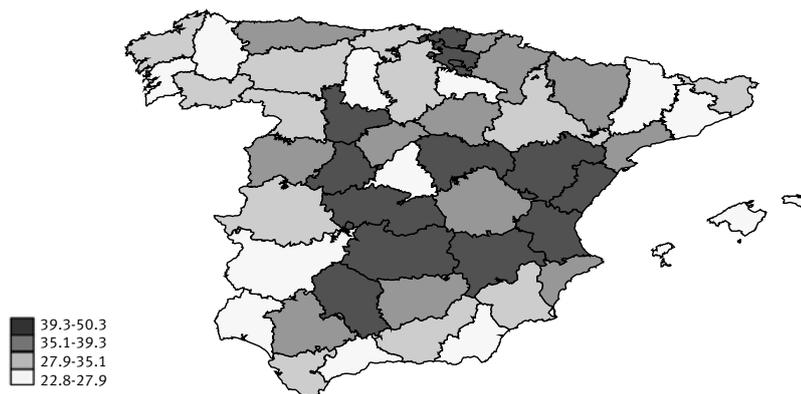
Regarding contextual variables, as shown in Figure 2, adult per capita alcohol consumption and the prevalence of adolescents perceiving easy access to alcohol showed the strongest positive correlations with youth binge drinking for both sexes ( $r(\text{girls})=0.304$ ;  $p\text{-value}=0.03$ ;  $r(\text{boys})=0.230$ ;  $p\text{-value}=0.10$ ; and  $r(\text{girls})=0.603$ ;  $p\text{-value}<0.001$ ;  $r(\text{boys})=0.585$ ;  $p\text{-value}<0.001$ ), respectively), while the unemployment rate showed a negative correlation, especially in boys ( $r(\text{boys})=-0.305$ ;  $p\text{-value}=0.03$ ). However, in the multilevel models (Table 2), only easy access to alcohol was significantly associated with binge drinking and only when contextual variables were considered isolated from the individual (PR 1.03; 95%CI 1.02-1.04). In fact, the empty model determined that variability in youth binge drinking between the different regions was around 3.6%. When all the individual variables were considered (model 3), they explained 75% of this variability in youth binge drinking. Despite this, model 2, which contained only alcohol-related individual variables, explained 78%. When contextual variables were considered alone, 46% of the variability in youth binge drinking was explained

Table1. Prevalence of binge drinking in the last 30 days and 95% confidence interval (95% CI) by sex and other individual variables among students aged 14-18 years. Spain, 2014.

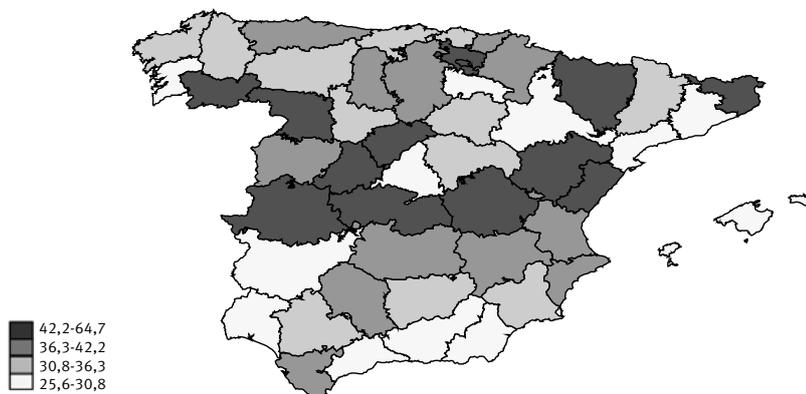
	Girls		Binge drinking		Boys		Binge drinking	
	n	%	%	95% CI	n	%	%	95% CI
<b>N total = 34,259</b>								
Total	17,498	51.1	31.6	(30.9-32.3)	16,761	48.9	34.0	(33.3-34.7)
<b>Age</b>								
14 years	3,517	20.1	14.8	(13.7-16.0)	3,143	18.8	13.6	(12.5-14.9)
15 years	4,423	25.3	25.4	(24.1-26.7)	4,130	24.6	24.3	(23.0-25.7)
16 years	4,221	24.1	37.3	(35.9-38.8)	3,928	23.4	38.2	(36.7-39.8)
17 years	4,080	23.3	41.9	(40.4-43.4)	4,039	24.1	47.6	(46.0-49.1)
18 years	1,258	7.2	47.9	(45.2-50.7)	1,521	9.1	55.3	(52.8-57.8)
<b>Country of birth</b>								
Spain	15,533	88.8	32.0	(31.3-32.8)	15,062	89.9	34.2	(33.5-35.0)
Outside Spain	1,965	11.2	28.1	(26.1-30.1)	1,700	10.1	32.1	(29.9-34.3)
<b>Parents' educational attainment</b>								
Secondary education or less	9,327	53.3	34.0	(33.0-34.9)	8,143	48.6	36.6	(35.6-37.7)
University	5,874	33.6	29.5	(28.3-30.6)	5,991	35.7	32.9	(31.7-34.1)
Unknown	2,297	13.1	27.4	(25.6-29.3)	2,627	15.7	28.4	(26.7-30.2)
<b>Perceived access to alcohol</b>								
Difficult	1,269	7.3	10.0	(8.4-11.8)	1,233	7.4	13.2	(11.5-15.3)
Easy	14,453	82.6	35.5	(34.8-36.3)	13,377	79.8	38.7	(37.9-39.5)
Unknown	1,775	10.1	14.9	(13.3-16.6)	2,151	12.8	16.5	(15.0-18.2)
<b>Alcohol consumption in open public areas</b>								
No	7,604	43.5	7.7	(7.1-8.3)	7,858	46.9	8.1	(7.6-8.8)
< once/month	5,312	30.4	34.9	(33.7-36.2)	4,808	28.7	40.9	(39.5-42.3)
≥ once/month	4,582	26.2	67.3	(66.0-68.7)	4,096	24.4	75.5	(74.1-76.8)
<b>Parental Permissiveness</b>								
Neither parent allows drinking	7,815	44.7	19.1	(18.2-19.9)	7,010	41.8	18.6	(17.7-19.5)
At least one parent allows drinking	7,067	40.4	48.8	(47.6-50.0)	6,916	41.3	52.9	(51.7-54.0)
Unknown	2,616	15.0	22.6	(21.1-24.3)	2,835	16.9	26.1	(24.6-27.8)
<b>Parents know with whom he/she goes out in the evenings</b>								
Often	14,769	84.4	28.9	(28.1-29.6)	12,742	76.0	31.5	(30.7-32.3)
Sometimes	1,633	9.3	44.6	(42.2-47.0)	2,104	12.6	41.2	(39.1-43.3)
Rarely	1,096	6.3	48.9	(46.0-51.9)	1,915	11.4	42.8	(40.6-45.1)
<b>Parents know where he/she goes out in the evenings</b>								
Often	14,156	80.9	28.5	(27.8-29.3)	12,015	71.7	30.53	(29.7-31.4)
Sometimes	1,930	11.0	42.6	(40.4-44.8)	2,412	14.4	41.52	(39.6-43.5)
Rarely	1,412	8.1	47.5	(44.9-50.1)	2,334	13.9	44.03	(42.0-46.0)
<b>Weekly pocket money</b>								
0 euros	1,869	10.7	17.9	(16.2-19.7)	1,948	11.6	16.9	(15.3-18.6)
Less than 10 euros	3,742	21.4	25.0	(23.6-26.4)	3,098	18.5	24.4	(23.0-26.0)
Between 10-30 euros	9,401	53.7	36.9	(36.0-37.9)	8,871	52.9	40.0	(39.0-41.0)
More than 30 euros	1,093	6.3	43.8	(40.9-46.8)	1,525	9.1	48.1	(45.6-50.6)
Unknown	1,393	8.0	22.4	(20.3-24.7)	1,319	7.9	25.1	(22.8-27.5)

Note. \*Excluding people with missing information on country of birth, alcohol consumption in open public areas or binge drinking occurrence. ESTUDES: Spanish School Survey on Drug use.

(a) Prevalence of binge drinking in girls



(b) Prevalence of binge drinking in boys



*Note.* \*The map excluded Las Palmas, Santa Cruz de Tenerife, Ceuta and Melilla. The prevalence of binge drinking in these regions was: 21.4% (girls) and 20.8% (boys) in Las Palmas; 28.7% (girls) and 30.4% (boys) in Santa Cruz de Tenerife; 5.5% (girls) and 11.9% (boys) in Ceuta; and 10.8% (girls) and 16.4% (boys) in Melilla.

\*\* Correlation coefficient between the prevalence of binge drinking in boys and girls in different regions.

\*\*\*Variance of the prevalence of binge drinking among regions: girls = 3.3%; boys = 3.1%.

Figure 1. Prevalence of binge drinking in the last 30 days by Spanish region and sex among students aged 14-18 years. Spain, 2014.

(model 4). Finally, when both individual and contextual variables were taken into account, the explanatory power of the model was 77%.

## Discussion

### Main findings

The prevalence of binge drinking in the last 30 days among Spanish students aged 14-18 years was 32% in girls and 34% boys, varying by region of residence. Although the prevalence was higher in boys than in girls, there was a high between-sex correlation in this prevalence in different Spanish regions of residence. At the individual level, the main variables associated with a higher risk of binge drinking among adolescents were perception of easy access to alcohol, participating in “botellón”—especially in the last month—, more parental permissiveness, less parental behavioral control, and having plenty of pocket money. Regions with a higher proportion of adolescents who

perceived easy access to alcohol had a higher prevalence of youth binge drinking. However, this association disappeared when individual variables were considered.

In our study, the overall prevalence of binge drinking in the last 30 days in Spanish students aged 14-18 years was 33%. This result is similar to those observed in other studies in Europe and the USA, with youth binge drinking prevalences ranging 26%-47% (CNAPA, 2014; Hibell et al., 2012; Llorens et al., 2011; Nelson et al., 2009; Nelson et al., 2005; Xuan et al., 2013). However, the prevalence of binge drinking seems to have decreased compared with that reported in the 2012 ESTUDES survey, which indicated a binge drinking prevalence of 42% (Plan Nacional Sobre Drogas, 2016). According to the National Plan on Drugs, this decrease can be explained by the reduction in alcohol drinking among students aged 14-15 years and coincides with an increase in the percentage of students who are aware of the risks of alcohol drinking in comparison to the 2012 survey.

Table 2. Effect of individual and contextual factors on binge drinking in the last 30 days among adolescents aged 14-18 years. Spain, 2014

BINGE DRINKING	Model 1 (socioeconomic variables)		Model 2 (alcohol-related variables)		Model 3 (all individual variables)		Model 4 (contextual variables)		Model 5 (multivariate)	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
<b>Individual factors among adolescents</b>										
Age	1.35	(1.31-1.40)			1.09	(1.06-1.12)			1.09	(1.06-1.12)
<b>Sex</b>										
Boys	1				1				1	
Girls	0.95	(0.91-0.99)			0.93	(0.90-0.96)			0.93	(0.90-0.97)
<b>Country of birth</b>										
Spain	1				1				1	
Outside Spain	0.88	(0.82-0.95)			1.13	(1.08-1.19)			1.13	(1.08-1.18)
<b>Parent's educational attainment</b>										
Secondary education or less	1				1				1	
University	0.95	(0.91-0.99)			0.96	(0.92-0.99)			0.95	(0.92-0.99)
<b>Adolescents' perceived access to alcohol</b>										
Difficult			1		1				1	
Easy			1.40	(1.25-1.58)	1.38	(1.23-1.54)			1.38	(1.23-1.55)
<b>Alcohol consumption in open areas</b>										
No			1		1				1	
< once/month			3.90	(3.50-4.34)	3.82	(3.44-4.24)			3.82	(3.44-4.24)
≥ once/month			6.77	(6.01-7.63)	6.56	(5.85-7.36)			6.57	(5.85-7.37)
<b>Parental permissiveness</b>										
Neither parent allows drinking			1		1				1	
At least one parent allows drinking			1.52	(1.45-1.59)	1.42	(1.37-1.47)			1.42	(1.37-1.47)
<b>Parents know with whom he/she goes out in the evenings</b>										
Often			1		1				1	
Sometimes			1.10	(1.04-1.16)	1.09	(1.04-1.15)			1.10	(1.04-1.16)
Rarely			1.17	(1.12-1.22)	1.16	(1.10-1.22)			1.16	(1.10-1.22)
<b>Parents know where he/she goes out in the evenings</b>										
Often			1		1				1	
Sometimes			1.07	(1.03-1.12)	1.07	(1.03-1.12)			1.07	(1.03-1.12)
Rarely			1.14	(1.07-1.20)	1.15	(1.09-1.22)			1.15	(1.09-1.22)
<b>Weekly pocket money</b>										
0 euros			1		1				1	
Less than de 10 euros			1.10	(1.00-1.22)	1.13	(1.02-1.25)			1.13	(1.02-1.25)
Between 10-30 euros			1.30	(1.19-1.43)	1.29	(1.18-1.42)			1.29	(1.18-1.41)
More than 30 euros			1.56	(1.42-1.73)	1.52	(1.38-1.67)			1.51	(1.37-1.67)
<b>Socioeconomic factors</b>										
Unemployment rate							1.01	(0.97-1.05)	0.98	(0.95-1.01)
<b>Proxies of effectiveness of alcohol control policies</b>										
Prevalence of adolescents perceiving easy access to alcohol							1.03	(1.02-1.04)	1.00	(0.99-1.01)
Prevalence of adolescents drinking in open public areas							1.00	(1.00-1.01)	1.00	(1.00-1.00)
<b>Adult per capita alcohol consumption</b>										
Grams of pure alcohol/day							1.00	(0.99-1.02)	1.00	(0.99-1.01)
Variance	0.0370		0.0080		0.0083		0.0196		0.0081	

Note. The variance of the empty model (model 0) was 0.0360. Model 1 was adjusted by age, sex, country of birth, and parent's educational attainment; model 2 was adjusted by adolescents' perceived access to alcohol, alcohol consumption in open areas, parental permissiveness, parents' knowledge about where and with whom the adolescent went out in the evenings, and weekly pocket money; model 3 was adjusted by all the variables included in models 1 and 2; model 4 was adjusted by socioeconomic factors, proxies of alcohol control policies, and adult per capita alcohol consumption; model 5 was adjusted by all the variables.

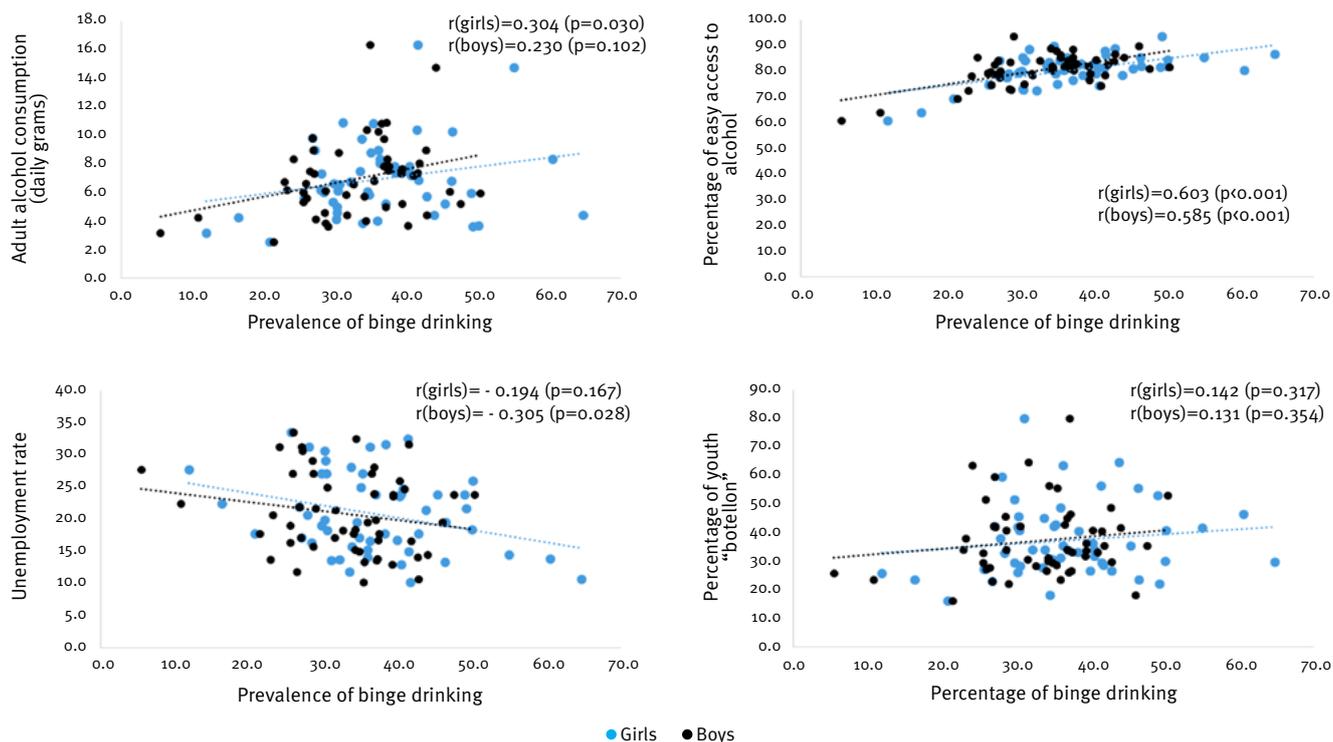


Figure 2. Correlations of region-level youth binge drinking with adult per capita alcohol consumption, unemployment rate and indicators of regional public alcohol policies.

Individual variables related to alcohol were the best predictors of the observed differences in adolescent binge drinking between Spanish regions. Thus, independently of contextual variables, a higher prevalence of binge drinking was found in adolescents who perceived easy access to alcohol, had participated in “botellón” during the last month, had at least one parent allowing alcohol consumption, whose parents rarely knew where and with whom they went out in the evenings, and who had pocket money for their expenses. Previous studies have already suggested that the availability of pocket money and easy access to alcohol in adolescents increases the probability of alcohol consumption and binge drinking (Jones & Magee, 2014; Llorens et al., 2011). There is also evidence that parental permissiveness and control could be associated with adolescents’ drinking (Abar, Abar, & Turrisi, 2009; Foley et al., 2004; Heimisdottir et al., 2010; Llorens et al., 2011; Nash, McQueen, & Bray, 2005; van der Vorst et al., 2005). Specifically, it seems that that establishing strict rules and complete disapproval of youth drinking prevents heavy alcohol use and negative alcohol-related consequences (Abar et al., 2009; van der Vorst et al., 2005). In this regard, one study found that adolescents who reported greater parental disapproval of alcohol use also reported a positive family environment, such as greater parental monitoring or better communication, which could attenuate the potentially negative impact of peers on adolescents’

drinking behavior and increase self-efficacy in refusing alcohol (Nash et al., 2005). Like other Spanish studies, our study found an association between “botellón” and youth binge drinking (Cortés et al., 2010; Romo-Avilés et al., 2016). Reasons that may explain high alcohol consumption during “botellón” include the focus on the positive effects of alcohol drinking (such as having fun or facilitating social relationships), peer pressure to drink alcohol, greater access to alcohol, and adolescents’ expectation that they will be cared for and looked after by their friends if they drink large amounts of alcohol (Espejo, Cortés, del Río, Giménez, & Gómez, 2012; Gómez, Fernández, Romero, & Luengo, 2008; Romo-Avilés et al., 2016).

Notwithstanding the above, almost half of the observed variability between Spanish regions was explained by contextual variables. Specifically, the greater the proportion of young people perceiving easy access to alcohol at the regional level, the higher the risk of binge drinking in that region. This result is consistent with evidence showing a relationship between more restrictive alcohol control policies and less youth binge drinking (Nelson et al., 2005; Xuan et al., 2015). However, when individual variables were taken into account, this association disappeared. This result can be explained by several reasons. Firstly, as reported in the ESPAD report (Hibell et al., 2012), most European students perceived easy access to alcohol (81% of students in both the ESPAD report and the present study)

even though many countries have laws restricting access for young people. Therefore, it is possible that although the laws in the different Spanish regions are very similar, compliance with these laws varies greatly. Secondly, in our study, this contextual variable may be strongly related to individual access to alcohol and its availability, because it is an aggregated individual variable. Finally, another possibility is that the variability of the contextual variables measured in our study between regions was quite small, and therefore, the most influential factor in youth binge drinking was the individual access of each adolescent to alcohol.

Surprisingly, in this study, adult per capita alcohol consumption was not associated with youth binge drinking. However, other studies have shown an influence of adult alcohol consumption at a population level on youth drinking (Bendtsen et al., 2014; Nelson et al., 2009; Nelson et al., 2005; Xuan et al., 2013, 2015). One possible explanation for this lack of significance in the association between adult and youth alcohol use could be that the variable used in this study to measure alcohol consumption in adults came from a population survey and may not have adequately captured the distribution of alcohol consumption in different regions.

### **Strengths and limitations**

To our knowledge, this is the first study in Spain that analyzes the influence of several individual and contextual variables on youth binge drinking at the regional level. One of the main strengths of this study is the use of multilevel methodology to analyze the phenomenon of binge drinking in adolescents, simultaneously taking into account individual and contextual factors. In addition, a population-based survey that is representative of Spanish students aged 14-18 years was used. However, this survey excludes those young people outside the formal education system. For this reason, a sensitivity analysis was performed including only students aged 14-16 years and the results showed no statistically significant differences compared to those from the entire study sample.

The main limitation of the study is its cross-sectional nature, which does not allow causal relationships to be established. In addition, both adolescents' and adults' alcohol consumption was self-reported. However, there is evidence that self-reported questionnaires are a feasible method for measuring alcohol consumption in adolescents (Engs & Hanson, 1990). Moreover, the individual and anonymous nature of both questionnaires (EDADES and ESTUDES) could reduce social desirability bias in self-reporting. Another limitation is the use of proxies to measure public alcohol policies that are individual aggregate variables. Even so, such measures may be more effective in determining the degree of enforcement of regulations than the existence or absence of alcohol control policies in each region.

## **Conclusion**

This study shows that youth binge drinking in Spain is associated with individual variables related to alcohol, regardless of contextual variables. In addition, these individual variables explained the variability in binge drinking among regions. Therefore, to be effective, alcohol control policies must be accompanied by interventions that take into account these individual variables, paying special attention to parental behavioral control and permissiveness toward drinking control and youth accessibility and availability to alcohol.

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## **Conflicts of interest**

The authors have no conflicts of interest to report, financial or otherwise.

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