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# Characterization of alcohol consumption and related problems in university students from Mexico City

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## ABSTRACT

**Introduction.** In Mexico, alcohol consumption is the main problem related to substance use among university students. **Objective.** To analyze emerging alcohol consumption patterns in students at a public university through the administration of an online survey. **Method.** This is a cross-sectional, survey-based study. Participants included 3,888 students from a large university in Mexico City, to whom the alcohol and sociodemographic data section of the *Cuestionario de Estudiantes 2014* was electronically administered in August-September 2018 and 2019. Latent Class Analysis was applied to the data obtained. During the research, the principles, norms, and ethical precepts of research on human beings were observed. **Results.** The relevant variables observed were *length of exposure to alcohol, excess alcohol consumption, consumption on a typical day and alcohol-related consequences*, which were used to create a model with four groups: *teetotalers and early drinkers without consequences, risky drinkers with consequences, experienced risky drinkers without consequences and habitual drinkers with consequences*. 36.7% of the sample were classified into groups with consequences and a high likelihood of excess consumption. **Discussion and conclusion.** Lengthy exposure to alcohol influences measures of frequency and intensity of consumption in relation to the number of consequences suffered. This latent class model can guide the design and priority of universal, selective, or suggested preventive interventions.

**Keywords:** Alcohol drinking, students, latent class analysis, threshold, measurement.

## RESUMEN

**Introducción.** En México, el consumo de alcohol es el principal problema relacionado con el uso de sustancias entre estudiantes universitarios. **Objetivo.** Analizar los patrones emergentes de consumo de alcohol en estudiantes de una universidad pública por medio de la aplicación de una encuesta en línea. **Método.** Es un estudio transversal por encuesta en que participaron 3,888 estudiantes de nivel medio superior y superior de una universidad pública de gran tamaño en la Ciudad de México, a quienes se les aplicó, vía electrónica, la sección de alcohol y datos sociodemográficos del *Cuestionario Estudiantil 2014*, en los meses de agosto-septiembre de 2018 y 2019. Se aplicó un Análisis de Clases Latentes a los datos obtenidos. Durante la investigación se observaron los principios, normas y preceptos éticos de la investigación con seres humanos. **Resultados.** Las variables observadas relevantes fueron: *tiempo de exposición a la sustancia, consumo excesivo de alcohol, consumo en un día típico y consecuencias asociadas al consumo*, con las cuales se integró un modelo de cuatro clases: *abstemios y bebedores iniciales sin consecuencias, bebedores riesgosos con consecuencias, bebedores riesgosos experimentados sin consecuencias y bebedores habituales con consecuencias*. El 36,7% de la muestra se agrupó en las clases con consecuencias y una alta probabilidad de consumo excesivo. **Discusión y conclusión.** El tiempo de exposición a la sustancia articula las medidas de frecuencia e intensidad del consumo en relación con el número de consecuencias sufridas. Este modelo de clases latentes puede guiar el diseño y prioridad de intervenciones preventivas universales, selectivas o indicadas.

**Palabras clave:** Consumo de alcohol, estudiantes, análisis de clases latentes, umbral, medición.

## INTRODUCTION

Excess alcohol consumption among teenage students and young adults is practically a worldwide problem (World Health Organization, 2018). The abrupt increase in this type of consumption during adolescence and the presence of peaks of consumption in young adults (Kuntsche & Gmel, 2013), with more severe effects among males, has been associated with short-term acute adverse consequences such as hangovers, forgetfulness, and alcohol-induced blackouts (Labhart, Livingston, Engels, & Kuntsche, 2018; Wetherill & Fromme, 2016), self-inflicted injuries or towards third parties (Borges et al., 2017; 2006; Korcha et al., 2018), and chronic, long-term effects such as non-transmissible diseases.

In Mexico, epidemiological studies on the type of alcohol consumption in the general population aged 12 to 17 nationwide indicates a certain degree of stability in *lifetime use, in the past year and in the past month*, whereas in women *excess consumption in the past month* increased without reaching the proportions observed in men. They also point to increased difficulty with housework, the ability to study, maintaining close relationships, social life, and days lost due to consumption as alcohol consumption increases (Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz, Instituto Nacional de Salud Pública, Comisión Nacional Contra las Adicciones, & Secretaría de Salud, 2017).

As for the student population aged 14 to 18, in Mexico City, the four types of consumption mentioned showed a consistent increase as age increased. Likewise, *problem drinking* among both girls and boys at junior and senior high school was higher than national rates (Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz, Comisión Nacional Contra las Adicciones, & Secretaría de Salud, 2015; Villatoro et al., 2015).

Studies on the Mexican university population report the presence of physical, relational, and legal problems and accidents as the amount of alcohol consumed increases (Mora-Ríos & Natera, 2001), identification of risky, harmful use (Díaz Martínez et al., 2008), the presence of alterations in the academic performance of students with excess consumption (Díaz Martínez, Díaz Martínez, Hernández Ávila, & María-Reydl, 2012), and changes in consumption patterns, and have characterized consumption patterns and violent victimization (Strunin, 2015a; 2015b), as well as the prevalence of deterioration in students with alcohol consumption disorder (ACD), placing it among the three main disorders affecting their performance at work or university (Alonso et al., 2018).

Many epidemiological studies use the threshold of  $\geq 4$  beverages consumed for women and  $\geq 5$  for men as an operational definition of excess alcohol consumption (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994), which has been a benchmark in various research contexts for over two decades. The National Institute on Alcohol Abuse and

Alcoholism (NIAAA, 2004) even suggests using it as an outcome measure in clinical trials, with the proviso that this consumption should take place in two hours. However, there are other proposals based on the time framework of occurrence of consumption, in university students and in the general population, which question its practical usefulness since it creates a binary distinction that overlooks the multiple forms of drinking that exceed this threshold (Pearson, Kirouac, & Witkiewitz, 2016), particularly in young people.

Alternatives to this dichotomized measure define excess consumption on the basis of the amount consumed, frequency or intensity, alcohol concentration or direct biomarkers in blood (Piano, Mazzucco, Kang, & Phillips, 2017). Their aim is to delimit the amount that places the drinker at the greatest risk of experiencing alcohol-related problems while putting others at a greater risk of indirectly experiencing its effects (Wechsler & Nelson, 2001). However, the literature reviewed is not conclusive in this respect (Borsari, Neal, Collins, & Carey, 2001; Esser, Kanny, Brewer, & Naimi, 2012; Linden-Carmichael, Russell, & Lanza, 2019).

The main criticisms of this definition point in two directions: the amount/frequency and risk of associated problems is a more suitable measure for prevalence studies, which estimate the proportions of individuals under the threshold and the presence of consequences suffered, yet fail to show the association between the number of beverages consumed and self-reported consequences (Fillmore & Jude, 2011; Linden-Carmichael, Vasilenko, Lanza, & Maggs, 2017), than an arbitrarily established threshold (Gruenewald, Johnson, Light, Lipton, & Saltz, 2003), or one that is above the threshold that fails to distinguish the number or type of consequences suffered (Labhart et al., 2018).

The second is its use as an outcome measure in interventions for alcohol consumption and related problems. It is striking that the  $\geq 4$  or  $\geq 5$  limits were specified for university students rather than clinical populations. However, empirical support has been found to consider it a valid but not the only indicator to predict the presence of negative consequences, reflecting a limited predictive and incremental validity, both of which are desirable for measuring results in studies on treatment efficacy (Pearson, Bravo, Kirouac, & Witkiewitz, 2017).

In Mexico, the  $\geq 4$  or  $\geq 5$  drink threshold as an operational definition of excess alcohol use is broadly accepted and has been used in epidemiological studies nationwide among the general and student populations (Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz et al., 2015; 2017; Villatoro et al., 2015), with certain variations in studies on treatment efficacy (Martínez Martínez, Pedroza Cabrera, Salazar Garza, & Vacio Muro, 2010; Rodríguez Durán, Echeverría San Vicente, Martínez Martínez, & Morales Chainé, 2017), identification of consumption patterns (Díaz Martínez et al., 2012; Solís, Gorab, & Fernández-Va-

rela, 2012a; 2012b), and factors associated with consumption in students (Villatoro et al., 2012).

Strunin et al. (2015b) recently used a probabilistic approach to study alcohol consumption in Mexican university students through frequency and intensity to identify prevalence consumption profiles and their association with violent victimization. They found that 61.6% of the sample focused on the *occasional with few consequences* and *regular with some consequences* profiles. Men were more affected regarding the frequency and amount of alcohol consumed in the previous year, reporting more problems than women. Women with *heavy and excess consumption* with multiple consequences were more likely than men to be beaten, insulted, threatened, humiliated, or forced to have sexual contact. Men with the same profile were more likely to be injured in accidents or assaults. This approach produced an empirically closer view to the consumption-intensity-consequences phenomenon.

In this context, we consider it important to deepen the study of the relational structure underlying alcohol use and its consequences in high school (HS) and university students (HE) to analyze emerging alcohol consumption patterns in students at a public university through the administration of an online survey.

## METHOD

### Design

Analytical cross-sectional study using the online survey method.

### Participants

Students between 14 and 30 enrolled in HS or HE at a large public university located north of Mexico City participated. The sampling was non-probabilistic for convenience.

## Measurements

Two sections of the *2014 Student Questionnaire* (Villatoro et al., 2015) were used, with 47 closed questions, and others on sociodemographic data (11 questions with items with two to seven response options) and alcohol consumption (10 questions with items with one to seven response options). The questionnaire has criterion validity for contrasted groups and inter-item consistency (Medina-Mora, Castro, Campillo-Serrano, & Gómez-Mont, 1981), and has been used with adjustments and corrections for the target population (Romero-Martínez, Téllez-Rojo Solís, Sandoval-Zárate, Zurita-Luna, & Gutiérrez-Reyes, 2013) in seven national epidemiological surveys and local surveys of students at various educational levels (Villatoro et al., 2015).

For frequency of consumption, female and male students who had consumed respectively  $\geq 4$  or  $\geq 5$  standard drinks respectively at least once in the past year were identified. As regards intensity, the maximum number of drinks consumed on a typical day of consumption was considered. Length of exposure was measured using age of onset of consumption and current age.

To measure the consequences associated with consumption, the occurrence of guilt or remorse, non-fulfillment of responsibilities, forgetfulness, self-injury or towards others and other people worrying about their drinking habits at least once in the past year was considered. The presence of consequences was recoded and treated as a numerical variable for analytical purposes.

### Procedure

The computer system for self-application of the 2014 Student Questionnaire was designed and presented to the staff at various Academic Units (AU) at a public university. Each AU expressed interest in participating in this research and appointed a liaison to invite students to collect information, which took place in August-September 2018 and Au-

Table 1  
*Proportion of questionnaires answered by academic unit*

Enrolment by academic unit	Men (50.4%)	Women (49.6%)	Mean age (SD)	Proportion of surveys answered by AU	
				2018	2019
NS 1. 2776	186	480	19.4 (2.2)	3.3%	20.7%
NS 2. 2688	30	71	20.2 (1.7)	-	3.7%
NS 3. 1207	74	307	20.8 (2.1)	-	31.6%
NS 4. 16175	8	2	24.6 (2.2)	.06%	-
MS 1. 2274	582	644	15.9 (1.3)	28.6%	-
MS 2. 4195	1080	424	15.9 (1.2)	35.8%	-
Total. 29315	1960	1928	17.1 (2.4)	13.3%	

Note: The table was compiled using the most recent data published in 2018. NS = Higher education; MS = High school.

Table 2  
Sociodemographic characteristics of participants

Variable	N = 3888	(%)	Men n = 1960	(50.4%)	Women n = 1928	(49.6%)
Level						
Higher education	1158	(29.8)	298	(15.2)	860	(44.6)
High school	2730	(70.2)	1662	(84.8)	1068	(55.4)
Time spent on studies						
Did not study last year	437	(11.2)	205	(10.5)	232	(12.0)
Part time	727	(18.7)	379	(19.3)	348	(18.0)
Full time	2724	(70.1)	1376	(70.2)	1348	(69.9)
Time spent on paid work						
Did not work last year	3117	(80.2)	1510	(77.0)	1607	(83.4)
Part time	478	(12.3)	284	(14.5)	194	(10.1)
Full time	293	(7.5)	166	(8.5)	127	(6.6)
Type of town of origin						
Large city	2040	(52.5)	979	(49.9)	1061	(55.0)
Medium city	1015	(26.1)	560	(28.6)	455	(23.6)
Small city	447	(11.5)	245	(12.5)	202	(10.5)
Town	353	(9.1)	158	(8.1)	195	(10.1)
Hamlet	33	(.8)	18	(.9)	15	(.8)
Limitations due to lack of health						
Yes	427	(11.0)	195	(9.9)	232	(12.0)
No	3461	(89.0)	1765	(90.1)	1696	(88.0)
Type of family they live with						
Nuclear/single parent	3030	(77.9)	1537	(78.4)	1493	(77.4)
Own family (partner and/or children)	53	(1.4)	21	(1.1)	32	(1.7)
Other	805	(20.7)	402	(20.5)	403	(20.9)
Marital status						
Single	3631	(93.4)	1803	(92.0)	1828	(94.8)
Married or partnered	145	(3.7)	84	(4.3)	61	(3.2)
Other	112	(2.9)	73	(3.7)	39	(2.0)
Father's educational attainment						
No schooling	43	(1.1)	22	(1.1)	21	(1.1)
Elementary and junior high	1130	(29.1)	449	(22.9)	581	(30.1)
Senior high school	1447	(37.2)	718	(36.6)	729	(37.8)
BA or MA	1164	(29.9)	633	(32.3)	531	(27.5)
Other	104	(2.7)	38	(1.9)	66	(3.4)
Mother's educational attainment						
No schooling	26	(.7)	13	(.7)	13	(.7)
Elementary and junior high	1184	(30.5)	563	(28.7)	621	(32.2)
Senior high school	1544	(39.7)	777	(39.6)	767	(39.8)
BA or MA	1094	(28.1)	592	(30.2)	502	(26.0)
Other	39	(1.0)	15	(.8)	24	(1.2)
The family income covers needs:						
Everyday						
Always	1227	(31.6)	666	(34.0)	561	(29.1)
Nearly always	1461	(37.6)	765	(39.0)	696	(36.1)
Sometimes	789	(20.3)	342	(17.4)	447	(23.2)
Never	411	(10.6)	187	(9.5)	224	(11.6)
Occasional						
Always	728	(18.7)	417	(21.3)	311	(16.1)
Nearly always	1489	(38.3)	802	(40.9)	687	(35.6)
Sometimes	1487	(38.2)	669	(34.1)	818	(42.4)
Never	184	(4.7)	72	(3.7)	112	(5.8)
Entertainment						
Always	625	(16.1)	341	(17.4)	284	(14.7)
Nearly always	1076	(27.7)	583	(29.7)	493	(25.6)
Sometimes	1714	(44.1)	828	(42.2)	886	(46.0)
Never	473	(12.2)	208	(10.6)	265	(13.7)

Note: Everyday needs refers to food, clothing, school supplies and services such as electricity, water, and transport. Occasional needs include maintaining the house and the clothes one wants. Entertainment includes recreation and gifts.

Table 3  
*Alcohol use and associated problems by sex*

Variable	N	(%)	Men	(%)	Women	(%)
Alcohol use						
Lifetime use	2540	(65.3)	1182	(60.3)	1358	(70.4)
In the past year	1219	(48.0)	612	(51.8)	607	(44.7)
In the past month	1214	(47.8)	590	(49.9)	624	(45.9)
Number of drinks in a typical day's drinking						
Up to 2	1124	(44.3)	557	(47.1)	567	(41.8)
Up to 4	445	(17.5)	209	(17.7)	236	(17.4)
Up to 6	277	(10.9)	122	(10.3)	155	(11.4)
Up to 9	99	(3.9)	60	(5.1)	39	(2.9)
Over 10	114	(4.5)	83	(7.0)	31	(2.3)
Consumption $\geq 5 / \geq 4$	1937	(76.3)	857	(72.5)	1080	(79.5)
History of consumption						
Age of onset (SD)	14.6	(2.0)	14.2	(1.9)	15.1	(2.0)
Length of exposure to substance (SD)	2.6	(2.3)	2.5	(2.2)	2.7	(2.4)
Frequency of drunkenness						
Never in the past year	910	(35.8)	457	(38.7)	453	(33.4)
At least once in the past year	653	(25.7)	308	(26.1)	345	(25.4)
Once in the past month	300	(11.8)	145	(12.3)	155	(11.4)
Two to three times in the past month	150	(5.9)	87	(7.4)	63	(4.6)
Once or more in the past week	46	(1.8)	34	(2.9)	12	(.9)
Consequences associated with consumption						
Guilt or remorse	524	(20.6)	258	(21.8)	266	(19.6)
Failure to meet responsibilities	391	(15.4)	200	(16.9)	191	(14.1)
Forgetfulness	533	(21.0)	267	(22.6)	266	(19.6)
Injuries to self or third parties	220	(8.7)	104	(8.8)	116	(8.5)
Other people worrying about your drinking habits	351	(13.8)	207	(17.5)	144	(10.6)

gust-September 2019. Two AU from HS and four from HE took part. Once the administration of the survey had been agreed on with the liaisons at each AU, one of the researchers went to the participating units to answer student queries and explain the purpose of the research.

Subjects read and recorded their agreement in the informed consent form required to access the questionnaire. After they had completed it, the system provided respondents feedback on their consumption characteristics, stressing that it was not a diagnosis. When the system detects consumption of  $> 4$  or  $> 5$  full drinks per occasion, at least once in the past 12 months, it includes information on specialized alcohol counselling centers, in addition to sending a message about whether the record used to access the questionnaire has already been used, so as to prevent case duplication.

## Statistical analysis

Latent Class Analysis (LCA) was undertaken to group students into clusters by identifying the most common and similar patterns in the distribution of the questionnaire answers. Using conditional probabilities of the distribution of

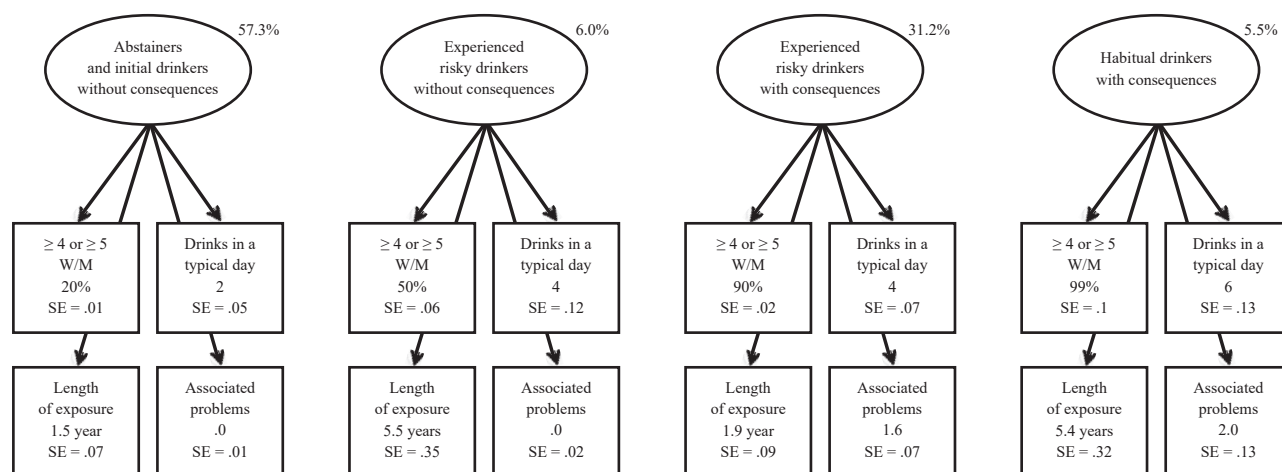
observed variables, the analysis estimated the parameters of the group model, in other words, unobserved discrete variables, without basing this on traditional modeling assumptions (Reyna & Brussino, 2011), which made it possible to analyze variables with different metrics including categorical data (Monroy Cazorla, Vidal Uribe, & Saade Hazin, 2010).

Technically speaking, model parameters are estimated by the maximum likelihood method, defined as the likelihood that each data set will have been generated by the model through the joint distribution of all data (Reyna & Brussino, 2011). The optimal number of latent classes is determined by examining the fit of each model using the Bayesian Information Criterion (BIC), the Akaike Information Criterion (AIC) and the statistical indexes of best fit of the model (LL). Data processing and LCA were performed using the Statistics Data Analysis Special Edition 16 program.

## Ethical considerations

During the research, the principles, norms, and ethical precepts of research with human beings were observed, endorsed by the Research Ethics Committee of the San-





**Figure 1.** Model of emerging alcohol consumption pattern in students.  $N = 3888$

The figure shows the result of the LCA, the ellipses indicate the latent variables that structure the set of variables observed in the sample, represented by squares. The percentage values for  $\geq 4$  or  $\geq 5$  W/M, represent the proportion of women and men who have reached this threshold of drinks consumed at least once in the last year. In all cases, SE refers to standard error.

to Tomás Unit of the Interdisciplinary Center of Health Sciences (CONBIOÉTICA-09-CEI-019-20170731) of the Instituto Politécnico Nacional (INP, National Polytechnic Institute). Students were informed that their participation was confidential, anonymous, not compulsory, and that their personal data would be respected. Regarding the consent of parents of those under 18 and the assent of the latter, researchers adhered to institutional norms, which in each case were enforced and supervised by the participating AU liaisons, which in turn received an executive report to support decision-making regarding the phenomenon studied.

## RESULTS

A total of 4,013 students answered the survey initially, 3.1% of whom were eliminated due to inconsistencies in the data. All the results were obtained from the remaining sample of 3,888 participants ( $\bar{X}_{\text{age}} = 17.1$  years,  $SD = 2.4$ ), 1,928 were women and 1,960 men, equivalent to 13.3% of the total enrolment of the AUs, updated to January 2018 (Table 1).

A total of 50.4% of the participants were men ( $\bar{X}_{\text{age}} = 16.6$ ,  $SD = 2.1$ ) and 49.6% women ( $\bar{X}_{\text{age}} = 17.6$ ,  $SD = 2.6$ ); 70.2% were HS students and 29.8% in HE; the remainder of the sociodemographic information is shown in Table 2.

Data in Table 3 show a narrowing of the gap between the drinking habits of men and women, although with a higher proportion of *lifetime consumption* (70.4%) and *at least excessive consumption* (79.5%) in them. The age of onset of consumption was  $M = 14.4$  years ( $SD = 2.6$ ), while length of exposure was  $M = 2.8$  years ( $SD = 2.7$ ). 35.8% of those who reported having had an alcoholic beverage at some point in their life had not got drunk in the past year,

25.7% had done so at least once, and 17.7% had done so in the past month or week, although the average of consequences reported for the sample was low.

The LCA yielded four groups with four variables: consumption of  $\geq 4$  and  $\geq 5$  standard drinks at least once in the past year, number of drinks consumed on a typical day, length of exposure to alcohol and total number of consequences suffered in the past year, as can be seen in Figure 1, while the model fit parameters were appropriate as shown in Table 4.

The joint use of these variables showed that frequency and intensity of consumption measures have a limited capacity to characterize the multiple drinking habits of students when they are used separately, associated with the number of alcohol-related problems. The joint use of the latter and consumption variables made it possible to design a coherent model based on excessive consumption-typical dose-consequences. However, incorporating length of exposure to alcohol into the analysis acted as an articulating axis between them. In other words, it helped structure the relationship between variables by creating more order within the groups.

**Table 4**  
Adjustment criteria of four latent class model for alcohol consumption and associated consequences

Model	AIC	BIC	LL	p-value
One class	28761.0	28786.1	-14376.5	< .001
Two classes	26160.3	26216.7	-13071.14	< .001
Three classes	25767.9	25855.7	-12869.97	< .001
Four classes	25619.8	25738.9	-12790.9	< .001

Note: AIC = Akaike Information Criterion; BIC = Bayesian Information Criteria; LL = Statistical Index of Best Model Fit.

## DISCUSSION AND CONCLUSION

This is the first study to use a version of the national questionnaire on substance use in Mexico to characterize different types of alcohol consumption related to the presence of adverse consequences in university students.

The findings of this study paint a disturbing picture of students' drinking habits. A total of 76% of students with lifetime use had drunk excessively at least once in the past year, with a higher proportion among women (79.5%) than men (72.5%), which is consistent with prevalence studies that show increasingly similar excess use by senior high school boys and girls (Villatoro et al., 2015), and university students in Mexico City (Strunin et al., 2015b). This suggests a growing need to design specific detection and intervention strategies with a gender perspective for students (Erol & Karpyak, 2015).

The model highlights the strengths and weaknesses derived from the specific drinking habits of students at the institution. For example, most students are teetotalers or have only recently begun drinking and have no consequences, which shows the importance of designing universal preventive interventions aimed at delaying the onset of drinking and to increase spacing in the periodicity and amount consumed, from various theoretical perspectives, as a means of improving young people's health (O'Connor et al., 2018; Witkiewitz et al., 2018).

The variable length of exposure proved crucial for standardizing the different drinking habits among students, since not all groups showed a positive link between excessive consumption and number of beverages and the increase in the number of consequences. This can be seen in the group of *risky drinkers with consequences*, which shows a slightly greater length of exposure than *beginning drinkers* with the presence of consequences, a very high likelihood of drinking in excess and twice the number of drinks normally consumed yet which remain below the  $\geq 4 / \geq 5$  threshold on average, which suggests the need to implement selective interventions designed to diminish consumption (Joseph & Basu, 2017), and reduce alcohol-related problems (Tanner-Smith & Lipsey, 2015).

The opposite happens with the group of *experienced risky drinkers without consequences*, where the length of exposure is three times higher than in the previous group but without consequences or a high likelihood of excessive consumption, although typically they do not exceed  $\geq 4$  and  $\geq 5$ . It is feasible to state that these people might respond more favorably to interventions to reduce consumption rather than alcohol-related problems, as reported by Witkiewitz et al., (2018), in a 36-month follow-up, according to its LCA of repeated measures, where similar alcohol use measures to ours were used. In this study, members of the *low-risk beverage* and *excess consumption groups* reported consuming fewer drinks a day with fewer consequences

than the more intense groups and worse results in the *excess consumption* group.

The *habitual drinkers with consequences* group obtained high values in all variables and a nearly absolute probability of exceeding the  $\geq 4 / \geq 5$  drink threshold, which was corroborated by the average number of drinks typically consumed. Despite the length of exposure, it is slightly less than that of *risky drinkers without consequences*, in addition to having the highest average number of consequences. This identifies them as the segment closest to the ACD diagnosis, which would keep this type of drinkers outside the scope of selective or universal institutional interventions. However, their detection and clinical evaluation are crucial for determining the need for the correct treatment, at institutions offering specialized care, particularly if we consider that this group of drinkers is the most likely to suffer violent victimization, as noted by Strunin et al. (2015b).

Based on the above, we can hypothesize the existence of a non-linear continuum in the consumption trajectory of participants and the consequences suffered. A relatively small part of the sample appears to have acquired a degree of expertise for avoiding certain consequences, which are more frequent in novices, such as intentional, self-inflicted or unintentional injuries (Borges et al. 2017; 2006). In this respect, those with expertise are likely to feel less of the need to begin a process of change, because they do not experience consequences despite their longer exposure to alcohol.

The progressive increase in consumption and the notable decrease in the size of proportions by group suggest that recurrent and prolonged exposure to alcohol could be moderating the presence of consequences, although its intensification appears to be a matter of time, even in a small proportion of the sample. This indicates that not all those who start drinking early will progress to the end of the continuum, while not all those who are already in the group of *regular drinkers with consequences* will have progressed through the preceding groups.

Although a convenience sample was used for this study, the findings highlight the complexity and changing dynamics of the drinking habits of young people, coinciding with national and state reports on the general and student population of HS and with specific studies in HE, suggesting that these results may reflect what is happening at other public educational institutions. It is therefore advisable to monitor alcohol consumption in students to identify consumption patterns that jeopardize their integrity, health, and academic functioning, and to implement intervention programs differentiated by emerging consumption patterns and sex.

The most obvious limitation of the study is the composition of the sample. Although the LCA is not limited by the assumptions of normal distribution, more rigorous sampling would have solved the problem of disproportionate samples by educational level and sex in higher education, thereby decreasing the information bias. It is therefore suggested that



the study be replicated with representative samples by educational level and sex at different educational institutions.

This study did not include specific information on school performance, which made it impossible to identify the relationship between emerging patterns and academic performance, completion of schoolwork, and dropout rates. Accordingly, it is suggested that information on this aspect be incorporated into subsequent studies.

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## Conflict of interest

The authors declare they have no conflicts of interest.

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