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Understanding adolescent binge drinking in Spain: How school information campaigns moderate the role of perceived parental and peer consumption

Abstract:

Despite its potentially harmful effects, adolescent binge drinking is becoming increasingly common worldwide. To enable the design of more effective school information campaigns, the underlying factors of heavy alcohol use must be carefully analysed. This study investigated how individual, social, and contextual factors relate to adolescent binge drinking. It also explored whether adolescents' exposure to information campaigns at school moderates the relationships between perceived parental and peer alcohol consumption and adolescent binge drinking. We used data from a Spanish nationwide representative sample of 47,803 students aged 14 to 18 years, of whom 25,576 had engaged in binge drinking behaviours. Data were collected every two years between 2006 and 2012. For the multilevel estimation in 2012, the sample comprised 10,577 students. Whilst perceived problems associated with binge drinking and perceived difficulty in accessing alcohol were associated with low levels of binge drinking, adolescents' perceptions of parental and peer consumption were associated, to a greater degree, with high levels of binge drinking. School information campaigns moderated the relationship between parental consumption and adolescent binge drinking but not the relationship between peer consumption and adolescent binge drinking. We conclude by highlighting implications for policymakers and offering possible directions for future research.

Introduction

Alcohol is the most commonly used and abused drug by adolescents worldwide [1]. Although adolescents tend to use alcohol less frequently than adults, they do so in larger quantities and over shorter periods [2]. This type of heavy consumption, known as binge drinking, is particularly alarming when carried out by adolescents because alcohol potentially causes the greatest degree of physiological intoxication of people in this age group [2]. Consequently, adolescents have become a prime target for prevention messages that promote healthy, drug-free behaviour through campaigns by national and international health organizations [3]. Although underage binge drinking in university students has been studied worldwide, few studies have examined binge drinking by school students [4].[1]

Alcohol consumption is a complex behaviour that is influenced not only by individual factors but also by social and contextual factors [5]. By identifying these factors, which act as barriers or drivers of binge drinking, decision makers can gain a thorough understanding of how to encourage adolescents to engage in more responsible alcohol use [5]. The aim of this study was therefore to investigate how individual, social, and contextual factors that have been used to explain youth and adult alcohol consumption relate to adolescent binge drinking. Considering the socializing effects of peer and parental alcohol consumption reported in the literature [6], we analysed whether adolescents' exposure to school information campaigns moderated the relationships between peer and parental alcohol consumption and adolescent binge drinking. The method that we applied in this study enhanced the external validity of our findings: We used a nationwide representative sample of individuals aged 14 to 18 years rather than individuals of a specific age. Moreover, our method overcame limitations reported in other studies [7] because our estimation procedures were sensitive to the quantitative

[1] In Spain, 18 years old is the age of legal majority and the legal drinking age.

discrete count nature of the dependent variable (binge drinking) and considered the multilevel nature of the binge drinking decision-making process.

We conducted this study in Spain, where problems due to adolescent binge drinking have increased over the last decade [8]. Despite a downward trend in recent years, adolescent binge drinking is still highly prevalent and is associated with heavier use of illegal drugs (polydrug use) at early ages [9]. Alarming events that have had major media ramifications in Spain include the death of a 12-year-old girl in Halloween in 2016 [10] and the hospitalization a 13-year-old girl after drinking half a bottle of rum in 45 minutes in 2017 [11]. Last year, the Spanish Minister of Health announced the government's intention to address this social problem using measures that include the development of a new 'Law on the Prevention of Underage Alcohol Consumption'. According to the literature, context must be considered when analysing binge drinking. Cultural background (e.g. norms or values) is particularly important [12]. Alcohol consumption in Spanish culture is generally characterised by the regular consumption of small quantities of fermented drinks such as wine and beer. These consumption habits contrast with those of other European countries such as the UK, where people generally (binge) drink alcohol in large quantities one or two days a week. Amongst adolescents, early drinking and consumption patterns may vary considerably across European countries. For instance, a recent study of European adolescents aged 12 to 16 years revealed three country clusters of alcohol consumption [13]. The first comprised eight countries (including Spain) with 'mainly non-using' adolescents. The second comprised six Eastern European countries with adolescents who used alcohol in a 'mainly mild but frequent' way. The third comprised 11 mainly Central European countries with the 'highest proportions of (heavy) episodic drinking adolescents' [13]. Although studies of adolescent binge drinking have been carried out in English-speaking countries (e.g. the UK, Australia, and the US), such studies in Spain are practically non-existent [8, 14]. Therefore, data on Spanish adolescents is vital to broaden scholars' understanding of adolescent binge drinking.

Factors influencing adolescent binge drinking

Research has shown a wide array of individual, social, and contextual factors that may influence binge drinking behaviour [5]. At the individual level, numerous reasons for drinking alcohol have been examined (e.g. socioeconomic factors, knowledge, and attitudes). An important factor that appears in most behavioural health models relates to the perceived outcomes of performing a behaviour [15]. Choices, attitudes, or beliefs result from weighing up expected costs (i.e. negative outcomes) and benefits (i.e. positive outcomes) and choosing options with the highest perceived gains [4]. In the health literature, perceived outcomes have been analysed especially within the framework of expectancy theory (see Jones *et al.*'s review of studies of alcohol consumption [15]). Expectancy theory posits that individuals are motivated to change their behaviours from behaviours that are associated with problems to behaviours that are associated with more positive outcomes and fewer risks. Essentially, models within this theory combine probability judgements regarding the likelihood of negative consequences of one's behaviour with the expected utility of these consequences [15]. Thus, a person's tendency to perceive problems associated with binge drinking should be higher when the probability of negative consequences due to excessive alcohol consumption (e.g. 'I expect to have a hangover if I have several drinks') is higher and the perceived utility (e.g. 'Drinking several drinks will help me to be the life and soul of the party') is lower. It is commonly accepted that adolescents underestimate the risks associated with the consumption of addictive substances because, although they might be aware of the negative consequences of excessive alcohol consumption, they do not believe that they are personally vulnerable [16]. Thus, the analysis of perceived problems associated with adolescent binge drinking is crucial [17]. Empirical studies [18, 19] have shown that perceived negative outcomes of alcohol consumption are negatively related to adolescent binge drinking.

Binge drinking has also been linked to certain personal characteristics such as gender, age, socioeconomic status, and level of education [20]. For example, heavy drinking behaviours are more prevalent amongst males in most European countries [21]. This finding seems to hold worldwide for people of any age [22]. Heavy drinking has traditionally been considered proof of masculinity. Females are more likely to restrict their intake to appeal to female characteristics of virtue and sensitivity [35]. However, recent studies of adolescents in Western countries [8] have shown that alcohol consumption by females has increased considerably in recent years and that the gender gap has narrowed [12]. Furthermore, empirical evidence suggests that binge drinkers differ according to age [20] and that binge drinking is more prevalent in older adolescents (16–18 years) than in younger adolescents [23, 24]. Finally, personal income (i.e. the amount of money that adolescents receive in a regular week), which has been analysed to a lesser degree in the literature on adolescent alcohol consumption, may also be an important factor and may be positively related to binge drinking [25, 26]. In recent years, the use of personal income as a factor considered in the literature on underage alcohol consumption has grown because adolescents' disposable income has risen in most Western countries and does not necessarily depend on family income [27].

Studies have also shown that social and contextual factors significantly influence alcohol consumption at any age because these factors are nested within the microsystems where individuals live and interact (e.g. home, neighbourhood, and school) [28]. Along with the impact of peers, parents, and communities on adolescent substance use, schools are recognised not only as sites for the delivery of preventive drugs programmes, but also as important social environments [29]. In tertiary education (e.g. university), variables such as student perceptions of permissive norms, institution ownership (private vs. public), and on-campus alcohol advertising have been used to explain alcohol consumption [30]. However, less is known in the school context. School ownership (i.e. private vs. public) should be analysed contextually because the structure of public and private education in each country is

different. Spain, where 3 out of 10 students are enrolled in private schools, has one of the highest rates of private education in Europe [31].[2] Crucially, more than 60% of these private schools are owned by religious institutions, which usually have stricter and more normative ethical codes of conduct and a more personalized approach enabled by smaller classes than in public education [32]. Although better behaviour is therefore expected in private schools, some studies [33, 34] have shown that religious private schooling reduces certain risky behaviours such as teen sexual activity, arrests, and the use of hard drugs (e.g. cocaine) but not the use of alcohol, tobacco, or marijuana. However, the scarce studies that have examined the relationship between school ownership and adolescent alcohol consumption, some of which have been carried out in the same countries, have yielded mixed results. For instance, Valois *et al.* [35] found that students attending private high schools in the US had higher binge drinking prevalence rates than those attending schools in the public system. However, Guilamo-Ramos *et al.* [36] reported the opposite. Therefore, further research is needed.

Alcohol availability is another contextual factor that should be considered because easy access to alcohol increases the probability of heavy drinking [37]. Hence, a primary goal of alcohol policies to reduce underage drinking is to increase the full acquisition costs of the provision of alcohol beyond just the purchase price [37]. Despite these legal restrictions, however, most adolescents seem to have easy access to alcohol [26]. This availability can be conceived as being external to the individual (actual availability), by analysing physical accessibility to alcohol, or as being internal to the individual, by examining perceptions of this availability. Prior research has primarily focused on actual availability, measured as the density of alcohol outlets or adults' use of alcohol [28]. Less attention has been paid to subjective perceptions. Such subjective perceptions, also known as 'subjective availability',

[2] After school students in Spain complete primary education at the age of 12, the education system is divided into two cycles. The first consists of four years of compulsory secondary education (Educación Secundaria Obligatoria) for students aged 12 to 16 years. The second consists of two final years of post-compulsory secondary education (from the age of 16 to 18 years) by students who want to attend university. Schools in both the public and private education systems are allowed to teach both cycles.

are defined as the 'individual differences in how accessible people feel that alcohol is to them' [38, p. 124]. Subjective availability does not always coincide with actual alcohol access. For instance, in Spain, although the purchase of underage alcohol is banned everywhere, a recent study by the Ministry of Health showed that 90% of students aged between 14 and 18 years believed that it was easy or very easy to obtain alcohol [9]. What does seem clear is that adolescents who perceive greater opportunities to obtain alcohol might develop the impression that underage drinking is common, which could lead to higher alcohol consumption [39]. Accordingly, the perception that access to alcohol is difficult should be associated with lower levels of adolescent binge drinking.

Reference groups may also be crucial to understanding binge drinking because they can be seen as a kind of social pressure pushing individuals to behave in a certain way [40]. Social influences on human behaviour have been widely acknowledged in the literature [40, 41]. Several theories (e.g. the theory of planned behaviour [4] and the norm activation model [42]) consider social influences to explain individual's decision making. A reference group may affect individuals' behaviours due to its routines [43]. Research focusing on adolescent alcohol consumption has depicted parents and peers as important models for adolescents [6,44,45]. Accordingly, adolescents may decide to consume alcohol only because their parents and peers do [6]. Adolescents may imitate others whom they admire as models (e.g. parents) and may consider alcohol consumption a good idea. Some scholars have even suggested that parents often serve as the providers of adolescents' first alcoholic drinks [46]. Similarly, peers' and friends' drinking is positively associated with alcohol consumption [26, 47]. We therefore propose that the level of alcohol consumption by parents and peers is positively related to adolescent binge drinking.

The moderating role of information campaigns

Public institutions undertake several actions to provide people with accurate information about the consequences of unhealthy behaviours such as excessive alcohol

consumption so that they can adjust their expectations and adopt healthier behaviours. Some countries, for example, have developed alcohol warning labels to increase awareness of the negative consequences of alcohol and restrict its consumption [48]. Mass media campaigns similar to campaigns to prevent the use of other drugs or tobacco have been designed to prevent and reduce alcohol consumption [49]. However, for adolescents, school is the primary source of alcohol and drug abuse information [50]. Thus, efforts have been made to develop alcohol education programmes and assess the effectiveness of schools' alcohol policies [23].

In Spain, 96.8% of students consider school information campaigns useful tools to prevent alcohol consumption [51]. Recent research has shown that school campaigns raise awareness of the risks associated with alcohol consumption and help reduce alcohol consumption [50]. According to self-perception theory [52], this reduction may be due to the weaker influence exerted by reference groups when teenagers are exposed to information campaigns at schools. In this sense, people adjust their expectations about a given behaviour when they acquire new information, which then provides the basis for subsequent behaviours [52,53]. In the absence of first-hand information, which is considered most realistic [54], individuals usually base their expectations on information provided by other information sources (e.g. others' opinions, beliefs, or behaviours [53]). In short, in situations where an adolescent is poorly informed about the negative consequences of alcohol consumption, the influence exerted by reference groups will be greater because the adolescent in question lacks first-hand information to make a decision [55]. Information campaigns provide adolescents with new information upon which to base their decisions, which may reduce the influence of reference groups, as per the previous reasoning. Despite its importance, to the best of our knowledge, this influence has not been examined by prior studies. Thus, we posit that the relationships between perceptions of parental and peer alcohol consumption and adolescent binge drinking are stronger amongst adolescents who have not been exposed to any information campaigns at school.

Method

Data and sample characteristics

The data used in this study were gathered from a nationwide representative survey of students in Spanish middle and high schools (aged 14–18 years). The survey collected data on different issues related to alcohol and drug consumption and sociodemographic variables. This study (hereinafter referred to as ESTUDES) is conducted every two years by the Spanish Observatory of Drug and Drug Addiction and is implemented using a two-step random sampling method. A detailed description of the sample and method is available from the Spanish National Drugs Plan [56]. The use of ESTUDES provided a final sample of 47,803 students, 25,576 of whom had experienced binge drinking behaviour. Data were collected for the period 2006 to 2012. Data on 10,577 students (only those who had engaged in binge drinking behaviour) were collected for the multilevel estimation in 2012 due to data limitations. This sample was therefore larger than in many prior studies. For example, Desousa *et al.* [23] used a sample of 3,882 pupils, and De Bruijn *et al* [57] used a sample of 241 children.

Measures

Binge drinking

ESTUDES measures binge drinking using the following item, which is commonly used in the literature: '*In the last 30 days, how many days have you had five or more alcoholic drinks in a row (2-hour interval)?*' Participants responded on an 8-point scale (0 = none; 1 = 1 day; 2 = 2 days; 3 = 3 days; 4 = between 4 and 5 days; 5 = between 6 and 9 days; 6 = between 10 and 19 days; and 7 = 20 or more days). This ordinal variable was recoded into a quantitative count variable by approximating the number of days (mid-point) of binge drinking behaviour for each level.

Factors related to binge drinking

As previously stated, the proposed binge drinking model consisted of individual factors (perceived associated problems, gender, age, and personal income) and contextual/social factors (school ownership, perceived difficulty in accessing alcohol, and perceived consumption of parents and peers). Table I summarizes the items used for each variable.

The moderating role of information

Another key variable in the model was 'information a student receives about alcohol consumption and related risks' at school. As justified earlier, this information was expected to moderate the relationships between parental consumption and adolescent binge drinking and between peer consumption and adolescent binge drinking. Hence, the interaction effects between alcohol information at school and both reference groups were included.

Table I. Specific items used in the ESTUDES questionnaire and included in our model

Block	Variable	Item	Scale
Individual factors	Perceived associated problems	We would like to know your opinion about health problems (or other type of problems) that could be associated to drink 5-6 beers or alcoholic beverages during the weekends?	4-point scale: 0 (no problem), 1 (few problems), 2 (quite problems) and 3 (many problems)
	Gender		Male = 0 and female = 1
	Age		Number of years old
	Personal income	Currently, how much money (in Euros) do you have available per week for your personal expenses?	In Euros
Social & contextual factors	School ownership		0= Public and Private=1
	Perceived difficulty to access (less availability)	What difficulty do you think you would have to get beer or alcoholic beverages?	4-point scale: 1 (nearly impossible), 2 (very difficult), 3 (relatively easy) and 4 (very easy)
	Parental consumption: Father + mother	Which of the following statements better describes the alcohol consumption of your mother and your father in the last 30 days?	5-point scale: 0 (never), 1 (isolated day), 2 (only during weekends), 3 (most of the days with moderation) and 4 (abused most of the days)
	Peer consumption[1]	Thinking of friends and peers which you usually go out with and are related to, in	5-point scale: 0 (never), 1 (isolated day), 2 (some

Block	Variable	Item	Scale
		the last 30 days, how many days they have: (1) drunk alcoholic beverages and (2) become drunk	days), 3 (most of the days) and 4 (everyday)
	School alcohol informative talks (moderating variable)	In your school, have you received information or have you discussed about the effects and problems associated to the consumption of alcohol?	No = 0 and yes = 1

[1] Following recent studies [e.g.,44,47], friends are also considered in the measurement of perceived alcohol consumption among peers

Table II describes the change in these variables between 2006 and 2012.

Table II. Descriptive statistics of the included variables: Total sample average and annual (wave) averages

Independent variables	Pooled sample (n = 47,803)		2006 (n_{2006}= 7,221)		2008 (n_{2008}= 7,463)		2010 (n_{2010}=12,810)		2012 (n_{2012}=20,309)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Perceived associated problems	1.33	0.86	1.29	0.87	1.24	0.87	1.21	0.84	1.49	0.85
Gender (1 = female)[a]	52.3%	-	52.3%	-	52.9%	-	53.6%	-	51.5%	-
Age	15.90	1.20	15.99	1.21	15.84	1.15	15.80	1.13	15.97	1.24
Personal income	18.19	13.43	25.01	15.84	17.36	12.51	18.31	13.33	14.34	11.83
School ownership (1 = private)a	36.26%	-	48.8%	-	32.77%	-	33.3%	-	32.58%	-
Perceived difficulty to access (less availability)	1.32	0.59	1.30	0.57	1.35	0.60	1.26	0.52	1.35	0.64
Parental perceived consumption	1.72	1.65	1.18	1.38	1.19	1.38	1.83	1.68	2.04	1.72
Peer perceived consumption	4.59	2.07	4.78	1.90	4.76	1.96	4.94	1.82	4.15	2.29
Alcohol school information (1 = available)[a]	77.59%	-	73.75%	-	77.39%	-	78.4%	-	79.6%	-
Dependent count variable: Binge drinking	3.73	3.85	3,54	3.17	4.04	4.14	3.71	4.05	3.55	3.80
0 days	45.2%		45.9%		35.8%		35.2%		48.0%	
1 day	16.3%		14.9%		17.7%		20.0%		13.9%	
2 days	11.8%		11.7%		13.5%		14.4%		12.2%	
3 days	9.3%		9.7%		10.1%		11.2%		10.1%	
Between 4 and 5 days	9.7%		10.8%		12.3%		10.6%		7.6%	
Between 6 and 9 days	4.9%		5.3%		6.5%		5.0%		4.3%	
Between 10 and 19 days	1.7%		1.3%		2.5%		2.0%		2.2%	
20 or more days	1.1%		0.4%		1.6%		1.7%		1.8%	

[a] Values for dichotomous variables are presented as percentages of female, private school ownership and schools with alcohol informative talks

The average level of binge drinking increased between 2006 and 2008 and steadily decreased after 2008. These changes in the average level of binge drinking were confirmed by changes in the variable at different levels of consumption. The perceived problems associated with alcohol consumption increased in the last two years. Whilst perceived parental alcohol

consumption increased steadily over the whole period, perceived peer alcohol consumption decreased considerably in the last two years. Finally, 77.59% of individuals reported that they had received informative talks at school about the risks of alcohol.

Data analysis

The recoded outcome variable, frequency of binge drinking in number of days in the last month, was treated as a discrete count variable. To test our proposed relationships, we used a generalized linear model (GLM) with a negative binomial (NB) outcome variable and log link. This was the most suitable approach, given that the behaviour under study was a count variable and the equidispersion assumption was violated, E(Y)/Var(Y) = .924, Pearson-χ2/df = 1.462 (Table III) [58]. We also addressed problems of potential heteroscedasticity using robust estimates of the variance/covariance matrix [59]. The model was estimated using two different approaches (Table III). First, a classical NB model was estimated by pooling all observations for the period 2006 to 2012. Afterwards, as suggested in the literature [5, 23, 25], multilevel hierarchical estimation was performed to account for the fact that factors influencing student binge drinking varied across different levels (individual and social/contextual). The proposed multilevel NB model was given by:

$$Level\ 1\ (i = student): \quad Y_{ij} = \beta_{0j} + \beta_{1j} * X_{ij} + \varepsilon_{ij}$$

$$Level\ 2\ (j = school): \quad \beta_{0j} = \gamma_{00} + \gamma_{01} * Z_j + \mu_{oj} \quad and \quad \beta_{1j} = \gamma_{10} + \gamma_{11} * C_j + \mu_{1j}$$

$$General\ mixed\ model:$$

$$Y_{ij} = \gamma_{00} + \gamma_{01} * Z_j + \gamma_{10} * X_{ij} + \gamma_{11} * [C_j * X_{ij}] + \mu_{oj} + \varepsilon_{ij}$$

where Y_{ij} was student binge drink measured as a count variable; X_{ij} were student level factors (perceived associated problems, gender, age, and personal income); Z_j were social and contextual factors (perceived difficulty of access, perceived parental and peer consumption, and school ownership); and C_j were moderating effects (alcohol information campaigns at school). Data availability limitations meant that this analysis could only be performed for

2012 because the school identifier was only available for 2012 (level 2). The data were analysed following the procedures described by Heck *et al.* [BBB] using IBM-SPSS-Statistics 24 [59]. Table III shows the estimation of the proposed model using both procedures.

Results

As Table III shows, both proposed models had a good overall fit to the data (NB: Adj. McFadden R^2 = .717, Omnibus-LR-χ2 = 9,789.028, p < .001; Multilevel NB: Deviance Stat. = 17256.97, p < .001). The detailed interpretation of results is based on the hierarchical multilevel estimation, but both estimation procedures yielded similar results.

Direct relationships of individual, social, and contextual factors with adolescent binge drinking

For the individual factors, we observed a negative relationship between perceived associated problems and adolescent binge drinking [SMD_{PROB} = -.083, $Exp(ES)_{PROB}$ = .943, p < .005]. Thus, the number of binge drinking occasions (days) decreased by 8.3% for each unit increase in perceived associated problems. For personal characteristics, the results were as expected. Males were more likely to binge drink than females. Specifically, there were 20.7% fewer binge drinking episodes in females than in males [SMD_{FEMALE} = -.207, $Exp(ES)_{FEMALE}$ = .857, p < .005]. The association between personal income and binge drinking was also positive [SMD_{INC} = .009, $Exp(ES)_{INC}$ = 1.006, p < .005], although the effect was small. Contrary to our expectations, however, we observed no relationship between adolescent age and binge drinking [SMD_{AGE} = .0018, $Exp(ES)_{AGE}$ = 1.012, p > .005].

Results were mixed for social and contextual factors. Whereas perceived parental and peer consumption appeared to be positively related to binge drinking, the effect size estimates suggested that peer alcohol consumption was a more influential predictor of binge drinking than parental consumption was [SMD_{PEER_CONS} = .119, $Exp(ES)_{PEER\_CONS}$ = 1.082, p < .005; SMD_{PARENT_CONS} = .056, $Exp(ES)_{PARENT\_CONS}$ = 1.039, p < .005]. Conversely, the perceived difficulty in accessing alcohol was not related to adolescent binge drinking [SMD_{ACCESS} = -

.061, $Exp(ES)_{ACCESS}$ = .958, p > .005]. Finally, the analysis of school ownership showed that the number of binge drinking episodes amongst students enrolled in private schools was 12.8% lower than it was amongst students in public education [$SMD_{PRIVATE\_OWN}$ = -.128, $Exp(ES)_{PRIVATE\_OWN}$ = .912, p < .005].

Interactions between alcohol information in schools and consumption by reference groups

The results revealed differences between the two reference groups (Table III). First, the information that students received at school regarding alcohol moderated the relationship between parental consumption and binge drinking [$SMD_{PARENT\_CONS*SCHOOL\_INFO}$ = -.036, $Exp(\beta_{PARENT\_CONS*SCHOOL\_INFO})$ = .975, p < .05]. Whilst we observed a positive relationship between parental consumption and binge drinking amongst students in schools without informative talks (omitted group) [$SMD_{PARENT\_CONS(WITHOUT\_INFO)}$ = .056, $Exp(ES)_{PARENT\_CONS(WITHOUT\_INFO)}$ = 1.039, p < .05], this relationship was almost non-existent for students who attended schools with informative talks about alcohol [$\beta_{PARENT\_CONS(WITH\_INFO)} = \beta_{PARENT\_CONS(WITHOUT\_INFO)} + \beta_{PARENT\_CONS*SCHOOL\_INFO}$ = -.001]. Thus, students' exposure to information about alcohol at school significantly reduced the association between perceived parental consumption and adolescent binge drinking.

However, the moderating effect of information at school on the relationship between peer consumption and binge drinking differed. The non-significance of the interaction term between school information and peer consumption [$SMD_{PEER\_CONS*SCHOOL\_INFO}$ = .001, $Exp(ES)_{PEER\_CONS*SCHOOL\_INFO}$ = 1.00, p > .05] indicated no difference between informed and non-informed students. Nevertheless, the direct relationship between peer consumption and binge drinking [SMD_{PEER_CONS} = .119, $Exp(ES)_{PEER\_CONS}$ = 1.082, p < .05] indicated that peer consumption increased binge drinking, regardless of the information received at school.

Table III. Results of the regression analysis relating binge drinking with main factors, interaction effects and including fixed effects

Factors	**Negative Binomial**[1] (2006-2012)				**Multilevel Negative Binomial**[2] (2012)			
	beta	Exp(b)	SMD(effect size)[3] [95% CI]	Exp(effect size)[3] [95% CI]	beta	Exp(b)	SMD(effect size)[3] [95% CI]	Exp(effect size)[3] [95% CI]
Main relationships								
Individual factors:								
Age	0.007^{**}	1.007^{**}	0.008^{*} [0.005, -0.010]	1.007^{*} [1.005, -1.009]	0.012^{ns}	1.012^{ns}	0.018^{ns} [-0.032, 0.068]	1.012^{ns} [0.979, 1.046]
Gender (1=female)	-0.142^{**}	0.868^{**}	-0.217^{*} [-0.222, -0.212]	0.868^{*} [0.866, 0.870]	-0.154^{**}	0.857^{**}	-0.207^{*} [-0.302, -0.137]	0.857^{*} [0.820, 0.898]
Personal income	0.007^{**}	1.007^{**}	0.008^{*} [0.007, 0.008]	1.007^{*} [1.007, 1.007]	0.006^{**}	1.007^{**}	0.009^{*} [0.006, 0.013]	1.006^{*} [1.004, 1.008]
Perceived associated problems	-0.056^{**}	0.946^{**}	-0.059^{*} [-0.062, -0.055]	0.946^{*} [0.943, 0.949]	-0.059^{**}	0.943^{**}	-0.083^{*} [-0.143, -0.032]	0.943^{*} [0.911, 0.977]
Social & contextual factors:								
Perceived difficulty of Access	-0.068^{**}	0.934^{**}	-0.071^{*} [-0.076, -0.065]	0.934^{*} [0.929, 0.939]	-0.043^{ns}	0.958^{ns}	-0.061^{ns} [-0.139, 0.019]	0.958^{ns} [0.906, 1.013]
Perceived parental consumption	0.027^{**}	1.027^{**}	0.029^{*} [0.027, 0.032]	1.027^{*} [1.025, 1.030]	0.038^{**}	1.039^{**}	0.056^{*} [0.020 , 0.100]	1.039^{*} [1.014, 1.062]
Perceived peer consumption	0.087^{**}	1.091^{**}	0.098^{*} [0.095, 0.100]	1.091^{*} [1.089, 1.093]	0.079^{**}	1.082^{**}	0.119^{*} [0.081 , 0.168]	1.082^{*} [1.063, 1.101]
School ownership (1=private)	-0.001^{ns}	0.999^{ns}	-0.001^{ns} [-0.007, 0.005]	0.999^{ns} [0.993, 1.005]	-0.092^{**}	0.912^{**}	-0.128^{*} [-0.227, -0.045]	0.912^{*} [0.855, 0.968]
Moderation relationships:								
School info. X Parental consumption	-0.018^{**}	0.982^{**}	-0.019^{*} [-0.022, -0.016]	0.982^{*} [0.979, 0.985]	-0.025^{**}	0.975^{**}	-0.036^{*} [-0.081, 0.004]	0.975^{*} [0.949, 1.002]
School info. X Peer consumption	-0.004^{ns}	0.996^{ns}	-0.004^{ns} [-0.019, 0.010]	0.996^{ns} [0.983, 1.009]	0.007^{ns}	1.007^{ns}	0.01^{ns} [-0.009, 0.033]	1.007^{ns} [0.993, 1.021]
Adjustment indicators:								
Adj. McFadden R2 (compared to null model)	0.717				-			
Dispersion 1: E(Y) / Var (Y)	0.924				-			
Dispersion 2: Pearson $\chi 2$ /dof	1.462				-			
Omnibus test (overall adjustment) LR $\chi 2$	31365.36^{**}				-			
Akaike Information Criterion (AIC)	3295496.878				-			
Bayesian Information Criterion (BIC)	3295634.199				-			
Negative binomial parameter (95% CI)	0.494 [0.491. 0.497]				0.494			
Deviance statistic (compared to null model)	-				17256.97^{**}			
$\sigma 2$ intercept (IDschool)	-				0.133^{**}			

Note: Only students with Binge >0 are included in the estimations to avoid problems of zero-inflated models.

[1] GLM estimation Negative Binomial distribution with Log link function. Covariance matrix robust estimation ($n_{2006\text{-}2012}$ = 25,576)

[2] Multilevel GLM, Negative Binomial target function with Log link function. Covariance matrix robust estimation. Level 1 = student & Level 2= School (n_{2012}= 10,577)

[3] Effect size measurements, Negative binomial: SMD = Standardized mean difference (SMD) effect size & Exp(ES) = Exponential effect size (Coxe, 2018 [COX])

* p<.05. **p<.01. ***p<.001. ^{ns} non-significant.

Discussion

Alcohol consumption increases during adolescence, potentially becoming normalized behaviour throughout the underage population [44]. However, alcohol misuse negatively affects young people and is one of the world's leading causes of premature death [2]. To better understand and design information campaigns to prevent excessive alcohol consumption by adolescents, this study investigated the individual, contextual, and social factors associated with adolescent binge drinking. This study also explored whether information campaigns at school were effective at reducing the relationships between perceived parental and peer alcohol consumption and adolescent binge drinking. A nationally representative sample of Spanish students aged 14 to 18 years was used to study these research questions.

As expected, the findings indicate that perceived associated problems are associated with lower levels of binge drinking. This finding is consistent with those of most alcohol studies, which generally indicate that perceived associated problems [60] are a major barrier to underage alcohol consumption. As expected, gender and personal income were related to adolescent binge drinking behaviour. Accordingly, males engaged more in binge drinking behaviours than females did, supporting the findings of previous studies [47]. However, future studies should analyse this variable by age group because some studies have found that prevalence rates of early use amongst adolescents may be similar for girls and boys but different for males and females when they reach young adulthood [61]. Personal income was also positively related to binge drinking. This finding is consistent with previous studies too [24], even though the relationship was small. Previous studies suggest that age exerts a positive influence on binge drinking [24]. However, we observed a non-significant relationship after applying the multilevel NB approach (and a very small effect considering the whole sample). The reason for this finding may be that alcohol consumption starts very early in Spain. According to the Ministry of Health, Social Services and Equality [9], the

average age at which teenagers in Spain start consuming alcohol is 13.8 years old, and, by the age of 15, most consume alcohol every week.

Although some studies have shown that binge drinking is more prevalent amongst adolescents who attend private schools [35], our results indicate that the opposite is true in Spain. This finding may reflect the country's unique school environment and the profile of students in private versus public education. For example, 60% of private schools in Spain are owned by religious institutions, which usually have strict ethical standards [32]. This situation may help explain why binge drinking is lower amongst private school students in Spain. Further research comparing the link between adolescent binge drinking in private versus public education in different countries may be of interest to study this question. Although previous studies have shown that the perceived difficulty in accessing alcohol negatively affects binge drinking (particularly in terms of actual availability) [39], results from the multilevel NB approach suggest a non-significant relationship (or a very small effect considering the whole sample). A plausible explanation for this unexpected result is the distribution of the perceived difficulty in accessing alcohol in our sample. Around 83% of students in 2012 reported that it was *very easy* or *easy* to obtain alcoholic beverages, despite being illegal for underage individuals in Spain. Finally, results suggest that adolescents increase their excessive consumption according to the alcohol consumption of reference groups. Peer influence was observed to be greater than parental influence. Our results are therefore consistent with prior research that has reported the prominent role of social motives in drinking behaviours [62], particularly the influence of parents [45] and peers [44, 47] on adolescent alcohol consumption. Thus, it seems that adolescents may imitate drinking behaviours that they have witnessed in key reference groups. Notably, our findings indicate that peers, with whom individuals spend considerably more time during adolescence [63], are the most influential reference group. This finding is consistent with those reported in the literature [6, 47].

School information campaigns may reduce the relationship between perceived parental consumption and binge drinking. As in prior research [53], this finding could be explained by the fact that adolescents adjust their expectations regarding binge drinking as they acquire new information (in this case, from school information campaigns). This new information provides a basis for future binge drinking behaviours. This finding is consistent with recent studies [64] and indicates that health campaigns may moderate interpersonal influences on health behaviours. In contrast, we observed that peer influence remained unaffected by information campaigns. This unexpected finding highlights the role of peers as the most influential models for adolescent binge drinking. Peers play a central role in adolescents' relational networks [44,45]. Peers are particularly important during adolescence, a period during which group belongingness is highly valued. If friends engage in excessive alcohol consumption, teenagers may imitate them and behave in a similar way to conform to group requirements. Because of the relevance of the group, it may be difficult to reduce the relationship between peer consumption and binge drinking, even with the help of information campaigns. Teenagers may even internalize their peers' behaviour, developing a positive attitude towards binge drinking that becomes entrenched in their adolescent minds, making such attitudes difficult to change [65]. We did not examine these aspects, so future research should study internalization processes and teenagers' perceptions to enrich our understanding of this moderating effect.

From a policymaking perspective, our findings have several implications. First, because peers seem to exert the greatest relationship, actions should focus on reducing peer influence, as already suggested by prior research [47]. Second, the finding that school information campaigns do not reduce the relationship between peer consumption and binge drinking suggests that, even though they do reduce parental influence, current information campaigns should be rethought. In Spain, most information campaigns are run by the Ministry

of Health, Social Services and Equality,[3] and are available for implementation in any school in public or private education. These campaigns are primarily informative and focused on the risks associated with alcohol consumption, including health problems, youth violence, and road traffic accidents. These campaigns also offer guidelines for educators to detect and prevent alcohol consumption by teenagers. However, these campaigns are optional, with each individual school deciding whether to implement them. In our sample, the percentage of students that had been exposed to alcohol information campaigns ranged from 75.2% in 2008 to 79.8% in 2012. Although most students in Spain think that information at schools may help reduce consumption [51, 56], it may be advisable to use other means to educate students. As Van Damme *et al.* [62] noted, multicomponent interventions might be more effective. Underage students in Spain would also like to be informed by health personnel or people who have experienced alcohol problems [56]. Therefore, organizing additional sessions conducted by peers or others who have experienced the negative consequences of alcohol consumption may be helpful. This recommendation is consistent with recent interventions reported in the literature [66], where young people were asked to develop health messages based on their own experiences of the consequences of binge drinking. These interventions have yielded promising results in the UK [66]. The results by type of educational institution suggest that greater efforts must be made in public education. Therefore, campaigns should be designed to target these schools and should be tailored to each school's specific characteristics. Consistent with recent literature [62], we advocate adapting interventions to the context to make them more effective.

Third, due to the negative effect that barriers can have on binge drinking, policymakers should strengthen these barriers. For instance, in Spain, alcohol is perceived as less risky than other substances such as tobacco and cannabis [51]. Therefore, information should increase students' awareness of alcohol consumption. Developing greater legal

[3] http://www.msssi.gob.es/alcoholJovenes/home.htm

restrictions to hinder adolescents' access to alcoholic beverages should also be considered. Underage students in Spain consider it easy to access alcohol, and most report that they can access alcohol by themselves [51]. These measures should focus on other factors besides price because recent studies have shown that increasing alcohol taxes and prices are ineffective measures [47].

Despite these findings, this study also has certain limitations that present interesting opportunities for future research. First, although ESTUDES provided a nationally representative sample, we focused only on one country (Spain), so we should be careful when extrapolating our findings. For example, the research context may explain why we observed greater alcohol consumption amongst students in public education. Education systems vary across countries, and this may explain the inconsistent results reported in the literature. We advocate cross-cultural analyses to generalize these findings. Second, the questionnaire was originally developed for purposes other than our study, so we could not include other relevant variables to help develop more appropriate measurement scales or theoretical models. For instance, future research could focus on the influence of other personal characteristics such as ethnicity and immigration status and affective factors to explain adolescent binge drinking. Third, family aspects such as the degree of communication may also be relevant because parental influence may differ depending on whether parents are talkative and persuasive [82]. Fourth, our findings must be interpreted with caution. The sample was large, so some of the relationships reported in this research (e.g. the relationship between personal income and binge drinking) might not have been significant for smaller samples. Finally, our sample was a nationwide representative sample of students in middle and high school (aged 14–18 years). Because secondary education in Spain is mandatory only until age 16, some adolescents (aged 16 to 18 years) may leave secondary education without having been exposed to any information campaign at school. For the sake of completeness, although the proportion of

these students is quite small, it would be of interest to study the factors that relate to binge drinking amongst adolescents who drop out of high school.

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