Peer group influence and illicit drug use among adolescent students in Brazil: a cross-sectional study

Influência do grupo de pares e uso de drogas ilícitas entre adolescentes brasileiros: um estudo transversal

La influencia del grupo y el consumo de drogas ilícitas entre estudiantes adolescentes en Brasil: un estudio transversal

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Abstract

The aim of the present cross-sectional study was to examine illicit drug use and associations with socioeconomic factors as well as peer group influence among Brazilian adolescents aged 15 to 19 years. Two-stage cluster sampling was adopted, involving the random selection of public and private schools from the nine administrative districts of a Brazilian state capital and the random selection of classrooms at each school. Illicit drug use was the outcome and was measured through the question: "Have you ever used any illicit drugs (marijuana, inhalants, hypnotics, cocaine/crack, hallucinogens, amphetamines and opioids) in your life?". The most important group of friends was ranked as school, family, religious activities and sports/culture. The area-based Health Vulnerability Index (HVI) was used to assess socioeconomic status. Data from 891 adolescents were analyzed using the chi-squared test and logistic regression. The overall rate of illicit drug use was 15.2%. Gender heterogeneity within groups (OR = 3.14; 95%CI: 1.63-6.06), religion-based friendships (OR = 0.36; 95%CI: 0.17-0.75) and sports/culture-based friendships (OR = 0.44; 95%CI: 0.22-0.87) remained significantly associated with illicit drug use. Adolescents who lived in less vulnerable areas had higher chance of drug use in comparison with those living in more vulnerable areas. Religion-based and sports/culture-based friendships seem to demonstrate a protective effect against lifetime illicit drug use. Gender heterogeneity within groups and residing in a less vulnerable area increased the chances of adolescents reporting illicit drug use.

Social Networking; Friends; Street Drugs; Adolescent Behavior

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Background

According to the World Health Organization [1], substance abuse is defined as the harmful use of psychoactive substances, and their repeated use can lead to dependence. The negative consequences of illicit drug use include behavioral, cognitive and physiological disorders.

A household survey addressing psychotropic drug use by Brazilian adolescents found that 22.8% of the population has used some psychotropic drug [2]. This prevalence rate is similar in Chile (23.4%) and was associated with higher rates of substance use, being lower than in the United States (45.8%). In the Brazilian survey, marijuana was the most reported drug (8.8%) among all adolescents, followed by solvents, benzodiazepine, cocaine, crack, anticholinergic agents, mescal and heroin (0.1%) [2].

The rate of psychotropic drug use has decreased among Brazilian students since 2004 [3]. However, Brazil occupies the first position in the number of users of inhalants in South America [4]. Moreover, the initiation of drug use occurs at an early age in Brazil, with 10.4% reporting first use at 10 to 12 years, 22.5% reporting first use at 13 to 15 years, and 42.8% reporting first use at 16 to 18 years [3].

Adolescence is a critical phase of human development, and it is characterized by the tendency to adopt risk behaviors [5], such as the use of illicit drugs. When illicit drug use is early initiated, the period in which such use continues tends to be longer, thereby increasing the chances of developing dependence. Moreover, the first contact of youths with drugs generally occurs in familiar settings with individuals in relationship circles, which makes the monitoring of indicators of drug use among students increasingly more important [6]. The early detection of groups that are vulnerable to illicit drug use can contribute to the establishment of public policies that consider the school setting as a favorable environment for preventive programs [7].

Gender differences have been noted concerning drug abuse. Patterns of usage tend to be different between boys and girls. A US national survey on drug use and health found that girls exceeded boys in their use of alcohol and nonmedical use of psychotherapeutic agents, whereas marijuana use, abuse and dependence was greater among male teens than for their female counterparts [8]. Interestingly, Simons-Morton & Chen [9] found that substance use was lower among females, but progressed more rapidly in comparison with males.

External factors, such as family, friends, siblings, as well as negative perceptions of school and community, are powerful mediators of risk of substance use. Having friends who use drugs and being more susceptible to peer pressure are the strongest predictors of adolescent substance use [10]. Moreover, researchers have demonstrated interest in the relationship between socioeconomic status and health-related behaviors. A number of studies state that adolescents from families with a low socioeconomic status are more prone to substance use [11,12]. However, there is growing evidence that adolescents with a higher socioeconomic status may also be at risk for developing substance use disorders, as having more financial resources may indicate greater ease in acquiring substances [13].

Social influence associated with different patterns of drug use may be largely responsible for determining individual behaviors and attitudes by shaping the flow of resources to individuals, providing them with access to opportunities and placing constraints on behavior [14]. A number of studies have highlighted the influence of one's type of social network on behavior [10,15], and peer influence is regarded as one of the factors associated with drug use [16], although evidence also suggests that the negative influence of friends on drug use is sometimes overestimated [17]. This finding is a further demonstration of the impact of social norms and learned behaviors on the use of substances among adolescents. Peer pressure exerts a very powerful influence on behavior, especially in young people [18].

Peer influence is a complex issue due to the potentially wide variety of contexts involving friendships and social networks. The literature puts forth two theories to explain the influence of peers on substance use among adolescents: social influence and social selection. Social influence theory states that deviant peers directly and indirectly influence illicit drug use and other risk behaviors during adolescence through peer pressure, modeling and behavioral reinforcement. Social selection theory states that adolescents search for deviant friends based on pre-existing deviant tendencies. However, adolescent friendship groups are often heterogeneous and therefore involve exposure to both deviant and non-deviant influences [19].

A number of studies have addressed peer group influence on the school environment and have contributed to the understanding of the structure and size of such networks and their association with

drug use [19,20]. However, a few investigations have been carried out at schools comparing different contexts in the same sample, such as participation in religious groups, sports and community activities [21].

Family conflict has been associated with adolescent drug use, which may be used as a form of escape from stressful situations. Conflict also may reinforce contradictions between parents, poor parenting skills and an inadequate monitoring style. Moreover, permissive parental attitudes toward drugs may encourage adolescents to use drugs perhaps more than their parents [5].

The aim of the present study was to examine illicit drug use (inhalants, marijuana, hypnotics, crack, cocaine, hallucinogens, amphetamines and opioids) and test possible associations with socioeconomic factors as well as peer group influence among Brazilian adolescents aged 15 to 19 years.

Methods

A cross-sectional study was carried out involving adolescents aged 15 to 19 years in the city of Belo Horizonte, state capital of Minas Gerais, Brazil. Belo Horizonte has approximately two million inhabitants distributed among nine administrative districts (Barreiro, Centro-sul, Leste, Nordeste, Noroeste, Norte, Oeste, Pampulha and Venda Nova) (Prefeitura de Belo Horizonte. Índice de vulnerabilidade social. 2000. http://portalpbh.pbh.gov.br/pbh/ecp/contents.do?evento=conteudo&idConte udo=18525&chPlc=18525&viewbusca=s, accessed on 15/Apr/2016). A total of 117,547 and 25,569 15-to-19-year-old students are enrolled in 820 public and 434 private schools, respectively (Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Sistema de consulta a matrícula do Censo Escolar – 1997 a 2010. http://portal.inep.gov.br/basica-censo-escolar-matricula, accessed on 20/Apr/2016). A full list of all students enrolled in public and private schools was obtained from the Belo Horizonte Secretariat of Education, and the distribution of students in each of nine administrative districts was calculated.

To represent the real distribution of 15-to-19-year-old students in Belo Horizonte, adolescents were selected from public and private schools in all nine administrative districts. Two schools (one public and one private) were randomly selected in each administrative district (total of 18 schools). However, three public schools refused to participate due to time constraints linked to a previous teachers' strike that year and were replaced by others through an additional random selection process. Next, thirty-four classrooms were randomly selected from the 65 high school classrooms in the 18 schools, with the inclusion of all adolescents in each classroom. Later, those questionnaires answered by participants that did not fit in the studied age range (15 to 19 years) were discarded. No random selection of the pupils inside of each classroom was carried out.

The sample size was calculated based on 4% standard error, 95% confidence interval (95%CI) and 50% prevalence rate of illicit drug use and an 80% test power The minimum sample size required was determined to be 600 individuals, to which 20% was added to compensate for possible non-responses (n = 720). A design effect of 1.3 was applied to increase the precision, as multistage sampling was employed rather than simple random sampling [22]. Thus, the sample was comprised of 936 adolescents.

Data collection was performed from August 2009 to February 2010 using a self-administered questionnaire that was distributed in the classroom by one of the researchers. To guard against biases that might occur due to the variability in reading proficiencies, each question was read aloud slowly and explained by the researcher. The students were told that the questionnaire would be anonymous and the responses would be treated confidentially. Students could refuse to participate.

Tools and measurement

Illicit drug use was the outcome and was measured through the question of the *Alcohol, Smoking and Substance Involvement Screening Test* (ASSIST), validated for use in Brazil [23]: "Have you ever used any illicit drugs (marijuana, inhalants, hypnotics, cocaine/crack, hallucinogens, amphetamines and opioids) in your life?" (yes/no). This question was posed considering each substance separately. Due to the small sample size for each substance, for statistical purposes, the dependent variable was the use of at least one of these substances in one's lifetime, which limited the analysis on more specific illicit drug use.

The Brazilian version of the ASSIST has demonstrated adequate sensitivity, specificity, internal consistency and validity, suggesting its usefulness in detecting the abuse of alcohol and other psycho-active substances [23].

Peer group influence was assessed using the short version of *Integrated Questionnaire for the Measurement of Social Capital* (IQ-MSC), which was developed by the World Bank and has 27 items distributed among six subscales (networks; trust and solidarity; collective action and cooperation; information and communication; cohesion and social inclusion; empowerment and political action) [24]. This questionnaire has been administered to Brazilian adolescents in a previous study [20]. The aim of the IQ-MSC is to contribute to new advances through the provision of a set of empirical tools for the measurement of social capital, focusing on applications in developing countries [24], such as Brazil. Questions on the subscale "groups and networks" were selected for the present study, since the aim was to assess social behavior related to membership in youth peer networks. This subscale was used to determine: (i) the most important group of friends (school, family, religious activities, sport/culture); (ii) whether the majority of group members had the same religion (yes/no); (iii) whether the majority of group members were of the same gender (yes/no); (iv) whether the majority of group members had the same ethnicity (yes/no); (v) whether the majority of group members had the same occupation (yes/no); and (vi) whether the majority of group members had the same level of schooling (yes/no). Only adolescents who reported having one or more groups of friends were included in the present study.

Regarding the variable "the most important group of friends", the original item in the questionnaire was open-ended ("Among all groups in which you take part, which is the most important to you?") and the answers were subsequently categorized as group of friends from school, family, religious activities and/culture. The most important group of school friends were those individuals who were not part of the same family, and did not participate in the same religious activities or organized groups of sports activities, dance, band, theater or language courses. Groups of family friends were those in which only relatives participated.

The group of friends from religious activities was composed entirely of individuals who belonged to the same religion. Groups linked to sports and culture were those involving friends who participated in sports, dance, band, theater and language courses, but who did not belong to the most important groups of friends from school, family or religious activities.

Mother's schooling was chosen as an individual socioeconomic indicator. This variable was determined based on the responses of participants regarding the years of study of their respective mothers. Respondents who reported that their mothers had studied for a period od 0 to 7 years were coded as 0 and those who reported 8 or more years were coded as 1. The cutoff point was based on the median.

For the statistical analysis, the age of the adolescents was grouped into two ranges (15 to 16 and 17 to 19 years). This cutoff point was also based on the median.

The questionnaires were administered in a pilot study, which demonstrated no need for changes. The pilot study was conducted with a convenience sample of 101 male and female adolescents aged 15 to 19 years enrolled at randomly selected public and private schools in one of the administrative districts of the city of Belo Horizonte. The questionnaires ASSIST and IQ-MSC were handed out in the classroom by the researcher and collected immediately after being filled out. The students did not suggest any changes to the questionnaires.

Data analysis

Data analysis was performed using Stata 12.0 statistical package (StataCorp LP, College Station, USA). The distribution of illicit drug use among administrative districts in the city and type of school (public and private) was evaluated using the chi-square test. In our data set, individuals were nested in schools, which were nested in administration districts. Then multilevel analyses were used to determine the relative size of the variance at each level. The multiple regression analyses began with the random intercept model (null model), and the likelihood ratio test was performed. This model allows determining the distribution of total variance of the response variable through clustering levels (school and administrative district). The result was non-significant for school (sd = 3.02e-06; p = 1.00), but significant for administrative district (sd = 0.4302235; χ^2 = 8.56; p = 0.002). We presented

fixed effect coefficients for independent variables on both the individual and contextual levels while accounting for random intercepts between contexts (Level 2: administrative district).

In the first stage, a null model was estimated without factors and only considering variance in the two levels of analysis (individual and contextual). Model 2 involved only factors in the individual level. Model 3 involved all factors with concomitant adjustments of individual and contextual variables. The goodness of fit of the models was evaluated using the -2 log likelihood function. Significant changes in the goodness of fit of the models were considered when the difference in the -2 log likeliness function between the two models was greater than the chi-square distribution for the number of degrees of freedom of the model (number of variables incorporated into the model).

The individual variables were aspects regarding peer group influence and the following covariables: age (15-16/17-19 years), gender (male/female) and mother's schooling (≤ 7/≥ 8 years of formal education). The cutoff point for age and mother's schooling was the median response.

The contextual variable was the municipal Health Vulnerability Index (HVI). For each administrative district, one obtained the percentage of the population living in an area with low HVI (less vulnerable). As the HVI expresses a negative attribute, higher scores denote a poorer situation. This index assesses two dimensions: sanitation and socioeconomic status. Concerning sanitation, the following indicators are included: percentage of permanent households with inadequate or no water supply; percentage of permanent households with inadequate or absent sanitation; percentage of permanent households with garbage disposal of inadequate or absent form. Regarding the socioeconomic aspect, the following indicators are included: number of household members; percentage of illiterate individuals; percentage of private households with per capita income up to ½ the minimum wage; average monthly income of the head of the household; and percentage of ethnicity. The values used in this study refer to the year of 2012, data available with the closest date to the period of data collection. The description of the content and the methods for its calculation are described in published material [25].

Ethical considerations

This study received approval from the Human Ethics Research Committee of the Minas Gerais Federal University (Brazil) under process n. 124/08. Authorization to undertake the research was obtained from the selected schools. The participants and their parents/guardians signed statements of informed consent.

Results

The final sample comprised 891 adolescents. The proportion of losses resulting from incomplete questionnaires was 4.8% (45 adolescents). The overall rate of illicit drug use was 15.2%, which was further broken down into the following categories of substances: inhalants (7.9%), marijuana (7.4%), hypnotics (2.5%), cocaine/crack (2%), hallucinogens (1.6%), amphetamines (1.5%) and opioids (0.1%). Some adolescents reported using more than one type of drug (6.9%).

Table 1 shows the prevalence in the use of drug at some time in life among the adolescents in public schools and in private schools, and among the nine administrative districts of Belo Horizonte. The prevalence of illicit drug use was greater among adolescents who resided in Centro-sul, Noroeste and Oeste administrative districts (Table 1).

Regarding the variable "the most important type of groups of friends" (peer group influence), having friends involved in the same religious activities (OR = 0.36; 95%CI: 0.20-0.64) and sports/culture (OR = 0.46; 95%CI: 0.26-0.81) decreased the chances of illicit drug use (Table 2).

Table 3 displays the results of the multilevel logistic regression analysis. Older adolescents reported more drug use (OR = 2.08; 95%CI: 1.24-3.48) in comparison with younger respondents. Participants who reported that their most important groups of friends came from religious activities (OR = 0.36; 95%CI: 0.17-0.75) and from sports/culture activities (OR = 0.36; 95%CI: 0.17-0.75) had lower chance of illicit drug use in comparison with those whose best friends were from school. Participation in groups consisting of friends of the opposite sex (OR = 3.14; 95%CI: 1.63 to 6.06) was associated with a greater chance of illicit drug use. Residing in most vulnerable areas (regional with the lowest

Table 1

Distribution of respondents according to lifetime use of illicit drugs, type of school and administrative district (n = 891); Belo Horizonte, Minas Gerais State, Brazil, 2010.

Contextual variables	Lifetime use of illicit drugs		
	No	Yes	Total
	n (%)	n (%)	n (%)
School type			
Public	615 (85.77)	102 (14.23)	717 (80.4)
Private	141 (81.03)	33 (18.97)	174 (19.6)
Administrative district of city *			
Centro-sul	146 (79.78)	37 (20.22)	183 (20.50)
Noroeste	66 (80.49)	16 (19.51)	82 (9.10)
Pampulha	47 (82.46)	10 (17.54)	57 (6.40)
Oeste	83 (77.57)	24 (22.43)	107 (12.10)
Venda Nova	103 (93.64)	7 (6.36)	110 (12.30)
Barreiro	169 (86.67)	26 (13.33)	195 (21.90)
Leste	87 (89.69)	10 (10.31)	97 (10.90)
Norte	55 (91.67)	5 (8.33)	60 (6.80)
Total	756 (84.85)	135 (15.15)	891 (100.00)

* Belo Horizonte has nine administrative districts (Barreiro, Centro-sul, Leste, Nordeste, Noroeste, Norte, Oeste, Pampulha and Venda Nova)

percentage of people living in areas of low HVI) was associated with lower prevalence rate of drug use, with a dose-response gradient. No significant interaction was found between gender and groups of friends of the same gender (p = 0.42).

The reliability among the questions of the groups and networks domain of the IQ-MSC is presented. However, the first item ("Which group of friends is the most important to you?") was not included, and since it would not compose a scale adequately, it would not make sense to generate a scale. This was an open-ended question and the responses were subsequently categorized based on the participants' answers.

Each item is correlated with the total scale (sum of five items) and with similar strength, which was lowest for the question "Do most of your friends in the group have the same religion?" (Table 4).

Discussion

The present study investigated illicit drug use and social influence among 891 adolescents from a state capital in Brazil (95.2% response rate). The rate of lifetime illicit drug use was 15.2%. A recent survey of students in the city of Belo Horizonte reports a 32.2% prevalence rate of lifetime illicit drug use [3]. However, the study cited included a broader age range (10 to 19 years) than that of the present investigation (15 to 19 years) and included 6th through 12th grade. Moreover, the data collection was carried out in different periods (April to June and September to November 2010) and a different questionnaire was employed, which was adapted by Carlini-Cotrim et al. [26], with a shorter version of the questionnaire (77 items) administered to students in elementary school, and a longer version administered to those in high school [3].

When broken down into different types of illicit drugs, inhalants and marijuana headed the list, with 7.9% and 7.4%, respectively. Inhalants can be easily made at home with cheap substances sold in small drugstores without strict regulation by Brazilian laws. This tendency also holds true for Brazilian college students residing in the same city, for which the prevalence rates of inhalants and marijuana are reported to be 16.8% and 16.5%, respectively [27]. Although consumption of alcoholic

Table 2

Characteristics of respondents and unadjusted association between illicit drug use and both individual and contextual variables determined by using multilevel logistic model. Belo Horizonte, Minas Gerais State, Brazil, 2010.

		Lifetime use of illicit drugs		
	n total (%)	n cases (%)	Crude OR *	95%CI *
Individual variables				
Age (years) [n = 891]				
15-16	529 (59.4)	75 (14.2)	1.0	
17-19	362 (40.6)	60 (16.6)	1.33	0.88-2.00
Gender [n = 891]				
Male	352 (39.5)	55 (15.6)	1.0	
Female	539 (60.5)	80 (14.8)	0.93	0.63-1.36
Mother's schooling (years of formal study) [n = 724]				
0-7	306 (42.3)	33 (10.8)	1.0	
8 or more	418 (57.7)	75 (17.9)	1.47	0.90-2.41
Most important groups of friends [n = 700] **				
School	194 (27.7)	48 (24.7)	1.0	
Family	149 (21.3)	28 (18.8)	0.68	0.40-1.16
Sports/Culture	170 (24.3)	23 (13.5)	0.47	0.27-0.81
Religious activities	187 (26.7)	20 (10.7)	0.36	0.20-0.65
Majority of group members of same religion [n = 700]				
Yes	443 (63.3)	73 (16.5)	1.0	
No	257 (36.7)	46 (17.9)	1.13	0.75-1.70
Majority of group members of same gender [n = 700]				
Yes	196 (28.0)	25 (12.8)	1.0	
No	504 (72.0)	94 (18.7)	1.51	0.93-2.44
Majority of group members of same ethnicity [n = 698]				
Yes	286 (41.0)	53 (18.5)	1.0	
No	412 (59.0)	66 (16.0)	0.87	0.58-1.31
Majority of group members with similar occupation [n = 700]				
Yes	261 (37.3)	51 (19.5)	1.0	
No	439 (62.7)	68 (15.5)	0.77	0.51-1.15
Majority of group members with same level of schooling (years of formal study) [n = 700]				
Yes	179 (25.6)	35 (19.6)	1.0	
No	521 (74.4)	84 (16.1)	0.81	0.51-1.27
Contextual variable				
Percentage of population living in areas of low HVI ***				
> 40	347 (38.85)	71 (20.46)	1.0	
10-40	266 (29.85)	32 (12.03)	0.53	0.29-0.98
< 10	278 (31.20)	32 (11.51)	0.49	0.26-0.92

95%CI: 95% confidence interval; HVI: Health Vulnerability Index; OR: odds ratio.

* OR and 95%CI not adjusted by other factors; estimates by multilevel logistic regression analysis;

** 191 respondents reported not participating in any groups and were excluded from multiple analyses. Sample of respondents who answered questions on groups of friends (n = 700);

*** For each administrative district of Belo Horizonte one obtained the percentage of the population living in an area with low HVI (less vulnerable).

beverages is considered a public health problem and also increases the propensity of young people to encourage themselves in risk behaviors, its investigation was not the objective of the present study because it is considered a type of licit drug. The longitudinal monitoring, initiated by the Brazilian Center for Information on Psychotropic Drugs since the 80s, indicates that alcoholic beverages and tobacco have been the substances most consumed by adolescents [3]. Regarding the use of illicit drugs

Table 3

Multilevel analysis of individual and contextual factors associated with lifetime use of illicit drugs among Brazilian adolescents (n = 891). Belo Horizonte, Minas Gerais State, Brazil, 2010.

	Model 1 * OR (95%CI) **	Model 2 * OR (95%CI) **	Model 3 * OR (95%CI) **
Intercept	0.16 (0.11-0.23)	0.16 (0.06-0.41)	0.93 (0.12-6.93)
Individual variables			
Age (years)			
15-16		1.00	1.00
17-19		**1.94 (1.14-3.28)**	**2.08 (1.24-3.48)**
Gender			
Male		1.00	1.00
Female		0.77 (047-1.27)	0.77 (047-1.26)
Mother's schooling (years of formal study)			
0-7			
8 or more		0.98 (0.56-1.71)	0.86 (0.49-1.51)
Most important groups of friends			
School		1.00	1.00
Family		0.67 (0.34-1.31)	0.69 (0.35-1.34)
Sports/Culture		**0.41 (0.20-0.83)**	**0.44 (0.22-0.87)**
Religious activities		**0.34 (0.16-0.71)**	**0.36 (0.17-0.75)**
Majority of group members of same religion [n = 700]			
Yes		1.00	1.00
No		1.00 (0.59-1.71)	1.01 (0.59-1.72)
Majority of group members of same gender			
Yes		1.00	1.00
No		**3.04 (1.57-5.88)**	**3.14 (1.63-6.06)**
Majority of group members of same ethnicity			
Yes		1.00	1.00
No		0.86 (0.51-1.45)	0.85 (0.51-1.44)
Majority of group members with similar occupation			
Yes		1.00	1.00
No		0.64 (0.37-1.13)	0.64 (0.37-1.12)
Majority of group members with same level of schooling (years of formal study)			
Yes		1.00	1.00
No		0.83 (0.46-1.49)	0.88 (0.49-1.59)
Contextual variable			
Percentage of population living in areas of low HVI ***			
> 40			1.00
10-40			**0.41 (0.18-0.91)**
< 10			**0.34 (0.14-0.86)**
-2 log likelihood	749.37	478.74	473.22
Level 2 (administrative district) variance #	0.18 (0.16)	0.35 (0.23)	0.11 (0.22)

95%CI: 95% confidence interval; HVI: Health Vulnerability Index; OR: odds ratio.

* Model 1 did not incorporate adjustment factors (null model). Model 2 involved adjustment of outcome by variables on individual level. Model 3 involved adjustment by variables on individual and contextual levels. Model with contextual and individual factors demonstrated best fit (lowest -2 log likelihood value);

** OR and 95%CI not adjusted by other factors; estimates by multilevel logistic regression analysis;

*** For each administrative district of Belo Horizonte one obtained the percentage of the population living in an area with low HVI (less vulnerable);

Variance estimate (standard error).

Table 4

Item-total statistics for the questions within the five subscales of the *Integrated Questionnaire for the Measurement of Social Capital* (IQ-MSC).

	Scale mean if item deleted	Scale variance if item deleted	Total correlation of corrected item	Cronbach's alpha if item deleted
Majority of group members of same religion?	2.68	1.526	0.036	0.574
Majority of group members of same gender?	2.33	1.329	0.262	0.430
Majority of group members of same ethnicity?	2.46	1.175	0.361	0.358
Majority of group members with similar occupation?	2.42	1.229	0.316	0.392
Majority of group members with same level of schooling?	2.30	1.251	0.371	0.361

by Brazilian students, there are still important information gaps, which difficult preventive actions for this social segment.

Living in a less vulnerable residential area increased the odds of lifetime drug use, which is in agreement with findings described by Carlini et al. [3]. The fact that the present study involved a sample of students may have influenced this result. Adolescents with a poorer socioeconomic status and who use cheaper drugs, such as marijuana and crack/cocaine, may not have been enrolled in school, as the obsessive search for drugs brings about risk behaviors that compromise the user's health and social relations, especially with regard to school attendance. However, Humensky [13] found that a higher socioeconomic status in adolescence, as measured by parental education and household income, was associated with higher rates of substance use in the United States. The high cost of illicit drugs may explain the higher rates of use among wealthier adolescents. However, the lack of consensus regarding the influence of socioeconomic status on illicit drug use among youths indicates a need for prospective cohort studies addressing this issue.

Social influence was associated with different patterns of drug use. An individual may be more influential than others depending on his or her position within the social network: central position (being popular), marginal position (isolated/having a few friends) or bridging position (liaison that bridges peer groups) [10]. Among the indicators investigated, gender heterogeneity was significant risk factor for drug use. Women and men may be influenced differently by peers. Opposite-gender friends may be stronger than same-gender friends with regard to drug use, particularly in young adulthood, when mixed-gender relationships become more central [28]. In the present study, opposite-gender friends affected the adolescents regarding illicit drug use. This finding may be related to sexuality, as illicit drug and alcohol use favors the encouragement and development of interpersonal relations between genders. Moreover, psychosocial changes, such as emotional instability and internal conflicts with feelings of individual unworthiness, are considered determinant factors for the consumption of psychotropic substances [29].

Religiosity plays an important role in constraining harmful behavior, and it is considered a protection factor against marijuana use and other undesirable risk behaviors among adolescents, such as smoking and binge drinking [20]. A qualitative study conducted by Sanchez et al. [30] in Brazil focused on how religious beliefs could prevent drug use among youths, and found that Protestants considered all drugs to be harmful to one's health, whereas Catholics and Spiritists considered licit drug use less harmful than illicit drug use, and were especially tolerant to the use of alcohol. It has been suggested that individuals who belong to a religion justify their choice for not using drugs based on religious concepts and strong family ties. Another hypothesis for not using drugs during adolescence is more related to the disapproval of church-going peers than one's own beliefs. Although religiosity

per se (type of religion, frequency of church attendance, e.g.) was not measured in the present study, religion-based friendships indicate that a portion of adolescents has ties to religion, as approximately 30% of the respondents reported that their most important groups of friends were from church. Findings from a longitudinal study indicate that drug use in adolescence and a lesser frequency of church attendance in early adulthood increases the risk of mid-life drug use [31].

In the present study, having groups of friends linked to sports and cultural activities seems to be a protective factor against lifetime illicit drug use among Brazilian adolescents. Participation in sports plays an important role in the development of children and young adolescents, resulting in positive health outcomes, a positive mood, functional capacity and general wellbeing [32,33]. Currently, there is a strong interest in the relationship between participation in sports and drug abuse. The findings of a systematic review of 17 longitudinal studies reveal that participation in sports appears to be related to reduced illicit drug use, especially use of non-cannabis related drugs [33]. Illicit drugs have immediate injurious effects on performance. For those who are playing at a competitive level, these detrimental effects are likely sufficient to inhibit illicit substance use [32].

The association between age and illicit drug use is a consistent finding in literature, as drug use by adolescents invariably increases with age [33,34,35]. Older adolescents are more exposed to social pressures and many can acquire some degree of financial independence through employment relationships and thus may have greater access to illicit drugs.

The present study has limitations that should be noted. Respondent bias is always a risk in this type of investigation. To maximize the possibility of obtaining honest responses, the students were ensured anonymity and that neither their parents nor teachers would be made aware of their individual answers. However, the respondents may have underestimated lifetime drug use due to a lack of attention, memory lapses, the desire for social acceptability and a suspicion that school authorities could demand access to the questionnaires. This study also lacked detailed information on network characteristics (density, size, quality of contacts, proximity, centrality, etc.). Mothers' schooling and the HVI were the only variables used to measure socioeconomic status. Other relevant parental characteristics (such as risky health behaviors, the amount of face-to-face contact with their adolescent sons and daughters, parental drug problems and a low degree of parental monitoring) were not analyzed. Moreover, the influence of religiosity on illicit drug use was not investigated. It is also not possible to extrapolate the findings to those students who were absent on the day of the survey or adolescents who do not attend schools in Belo Horizonte.

A 1.3 design effect was applied, increasing the sample size by 30% to compensate for imprecision to cluster sampling [36]. In the data analysis, weighting is recommended for correction due to the design effect to compensate for unequal probabilities in the selection of sampling elements. However, this process has been debated. It is often unclear whether a given strategy requires adjustment for stratification and/or clustering and the "*need for such adjustment depends on the primary study objective. As a general rule, if the study goal is to estimate the magnitude of either a population value of interest (e.g., prevalence) or an established exposure-outcome association, the adjustment of variances to reflect is essential because obtaining appropriate variance estimates is a priority. If the study goal is to establish the presence of an association, especially in a preliminary investigation, of novel conditions or understudied populations, obtaining appropriate variance estimates may not be of primary importance; hence, adjustment of variances for complex sampling is not always required*" [37] (p. 52). As the aim of this preliminary study was to investigate illicit drug use and its associations with socioeconomic factors and types of friends, the decision was made to use the data without weighting. However, the frequency of the response variable cannot be extrapolated to the student population of the city of Belo Horizonte.

The inclusion of only adolescents enrolled in schools can facilitate the identification of a critical phase of drug use, such as its initiation in early adolescence. This could contribute to the development of preventive strategies in the school setting, which is a favorable environment for preventive strategies and interventions regarding deviant behaviors. It has been shown that schools play an important role in drug use during adolescence [7,38]. However, type of school (public or private) was the only information collected on schools in the present sample. Moreover, dropping out of school due to drug consumption was not investigated and should be addressed in future studies, along with school policies related to behaviors considered harmful to health.

Even with the abovementioned limitations, the present study has strengths. The results can help guide future studies and/or interventions directed at drug use among adolescents, focusing on peer group influence and the school environment as a facilitating factor for healthy connections.

Studies have shown that numerous factors in different domains are related to risk behaviors among adolescents, such as individual factors and factors related to personality [39], influence of friends [10,18], use of psychoactive drugs by parents, family conflicts [5,6] and factors involving the school setting, such as academic failure, commitment to one's education and disengagement from school [40]. School factors are among the strongest predictors of behavior among adolescents [41,42]. There is growing interest in the role schools can play in the prevention of risk behaviors in this population [40]. Different contexts can exert different forms of influence on risk behavior regarding drug use or protection from drug use in the same sample of students. Understanding these contexts and how they influence the use of illicit drugs is important to the establishment of strategies directed at prevention and intervention, which should extend throughout elementary school and high school, as satisfactory results are obtained when such strategies are employed in a continuous fashion [6,43].

The present findings are particularly relevant to prevention programs and educational curriculum. Knowledge of the consequences of substance use continues to be a mainstay of most prevention approaches. The inclusion of this subject in the curriculum may be an effective strategy for decreasing illicit drug use among youths. Indeed, the findings are currently being discussed at all schools that participated in this study under the guidance of the researchers.

Conclusion

Religious activities and sports/cultural-based friendship seem to demonstrate a protective effect against lifetime illicit drug use among adolescents in comparison with school-based friendships. Conversely, gender heterogeneity within groups increased the chances of adolescents reporting illicit drug use. Adolescents who lived in less vulnerable areas had greater odds of drug use in comparison with those living in more vulnerable areas.

Contributors

K. O. Jorge made substantial contributions to the conception and design of the study and drafted the manuscript, contributed to study design, collected the data and reviewed the final version. R. C. Ferreira conducted the statistical analysis and critically reviewed the final version. E. F. Ferreira, I. Kawachi, P. M. Zarzar and I. A. Pordeus made substantial contributions to the conception and design of the study and reviewed the final version.

Acknowledgments

References

1. World Health Organization. Health topics: substance abuse. http://www.who.int/topics/substance_abuse/en (accessed on 12/Jul/2016).
2. Carlini EA, Galduroz JCF, Silva AAB, Noto AR, Fonseca AM, Carlini CM, et al. II levantamento domiciliar sobre o uso de drogas psicotrópicas no Brasil: estudo envolvendo as 108 maiores cidades do Brasil, 2005. São Paulo: Centro Brasileiro de Informações sobre Drogas Psicotrópicas/ Secretaria Nacional Antidrogas; 2007.
3. Carlini EA, Noto AR, Sanchez ZM, Carlini CMA, Locatelli DP, Abeid LR, et al. VI Levantamento Nacional sobre o Consumo de Drogas Psicotrópicas entre Estudantes do Ensino Fundamental e Médio das Redes Pública e Privada de Ensino nas 27 Capitais Brasileiras – 2010. São Paulo: Centro Brasileiro de Informações sobre Drogas Psicotrópicas; Universidade Federal de São Paulo/Brasília: Secretaria Nacional de Políticas sobre Drogas; 2010.

4. Organization of American States; Inter-American Drug Abuse Control Commission; Observatorio Interamericano sobre Drogas; Sistema Interamericano de Datos Uniformes sobre Consumo de Drogas. Estudio comparativo del consumo de drogas en paises Americanos. Washington DC: Organization of American States; 2003.

5. Kodjo CM, Klein JD. Prevention and risk of adolescent substance abuse: the role of adolescents, families, and communities. Pediatr Clin North Am 2002; 49:257-68.

6. Horta RL, Horta BL, Costa AWN, Prado RR, Oliveira-Campos M, Malta DC. Lifetime use of illicit drugs and associated factors among Brazilian schoolchildren, National Adolescent School-based Health Survey (PeNSE 2012). Rev Bras Epidemiol 2014; 17 Suppl 1:31-45.

7. Tavares BF, Béria JU, Lima MS. Drug use prevalence and school performance among teenagers. Rev Saúde Pública 2001; 35:150-8.

8. Cotto JH, Davis E, Dowling GJ, Elcano JC, Staton AB, Weiss SRB. Gender effects on drug use, abuse, and dependence: a special analysis of results from the National Survey on Drug Use and Health. Gend Med 2010; 7:402-13.

9. Simons-Morton BT, Chen RS. Over time relationships between early adolescent and peer substance use. Addic Behav 2006; 31:1211-23.

10. Fujimoto K, Valente TW. Social network influences on adolescent substance use: disentangling structural equivalence from cohesion. Soc Sci Med 2012; 74:1952-60.

11. Goodman E, Huang B. Socioeconomic status, depressive symptoms, and adolescent substance use. Arch Pediatr Adolesc Med 2002; 156:448-53.

12. Hamilton H, Noah S, Adlaf E. Perceived financial status, health and maladjustment in adolescence. Soc Sci Med 2009; 68:1527-34.

13. Humenssky JL. Are adolescents with high socioeconomic status more likely to engage in alcohol and illicit drug use in early adulthood? Subst Abuse Treat Prev Policy 2010; 5:19.

14. Berkman LF, Glass T. Social integration, social networks, social support, and health. In: Berkman L, Kawachi I, editors. Social epidemiology. New York: Oxford University Press; 2000. p. 137-73.

15. Bohnert AS, Bradshaw CP, Latkin CA. A social network perspective on heroin and cocaine use among adults: evidence of bidirectional influences. Addiction 2009; 104:1210-8.

16. Mednick SC, Christakis NA, Fowler JH. The spread of sleep loss influences drug use in adolescent social networks. PLoS One 2010; 5:e9775.

17. Bauman KE, Ennett ST. On the importance of peer influence for adolescent drug use: commonly neglected considerations. Addiction 1996; 91:185-98.

18. Birhanu AM, Bisetegn TA, Woldeyohannes SM. High prevalence of substance use and associated factors among high school adolescents in Woreta Town, Northwest Ethiopia: multi-domain factor analysis. BMC Public Health 2014; 14:1186.

19. Richmond MJ, Mermelstein RJ, Metzger A. Heterogeneous friendship affiliation, problem behaviors, and emotional outcomes among high-risk adolescents. Prev Sci 2012; 13:267-77.

20. Zarzar PM, Jorge KO, Oksanen T, Vale MP, Ferreira EF, Kawachi I. Association between binge drinking, type of friends and gender: a cross-sectional study among Brazilian adolescents. BMC Public Health 2012; 12:257.

21. Mason MJ, Mennis J, Schmidt C. A social operational model of urban adolescents' tobacco and substance use: a mediational analysis. J Adolesc 2011; 34:1055-63.

22. Pearce N. Effect measures in prevalence studies. Environ Health Perspect 2004; 112:1047-50.

23. Henrique IF, Micheli D, Lacerda RB, Lacerda LA, Formigoni MLOS. Validação da versão brasileira do teste de triagem do envolvimento com álcool, cigarro e outras substâncias (ASSIST). Rev Assoc Med Bras 2004; 50:199-206.

24. Grootaert C, Narayan D, Woolcock M, Nyhan-Jones V. Measuring social capital: an integrated questionnaire. Whashington DC: World Bank; 2003.

25. Pitchon A, Girodo AM, Gomes CC, Gomes DHP, Pimenta Júnior FG, Freire F, et al. Índice de vulnerabilidade da saúde – 2012. http://portalpbh.pbh.gov.br/pbh/ecp/comunidade.do?evento=portlet&pIdPlc=ecpTaxonomiaMenuPortal&app=estatisticaseindicadores&lang=pt_BR&pg=7742&tax=41981 (accessed on 01/May/2016).

26. Carlini-Cotrim B, Carlini EA, Silva-Filho AR, Barbosa MT. O uso de drogas psicotrópicas por estudantes de primeiro e segundo graus da rede estadual, em dez capitais brasileiras, 1987. In: Ministério da Saúde, organizador. Consumo de drogas psicotrópicas no Brasil, em 1987. Brasília: Centro de Documentação do Ministério da Saúde; 1989. p. 9-84. (Série C: Estudos e Projetos, 5).

27. Petroianu A, Reis DC, Cunha BD, Souza DM. Prevalence of alcohol, tobacco and psychotropic drug use among medical students at the Universidade Federal de Minas Gerais. Rev Assoc Med Bras (1992) 2010; 56:568-71.

28. Andrews JA, Tildesley E, Hops H, Li F. The influence of peers on young adult substance use. Health Psychol 2002; 21:349-57.

29. Moral MV, Rodríguez FJ, Ovejero A. Correlatos psicosociales del consumo de sustancias psicoactivas en adolescentes españoles. Salud Pública Méx 2010; 52:406-15.

30. Sanchez ZM, Opaleye ES, Chaves TV, Noto AR, Nappo AS. God forbids or mom disapproves? Religious interventions that prevent drug use among youth. J Adolesc Res 2011; 26:591-616.

31. Fothergill KE, Ensminger ME, Green KM, Roberstons JA, Juon HS. Pathways to adult marijuana and cocaine use: a prospective study of African Americans from age 6 to 42. J Health Soc Behav 2009; 50:65-81.

32. Lisha NE, Sussman S. Relationship of high school and college sports participation with alcohol, tobacco, and illicit drug use: a review. Addict Behav 2010; 35:399-407.

33. Kwan M, Bobko S, Faulkner G, Donnelly P, Cairney J. Sport participation and alcohol and illicit drug use in adolescents and young adults: a systematic review of longitudinal studies. Addict Behav 2014; 39:497-506.

34. Muza GM, Bettiol H, Muccillo G, Barbieri MA. Consumo de substâncias psicoativas por adolescentes escolares de Ribeirão Preto, SP (Brasil). Rev Saúde Pública 1997; 31:21-9.

35. Baus J, Kupek E, Pires M. Prevalence and risk factors associated with drug use among school students, Brazil. Rev Saúde Pública 2002; 36:40-6.

36. Luiz RR, Magnanini MMF. A lógica da determinação do tamanho da amostra em investigações epidemiológicas. Cad Saúde Colet (Rio J.) 2000, 8:9-28.

37. Caplan DJ, Slade GD, Gansky SA. Complex sampling: implications for data analysis. J Public Health Dent 1999; 59:52-9.

38. Benningfield MM, Riggs P, Stephan SH. The role of schools in substance use prevention and intervention. Child Adolesc Psychiatr Clin N Am 2015; 24:291-303.

39. Garavan H, Stout JC. Neurocognitive insights into substance abuse. Trends Cogn Sci 2005; 9:195-201.

40. Bond L, Butler H, Thomas L, Carlin J, Glover S, Bowes G, et al. Social and school connectedness in early secondary school as predictors of late teenage substance use, mental health, and academic outcomes. J Adolesc Health 2007; 40:357.e9-18.

41. Case S. Indicators of adolescent alcohol use. A composite risk factor approach. Subst Use Misuse 2007; 42:89-111.

42. Kliewer W, Murrelle L. Risk and protective factors for adolescent substance use: findings from a study in selected Central American countries. J Adolesc Health 2007; 40:448-55.

43. Cleveland MJ, Feinberg ME, Bontempo DE, Greenberg MT. The role of risk and protective factors in substance use across adolescence. J Adolesc Health 2008; 43:157-64.

Resumo

O estudo teve como objetivo examinar o uso de drogas ilícitas e as associações com fatores socioeconômicos e influência do grupo de pares entre adolescentes brasileiros de 15 a 19 anos de idade. Foi adotada uma amostra de clusters em dois estágios, com a seleção aleatória de escolas públicas e privadas entre os nove distritos administrativos de uma capital de estado, e a seleção aleatória de turmas em cada escola. A variável de desfecho foi o uso de drogas ilícitas, medido pela seguinte pergunta: "Você já usou drogas ilícitas (maconha, inalantes, hipnóticos, cocaína/crack, alucinógenos, anfetaminas e/ou opióides) alguma vez na vida?". Os grupos de pares foram classificados como: escola, família, atividades religiosas e esportes/cultura. O nível socioeconômico foi avaliado com o Índice de Vulnerabilidade em Saúde (IVS) baseado em área. Foram analisados os dados de 91 adolescentes com o teste do qui-quadrado e regressão logística. A proporção global de uso de drogas ilícitas foi 15,2%. A heterogeneidade por gênero dentro de grupos (OR = 3,14; IC95%: 1,63-6,06), amizades baseadas em religião (OR = 0,36; IC95%: 0,17-0,75) e amizades baseadas em esportes/cultura (OR = 0,44; IC95%: 0,22-0,87) permaneceram associadas significativamente com o uso de drogas ilícitas. Os adolescentes que residiam em áreas menos vulneráveis mostraram maior probabilidade de uso de drogas ilícitas, quando comparados aos jovens em áreas mais vulneráveis. As amizades baseadas em religião e esportes/cultura parecem ter um efeito protetor contra o uso de drogas ilícitas. A heterogeneidade de gênero dentro de grupos e a residência em áreas menos vulneráveis aumentaram as chances de uso de drogas ilícitas por adolescentes.

Rede Social; Amigos; Drogas Ilícitas; Comportamento do Adolescente

Resumen

El objetivo del presente estudio transversal fue examinar el consumo de drogas ilícitas, y su asociación con factores socioeconómicos, así como con la influencia del grupo entre adolescentes brasileños de 15 a 19 años de edad. Se adoptó una muestra del grupo en dos etapas, considerando una selección aleatoria de escuelas públicas y privadas de nueve distritos administrativos de una capital de estado brasileña y una selección aleatoria de clases en cada escuela. El consumo ilícito era el resultado que se midió a través de la pregunta: "¿Has consumido alguna vez drogas legales (marihuana, inhalantes, hipnóticos, cocaína/crack, alucinógenos, anfetaminas y opioides) en tu vida?" El grupo más importante de factores protectores fue categorizado como: escuela, familia, religioso y deportes/cultura. El área, basada en el Índice de Vulnerabilidad de la Salud (IVS), se usó para evaluar el estatus socioeconómico. Se analizaron los datos de 891 adolescentes, usando el test chi-cuadrado test y regresión logística. El porcentaje global de consumo de drogas ilícitas fue de un 15.2%. La heterogeneidad de género en los grupos (OR = 3.14; 95%CI: 1.63-6.06), amistad basada en la religión (OR = 0.36; 95%CI: 0.17-0.75) y amistades basadas en deporte/cultura (OR = 0.44; 95%CI: 0.22-0.87) quedaron significativamente asociadas con el consumo de drogas ilícitas. Los adolescentes que vivían en áreas menos vulnerables tenían una oportunidad más alta de consumo de drogas, en comparación con aquellos que vivían en áreas más vulnerables. Las amistades basadas en la religión y deporte/cultura parece que demuestran ser un factor protector contra el consumo de drogas a lo largo de la vida. La heterogeneidad de género en los grupos y residir en áreas menos vulnerables incrementó la oportunidad en el consumo de ilícito de drogas.

Red Social; Amigos; Drogas Ilícitas; Conducta del Adolescente