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Original Article

Psychosocial factors associated with problematic alcohol use

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Objective: to identify the psychosocial factors associated with different patterns of alcohol consumption in the Brazilian southeastern population. **Methodology:** a study was carried out in which data was collected using a digital form containing sociodemographic questions, psychometric tests and the Alcohol Use Disorders Identification Test. The Partial Least Squares Discriminant Analysis method was used to analyze the associations between the variables and 4 models were developed: control versus risky use, control versus harmful use, control versus possible dependence and control versus problematic use. **Results:** a sample of 774 people was obtained, of which 296 (38%) had problematic alcohol use. Additionally, a number of factors were found to be associated with different types of alcohol consumption, which included color/race, age, income, education, form of sewage disposal, experience with a romantic breakup, violence victimization and personality traits. **Conclusion:** several psychosocial factors associated with different types of alcohol consumption were identified, these being relevant social determinants of health. However, based on other research, it is necessary to observe how these factors interact with consumption and with each other, to obtain a better characterization of the population segments most susceptible to problematic patterns of alcohol use.

Descriptors: Alcoholism; Ethanol; Psychosocial Impact; Multivariate analysis.

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Fatores psicossociais associados ao uso problemático de álcool

Objetivo: identificar os fatores psicossociais associados aos diferentes padrões de consumo de álcool na população do sudeste brasileiro. **Metodologia:** realizou-se um estudo cuja coleta de dados foi feita a partir de um formulário digital contendo questões sociodemográficas, testes psicométricos e o *Alcohol Use Disorders Identification Test*. Para analisar as associações entre as variáveis, usou-se o método *Partial Least Squares Discriminant Analysis* e foram desenvolvidos quatro modelos: controle versus uso de risco, controle versus uso nocivo, controle versus possível dependência e controle versus uso problemático. **Resultados:** obteve-se uma amostra de 774 pessoas, das quais 296 (38%) faziam um uso problemático de álcool. Adicionalmente, observou-se a associação, com diferentes tipos de consumo de álcool, de vários fatores que englobaram cor/raça, idade, renda, escolaridade, forma de despejo de esgoto, experiência com rompimento amoroso, vitimização de violência e traços de personalidade. **Conclusão:** foram identificados diversos fatores psicossociais associados a diferentes tipos de consumo de álcool, sendo estes relevantes determinantes sociais em saúde. Entretanto, a partir de outras pesquisas, deve-se observar como esses fatores interagem com o consumo e entre si, para obter uma melhor caracterização das parcelas populacionais mais suscetíveis a padrões problemáticos de uso de álcool.

Descritores: Alcoolismo; Etanol; Impacto Psicossocial; Análise multivariada.

Factores psicosociales asociados con el consumo problemático de alcohol

Objetivo: identificar los factores psicosociales asociados a diferentes patrones de consumo de alcohol en la población del sudeste de Brasil. **Metodología:** se realizó un estudio en el que se recolectaron datos mediante un formulario digital que contenía preguntas sociodemográficas, pruebas psicométricas y el *Alcohol Use Disorders Identification Test*. Para analizar las asociaciones entre las variables se utilizó el método *Partial Least Squares Discriminant Analysis* y se desarrollaron 4 modelos: control versus uso riesgoso, control versus uso nocivo, control versus posible dependencia y control versus uso problemático. **Resultados:** se obtuvo una muestra de 774 personas, de las cuales 296 (38%) presentaban consumo problemático de alcohol. Además, se observó una asociación, con diferentes tipos de consumo de alcohol, de varios factores, que incluyeron color/raza, edad, ingresos, nivel de educación, forma de eliminación de aguas residuales, experiencia de ruptura sentimental, victimización por violencia y rasgos de personalidad. **Conclusión:** se identificaron varios factores psicosociales asociados a diferentes tipos de consumo de alcohol, siendo estos determinantes sociales relevantes de la salud. Sin embargo, con base en otras investigaciones, es necesario observar cómo estos factores interactúan con el consumo y entre sí, para obtener una mejor caracterización de los segmentos poblacionales más susceptibles a patrones problemáticos de consumo de alcohol.

Descriptores: Alcoholismo; Etanol; Impacto Psicosocial; Analisis multivariable.

Introduction

Currently, the most widely used psychoactive substance in Brazil is alcohol. The III National Survey on the Drug Use of the Brazilian Population (III *Levantamento Nacional sobre o Uso de Drogas*, III LNUD) found that around 30.1% of Brazilians had consumed alcoholic beverages in the 30 days prior to the survey, 16.5% of which were binge drinkers. In the southeast region, in the same period, the percentage of consumption reached 32.1% and binge drinking 15.6%. In addition, in the 12 months prior to the survey, approximately 1.5% of Brazilians aged between 12 and 65 presented criteria for alcohol dependence and 7.5% drove under the influence of the substance[1].

In 2016, around three million people died from alcohol abuse, which was also related to more than 5% of the global burden of diseases and injuries in the same year. Alcohol has been linked to diseases such as tuberculosis, HIV/AIDS, some types of cancer, diabetes mellitus, epilepsy, cardiomyopathy, hemorrhagic strokes, cirrhosis of the liver and pancreatitis. The main cause of injury was road accidents[2].

Alcohol consumption is considered to have different patterns, encompassing low-risk consumption, which does not represent an increase in the health damage risk; risky consumption, which increases the negative consequence risk; harmful or abusive consumption, which leads to physical and mental damage; and dependence[3-4]. It is also associated with multiple factors that can be both genetic and environmental[5]. For instance, epidemiological studies have identified a relationship between factors such as age, family relationship, sex/gender, marital status, income, religion, education, skin color and type of occupation and variables related to alcohol, such as consumption frequency, binge drinking and alcohol use disorder[6-9].

The aim of this study was to identify the psychosocial factors associated with different patterns of alcohol consumption in the Brazilian southeastern population, since identifying these factors can help define the population groups most susceptible to problematic consumption, enabling more effective interventions.

Methodology

Study design and data collection period

This is a cross-sectional study in which data was collected using a digital form drawn up using the Google Forms application. This document was disseminated on the internet through social networks and was available for responses from September 13 to December 13, 2021.

Selection criteria

In order to take part in the study, it was initially necessary to read and agree to the Free and Informed Consent Form (FICF). In addition, the inclusion criteria were being Brazilian, aged 18 or over and having consumed alcohol at least once in their lives; and the exclusion criteria were not having access to the internet, being a foreigner, being under 18 and never having consumed alcohol. It should also be noted that this study only analyzed data from the southeast region.

Study variables

Sociodemographic variables were assessed: gender; color or race; age; family income; education level; geographic housing area (rural or urban area); main form of water supply, sewage disposal and garbage disposal; safety level in relation to the neighborhood and satisfaction with life at home; experience with a romantic breakup; presence of a romantic partner; recent grief experience; occupational situation; degree of satisfaction with occupational situation; violence experience (victimization, perpetration or having witnessed it); and presence of food insecurity, using a short version of the Brazilian Food Insecurity Scale, which showed similar results to the full version[10].

Levels of social competence and perceived social support were also measured using sub-scales from the Brazilian versions of the Resilience Scale for Adults[11] and the Multidimensional Scale of Perceived Social Support (sub-scale on friends)[12], respectively. As well as levels of sensitivity to anxiety, hopelessness, sensation-seeking and impulsivity, using the Brazilian version of the Substance Use Risk Profile Scale (SURPS) [13]. Thus, a total of 44 predictive variables were assessed (Figure 1).

As a response variable (y), the alcohol use pattern was analyzed using a Brazilian version of the Alcohol Use Disorders Identification Test (AUDIT). In this test, the values of the answers are added up and, depending on the result, consumption is classified as low-risk consumption from 0 to 7 points; risky consumption from 8 to 15 points; harmful consumption from 16 to 19 points; and possible dependence from 20 to 40 points[3].

Gender								Color or race							
1. Female		2. Male		3. Non-binary		4. Preferred not to say		5. Black		6. White		7. Brown		8. Yellow	
Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)

9. Age	10. Income						11. Education Level						12. Geographical space	
≥ 18	NI* (0)	≤ 2 MW† (1)	2 a 4 MW† (2)	4 a 10 MW† (3)	10 a 20 MW† (4)	> 20 MW† (5)	Illiterate (0)	IPE‡ (1)	CPE§ (2)	ISE‖ (3)	CSE¶ (4)	IHE** (5)	CHE†† (6)	Urban area (1)	Rural area (0)

Water supply						Sewage disposal							
13. General network		14. Well or spring		15. Directly from water bodies		16. Trench		17. General network		18. Disposal into water bodies		19. Pit		20. Waste disposal	
Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Collection by responsible entity (1)	Thrown/burned near home (0)

Life at home		Romantic relationship experience						Grief experience	
21. Safety level in relation to the neighborhood	22. Level of satisfaction with life at home	23. Breakup more than a year ago		24. Breakup in less than a year		25. Current romantic partner		26. Death of someone close in the last 12 months	
1-5	1-5	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)

Occupational status															
27. Regular work or with fixed hours		28. Irregular work and no fixed hours		29. Unemployed and actively looking for work		30. Householder		31. Student		32. Retired		33. Temporarily disabled or on sick pay		34. Level of satisfaction with occupational situation	
Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	1-5	

Adverse experiences								Psychological tests					
35. Witnessed any violence		36. Violence victim		37. Committed any violence		38. Food insecurity presence		39. Social competence level	40. Perceived level of social support	41. Level of sensitivity to anxiety	42. Hopelessness level	43. Sensation-seeking level	44. Impulsiveness level
Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)	1-7	1-7	1-4	1-4	1-4	1-4

*NI = No income; †MW = Minimum wage; ‡IPE = Incomplete primary education; §CPE = Complete primary education; ‖ISE = incomplete secondary education; ¶ CSE = Complete secondary education; ** IHE = Incomplete higher education; ††CHE = Complete higher education

Figure 1 - Predictive variables assessed in the study and their possible answers. The categorical variables are coded in brackets

Data processing and analysis

In order to identify the associations between psychosocial variables and alcohol use patterns, the Partial Least Squares Discriminant Analysis (PLS-DA) multivariate classification method was used, since it enables the models to be developed with statistically reliable results, even when the predictor variables have some collinearity[14]. Four binary models were then developed: low-risk use (control) versus risky use, control versus harmful use, control versus possible dependence and control versus problematic use (sum of risky use, harmful use, and possible dependence). It is important to note that, for all comparisons, representative samples were selected in the control group, since it had the largest number of samples. To do this, a number of samples was selected that matched that of the comparison group, using the Kennard-Stone algorithm.

To apply the PLS-DA technique, it was necessary to: code the categorical variables (the numerical values used are in brackets in Figure 1), organize all the predictors in an *X* matrix and the response variable in a *y* vector and, finally, autoscale all the data. In the *y*-vector, the use of low risk was defined by the value 0 and the other pattern of use of the comparison by the value 1. In addition, the choice of the number of latent variables (LVs) was based on a low classification error entailed in the Venetian blinds cross-validation.

To evaluate the models, the figures of merit were calculated: sensitivity (SEN); specificity (SPE); false positive rate (FPR); false negative rate (FNR); reliability rate (TCONF), which is the difference between 100 (%) and the FPR and FNR sum; and F1 score. Also evaluated were the VIP scores vector, whose variables with a value greater than 1 (to one decimal place) were considered to be the most important predictors; and the regression coefficients vector, where variables with negative coefficients were associated with the control group and those with positive coefficients with the other group in the model.

The *X* matrix and the *y* vector were obtained in the Jupyter Notebook version 6.3.0 computer environment using the Anaconda Navigator version 2.0.3 software. The data was autoscaled and the Kennard-Stone algorithm and the PLS-DA method were applied using the MATLAB version 7.10 and PLS_Toolbox version 5.2.2 software.

Ethical aspects

This research was approved by the Research Ethics Committee of the Minas Gerais Federal University (CEP opinion no.: 4.922.685). In addition, all the participants gave their consent.

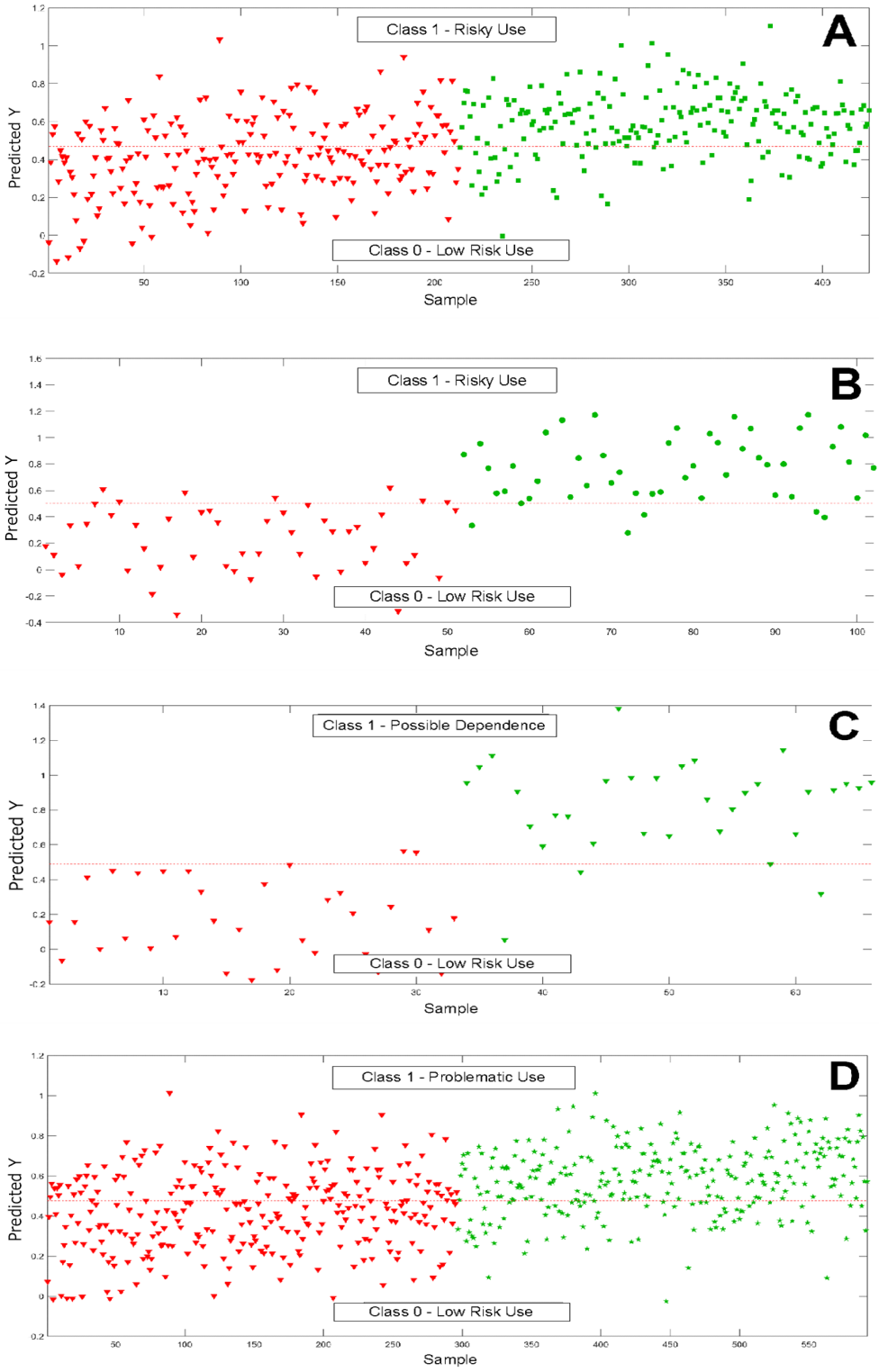
Results

The form was answered by a total of 1,408 people, of whom, following the inclusion criteria, 1,319 remained. Of these, 774 were from the southeast region, where it was observed that 478 (62%) participants fell into the low-risk alcohol use category, 212 (27%) into risky use, 51 (7%) into harmful use and 33 (4%) into possible dependence. As a result, a total of 296 (38%) participants with problematic alcohol use were identified.

The PLS-DA control versus use of risk model was built with 4 LVs, explaining 17.52% of the variance in *X* and 17.02% in *y*. Figure 2A shows the prediction of the samples and concludes that the model had 77.4% SEN, 62.7% SPE, 37.3% FPR, 22.6% FNR, 40.1% TCONF and 72.1% F1-score. The variables white color/race (6), age (9), education (11), sewage disposal by pit (16) and general network (17), romantic breakup in less than a year (24), being a student (31) and retired (32), violence victimization (36) and levels of social competence (39), hopelessness (42), sensation-seeking (43) and impulsiveness (44) had a VIP score greater than 1 (Figure 3A), and were therefore the most important predictors. The regression coefficients showed that the variables white color/race (b = 0.09), education (b = 0.12), general network sewage disposal (b = 0.09), romantic breakup in less than a year (b = 0.08), violence victimization (b = 0.13), levels of social competence (b = 0, 13), hopelessness (b = 0.14), sensation-seeking (b = 0.12) and impulsiveness (b = 0.07) were related to risky use and age (b = -0.15), sewage disposal by pit (b = -0.01), being a student (b = -0.14) and retired (b = - 0.06) to low-risk use (Figure 4A).

The control versus harmful use model was calculated with 5 LVs, explaining 29.77% of the variance in *X* and 56.04% in *y*. The model's prediction (Figure 2B) resulted in SEN of 90.2%, SPE of 86.3%, FPR of 13.7%, FNR of 9.8%, TCONF of 76.5% and F1-score of 88.5%. Black (5) and white (6) color/race, age (9), income (10), education (11), water supply by general network (13) and well or spring (14), sewage disposal by pit (16) and general network (17), romantic breakup in less than a year (24), violence victimization (36) and levels of hopelessness (42), sensation-seeking (43) and impulsiveness (44) were the most predictive variables (Figure 3B), with white color/race (b = 0.26), education (b = 0.34), general network water supply (b = 0.12), general network sewage disposal (b = 0.006), romantic breakup in less than a year (b = 0.04), violence victimization (b = 0.05), levels of hopelessness (b = 0.25), sensation seeking (b = 0.18) and impulsivity (b = 0.2) being associated with harmful use; and black color/race (b = -0.09), age (b = -0.31), income (b = -0.27), water supply by well or spring (b = -0.09) and sewage disposal by pit (b = -0.01) with low-risk use (Figure 4B).

The control versus possible dependence model was made with 9 LVs, explaining 50.14% of the variance in *X* and 64.75% in *y*. Based on the interpretation of the predicted values of y (Figure 2C), it was concluded that the model had SEN of 90.9%, SPE of 93.9%, FPR of 6.1%, FNR of 9.1%, TCONF of 84.8% and F1-score of 92.3%. Among the variables with the greatest predictive importance were black (5) and white (6) color/race, age (9), level of satisfaction with life at home (22), being unemployed (29), violence victimization (36) and levels of sensitivity to anxiety (41), hopelessness (42), sensation-seeking (43) and impulsivity (44) (Figure 3C) which, except for age (b = -0.4) and being unemployed (b = -0.32), were related to possible dependent use (Figure 4C).



Note: Sample symbols: red triangle down = low-risk use sample; green square = risky use sample; green circle = harmful use sample; green triangle down = possible dependent use sample; green star = problematic use sample

Figure 2 - Predicted y-values from PLS-DA models: control versus risky use (A), control versus harmful use (B), control versus possible dependence (C) and control versus problematic use (D). The red line defines the classification threshold. Samples above the line are assigned to class 1 and samples below to class 0

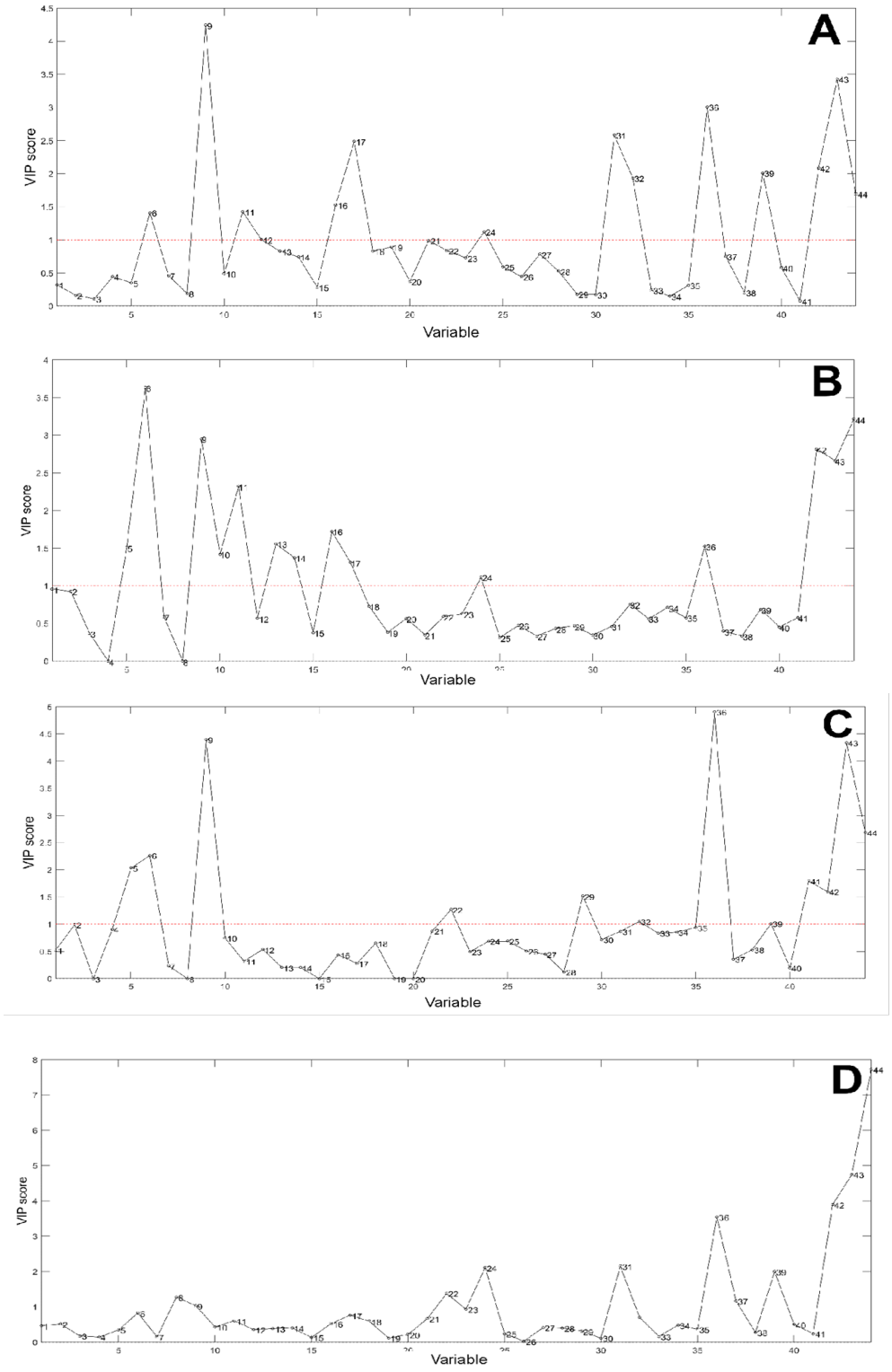


Figure 3 - VIP scores from PLS-DA models: control versus risky use (A), control versus harmful use (B), control versus possible dependence (C) and control versus problematic use (D). The red line at value 1 aims to separate the variables with the greatest predictive importance

Finally, the control versus problematic use model was developed with 5 LVs, which explained 23.81% of the variance in *X* and 16.03% in *y*. The model prediction (Figure 2D) was characterized with 74.3% SEN, 60.8% SPE, 39.2% FPR, 25.7% FNR, 35.1% TCONF and 69.6% F1-score. The variables yellow color/race (8), level of satisfaction with life at home (22), romantic breakup in less than a year (24), being a student (31), victimization (36) and violence perpetration (37) and levels of social competence (39), hopelessness (42), sensation-seeking (43) and impulsiveness (44) were the most predictive (Figure 3D), of which were related to problematic use the level of satisfaction with life at home (b = 0.09), romantic breakup in less than a year (b = 0.12), violence

victimization (b = 0.13), levels of social competence (b = 0.11), hopelessness (b = 0.17), sensation-seeking (b = 0.12) and impulsivity (b = 0.17) and the rest to low-risk use (Figure 4D).

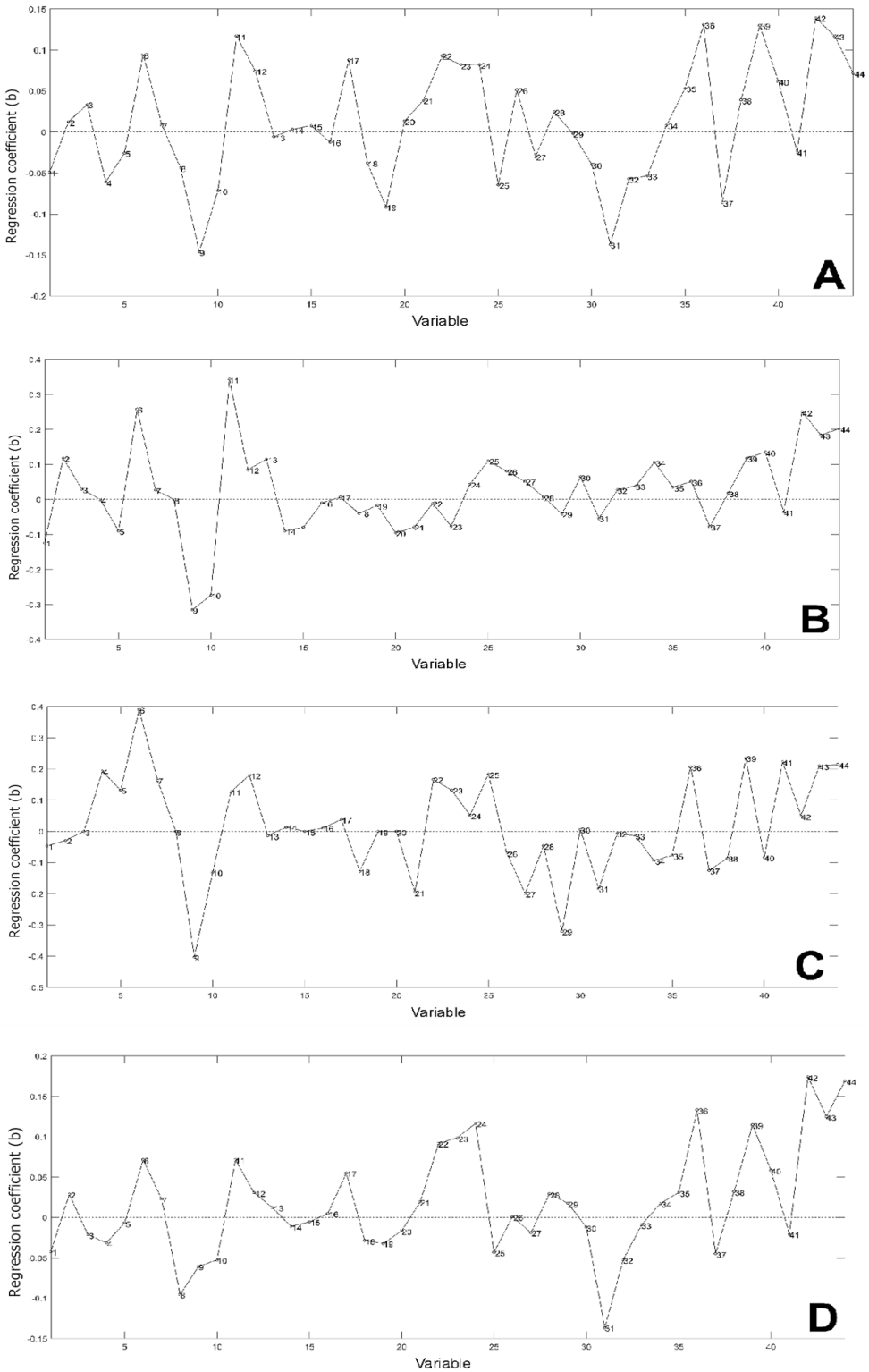


Figure 4 - Regression coefficients of the PLS-DA models: control versus risky use (A), control versus harmful use (B), control versus possible dependence (C) and control versus problematic use (D). The black line at 0 separates the positive coefficients, which are related to class 1, from the negative coefficients, which are related to class 0

Discussion

It was observed that 38% of the participants were classified as problematic alcohol users. This is a significant proportion which is similar to that of other studies carried out in southeast cities[15-16].

The racial aspect was relevant in all the models. White color/race was positively related to risky use,

harmful use, and possible dependence; black to possible dependence and negatively to harmful use; and yellow to problematic use, in a negative way. In an analysis of a nationwide survey, the race variable was also significant, given that self-declared white people had a higher prevalence of recent alcohol use, while non-white people (black, brown and indigenous) had a higher prevalence of excessive episodic use[17]. However, there is a lack of research in the Brazilian population on the etiologies of racial inequalities in behaviors related to alcohol use.

Some research in the United States has suggested that racial/ethnic disparities can be partly explained by differences in the socio-cultural norms of each group. Some studies, for example, have identified that religiosity among black people is higher than among white people and this is a factor that has an inverse relationship with alcohol us[18]. It was also observed that blacks, latinos and indigenous people are more likely than whites to live in socioeconomically disadvantaged places, where there are usually many establishments selling alcohol and this greater availability was associated with increased consumption[19].

There was an inverse association between age and risky use, harmful use and possible dependence, in line with various studies which have observed a higher proportion of problematic use among younger people[16-17,20-22]. One possible explanation for this trend is that the Brazilian alcohol industry targets its advertising at young people[22].

Income had an inverse relationship with harmful use, which corroborates other studies that have also shown an inverse relationship between this factor and problematic use patterns[23-24]. Whereas education had a positive relationship with risky use and harmful use, a trend also observed in the alcohol use types analyzed in other studies[21-22,24]. Therefore, in this research, the opposite influences of income and education were identified and, although not expected, it has already been suggested that education has a very limited contribution to the generation of per capita income in cities[24].

The form of sewage disposal was positively related to risky use and harmful use when it was done through a general sewage system and negatively in the case of pits. According to the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*, IBGE)[25], the highest proportion of sewage systems is in municipalities with more than 100,000 inhabitants, whereas the lowest proportion is in municipalities with less than 20,000, which is below the national mean of 57.6%. Therefore, the form of sewage disposal can be a marker of the living space's degree of urbanization. Thus, a higher degree of urbanization may be associated with harmful alcohol consumption, something corroborated by observations of high consumption in capitals and metropolitan regions[1,23,26]. The 2021 Vigitel survey also identified high frequencies of binge drinking in some southeastern capitals[27]. The greater availability of alcohol and consumption stimuli in urban centers is a possible explanation for these phenomena[17].

Experiencing a romantic breakup in less than a year was positively associated with risky use, harmful use and problematic use, corroborating Brazilian studies which found a higher prevalence of alcohol use among separated/divorced people[17,20]. Additionally, longitudinal research from other countries, with students in their first year of university, showed that the incidence of alcohol use problems/disorders was positively associated with the end of romantic relationships[28-29]. This can be explained by the negative psychological effects that can be generated, such as sadness, anger, anguish, anxiety, depression and grief[30], which can lead to alcohol consumption, given that people drink to manage negative emotional states[31].

Having been a victim of violence was positively related to all problematic alcohol consumption patterns. This is consistent with the literature, since it has been identified that having a history of sexual abuse increased the chance of regular alcohol use[32] and having been a victim of two or more forms of violence during childhood or adolescence increased the chance of abusive and/or dependent use[33]. There was also a positive relationship between binge drinking and alcohol use disorders and intimate partner violence and urban violence[35].

Higher levels of hopelessness, sensation seeking, and impulsivity were positively associated with all patterns of problematic alcohol use and a higher level of anxiety sensitivity was specifically associated with possible dependence. Previously, sensation-seeking was found to be associated with early onset of alcohol use, use in high quantities and dependence development[36-37]. In the case of impulsivity, it was observed that this trait can be both a risk factor for alcohol consumption and a consequence of abusive consumption[31,38-39].

As emotional regulation is a relevant reason for drinking in impulsive people, it has also been suggested that impulsivity is an important mediator in the relationship between mood and alcohol use[31]. Furthermore, in line with this research, patients with addiction were found to have high levels of anxiety sensitivity, which also predicted the development of alcohol use disorders in a prospective study. This may be a consequence of a strong relationship between this trait and motives for drinking such as coping and conformity, which are negatively reinforcing motives and are associated with alcohol problems[40].

This study made it possible to identify various psychosocial factors associated with different alcohol consumption patterns. However, more research is

needed, of a qualitative and longitudinal nature, in order to observe how these factors interact with consumption and with each other, so that more effective interventions can be made in those parts of the population most susceptible to problematic alcohol use. In addition, it is suggested that other factors be evaluated, such as the spatial density of places where alcoholic beverages are sold, the cost and types of these beverages, religion, the influence of advertising and different types of violence victimization.

As it is well established in the literature that the personality traits analyzed are risk factors for substance use and associated problems, it could be planned to implement psychosocial intervention programs aimed at modifying these traits and/or associated problem behaviors in people with high levels. One example of a program that has shown promising results is Preventure, whose target audience is adolescents with a high score on one of the SURPS subscales. It has enabled a significant reduction in various alcohol-related outcomes, such as rate and quantity of consumption[41].

The study's limitations included the risk of memory bias on the part of the participants and the inability to deduce causal relationships between the predictive variables and the different levels of alcohol use patterns, since it was a cross-sectional study. In addition, it should be noted that the PLS-DA model of control versus risky use showed a low TCONF. This suggests that, for the variables addressed, the groups compared are similar, making it difficult to effectively discriminate between the two. And since the problematic use group encompasses the risky use group, the control versus problematic use model also showed a low TCONF. Therefore, the results of these two models have low reliability.

Conclusion

This study was able to identify psychosocial factors associated with different alcohol use levels. The association was mainly observed between color/race, age, income, education, form of sewage disposal, romantic breakup experience, violence victimization and personality traits, which are relevant social health determinants. However, more research is needed, such as qualitative and longitudinal research, to analyze how these factors interact with consumption and with each other, in order to obtain a better characterization of the population groups most susceptible to problematic patterns of alcohol use.

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