

# Alcohol use and misuse: a profile of adolescents from 2018 Italian HBSC data

Lorena Charrier<sup>1</sup>, Natale Canale<sup>2</sup>, Paola Dalmasso<sup>1</sup>, Alessio Vieno<sup>2</sup>, Veronica Sciannameo<sup>3</sup>, Alberto Borraccino<sup>1</sup>, Patrizia Lemma<sup>1</sup>, Silvia Ciardullo<sup>4</sup>, Paola Berchiolla<sup>5</sup> and the 2018 HBSC-Italia Group\*

<sup>1</sup>Dipartimento di Scienze della Sanità Pubblica e Pediatriche, Università degli Studi di Torino, Turin, Italy

<sup>2</sup>Dipartimento di Psicologia dello Sviluppo e della Socializzazione, Università degli Studi di Padova, Padua, Italy

<sup>3</sup>Dipartimento di Scienze Cardio-Toraco-Vascolari e Sanità Pubblica, Università degli Studi di Padova, Padua, Italy

<sup>4</sup>Centro Nazionale per la Prevenzione delle Malattie e la Promozione della Salute, Istituto Superiore di Sanità, Rome, Italy

<sup>5</sup>Dipartimento di Scienze Cliniche e Biologiche, Università degli Studi di Torino, Turin, Italy

\*The members of the 2018 HBSC-Italia Group are listed before the References

## Abstract

**Objective.** Alcohol remains the most commonly substance used by adolescents. The aim of the study was to draw a comprehensive picture of the behavioural patterns that characterize alcohol use and abuse among 15-year-olds.

**Materials and methods.** The study sample included 18,918 15-year-olds participating in the 2018 Italian Health Behaviour in School-aged Children (HBSC) survey. A Bayesian approach was adopted for selecting the manifest variables associated with alcohol consumption; a latent class regression model was employed to identify health-related risk patterns associated with alcohol use.

**Results.** 21% of our sample represented the cluster of heavy drinkers who shared other risk behaviours: heavy smoking habits (29%), cannabis (68%), gambling (52%) and drunkenness (76%) experience, binge drinking (96%) and sexual intercourse (51%).

**Conclusions.** Our results confirm multiple risk-taking behaviours among adolescents tending to cluster in behavioural patterns. This has implications for public health policies and must be considered when planning interventions and prevention strategies.

## Key words

- adolescent health
- alcohol
- drunkenness
- co-substances use
- risk behaviour

## INTRODUCTION

Despite a trend of declining in alcohol consumption simultaneously to its abstinence increase among adolescents highlighted by different authors [1-3] and confirmed by data from the two most recent waves of HBSC surveillance (2014 and 2018), alcohol remains the most commonly substance used by 15-year-olds: overall almost three in five have drunk alcohol in their lifetime, compared with one in four for smoking and around one in seven that use cannabis [4, 5]. For decades two main models of alcohol consumption among adolescents have been described in Europe: the “dry culture” model in Northern Europe, characterized by sporadic consumption, mainly concentrated in the weekend, outside of mealtimes with the primary aim to get drunk; the “wet culture”, specific to the Mediter-

anean countries, characterized by more regular alcohol consumption, with greater overall quantities, but associated with meals and rituals. In this framework, Italy had a long-standing “wet culture” that has always been associated with high levels of alcohol consumption, especially wine [6-8]. However, recent reports indicate also for Italy and other Mediterranean countries an increase of the phenomenon of drinking “out of meal” and the growing tendency to approximate a Northern European style in the use of alcohol, that is, binge drinking (having experienced binge drinking – five or more drinks on one occasion – in the last 12 months was the question asked in the national HBSC questionnaire) [9, 10].

Data from the last international HBSC survey show that the overall prevalence of lifetime drunkenness remained relatively stable since 2014, with Italian data in

line with the HBSC averages (about 20% of 15-year-old adolescents had been drunk twice or more in their lifetime).

Alcohol abuse in adolescence may have a variety of adverse social, physical, psychological consequences for young people including missing school, school failure, having unprotected sex (with unintended pregnancy and sexually transmitted diseases as consequences), destructive behaviour, increase in injury likelihood, violence and even deaths [11-20].

The behavioural pattern of adolescents who consume alcohol can become even more complex. Findings from many studies confirm the co-occurrence of health risk behaviours, the idea that young adolescents exhibit multiple health risk behaviours that tend to cluster together [21-27] and also the evidence of strong similarities between countries in the clustering of adolescent risk behaviours [2].

On the other hand, proximal contexts such as family environment and school may shape the behavioural pattern of adolescents. Previous studies suggest that living in an intact family structure, having good relations with parents and parental control are protective factors for alcohol use and abuse as well as adolescents who spend a lot of time doing homework, enjoy school and perceive their school climate as positive, have lower prevalence rates of all alcohol outcomes [28, 29].

Although previous studies have found these relationships separately, less is known about the psychosocial pattern of alcohol in adolescents.

The aim of the present study was to draw a comprehensive picture of the behavioural social and psychological patterns that characterize alcohol use and abuse among 15-year-old adolescents in Italy.

## MATERIALS AND METHODS

### Study population and design

A summary of the methodology, the main areas and questions included in the Italian HBSC questionnaire can be found in a previous paper [30] and in the Appendix 1 of the paper by Nardone *et al.*, published in this issue of *Annali dell'Istituto Superiore di Sanità*.

### Participants

Because most risk behaviours showed more robust estimates of prevalence among 15-year-old students and some behaviours (i.e. gambling, cannabis use, binge drinking and sexual intercourse) were only assessed in this age-class, we limited our analyses to 15-year-old adolescents included in the Italian HBSC survey conducted in 2018.

### Statistical analyses

Details about the statistical analysis plan can be found in a previous paper [26].

A logistic regression model (LRM) was run on the dependent variable "frequent alcohol use" (response "weekly" or "every day" at the question "How often do you drink alcohol at present?"), and a spike-and-slab prior approach was used for selecting variables associated to alcohol use among: gender, Family Affluence Scale (FAS), which measures the socioeconomic sta-

tus of adolescents' family (see Appendix 1 in the paper by Nardone *et al.*, published in this same issue of *Annali dell'Istituto Superiore di Sanità*), parents's country of birth, family structure, easy to talk to father and mother, drunkenness, binge drinking, friends that drink alcohol, friends drunk at least weekly, having smoked every day in the last 30 days, cannabis and gambling lifetime experience, ever had sexual intercourse, self-rated health, life satisfaction, health complaints (like headache, stomach aches, feeling low, irritable or bad tempered, and having difficulty getting to sleep), liking school, been bullied, bullied others, fight, Body Mass Index (BMI, Cole's classification), body image, consumption of fruit and vegetables, consumption of sweets, use of soft-drinks, breakfast during schooldays and meals with family.

Variables with a posterior probability of a non-zero coefficient greater than 5% were entered as manifest variables in a latent class regression (LCR) model to identify clusters of adolescents sharing similar drinking habits [31]. Since the LCR model requires the specification of the number of clusters (latent classes), a series of models were fitted for two to five clusters. The choice of the best model was based upon the lowest value of the Bayesian information criterion [32].

Statistical analyses were performed using R version 4.0.0 [33]. R package PoLCA [34] was used to carry out the LCR analysis and Boom Spike Slab for the spike-and-slab regression.

## RESULTS

Analyses were performed on 18,918 questionnaires of 15-year-old students (9,506 females and 9,412 males).

Table 1 reports the characteristics of the study sample stratified for self-reported alcohol consumption among 15-year-old students. These data show high rates of other risk behaviours like heavy smoking habits, cannabis and gambling lifetime experience, drunkenness and binge drinking, fights, having friends who drink alcohol and experience frequent alcohol abuse and having had sexual intercourse, among adolescents that reported to drink at least weekly or every day. In addition, these adolescents tend to show lower life satisfaction, a lower rate of their health and more health complains than their peers who don't drink or drink rarely; they also seem to eat fruit and vegetables less frequently, and to consume sweets and soft-drinks at least once a day. High prevalence of alcohol consumption turned out to be associated with a family structure different from living with both parents and with more difficult relationships with adolescents' mother.

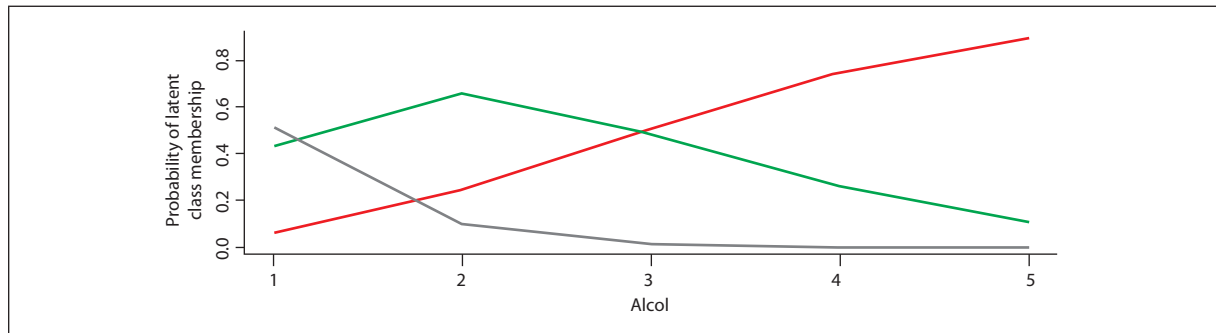
On the basis of the self-reported alcohol consumption (the possible responses to the question "How often do you drink alcohol at present?" ranged from never to every day – never; rarely; every month; every week; every day), the LCR model identified three latent classes for the second-grade HS students (Figure 1), which separate the sample (cluster 1 vs cluster 2,  $p < 0.001$ ; cluster 3 vs cluster 1,  $p < 0.001$ ).

The first cluster (red line) consisted mostly of adolescents who drink alcohol every day; the second cluster (green line) was composed of mostly "more moderate"

**Table 1**

Characteristics of the study sample stratified for alcohol consumption (responses from “Never” to “Everyday” to the question “How often do you drink alcohol at present?”)

<i>n</i>	How often do you drink alcohol at present?					p-value
	Never 3827	Rarely 6376	Monthly 3412	Weekly 4093	Every day 718	
Gender = female (%)	2025 (52.9)	3494 (54.8)	1860 (54.5)	1710 (41.8)	193 (26.9)	<0.001
<b>FAS (%):</b>						<0.001
Low	806 (21.6)	1208 (19.3)	528 (15.8)	666 (16.7)	137 (19.9)	
Medium	2024 (54.2)	3436 (54.8)	1741 (52.1)	2031 (50.9)	372 (54.1)	
High	903 (24.2)	1624 (25.9)	1075 (32.1)	1297 (32.5)	178 (25.9)	
<b>Parents born (%):</b>						<0.001
both in Italy	3000 (80.2)	5496 (87.3)	2960 (88.2)	3574 (88.4)	591 (84.7)	
1 abroad	267 (7.1)	440 (7.0)	225 (6.7)	281 (7.0)	46 (6.6)	
both abroad	473 (12.6)	361 (5.7)	172 (5.1)	186 (4.6)	61 (8.7)	
Family structure = living with both parents (%)	3083 (82.4)	5168 (82.2)	2686 (79.5)	3202 (79.5)	529 (77.2)	<0.001
Talk father = easy or very easy (%)	2117 (56.4)	3263 (51.8)	1599 (47.3)	2021 (49.9)	418 (60.0)	<0.001
Talk mother = easy or very easy (%)	2882 (76.7)	4675 (74.4)	2342 (69.5)	2738 (67.8)	490 (70.4)	<0.001
Drunkenness = lifetime, at least twice (%)	24 (0.6)	467 (7.3)	872 (25.7)	1784 (43.9)	366 (52.1)	<0.001
Binge drinking = yes in the past 12 months (%)	166 (4.4)	1752 (27.6)	2092 (61.5)	3162 (77.7)	563 (78.9)	<0.001
Friends that drink alcohol = lots-all (%)	1812 (47.3)	4047 (63.5)	2814 (82.5)	3587 (87.6)	558 (77.7)	<0.001
Friends drunk at least weekly = lots-all (%)	548 (14.3)	1038 (16.3)	657 (19.3)	1303 (31.8)	314 (43.7)	<0.001
Smoking = every day in the last 30 days (%)	46 (1.2)	252 (4.0)	246 (7.3)	692 (17.2)	230 (32.5)	<0.001
Cannabis = lifetime, yes (%)	181 (5.1)	846 (13.9)	970 (29.3)	1696 (42.9)	327 (50.3)	<0.001
Gambling = lifetime, yes (%)	888 (25.1)	2134 (35.2)	1437 (43.7)	2046 (51.8)	394 (60.9)	<0.001
Ever had sexual intercourse = yes (%)	300 (8.7)	936 (15.8)	750 (23.2)	1361 (35.1)	331 (52.5)	<0.001
Self-rated health = good/excellent (%)	3348 (88.0)	5600 (88.1)	2892 (85.0)	3467 (85.0)	562 (78.9)	<0.001
Life satisfaction ≥6 (%)	3267 (86.2)	5503 (86.9)	2836 (83.4)	3410 (83.8)	559 (79.1)	<0.001
Health complaints = at least 2 more than once a week (%)	2734 (72.2)	4927 (77.8)	2750 (80.9)	3387 (83.2)	590 (83.6)	<0.001
<b>Body Mass Index (%):</b>						<0.001
underweight	101 (3.0)	116 (2.0)	68 (2.2)	45 (1.2)	13 (2.1)	
proper weight	2719 (79.9)	4724 (80.7)	2571 (81.7)	3011 (79.4)	466 (74.4)	
overweight	494 (14.5)	845 (14.4)	430 (13.7)	614 (16.2)	116 (18.5)	
obese	87 (2.6)	167 (2.9)	76 (2.4)	123 (3.2)	31 (5.0)	
Body image = perceiving to be too fat (%)	1005 (26.7)	1893 (30.0)	1104 (32.6)	1329 (32.9)	200 (28.6)	<0.001
Liking school = a bit or a lot (%)	2633 (69.1)	4181 (65.8)	2013 (59.2)	2068 (50.7)	281 (39.7)	<0.001
Been bullied = never (%)	3414 (90.0)	5769 (91.2)	3107 (91.4)	3698 (91.0)	616 (87.4)	0.004
Bullied others = never (%)	3481 (91.8)	5695 (90.0)	2985 (87.8)	3392 (83.5)	517 (73.0)	<0.001
Fight = never in the last 12 months (%)	3112 (81.9)	4737 (74.8)	2283 (67.0)	2267 (55.8)	296 (41.9)	<0.001
Fruit = at least once a day everyday (%)	1396 (36.5)	2225 (34.9)	1185 (34.8)	1302 (31.9)	244 (34.2)	<0.001
Vegetables = at least once a day everyday (%)	1202 (31.5)	1949 (30.6)	1107 (32.5)	1134 (27.8)	200 (28.1)	<0.001
Sweets = less than once a day (%)	2853 (74.5)	4774 (74.8)	2560 (75.0)	2909 (71.0)	432 (60.2)	<0.001
Soft-drinks = less than once a day (%)	3480 (90.9)	5753 (90.2)	3103 (91.0)	3533 (86.3)	488 (68.0)	<0.001
Breakfast during schooldays = 5 days (%)	2224 (59.0)	3494 (55.5)	1742 (51.5)	1996 (49.3)	330 (46.9)	<0.001
Meals with family = every day (%)	2196 (57.4)	3525 (55.3)	1667 (48.9)	1988 (48.6)	385 (53.6)	<0.001



**Figure 1**

Alcohol consumption clusters of 15-year-old adolescents. Predicted prior probabilities of latent class membership based on the self-reported alcohol use of Italian adolescents involved in HBSC (with answer ranging from 1 -never to 5 -every day).

drinkers (students who refer to drink rarely or monthly); finally, the third cluster (grey line) comprised adolescents who do not drink or rarely drink alcohol.

According to the class-conditional probabilities estimated by the LRC model, the first cluster of heavy drinkers corresponds to the 21% of the sample. Adolescents who reported to drink everyday have a membership probability of about 89%; for those who reported to drink weekly but not every day it was 74% and for occasionally (monthly) drinkers 51%. The membership probability of those who reported to not drink was only 5%, while it was 25% for those who reported to drink rarely.

The second cluster (moderate) comprised adolescents who reported to drink rarely (66% of membership probability to the cluster) or monthly (48% of membership probability to the cluster) as well as non-drinkers (43% of membership probability to the cluster), and represents about the 41% of the sample.

Finally, the third cluster grouped mainly non-drinkers (50% of membership probability) and occasionally drinkers (9% of membership probability), who are about the 38% of the sample.

An indicator of the goodness of fit of the LCR models is the congruence between the estimated class population shares and the model predicted class membership. Estimated class population shares are 21%, 41% and 38% for cluster 1, cluster 2 and cluster 3 respectively, whereas model predicted class memberships are 20%, 40% and 40%, for cluster 1, cluster 2 and cluster 3, respectively.

Based on the assumption that adolescents with similar responses tend to cluster within the same risk profile, the class-conditional response probabilities of other self-reported risk behaviours were examined to obtain a risk profile of alcohol drinkers.

Figure 2 shows the profile of 15-year-old adolescents according to their propensity to consume alcohol.

As analyses showed similar profiles for boys and girls, the results are presented without stratifying by gender.

Adolescents who report heavy alcohol consumption (alcohol abuse profile) show higher prevalence of lifetime drunkenness (76%) compared to peer that drink less frequently (8%); they tend to have friends that drink alcohol as well, and experience weekly drunkenness (41% vs 12% among adolescents that do not drink).

Among moderate drinker adolescents (moderate profile), 83% reported to have friends who drink and 51% reported to have experienced binge drinking in the past 12 months. Similarly to adolescents who abuse alcohol, 47% of them experienced gambling (against 52% among teens who abuse alcohol). However, differently from adolescents who abuse alcohol, only 19% experienced cannabis use (against 68%) and a higher percentage reported to like school (61% against 45%).

Finally, among teens who do not drink or drink rarely alcohol (no Alcohol profile), only 52% reported to have friends who make use of alcohol, and 74% noticed to like school. None of them experienced drunkenness nor smoking every day in the last 30 days, and only 2% make binge drinking and cannabis use. Other risk behaviours are considerably lower: 14% reported fights and only 6% had sexual intercourse against 51% among heavy alcohol consumers for both items.

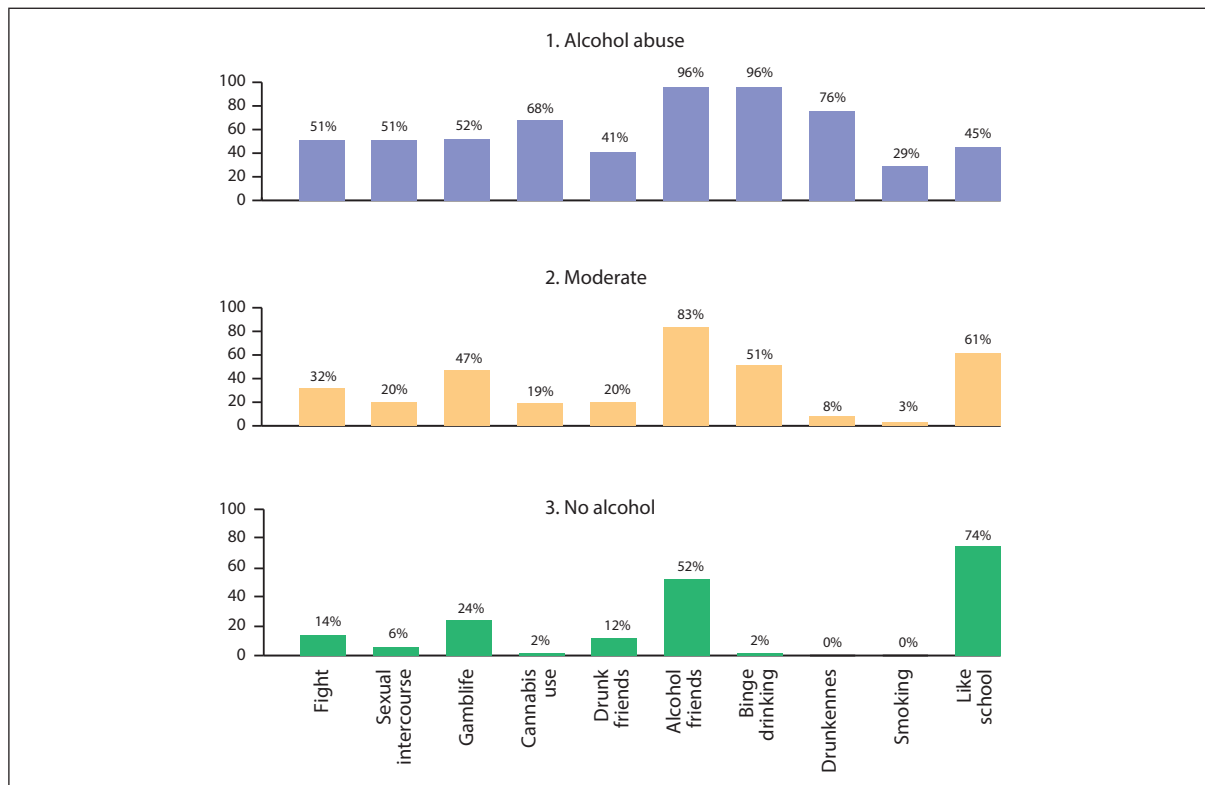
## DISCUSSION

Adolescence is a transitional phase of life particularly susceptible to transgressions and risk-taking impulses, like smoking, cannabis use and harmful drinking [9, 35]. Moreover, the evidence about the co-occurrence of risk behaviours among adolescents may have important implications for the design of intervention programs and the most promising approaches for reducing risk behaviours are those that simultaneously address several domains of risk and protective factors [23, 24].

To depict these aspects of adolescent health, we searched for the behavioural patterns that characterize different levels of alcohol consumption and drew up a profile of Italian teens who use and abuse alcohol.

Confirming previous findings that adolescents exhibit multiple health risk behaviours that tend to cluster in behavioural patterns [21-27], we have identified a cluster of about 21% of 15-year-old adolescents who abuse alcohol and show higher rates of other risk behaviours such as cannabis use, gambling experience, fights with peers, heavy smoking habits in addition to a more negative school approach with respect to peers with a more moderate alcohol use or adolescents who do not drink or drink rarely.

Other aspects that the literature recognized as protective for alcohol use and abuse [28, 29], like living in



**Figure 2**

Profiles of 15-year-old adolescents who abuse alcohol, who are moderate drinkers and adolescents who do not drink or rarely drink alcohol.

intact families and having good relations with parents, did not turn out to be distinctive features of the behavioural pattern of teens in Italy. Conversely, in line with literature results, the role of peers showed a significant association with alcohol abuse, confirming that in this phase of life the influence of friends increases and becomes greater than that of parents [28, 36].

#### **Alcohol use and abuse: Italian HBSC results 2018 vs International HBSC results 2018**

Data about alcohol consumption obtained from Italian HBSC 2018 study were compared to those from the International HBSC 2018, which involved 45 countries (including Italy).

Data from the last international survey [5] confirm alcohol as the most commonly used substance by 15-year-olds, despite the decline of lifetime use since 2014: almost 3 in 5 have drunk alcohol in their lifetime, with a higher prevalence among boys, especially among younger adolescents. 1 in 5 15-year-olds had been drunk twice or more in their lifetime and almost 1 in 7 (15%) had been drunk in the last 30 days; drunkenness remains higher among boys than girls in all age groups and in almost all HBSC countries [5], even though an increase in alcohol use among adolescent girls was noticed in some countries [1], confirming the gender convergence of the last decade highlighted in previous studies [9].

Italy ranked among the HBSC countries with the highest prevalence of regular alcohol consumption (7°

and 15° place for boys and girls, respectively, who reported having ever drunk alcohol in their lifetime; 4° and 13° place for having drunk alcohol in the last 30 days). Conversely, our country was in the second half of the international ranking for drunkenness for both genders (27° place for 15-year-olds who declare having been drunk at least twice in their lifetime and 26° place for having been drunk in the last 30 days).

Further research is needed to better understand the long-term impact of interventions with proven positive short-term effects and to improve the evidence of effectiveness of interventions addressing multiple risk-taking behaviours. In a public health perspective, the evidence of strong similarities between countries in the clustering of adolescent risk behaviours suggests to European and North American countries to collaborate in developing and implementing programs aimed at preventing or reducing adolescent risk behaviours [2]. Furthermore, interventions and policies focused on adolescent health should consider the presence of vulnerability in some young people evaluating differences and possible inequalities among them.

#### **STRENGTHS AND LIMITATIONS**

The main strength of this study was the use of a large and representative Italian sample that allowed to draw a profile of teens who drink and abuse alcohol.

To do that, we used a Bayesian approach to select variables for clustering adolescents into risk profiles,



which has proven advantageous in the analysis of highly correlated information.

Unfortunately, as details are lacking about some risk behaviours among younger students, we had to limit our analyses to 15-year-olds.

The HBSC methodology strengths and limitations were described in Appendix 1 of the paper by Nardone et al., published in this issue of *Annali dell'Istituto Superiore di Sanità*.

## CONCLUSIONS

Our findings highlighted that 1 in 5 Italian adolescents aged 15 years are heavy alcohol consumers and confirmed previous findings that risk-taking behaviours tend to cluster in behavioural patterns. In fact, the same adolescents that showed alcohol abuse, experienced other risk behaviours such as cannabis use, binge drinking, drunkenness, heavy smoking, gambling, sexual intercourse and fighting more frequently than their peers with a more moderate alcohol consumption.

This should be considered when designing and implementing programs to reduce risk behaviours among adolescents.

## Acknowledgments

We thank all students who completed the questionnaires. Special thanks to the school head teachers, class teachers and other school staff who actively participated in the implementation of the HBSC survey. We thank all the Regional and Local Health Unit coordinators and the health workers for their fundamental contribution to the HBSC.

## Funding

Italian HBSC survey is promoted and funded by the Ministry of Health – Centro per la Prevenzione e Controllo delle Malattie and by the Italian National Institute of Health.

## Ethical approval

The Italian HBSC study protocol and questionnaire were formally approved by the Ethics Committee of the Italian National Institute of Health (PROT-PRE876/17, 20 November 2017).

## Authors' contribution

LC, PB and PD participated in designing the study. LC, PB, AV, NC, SC, PD, PL AB and VS drafted the manuscript. PB conceived the analyses plan; PB and LC performed the statistical analysis. All authors participated in data collection as members of the Italian HBSC team.

## Conflict of interest statements

All Authors declare that they have no conflict of interest.

Submitted on invitation

Accepted on 14 September 2020.

## Members of the 2018 HBSC-Italia Group

Paola Nardone, Angela Spinelli, Serena Donati, Daniela Pierannunzio, Enrica Pizzi, Silvia Ciardullo, Silvia Andreozzi, Mauro Bucciarelli, Barbara De Mei, Chiara Cattaneo (Istituto Superiore di Sanità, Rome, Italy); Franco Cavallo, Nazario Cappello, Giulia Piraccini, Paola Berchiolla, Alberto Borraccino, Lorena Charrier, Paola Dalmasso, Patrizia Lemma, Veronica Sciannameo (Università degli Studi di Torino, Turin, Italy); Alessio Vieno, Natale Canale, Marta Gaboardi, Michela Lenzi, Claudia Marino, Massimo Santinello (Università degli Studi di Padova, Padua, Italy); Giacomo Lazzeri, Mariano Vincenzo Giacchi, Andrea Pammolli, Rita Simi (Università degli Studi di Siena, Siena, Italy); Daniela Galeone, Maria Teresa Menzano (Ministero della Salute, Rome, Italy); Alessandro Vienna (Ministero dell'Istruzione, dell'Università e della Ricerca, Rome, Italy); Claudia Colleluori, Manuela Di Giacomo, Ercole Ranalli (Regione Abruzzo), Gabriella Cauzillo, Mariangela Mininni, Gerardina Sorrentino (Regione Basilicata), Caterina Azzarito, Antonella Cernuzio, Marina La Rocca, Adalgisa Pugliese (Regione Calabria), Gianfranco Mazzarella (Regione Campania), Paola Angelini, Marina Fridel (Regione Emilia-Romagna), Claudia Carletti, Federica Concina, Luca Ronfani, Paola Pani (Regione Friuli Venezia Giulia), Giulia Cairella, Laura Bosca, Maria Teresa Pancallo (Regione Lazio), Giannaelisa Ferrando (Regione Liguria), Corrado Celata, Liliana Coppola, Claudia Lobascio, Giuseppina Gelmi, Lucia Crottogini, Veronica Velasco (Regione Lombardia), Simona De Introna, Giordano Giostra (Regione Marche), Maria Letizia Ciallella, Michele Colitti, Ermanno Paolitto (Regione Molise), Marcello Caputo (Regione Piemonte), Domenico Stingi, Pina Pacella, Pietro Pasquale (Regione Puglia), Maria Antonietta Palmas, Alessandra Murgia (Regione Sardegna), Achille Cernigliaro, Maria Paola Ferro, Salvatore Scondotto (Regione Sicilia), Laura Aramini, Valentina Corridori, Giacomo Lazzeri (Regione Toscana), Marco Cristofori, Daniela Sorbelli, Giovanni Giovannini (Regione Umbria), Anna Maria Covarino (Regione Valle D'Aosta), Federica Michieletto, Erica Bino (Regione Veneto), Maria Grazia Zuccali (Provincia Autonoma di Trento), Antonio Fanolla, Sabine Weiss (Provincia Autonoma di Bolzano).

## REFERENCES

- Inchley J, Currie D, Vieno A, et al. Adolescent alcohol-related behaviours: trends and inequalities in the WHO European Region, 2002-2014. WHO Regional Office for Europe; 2018. Available from: [/www.euro.who.int/en/publications/abstracts/adolescent-alcohol-related-behaviours-trends-and-inequalities-in-the-who-european-region,-20022014-2018](http://www.euro.who.int/en/publications/abstracts/adolescent-alcohol-related-behaviours-trends-and-inequalities-in-the-who-european-region,-20022014-2018).
- Looze MD, Raaijmakers Q, Bogt TT, et al. Decreases in adolescent weekly alcohol use in Europe and North America: evidence from 28 countries from 2002 to 2010. *Eur J Public Health*. 2015;25:69-72.
- Vieno A, Altoè G, Kuntsche E, Elgar FJ. Do public ex-

- penditures on health and families relate to alcohol abstaining in adolescents? Multilevel study of adolescents in 24 countries: International trend in alcohol abstaining in adolescence. *Drug Alcohol Rev.* 2018;37:S120-S128.
4. Inchley J, Currie D, Cosma A, Samdal O. Health Behaviour in School-Aged Children (HBSC) study protocol: Background, methodology and mandatory items for the 2017/18 Survey. St Andrews: CAHRU; 2018.
  5. Inchley J, Currie D, Budisavljevic S, Torsheim T, Jastad A, Cosma A. Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings. Copenhagen: WHO Regional Office for Europe; 2020.
  6. Room R. Intoxication and bad behaviour: understanding cultural differences in the link. *Soc Sci Med.* 2001;53:189-98.
  7. Room R, Bullock S. Can alcohol expectancies and attributions explain western europe's north-south gradient in alcohol's role in violence? *Contemp Drug Probl.* 2002;29:619-48.
  8. Collicelli C. Italian lifestyle and drinking cultures. In: Prina F, Tempesta E (Eds.). *Salute e società. Youth and alcohol: Consumption, abuse and policies, an interdisciplinary critical review.* Franco Angeli; 2010.
  9. Vieno A, Lenzi M, Santinello M, Cavallo F. Gender convergence in adolescent drunkenness in different Italian regions. *Int J Public Health.* 2013;58:785-90.
  10. Aresi G, Cleveland MJ, Vieno A, Beccaria F, Turrisi R, Marta E. A mixed methods cross-cultural study to compare youth drinking cultures in Italy and the USA. *Appl Psychol Health Well-Being.* 2020;12:231-55.
  11. Perkins HW. Surveying the damage: a review of research on consequences of alcohol misuse in college populations. *J Stud Alcohol Suppl.* 2002;91-100.
  12. Ellickson PL, Tucker JS, Klein DJ. Ten-year prospective study of public health problems associated with early drinking. *Pediatrics.* 2003;111:949-55.
  13. Tomlinson KL, Brown SA, Abrantes A. Psychiatric comorbidity and substance use treatment outcomes of adolescents. *Psychol Addict Behav.* 2004;18:160-9.
  14. Currie D, Small G, Currie C. Prevalence and profiles of substance and multi-substance use by adolescents: UK and international perspectives. London: Advisory Council on the Misuse of Drugs; 2005.
  15. Crosnoe R. The connection between academic failure and adolescent drinking in secondary school. *Sociol Educ.* 2006;79:44-60.
  16. Shope J, Bingham C. Teen driving/motor-vehicle crashes and factors that contribute. *Am J Prev Med.* 2008;35:S261-S271.
  17. Alex Mason W, Hitch JE, Kosterman R, McCarty CA, Herrenkohl TI, David Hawkins J. Growth in adolescent delinquency and alcohol use in relation to young adult crime, alcohol use disorders, and risky sex: a comparison of youth from low- versus middle-income backgrounds: Adolescent delinquency and alcohol use. *J Child Psychol Psychiatry.* 2010;51:1377-85.
  18. Boden JM, Fergusson DM. The short- and long-term consequences of adolescent alcohol use. In: Saunders JB, Rey JM (Eds.). *Young people and alcohol.* Chichester, UK: John Wiley & Sons, Ltd; 2014.
  19. Feldstein Ewing SW, Sakhardande A, Blakemore S-J. The effect of alcohol consumption on the adolescent brain: A systematic review of MRI and fMRI studies of alcohol-using youth. *NeuroImage Clin.* 2014;5:420-37.
  20. Marshall EJ. Adolescent alcohol use: Risks and consequences. *Alcohol Alcohol.* 2014;49:160-4.
  21. DuRant RH, Smith JA, Kreiter SR, Krowchuk DP. The relationship between early age of onset of initial substance use and engaging in multiple health risk behaviors among young adolescents. *Arch Pediatr Adolesc Med.* 1999;153:286-91.
  22. French S, Rosenberg M, Knuiman M. The clustering of health risk behaviours in a Western Australian adult population. *Health Promot J Austr.* 2008;19:203-9.
  23. Jackson C, Sweeting H, Haw S. Clustering of substance use and sexual risk behaviour in adolescence: analysis of two cohort studies. *BMJ Open.* 2012;2:e000661.
  24. Spring B, Moller AC, Coons MJ. Multiple health behaviours: overview and implications. *J Public Health.* 2012;34:i3-i10.
  25. Molinaro S, Benedetti E, Scalese M, et al. 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: Underage gambling in Europe. *Addiction.* 2018;113:1862-73.
  26. Charrier L, Berchiolla P, Dalmasso P, Borraccino A, Lemma P, Cavallo F. Cigarette smoking and multiple health risk behaviors: A latent class regression model to identify a profile of young adolescents. *Risk Anal.* 2019;39:1771-82.
  27. Walsh SD, Sela T, De Looze M, et al. Clusters of contemporary risk and their relationship to mental well-being among 15-year-old adolescents across 37 countries. *J Adolesc Health.* 2020;66:S40-S49.
  28. Steketee M, Jonkman H, Berten H, Vettenburg N. Alcohol use among adolescents in Europe: environmental research and preventive actions. The Netherlands: the Verwey-Jonker Institute; 2013. Available from: <http://hdl.handle.net/1854/LU-3257735>.
  29. Tomčíková Z, Dankulincová Veselská Z, Madarasová Gecková A, van Dijk JP, Reijneveld SA. Adolescents' drinking and drunkenness more likely in one-parent families and due to poor communication with mother. *Cent Eur J Public Health.* 2015;23:54-8.
  30. Lazzari G, Giacchi MV, Dalmasso P. The methodology of the Italian HBSC 2010 study (Health Behaviour in School-aged Children). *Ann Ig Med Prev E Comunità.* 2013;25:225-33.
  31. Laska MN, Pasch KE, Lust K, Story M, Ehlinger E. Latent class analysis of lifestyle characteristics and health risk behaviors among college youth. *Prev Sci.* 2009;10:376-86.
  32. Lin TH, Dayton CM. Model selection information criteria for non-nested latent class models. *J Educ Behav Stat.* 1997;22:249-64.
  33. R Core Team. R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing; 2019.
  34. Linzer DA, Lewis JB. *poLCA*: An R package for polytomous variable latent class analysis. *J Stat Softw.* 2011;42. doi: 10.18637/jss.v042.i10
  35. Simons-Morton BG, Farhat T, Ter Bogt TFM, Hublet A, Kuntsche E, Saoirse Nic Gabhainn SN, Godeau E, Kokkevi A, and the HBSC Risk Behaviour Focus Group. Gender specific trends in alcohol use: cross-cultural comparisons from 1998 to 2006 in 24 countries and regions. *Int J Public Health.* 2009;54:199-208.
  36. Currie C, Gabhainn S, Godeau E, et al. Inequalities in young people's health: HBSC international report from the 2005/06 Survey. Health Policy for Children and Adolescents, No. 5, Copenhagen, Denmark: WHO Regional Office for Europe; 2008.