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ORIGINAL PAPER

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Prevalence of psychoactive drug use among medical students in Rio de Janeiro

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Abstract *Background* Drug use and abuse may hamper learning capabilities and the development of technical skills in medical students and, therefore, the quality of care offered to patients. The aim of this investigation was to estimate the prevalence of psychoactive drug use among medical students of public universities in Rio de Janeiro, Brazil, and to identify characteristics associated with substance use. *Method* This was a cross-sectional investigation designed to include all medical students of four universities. The final sample included 1,054 students. Patterns of licit and illicit drug use (at least once in lifetime drug use, drug use in the last 30 days (LTD) and CAGE) before and during medical school were assessed by a multiple-choice, self-administered anonymous questionnaire. *Results* Alcohol abuse was more prevalent among male students from higher income families. Alcohol LTD use was more prevalent among male students with college-educated parents. Tobacco, cannabis and inhalant lifetime use was more prevalent among males and tranquillizer use among females. Tobacco, cannabis and tranquillizer lifetime use was more prevalent among students with divorced or dead parents. Inhalant lifetime use was more prevalent among students from higher income families. Students who had college-educated, divorced or dead parents or evidenced tobacco, cocaine or inhalant lifetime use were more prevalent among cannabis users. Male students from higher income families had higher prevalence of cocaine lifetime use. *Conclusion* Substance use in this group of medical students is not widespread compared to rates reported for developed countries. Preventive efforts should focus on alcohol and cannabis use by medical students.

Key words students – medical – substance use – substance abuse – illicit drugs – street drugs – alcohol – alcoholism

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Introduction

Patterns of drug use among physicians [1–5] and, more specifically, among medical students have been regularly studied in the last three decades [6–11]. Research work on the topic investigates whether patterns of use are influenced by particularities of medical education [12–15] and profession [11, 16], for which specific corrective measures could be targeted, or to pre-school characteristics of students dictating higher rates of drug use [11, 13, 15, 17, 18].

Initial interest in the subject aroused with reports of high rates of drug use among physicians [2] and by the potential impacts of these patterns of use on medical profession and society. Although the prevalence of alcohol and drug abuse may in fact not significantly differ between physicians and the general population [5, 19], since 1973 substance abuse is defined as impairment to the practice of medicine in the

US [20]. As patient safety turns into a central concern in healthcare quality, substance abuse by health professionals is increasingly being used as a standard for credentialing organizations such as hospitals and HMOs [5].

Besides ill-effects on students', physicians' and patients' health, practicing medicine under the effects of drugs engenders personal and corporate liabilities, including potential loss of credibility for the medical profession. Steps to identify and treat physicians with substance abuse problems are, therefore, an important issue for medical associations and licensing boards [5].

While liability issues may still not be a pressing concern in developing countries, interest in patterns of drug use among physicians and medical students is evidenced by the existence of several surveys on the topic [21–26]. Also, physicians in these countries tend to be important role models and may significantly influence lifestyles of patients.

Drug use patterns are also of interest due to the potential impacts of drug-related functional impairments on medical students, i.e., accidents, falling behind and missing school. In addition, some studies have shown that drug abuse [20] may be a proxy of other psychiatric co-morbidities, which could further impair medical education and professional performance [27].

A number of cross-sectional studies have tracked the use of licit and illicit drugs among Brazilian medical students [13, 28–32]. The present survey intended to detect the magnitude of drug use, patterns of use, and conditions of access to drugs in order to make recommendations and define priorities for intervention for medical students in Rio de Janeiro, Brazil.

Objectives

To estimate the prevalence of psychoactive drug use among students of four medical schools at Rio de Janeiro and to identify socio-demographic and drug-related characteristics which could be associated with substance abuse in this population.

Subjects and methods

This is a cross-sectional study comprising medical students who agreed to take part in a survey on patterns of psychoactive drug use. The study was carried out in 1998 at public universities in Rio de Janeiro and was sponsored by CREMERJ (*Conselho Regional de Medicina do Rio de Janeiro*), the medical licensing board at Rio de Janeiro. The survey was designed to include all medical students of four public universities and, therefore, a probabilistic sample was not calculated. Students were only excluded when absent from class or if they did not agree to answer the questionnaire. Given the sensitivity of the issues surveyed, no checklist or attempt to identify non-respondents was made.

Socio-demographic variables and patterns of licit and illicit drug use before and during medical school were assessed by a multiple-choice, self-administered anonymous questionnaire. The "Access to Drugs" questionnaire had been previously employed by World Health Organization (WHO) in surveys on drug use and HIV prevalence [33], and was translated into Portuguese and field-tested beforehand in a group of medical students at another medical school by our research group. The Portuguese version of the questionnaire took approximately 20 min to be completed.

Fieldwork was performed between May and November 1998. Activities were planned at least a month in advance of actual questionnaire completion by students. Field staff met each class at previously scheduled places and times and instructed students on conditions of participation and on how to answer the questionnaire. All staff was also trained to follow a protocol to secure the anonymity of volunteers. When planning the survey, the authors assumed that no significant differences would be associated with drug use at different public medical schools in the same region. Therefore, as a means of further securing anonymity, data on school identification was neither required in the questionnaire nor included in the database.

Field supervision of the work by the main investigators was primarily made by telephone. Approval for the study was obtained from both the medical schools' deans and the Research Ethics Committee of the State University of Rio de Janeiro before the survey was initiated.

Drugs of interest included tobacco, alcohol, cannabis, tranquillizers, cocaine, and inhalants (presented as structured questions) and others (presented as a non-structured question). For each drug of interest, students were asked to report "at least once in lifetime use" (Table 1) and "use in the last 30 days" (LTD) (Table 2), including frequency of use in this period (daily, weekly or monthly basis). At least once in lifetime use (or lifetime use) was defined as intentional experimentation in any amount of each drug of interest (inhalants, cocaine, alcohol, cannabis, tobacco, LSD, amphetamines) at least once in lifetime. For the purpose of estimating prevalence among strata of alcohol abuse and cannabis use (Tables 3 and 4), we employed data on lifetime drug use. Severity of the alcohol use was assessed by CAGE (an acronym for cut-down, annoyed, guilty, eye-opener) [34], with two positive answers being considered indicative of risk of alcohol abuse.

Statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS) 11.0 and Stata 9.0. Statistical methods include *t*-tests, Pearson chi-square tests for contingency tables, confidence intervals, non-parametric test for linear trends (Cuzik extension for Wilcoxon rank-sum) for prevalence and multiple logistic regression, depending on the number and measurements levels of variables. Linear trend analyses are commonly used to analyse variations in dichotomic variables (in this case "last 30 days use"—LTD) according to an ordinal variable (in this case "age range"). Multiple backward logistic regression was conducted for cannabis lifetime use and CAGE (alcohol abuse) as dependent variables separately. Some socio-demographic characteristics and use of other drugs were used as independent variables (i.e., gender; academic level; marriage status; parents marriage status; family income: parents education; tobacco use; CAGE positive and lifetime use of other drugs). Significance of 5% was used to keep variables and 20% was used to drop variables from the model adjustment. Missing data was excluded from the analysis. The investigators decided that imputing data would be very difficult and could jeopardize the results more than the missing data.

For estimating prevalence among strata through logistic regression, some variables were dichotomized. Family income was measured as the number of minimal wages earned by the family as a whole per month. High family income was defined as >10 minimal wages/month and low family income as <10 minimal wages/month. Both parents' and students' marital statuses were dichotomized into "married" vs. "divorced dead" or single. Parent education level was defined as the last grade completed by the most educated parent and further dichotomized into college (those who graduated at college) and non-college.

Table 1 Prevalence of lifetime drug use in socio-demographics characteristics subgroups

	Tobacco		Alcohol		Tranquilizers		Cannabis		Cocaine		Inhalants		LSD		Total
	N %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %
Sex															
Male	293	*	478		89	*	123	*	23		116	*	18		499
	59.1	[54.8,63.4]	96.8	[94.8,98.0]	17.9	[14.8,21.6]	24.9	[21.3,28.9]	4.7	[3.1,6.9]	23.4	[20.0,27.4]	3.7	[2.3,5.7]	47.4
Female	274		525		164		94		13		76		16		553
	49.8	[45.6,54.0]	95.9	[93.9,97.3]	29.8	[26.1,33.8]	17.1	[14.2,20.5]	2.3	[1.4,4.0]	13.8	[11.2,17.0]	2.9	[1.8,4.7]	52.7
Marriage status															
Married	16		31		11		5		30		3		0		34
	48.9	[32.2,65.1]	93.9	[78.7,98.5]	33.3	[19.5,50.8]	15.2	[6.4,31.7]	3.9	[2.7,5.5]	9.1	[2.9,24.7]			03.2
Single	553		974		242		213		5		190		35		1020
	54.5	[51.4,57.6]	96.4	[95.1,97.4]	23.9	[21.3,26.6]	21.1	[18.7,23.7]	1.9	[0.8,4.4]	18.7	[16.5,21.3]	3.4	[2.8,4.7]	96.8
Parents m. status															
Married	397	*	737		163	*	141	*	30		135		27		779
	51.3	[47.8,54.9]	95.7	[94.0,96.9]	21.1	[18.3,24.1]	18.3	[15.7,21.2]	3.9	[2.7,5.5]	17.5	[14.9,20.3]	3.5	[2.4,5.0]	73.97
Divorced or dead	171		266		89		76		5		57		8		273
	62.9	[56.9,68.4]	98.1	[95.6,99.2]	32.7	[27.4,38.5]	28.2	[23.1,33.8]	1.9	[0.8,4.4]	20.9	[16.5,26.2]	2.9	[1.5,5.8]	25.9
Parents education															
College	425		746		185		173		27		144		30		774
	55.1	[51.6,58.6]	97.1	[95.7,98.1]	23.9	[21.1,27.1]	22.5	[19.7,25.6]	3.5	[2.4,5.0]	18.7	[16.1,21.6]	3.9	[2.7,5.5]	73.6
Non-college	143		258		67		45		9		49		5		277
	52.2	[46.3,58.0]	94.5	[91.1,96.6]	24.4	[19.7,29.9]	16.4	[12.5,21.3]	3.3	[1.7,6.2]	17.9	[13.8,22.9]	1.8	[0.8,4.3]	26.4
Family income															
>10	408		702		177		170		3		153	*	0		730
	56.2	[52.6,59.8]	96.9	[95.4,97.9]	24.4	[21.4,27.6]	23.5	[20.5,26.7]	1.6	[0.5,4.6]	21.1	[18.3,24.2]			78.6
<10	97		187		42		30		31		22		32		199
	48.9	[42.1,55.9]	94.4	[90.2,96.9]	21.2	[16.1,27.5]	15.2	[10.8,20.9]	4.3	[3.0,6.0]	11.1	[7.4,16.3]	3.4	[2.4,4.8]	21.4
Age															
17–19	139	*	289		67	*	42		6		33	*	4		308
	45.3	[39.8,50.9]	94.5	[91.2,96.5]	21.8	[17.5,26.8]	13.7	[10.3,18.1]	2.0	[0.9,4.3]	10.8	[7.7,14.7]	1.3	[0.5,3.4]	29.2
20–22	297		514		113		117		16		108		21		539
	55.7	[51.5,59.9]	96.9	[95.1,98.1]	21.2	[17.9,24.9]	21.9	[18.7,25.7]	3.0	[1.8,4.8]	20.3	[17.1,23.9]	3.9	[2.6,5.9]	51.1
23 or >	133		202		73		59		14		52		10		207
	64.2	[57.5,70.5]	97.6	[94.3,98.9]	35.3	[29.0,42.0]	28.6	[22.9,35.2]	6.8	[4.1,11.2]	25.1	[19.7,31.5]	4.8	[2.6,8.8]	19.6
Total															
N		569		1005		253		218		36		193		35	1054
%		54,3		96.4		24,2		20,9		3,4		18,4		3.3	

*95% confidence interval with statistical significance

Results

Subjects were predominantly single (96%). There was a slightly higher proportion of females (53%). Most students had living and married (74%), college-graduated parents (74%) and family income >10 minimal wage/month (78.6%). Mean student age was 21.1 years (SD = 3.9).

Response rates

The sample comprised 1,054 students. This is about twice the number necessary to detect prevalences as low as 3% with a 5% error and 95% confidence. The total number of students enrolled at the four medical schools at the time of the survey was about 1,700 and, therefore, well over half of the eligible students participated in the survey.

The distribution of respondents according to time elapsed since starting college was very heterogeneous and there was a higher concentration of students from the second, first and sixth semesters among respondents. Non-respondents were particularly prevalent among senior students and comprised mainly those who were not in class to answer the questionnaire. Therefore, voluntary bias was not considered a problem. If non-respondents are assumed to be random in terms of drug use, sample size is much bigger than that necessary to find small magnitude associations in most drug categories.

Missing information on socio-demographic characteristics of non-responders could create some bias in the way that associations towards the dependent variables (comparing respondents and non-respondents) could have any direction or magnitude. Nevertheless, much of partial missing data was found in the illicit drug questions and most of the students who answered these questions reported some kind of drug use (Table 1). Also, gender, family income, marital status and parent education distributions in our sample were similar to those described in a recent survey, held by the Ministries of Health and Educa-

Table 2 Prevalence of drug use in the last 30 days among some socio-demographic characteristics

	Tobacco last 30 days		Alcohol last 30 days		Alcohol abuse		Tranquilizers last 30 days		Cannabis last 30 days		Cocaine last 30 days		Inhalants last 30 days		Total
	N %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %	CI 95%	*N* %
Male	69		322	*	133	*	26		41		23		116		499
	23.63	[19.09,28.86]	67.79	[63.44,71.85]	28	[24.14,32.22]	27.96	[19.74,37.97]	33.88	[25.96,42.82]	100		100		47.43
Female	65		265		64		41		17		14		78		553
	23.81	[19.12,29.24]	50.77	[46.48,55.05]	12.24	[9.69,15.34]	24.85	[18.81,32.05]	17.89	[11.38,27.00]	93.33	[62.56,99.15]	98.73	[91.43,99.83]	52.57
Marriage status															
Married	1		16		5		5		2		1		3		34
	6.25	[0.86,33.68]	51.61	[34.50,68.36]	16.13	[6.86,33.41]	45.45	[20.15,73.35]	40	[9.89,80.19]	100		100		3.2
Single	134		572		193		62		57		36		192		1020
	24.32	[20.91,28.09]	59.09	[55.96,62.15]	19.92	[17.52,22.56]	25.1	[20.06,30.92]	26.89	[21.31,33.31]	97.3	[81.78,99.60]	99.48	[96.36,99.93]	96.77
Parents m. status															
Married	93		419		142		47		43		31		136		779
	23.54	[19.61,28.00]	57.24	[53.62,60.79]	19.35	[16.64,22.37]	28.31	[21.94,35.69]	30.94	[23.76,39.16]	96.88	[79.38,99.60]	99.27	[94.92,99.90]	73.98
Divorced or dead	41		168		56		19		15		5		58		273
	23.98	[18.15,30.96]	63.4	[57.42,68.99]	21.13	[16.63,26.47]	20.88	[13.69,30.51]	19.48	[12.05,29.93]	100		100		25.93
Parents education															
College	104		458	*	149		45		47		28		147		277
	24.64	[20.76,29.00]	61.73	[58.17,65.16]	20.05	[17.32,23.09]	24.06	[18.44,30.75]	27.33	[21.15,34.52]	100		100		73.64
Non-college	31		130		49		21		12		9		48		774
	21.53	[15.55,29.01]	50.78	[44.67,56.87]	19.14	[14.77,24.43]	30	[20.39,41.76]	26.67	[15.74,41.44]	90	[50.82,98.74]	97.96	[86.69,99.72]	26.36
Family income															
>10	106		432		156	*	45		5		31		153		730
	26.17	[22.11,30.69]	61.89	[58.22,65.43]	22.32	[19.38,25.56]	25	[19.18,31.89]	16.67	[7.05,34.50]	96.88	[79.28,99.60]	99.35	[95.46,99.91]	78.58
<10	19		98		25		14		51		4		23		199
	19.39	[12.70,28.45]	52.69	[45.49,59.77]	13.51	[9.29,19.25]	31.82	[19.76,46.93]	30.36	[23.83,37.79]	100		99.44	[96.03,99.92]	21.42
Age															
17–19	34		180		59		14		9		6		34		308
	24.46	[18.01,32.31]	62.72	[56.97,68.13]	20.42	[16.15,25.46]	20.59	[12.55,31.90]	21.95	[11.78,37.21]	100		100		29.22
20–22	66		299		105		28		35		17		110		539
	22.37	[17.97,27.50]	58.51	[54.18,62.72]	20.55	[17.26,24.28]	24.35	[17.33,33.07]	30.17	[22.47,39.19]	94.44	[67.27,99.29]	100		51.14
23 or >	35		109		34		25		15		14		51		207
	26.32	[19.52,34.47]	54.23	[47.29,61.00]	17	[12.40,22.86]	33.33	[23.57,44.77]	25	[15.61,37.53]	100		98.08	[87.38,99.73]	19.64
Total															
N		135		588		198		67		59		37		195	1054
%		23.81		58,85		19.80		25.97		27.19		97.37		99.49	

*95% confidence interval with statistical significance

Table 3 Odds ratio by logistic regression with alcohol abuse as dependent variable

Independent variables	Odds ratio	95% CI
Male gender	2.34	[1.64–3.16]
High family income	1.28	[1.01–1.62]
Tobacco use	1.48	[0.99–2.22]
Inhalants use	1.48	[0.92–2.22]
Cannabis use	1.47	[0.92–2.34]

Table 4 Odds ratio by logistic regression with cannabis use as dependent variable

Independent variables	Odds ratio	95% CI
Tobacco use	15.91	[8.12–31.14]
Parents with college education	1.73	[1.08–2.78]
Dead/divorced parents	1.82	[1.20–2.70]
Cocaine use	13.92	[4.13–46.87]
Inhalants use	8.34	[5.50–12.65]

tion, of south-eastern Brazilian medical schools for the 1991–2004 period, suggesting that non-respondents may be in many ways similar to respondents.

Type of drug use and prevalence and number of episodes of drug use

Alcohol was the most frequently substance reported in lifetime use (96.4%). Among subjects who reported alcohol lifetime use, 58.9% also reported LTD alcohol use. The CAGE questionnaire identified 198 (19.8%) students evidencing alcohol-abusing behaviour. Other drugs reported in lifetime use (Table 1) were tobacco (54.3%), tranquillizers (24.2%), cannabis (20.9%), inhalants (18.4), cocaine (3.4%), LSD (3.3%), amphetamines (1.1%) "substances to lose weight" (0.9%) and Ecstasy (0.4%), a synthetic drug that acts as both a stimulant and psychedelic. Many medicines and teas, such as carnitine, *guaraná* (Brazilian fruit), and many other non-specified drinks or foods, were reported as being used for weight-losing purposes.

Overall, 253 students (24%) reported tranquillizer lifetime use. One hundred and forty-four in this group (64%) had psychotropic medicines at home and 83 (34%) had bought them with medical prescriptions. Two percent had bought them at drugstores without prescriptions and 5% got these medicines from other sources, such as friends and free samples from pharmaceutical laboratories.

Almost half of the students (45%) knew how and where to buy illicit drugs and 62% believed it was very easy to do so. Of the 113 students reporting cannabis lifetime use, 33% also acknowledged cocaine lifetime use.

Use before and during medical school

Mean age of first drug use in years (standard deviation) revealed a pattern of licit lifetime drug use preceding lifetime use of illicit drugs: alcohol, 14.1 (SD 2.5); tobacco, 15.6 (SD 3.5); cannabis, 17.4 (SD 2.4); inhalant, 17.7 (SD 3.2); tranquillizers, 18.1 (SD 3.4); and cocaine, 18.5 (SD 4.1). It was not possible to analyse trends (increase or decrease) by semesters or years, due to the uneven distribution of our sample.

Mean age of first drink for CAGE-positive subjects was 13.8 years (SD 2.4), compared to 14.2 years (SD 2.5) for CAGE-negatives ($P = 0.06$). This statistical association was also observed for younger age at first drink and cannabis lifetime use at college and for younger age at first drink and cocaine lifetime use. Mean age at first drink ($P = 0.000$) for cannabis lifetime use was slightly lower—13.4 years (SD 2.3)—than for those who did not report cannabis use—14.3 years (SD 2.5). The same association with mean age of first drink was found for cocaine lifetime use—12.3 years (SD 2.7) versus 14.2 years (SD 2.4), for those who did not use cocaine ($P = 0.00$). Even though these associations are statistically significant, they may not be clinically relevant, as the difference found between comparison groups was of only about 1 year.

Which medical students use drugs

Tobacco, inhalant and cannabis lifetime use (Table 1), cannabis LTD use, inhalant LTD use, alcohol LTD use and alcohol abuse were more prevalent among males (Table 2). Some drug prevalences between strata (e.g., tobacco) showed confidence intervals that were very close to each other, indicating marginal statistical significance. However, alcohol abuse and inhalant use were more than twice as prevalent among males than females, while tranquillizer lifetime use was as much as 60% more prevalent among females.

Some drugs appeared to be more prevalent among specific marital statuses. Cocaine and tranquillizer use appeared to be as much as twice more prevalent among married students than among single students. Also, tobacco LTD use was four times more prevalent among single students. However, none of these results reached statistical significance, probably because of the small number of married students answering the survey.

Tobacco, tranquillizer and cannabis lifetime use was 20–50% more prevalent among students with divorced or dead parents. However, the same results were not found when analysing LTD data.

Prevalence of alcohol LTD use was about 20% higher among students with college-educated parents and alcohol abuse and both LTD and lifetime inhalant use were about twice as prevalent among students with higher family incomes.

Logistic regression was carried out to estimate prevalences in the alcohol abuse group. Males had twice the prevalence of females (OR for males = 2.34) and high family income was about 20% more prevalent among students reporting alcohol-abusing

behaviour (OR for high family income = 1.28). Both tobacco lifetime use (OR = 1.48) and inhalant lifetime use (OR = 1.48) seemed to be more prevalent among CAGE-positive subjects. Other variables tested did not show any difference among CAGE-positive and CAGE-negative subjects (Table 3).

Logistic regression was also carried out for estimating prevalence in the cannabis lifetime use group (Table 4). Tobacco lifetime use was about 15 times more prevalent among those reporting cannabis lifetime use (OR = 15.9) and cocaine lifetime use was also much more prevalent in this group (OR = 13.9). Inhalant lifetime use was about eight times more prevalent among those who reported cannabis lifetime use (OR = 8.3). Students who had college-educated parents and students with divorced or dead parents had higher prevalence of cannabis lifetime use (OR = 1.73 and OR = 1.82, respectively) (Table 4). Other variables considered (e.g., gender, family income) did not seem to be more prevalent among those reporting lifetime cannabis use than among non-users. It was not possible to stratify cocaine use for analysis, because of the small amount of students (3%) reporting use.

Trends for drug LTD use and age groups were tested. Tobacco showed a *P* value very close to significance (0.065). Tranquillizer LTD use had a *P* value of 0.002. Cannabis LTD use also showed a low *P* value (0.024). Cocaine LTD use and inhalant LTD use also showed linear trends with age (*P* value 0.005 and 0.0, respectively). Results evidence linear trends of growing prevalence of drug use as the age of the group increases.

Stratified analysis considering the semester or year of the students in college was not possible, as response rates in the various semesters or years were highly heterogeneous. Prevalence estimates (odds ratio estimating prevalence) were at times very difficult because of lack of observations in some strata.

Discussion

Substance use by medical students in public universities of Rio de Janeiro was not widespread compared with that reported for developed countries [35] or with an age-matched cohort in Brazil [36]. Although results are difficult to compare, as different instruments were employed for data collection, regional country differences are apparent in patterns of use among medical students. Overall, lifetime use in this study was slightly higher than that described in similar Brazilian studies held at Sao Paulo [28–30] and a higher prevalence of licit drug use and lower rates of illicit drug use was noted compared with findings of a survey in Minas Gerais [37]. Patterns of LTD use for all drugs investigated were similar to those found in other studies in Brazil [28–30].

Prevalence of licit drug use was also higher than that reported in other developing countries. In surveys held in Calcutta, Beirut, Bogota, Zagreb and Istanbul, prevalence for tobacco use was 12.6, 18.3, 24.4, 25 and 39.8% and for alcohol use was 3.6, 49.4, 86.5, 65 and 62.3%, respectively [22–26].

The age of starting to use drugs was similar to that described by other authors, where licit drugs tended to be used before illicit ones (16.6 years (SD 2.7) for tobacco and 15.9 years (SD 2.4) for alcohol) [26]. Mean age of first alcohol drink (13.8 years) was similar to age of first full drink (13–15 years) found in another study [38].

The association detected between mean age of first alcohol drink and CAGE-positive scores and cannabis and cocaine lifetime use is consistent with findings that premature drinking and smoking act as concurrent predictors of illicit drug use. The transition to illicit drug experimentation may involve attitudinal as well as behavioural components [35, 39].

In our sample, tranquillizer, inhalant and cocaine lifetime use are mainly reported after entering medical school, as has also been described for Americans students [6, 9]. This finding causes concern, because medical professionals enjoy differentiated access to some of those potentially addictive substances.

Especially alarming are patterns of alcohol LTD use and CAGE scores. Alcohol abuse is a possible coping mechanism for dealing with the pressure associated with medical studies. Positive CAGE scores are close to those found in Turkey (20%) [26] and higher than in Peru (13.7%) [40] and Bogota (5%) [25].

Low prevalence of tobacco use is consistent with an important decline in smoking detected at consecutive surveys performed in 1986, 1991 and 1996 in southeastern Brazil [32]. Anti-tobacco campaigns held by the Ministry of Health, addiction education, and restriction of tobacco company advertisement in Brazil may have contributed to reducing the prevalence of nicotine use in this sample. Given that physician advice concerning tobacco use has impact over subsequent use of tobacco by patients [41], this reduction could have important future impacts on public health.

Subjects belong, as do most medical students in Brazil, to privileged social strata. Alcohol LTD use is more prevalent in students having parents with >8 years of education and alcohol abuse is more prevalent among those with family incomes >10 minimal wages. Higher prevalence of alcohol use among medical students and physicians may be more characteristic of socio-economic status than of profession, as persons of higher socio-economic classes are more likely to drink alcohol and to do so more frequently [3, 4, 28, 29].

Significant gender differences detected for tranquillizer lifetime use (female), cannabis lifetime use (male) and inhalant lifetime use (male) and for alco-

hol LTD use (male) are similar to those found in other studies [9, 11, 21, 28, 29].

Response rates in several studies are around 59–68%, similar to our study [3, 4, 7, 9, 42]. Overall, reliability and validity of similar self-reported measures for drinking behaviour were found to be good [43–45].

Results must be viewed in light of the limitations of a self-reported survey design (i.e., recall bias, reporting errors and potential sample bias of unknown quantity). Methodological research has found little response bias in surveys of drug use in which responders remain anonymous [46]. However, respondents could have underreported drug use out of concern with negative social implications and, among non-respondents, students evidencing heaviest drug use and impairment may have been less likely to volunteer or tend not to be in class at the time of the survey. Therefore, it is unlikely that the present results overstate the truth about this population.

Conclusion

Although drug use among medical students in Rio de Janeiro does not seem to be exceptionally widespread, a significant minority of students either develop or persist in potentially harmful substance use behaviour during medical school. Preventive efforts should focus on alcohol and cannabis use by these medical students.

Steps to identify and treat physicians with substance abuse problems are an important issue for medical associations and licensing boards [5], many of whom have implemented "Impaired Physician" treatment programs [47]. Brazilian licensing boards and medical associations plan to sponsor similar programs in Brazil in the near future.

Similar to most surveys on drug use held in developing countries, this is a sectional study, of limited geographic range, to determine prevalence and association of use with demographic factors. In developed economies, large scale or nation-wide surveys and cohorts are being performed, intending to track more details of the "natural history" of drug use in this population. Further research may be warranted in less developed countries using more sophisticated designs.

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