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Contextual factors associated with marijuana use in school population

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ABSTRACT

Introduction. Marijuana use among the student population has increased in Mexico and Latin America. There are social, interpersonal and individual factors associated with the onset and continuation of marijuana use. These include the availability of drugs in the community, opportunity for use, low perceived risk of harm from marijuana use and social tolerance by family and close friends. Moreover, these factors increase the probability of experimenting with other drugs, polysubstance use and dependence. **Objective.** To identify the relationship between the level of urbanization, drug availability, exposure to opportunity for use, risk perception and social tolerance of the level of marijuana use among Mexican middle and high school students. **Method.** The results are drawn from various surveys conducted in Mexico City and the National Survey of Drug Use among Students 2014. A total of 114 364 middle and high school students participated (49.8% boys and 50.2% girls). **Results.** Of the respondent 10.6% had used marijuana at least once (12.9% boys and 8.4% girls). The variables that predicted higher marijuana use were drug use approval by family and best friend, the level of urbanization and low risk perception. **Discussion and conclusion.** Action must be taken on the factors mentioned to decrease the availability and use of drugs in the environment, and raise awareness of their consequences. These elements must be introduced systematically and creatively into preventive programs in this area.

Keywords: Risk factors, drug availability, exposure to opportunity of use, social tolerance, marijuana use, adolescence.

RESUMEN

Introducción. El consumo de marihuana en población estudiantil se ha incrementado en México y América Latina. Existen factores sociales, interpersonales e individuales asociados con el inicio y la continuación de su consumo. Entre ellos encontramos la disponibilidad de drogas en la comunidad, la oportunidad de consumo, la baja percepción de riesgo por consumir marihuana, la tolerancia social de la familia y la de los amigos cercanos. Además, estos factores aumentan la probabilidad de experimentar con otras drogas, ser policonsumidor y producir dependencia. **Objetivo.** Conocer la relación entre el nivel de urbanización, la disponibilidad de drogas, la exposición a la oportunidad de consumo, la percepción de riesgo y la tolerancia social con el nivel de consumo de marihuana en los estudiantes mexicanos de secundaria y bachillerato. **Método.** Los resultados parten de diversas encuestas realizadas en la Ciudad de México y de la Encuesta Nacional de Consumo de Drogas en Estudiantes 2014. Participaron 114 364 alumnos de secundaria y bachillerato (49.8% hombres y 50.2% mujeres). **Resultados.** El 10.6% consumieron marihuana alguna vez (12.9% hombres y 8.4% mujeres). Las variables predictoras de un mayor consumo de marihuana fueron la tolerancia ante el consumo de drogas de la familia y del mejor amigo, el nivel de urbanización y una baja percepción de riesgo. **Discusión y conclusión.** Es necesario incidir en los factores señalados con objeto de disminuir la disponibilidad y el consumo de drogas en el entorno, así como en el conocimiento real de sus consecuencias. Estos elementos deben introducirse sistemática y creativamente en los programas preventivos del área.

Palabras clave: Factores de riesgo, disponibilidad de drogas, oportunidad de consumo, tolerancia social, consumo de marihuana, adolescencia.

INTRODUCTION

The marijuana use theme has attracted increasing interest worldwide in recent years, particularly the approaches by various countries to legalize it and the range of possibilities this implies. In Mexico, a law legalizing the medicinal use of cannabis was passed by both chambers (Senate of the Republic, 2017).

Evolution of marijuana use in Mexico

Marijuana use has risen in Mexico and various countries. Regular surveys among the school population in Mexico City from 7th to 12th grade indicate that it is the main illegal drug used. Between 2009 and 2012, marijuana use increased from 11.4% to 15.9% (Villatoro et al., 2014); the highest use was among boys (18.8%), though prevalence was also significant among girls (12.9%). This was observed among the school population in the state of Jalisco, where use rose from 6.2% to 8.4% between 2009 and 2012, and it is the drug of choice for teenagers (Chávez et al., 2013).

As regards the National Survey on Addictions 2011 (Villatoro et al., 2012), the proportion of adolescents ages 12 to 17 who had used marijuana at least once increased from 1.1% to 2.4% between 2002 and 2011 (from 2.1% to 3.5% among boys and from 0.2% to 1.3% among girls).

In the Americas, (Organization of American States [OAS] and Inter-American Commission for the Control of Drug Abuse [CICAD], 2015), marijuana use by Mexican middle school students in the past year (7.6%) was average for the continent as a whole, as in the case of Colombia (7.1%). This is lower than the rates in Chile (28.3%), Canada (24.5%), the United States (24.2%), Uruguay (17%), Belize (15.8%), Costa Rica (10.8%) and Argentina (10.3%), and higher than those in Surinam (4.8%), Guyana (4.2%) and Brazil (3.7%). A constant feature in the countries mentioned is the upward trend in cannabis use.

Factors related to marijuana use

Scientific literature has indicated a variety of social, interpersonal and individual factors associated with drug use in general and with marijuana in particular. Some have a greater effect on the decision to begin and continue use, such as availability in the environment, exposure to the opportunity of drug use, risk perception by adolescents and social tolerance of marijuana use.

The availability of drugs in the community has a direct relationship with the onset of marijuana use: the greater the availability, the higher the likelihood of using drugs in general (López & Rodríguez-Arias, 2010), marijuana or multiple drugs (Peñafiel, 2009). Thus, a high availability of substances raises the risk of beginning to use cannabis, even before alcohol and tobacco (Tarter, Vanyuki, Kirisci, Reyn-

olds & Clark, 2006). This availability appears to be linked to an environment of social approval, which contributes to normalizing marijuana use (McIlwaine & Moser, 2004).

Tarter et al. (2006) and McIlwaine et al. (2004) consider that the characteristics of the community, such as physical conditions, criminal activity and exposure to drugs in the zone have an impact on the onset of marijuana use and its subsequent use.

Furthermore, it has been pointed out that adolescents in higher grades have a perception of greater marijuana use among their friends and consider that marijuana to be more widely and easily available (Pedersen et al., 2013). Jiménez-Muro, Beamonte, Marqueta, Gargallo and Nerín (2009) state that, out of students who consume marijuana, 57% report that their friends also do. In general, the substance tends to be provided by a friend and used in their company, either at a friend's house or at a party. In certain groups, it is even more socially acceptable to use marijuana than tobacco (Roditis, Delucchi, Chang & Halpern-Feksher, 2016). Moreover, frequent exposure at home to illegal substances and alcohol is a risk factor for drug use (Nuño & Flores, 2004; Díaz-Negrete & García-Aurrecoechea, 2008). When onset of use is earlier, the substance is used more often, and problems related with multiple drug use emerge (Ellickson, Trucker, Klein & Saner, 2004).

These factors (marijuana use by peers, being offered marijuana and actual use) contribute to an increase in the perceived norms. That is, at a higher perception that friends use marijuana and that they also would approve its use, it leads to a higher frequency of use among adolescents (Pedersen, Miles, Ewing, Shih, Tucker & D'Amico, 2013; Trujillo, Martínez-González & Vargas, 2013; Burdzovic, Pape & Bretteville-Jensen, 2016). Moreover, if teenagers expect that marijuana use will help them to improve socially or academically, this may lead to abuse or dependency (Neighbors, Geisner & Lee, 2008; Walker, Neighbors, Rodriguez, Stephens & Roffman, 2011).

In terms of risk perception, it has been found that marijuana users have a lower perception of its danger than non-users (Jiménez-Muro et al., 2009), not only as regards health consequences but also social and school performance (Kilemer, Hunt, Lee & Neighbors, 2007). Moreover, regular users have a lower perception of the hazards involved than experimental users (Chomynova, Miller & Beck, 2009). This low perception can make it easier to use several drugs at once (Peñafiel, 2009).

It has also been observed that among adolescents ages 16 to 20 there is a greater risk of marijuana use when the person has positive concepts and opinions of drugs (Rodríguez-Kuri, Díaz-Negrete, García-Gutiérrez, Guerrero-Huesca & Gómez-Maqueo, 2007; Morales, Plazas, Sánchez & Ventura, 2011). For example, some of the beliefs that may contribute to a low risk perception of drug use are the teenagers' belief that marijuana helps them to escape from sit-

uations that they cannot control, to interact, relax, improve their verbal expression and sexual activity, reduce physical tension and improve their cognitive skills. As a result, recreational use is important at that age (Sierra, Pérez, Pérez & Nuñez, 2005; Duarte, Varela, Salazar, Lema & Tamayo, 2012).

Sierra et al. (2005) state that though adolescents may have formerly regarded marijuana use as dangerous, this perception changes when they associate it with people who experiment with it, becoming a neutral appraisal.

Since it is a plant, young people usually do not associate health risks with its use, and instead highlight the medicinal properties attributed to the substance as confirmation of its benefits.

Lastly, when drug users perceive greater tolerance towards its use in their environment, they are more willing to use them (Rodríguez-Kuri, et al., 2007). Accordingly, when there are favorable attitudes both within the community and among family members, there is a greater tendency to use marijuana and other drugs (Ellickson, et al., 2004; López, et al., 2010). Likewise, the highest rates of use risk are found when friends approve its consumption and increase when the adolescent lacks the skills to resist peer group pressure (Peñafiel, 2009).

Currently, the studies mentioned do not indicate the joint link between the factors reviewed and drug consumption, or the way the perception of risk of marijuana use has evolved, nor its relationship in probabilistic and representative samples. This study is therefore designed to expand knowledge of marijuana use and its link with various contextual factors (urbanization, availability of the substance, exposure to opportunity for use, risk perception and social tolerance). In order to analyze these elements, we present the results of the surveys on the school population of Mexico City in order to illustrate trends in marijuana use, risk perception and social approval in relation to drug use. In order to deepen the analysis of these two factors, in addition to those indicated in the main objective, data were drawn from the 2014 Encuesta Nacional de Consumo de Drogas en Estudiantes [National Survey of Drug Use in Students] (Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz [INPRFM [National Institute of Psychiatry]], Consejo Nacional contra las Adicciones [CONADIC [National Council against Drugs]], Consejo Nacional contra las Adicciones [CONADIC [National Council against Drugs]], Secretaría de Salud [SSA [Ministry of Health]], 2015).

METHOD

The population for this study was part of the Encuesta Nacional de Consumo de Drogas en Estudiantes (ENCODE [National Survey for Drug Use among Students]), undertaken in Mexico in 2014, with state representativeness. Data were also drawn from surveys conducted in Mexico City

with a similar, comparable methodology (Villatoro et al., 2014).

In the interests of brevity, we refer the reader to the following sources for more specific information on the methods and results of these surveys. Moreover, this section focuses on ENCODE, since the study has national representativeness (INPRFM, CONADIC, SSA, 2015).

Design and participants

The sample design was stratified and by clusters, considering educational level (though the survey was also applied to elementary school students, this study only considered middle and high school students) and the state. The selection unit was the school group within schools. It considered a non-response rate of 20%. The survey has a confidence level of 95%, an absolute average error of 0.004 and a design effect of 2.

The survey aimed to have a sample of 1 560 students at each educational level (5th and 6th grades of elementary school, 7th to 9th grades of middle school and 10th to 12th grades of high school), giving an estimated total of 4 680 applications per state. Schools were selected randomly and independently in each state-stratus, through systematic sampling. This produced an estimate for middle and high school students of 127 920 respondents. Figure 1 shows a diagram of the study with the sample size calculated as a total for each educational level (Figure 1).

This work considered middle and high school students at public and private schools in the official register for the 2013-2014 school year of the Secretaría de Educación Pública (Ministry of Public Education). The final sample obtained

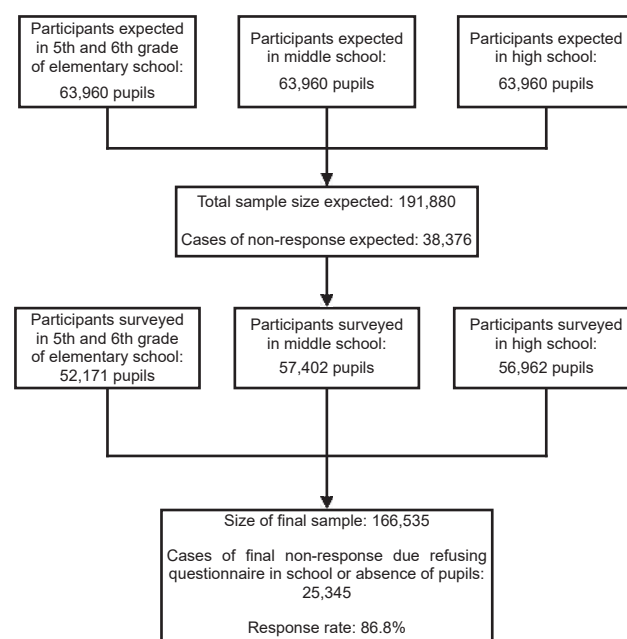


Figure 1. Diagram of study.

consisted of 114 364 pupils (49.8% boys and 50.2% girls); 57 402 middle school (50.4% boys and 49.6% girls) and 56 962 high school students (48.8% boys and 51.2% girls).

Definition of variables

This study used the questions on the number of times the respondents had used marijuana, level of urbanization, exposure to opportunity, availability of drugs in the environment, perceived risk of harm from marijuana use and social tolerance of drug use.

Marijuana

Students were asked how many times they had used marijuana in their lives, with the following possible answers: *1-2 times/ 3-5 times/ 6-10 times/ 11-49 times/ 50 times or more/ I have never used marijuana*. The midpoint of each range was used for purposes of analysis.

Level of urbanization

The study was conducted at rural schools (fewer than 2 500 inhabitants) and urban schools (2 500 or more inhabitants). The variable indicates the type of zone in which the school is located.

Opportunity for use

With the following response options to this question: *Has anyone ever offered you either bought or given away drugs like marijuana, cocaine, ecstasy? Yes, they have been offered to me as a present/ Yes, they have been offered to me to buy/ No, neither as a gift or a purchase*. To obtain the variable for drug exposure to opportunity, the two first response options were considered to mean “Yes, this has happened”, otherwise it was regarded as “No”.

Drug availability

The variable was constructed using the items. “*Regardless of whether you use drugs or not, how easy would it be*

for you to: a) Obtain drugs? b) Obtain drugs at school? c) Obtain drugs around your school? d) Introduce drugs into your school? All these questions had the following response options: *Impossible/ Very difficult/ Difficult/ Easy/ Very easy*. For the variable constructed, a point was given per item if the last two options were chosen; therefore, the variable had final values of 0 to 4.

Risk perception

Students were asked: “*How dangerous do you think using marijuana is?*,” with the following response options: *It is not dangerous / It is dangerous / It is very dangerous*. The last option was used to indicate that it is very dangerous to use marijuana.

Social tolerance of drug use

The social tolerance variable analyzed acceptance of drug use by the family (father and mother) and best friend. This was measured using the questions “*What would the following people think if you used drugs, such as marijuana, inhalants or methamphetamines?: a) My mother or the person who substitutes her, b) My father or the person who substitutes him, c) My best friend*.” The response options for each category were: “*Would approve/ Neither approve nor disapprove/ Would disapprove*.”

Two variables were obtained: tolerance of drug use by best friend and the family; the latter combined the answers to the questions on the mother and father. If the respondent indicated one of the first two options, this was considered to be tolerance to drug use.

Procedure

Supervisors and interviewers were trained for 32 hours, mainly on aspects related to the application of the questionnaires in classrooms. The questionnaires were applied in the field for two days and on the following day. Re-train-

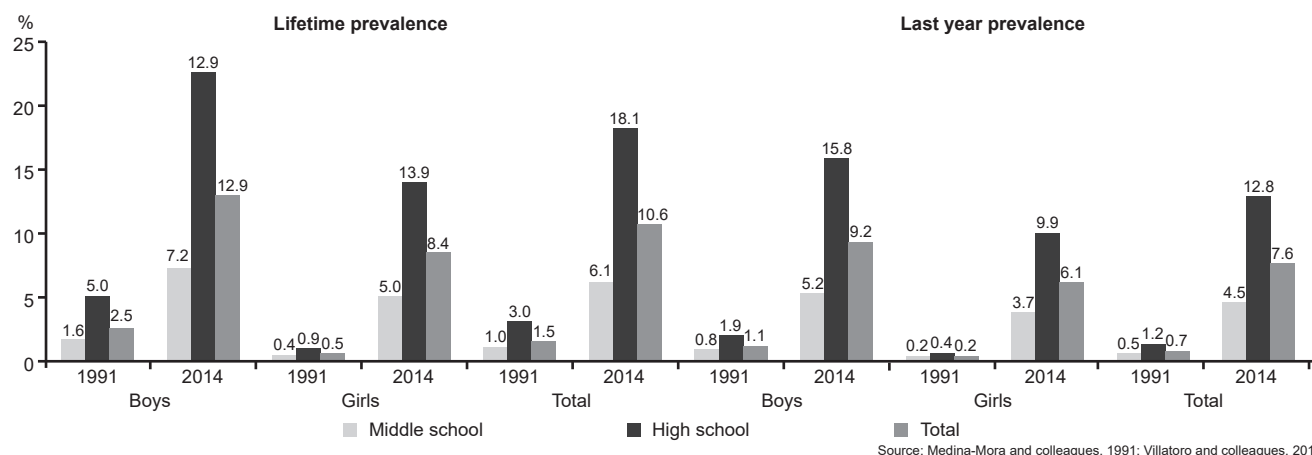


Figure 2. Trends in marijuana use among students.

ing took place to answer the questions that arose among the interviewers during the two days of field work, and thus improve subsequent applications. The questionnaire was applied between August and December 2014.

Subsequently, the field work took place in the selected groups. The application was carried out collectively to each school group, and lasted approximately 70 minutes. As the interviewers received the completed questionnaires, they checked to see these were fully completed and gave the respondents an information booklet on where to go if they had drug problems. There was full supervision of all the groups studied, by contacting the schools by telephone or in person and ensuring that the questionnaires had been given to the right group. In the cases where the questionnaire was mistakenly applied to groups that had not been selected, these questionnaires were not considered, and the interviewers returned to apply them to the group that had been selected. This procedure was repeated in the surveys in Mexico City.

Ethical considerations

The ENCODE project and the Mexico City surveys were authorized by the INPRFM Ethics Committee for Research. One relevant aspect is that the initial instructions in the questionnaire clearly stated that respondents could agree or refuse to answer the questionnaire, or could stop answering whenever they wished. Moreover, at all times, given the group nature of the application, the confidentiality of the data and students' anonymity was guaranteed.

Data analysis

This initially includes how use evolved in Mexico between 1991 and 2014. Later, the results of student surveys conducted in Mexico City between 2000 and 2014 were discussed descriptively (the latter using the ENCODE 2014 measurement) to analyze how the prevalence of use varied together with the perceived risk of harm from marijuana and alcohol use.

In order to determine the link between the predictive variables and marijuana use, an aggregate database was obtained from the original database containing the individuals, in which the analysis units were state/educational level/gender, with the average values of each of the variables of interest. This produced a database with 128 observations (32×2×2) and the sum of weighting factors was obtained for each unit, in order for each combination to be expanded to the national level. For example, the level of urbanization was calculated as a proportion of urban schools located in each observation. This database was used to conduct the analyses mentioned using the STATA SE Version 13 program.

Given how closely linked the various indicators are, an analysis was conducted of the Factor of Inflation of Variance and the matrix of correlations to analyze which variables would be added to the multiple linear regression analysis (in the definition of the `svy` command, the weighting factor indicated was used), while the "average number of times marijuana has been used" was employed as a criterion variable.

Table 1

Marijuana use, social approval, risk perception and availability of drugs, by gender and educational level

	Girls			Boys			Total population		
	7th-9th grade	10th-12th grade	Total	7th-9th grade	10th-12th grade	Total	7th-9th grade	10th-12th grade	Total
Expanded N =	3,225,676	2,024,155	5,249,831	3,275,978	1,930,005	5,205,983	6,501,654	3,954,160	10,455,814
	%	%	%	%	%	%	%	%	%
Community									
Rural	20.0	6.6	14.8	20.8	6.4	15.5	20.4	6.5	15.1
Urban	80.0	93.4	85.2	79.2	93.6	84.5	79.6	93.5	84.9
Exposure to opportunity	17.7	34.8	24.3	21.5	45.6	30.4	19.6	40.1	27.4
Tolerance of drug use									
by parents	4.2	2.4	3.5	6.7	4.4	5.9	5.5	3.4	4.7
by best friend	12.5	15.5	13.6	14.8	21.1	17.1	13.6	18.2	15.4
Risk perception of marijuana (Very dangerous)	79.8	60.9	72.5	75.5	49.6	65.9	77.6	55.4	69.2
Marijuana use	5.0	13.9	8.4	7.2	22.5	12.9	6.1	18.1	10.6
	\bar{X}/S	\bar{X}/S	\bar{X}/S	\bar{X}/S	\bar{X}/S	\bar{X}/S	\bar{X}/S	\bar{X}/S	\bar{X}/S
Drug availability	.5	1.1	.7	.5	1.2	.7	.5	1.1	.7
	.11	.21	.34	.10	.19	.36	.11	.20	.35
Times that respondent has used marijuana*	7.6	9.3	8.7	10.2	13.6	12.4	9.1	11.9	10.9
	13.8	15.4	14.9	17.2	19.7	18.9	16.0	18.2	17.5

Note: * Averages only for those who use marijuana.

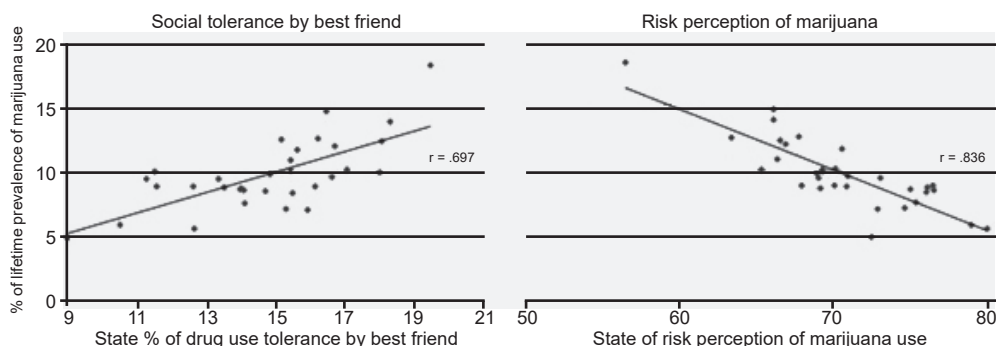


Figure 3. Relationship between marijuana use, social tolerance and risk perception.

RESULTS

Marijuana use trends

Twenty-three years after the last national survey was conducted, in 1991, the lifetime prevalence of marijuana use has risen 1.5% to 10.6%. Among boys, it rose from 2.5% to 12.9%, whereas among girls, it increased from 0.5% to 8.4%. This same pattern emerged when we analyzed the increase by gender and educational level, and is higher among girls than boys (Figure 2).

States with a higher than the national lifetime prevalence of marijuana use are Mexico City (18.2%), Quintana Roo (14.6%) and the State of Mexico. By gender, the same states report higher use among both boys and girls: Mexico City (19.7% and 16.5%), Quintana Roo (18.2% and 11%) and the State of Mexico (15.9% and 11.5%), together with girls in Morelos (11.2%).

Analysis of factors associated with marijuana use

On the basis of an analysis of the data obtained specifically from ENCODE, Table 1 presents the descriptive results of the variables analyzed. This shows that on average, students who use marijuana have done so approximately 11 times, and that the average is greater among high school students. By gender, boys report that they have used marijuana more often than girls (12.4 and 8.7 times, respectively) (Table 1).

Moreover, there is a variation between urban and rural communities, which we noted since 15% of the schools included in this study are located in rural settings. A total of 27.4% of students reported that they had been offered drugs as a gift or to purchase. As regards parents' tolerance of drug use (4.7%), in general, very little tolerance is observed across the various conditions of gender and educational level. The opposite is true for the best friend, whose tolerance is three times that of the respondent's parents (15.4%), and varies by gender and educational level.

In terms of the perceived risk of harm from marijuana use, three out of four students consider that it is a dangerous substance. By gender, boys (65.9%) report a lower risk perception than girls (72.5%), in both middle and high school.

As for the perception of the availability of drugs, analyzed by gender, the averages are similar for boys and girls, although high school students perceive the drug to be twice as available as do middle school students.

Figure 3 displays the average state data for marijuana use correlated with perceived risk of harm and social tolerance. This shows that states with the highest social tolerance also have the greatest marijuana use ($r = 0.697$, $p < 0.01$), and the states with the highest perception of risk of harm have lower marijuana use ($r = -0.836$, $p < 0.01$).

Figure 4 describes the evolution of the perception of risk of harm from marijuana use in relation to drug use, using data from periodic studies in Mexico City among middle and high school students. They show that between 2000 and 2014, as risk perception dropped from 74.2% to 53.2%, marijuana use increased from 5.8% to 19.6%. Figure 4 also shows that in 2000, the difference between the perceived

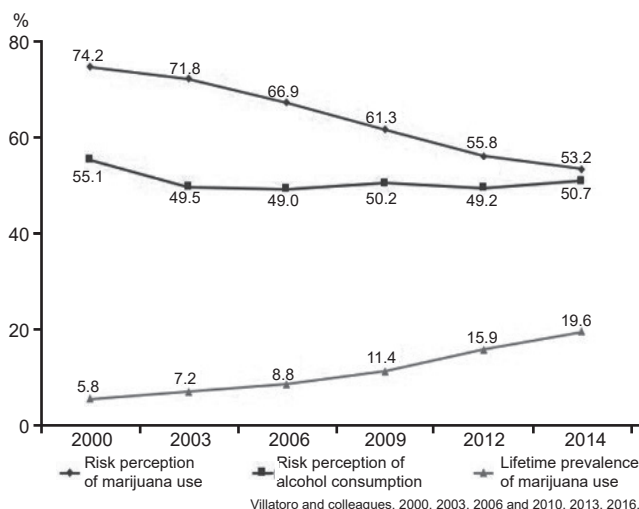


Figure 4. Trends in risk perception and marijuana use.

Table 2
Relationship between marijuana use and environmental, social and individual variables

Variables of interest	1	2	3	4	5	6	7	VIF
1. Times that respondent has used marijuana	-							
2. Gender	.316**	-						3.20
3. Urbanization of the community	.464**	-.019**	-					1.78
4. Drug availability	.878**	.045**	.577**	-				17.43
5. Exposure to opportunity	.950**	.246**	.518**	.946**	-			24.76
6. Tolerance of drug use by family	.161**	.644**	.386**	.405**	.259**	-		3.16
7. Tolerance of drug use by best friend	.866**	.427**	.370**	.694**	.814**	.085**	-	4.65
8. Risk perception	-.956**	-.369**	-.548**	-.861**	-.919**	-.111**	-.830**	9.41

Note: ** The correlation is significant at .01 (bilateral); VIF = Variance Inflation Factor; the *n* used corresponds to the expansion of the 128 aggregated units and is of 127,920 students.

risk of harm from alcohol and marijuana was almost 20%, whereas the 2014 data show that the risk perception of both is nearly the same (53.2% and 50.7%, respectively).

In order to determine which contextual factors are related to marijuana use, given the fact that they are closely linked, a matrix of intercorrelation was obtained (Table 2). It shows mainly that frequency of use is related to drug availability, exposure to opportunity, social tolerance by the best friend and risk perception.

Before proceeding with the data regression analysis, the co-linearity between the predictors was verified, using the variance inflation factor, showing that risk perception, availability and opportunity for use presented co-linearity. When analyzing the variables, the decision was taken to only maintain the risk perception variable, since it is a factor that is included as part of several preventive programs and is easier to modify than drug availability and being offered drugs.

The multiple linear regression analysis (Table 3) indicates that the predictors of greater marijuana use are low risk perception in the community, greater tolerance by the group of friends or parents and a higher level of urbanization. The model adjusts adequately, with an explained variance of 96%.

DISCUSSION AND CONCLUSION

The data obtained in this study shows that the prevalence of marijuana use has increased among students, and proportionately more among girls, particularly in high school.

However, use among boys is higher, who also report a lower risk perception of marijuana use. This is consistent with the literature, which indicates that cannabis use has increased in Mexico and other countries (Villatoro et al., 2012; Villatoro et al., 2014; Villatoro et al., 2014; Villatoro et al., 2016; OAS & CICAD, 2015; Centros de Integración Juvenil (CIJ [Youth Integration Centers]) & Secretaría de Salud (SSA [Ministry of Health]), 2016). In particular, the reports by CIJ show greater use of marijuana, both as used drug and as impact drug on patients that they first received.

Moreover, the results of this study reflect the importance of the availability of drugs in urban areas, the tolerance of drugs by friends and parents and risk perception, as variables affecting the decision to use marijuana. States with the most urban zones, with greater tolerance and less risk perception have the highest marijuana use.

This tallies with the findings of various authors that drugs are more available in urban zones, which encourages greater drug use. In particular, several authors agree that there is a greater likelihood of an early onset of marijuana use in these areas (Díaz-Negrete et al., 2008; Peñafiel, 2009; López et al., 2010; Morales et al., 2011). In some cases, this early onset increases the likelihood of using other substances with a greater addictive potential (Ellickson et al., 2004). Likewise, the conditions of violence and crime in streets and schools (elements that are more common in urban zones) increase the availability of these substances (McIlwaine et al., 2004; Tarter et al., 2006; López et al., 2010). It has also been found that in geographic areas with high levels of

Table 3
Multiple Linear Regression of marijuana use with environmental, social and individual variables

Variables predicting	Standardized coefficients	EE	t	p	95% CI	
Times that respondent has used marijuana						
Gender						
Boys	.00	.03	.11	.909	-.054 – .061	
Level of urbanization:	.12	.03	4.39	.001	-.172 – -.065	<i>R</i> ² = .96 adjusted
Tolerance of drug use by family	.15	.03	4.67	.001	.085 – .210	
Tolerance of drug use by best friend	.28	.04	7.04	.001	.205 – .365	
Risk perception	-.77	.05	-14.09	.001	-.875 – -.660	

crime and marginalization, adolescents are more exposed to opportunities for substance use (Neumark, Lopez-Quintero & Bobashev, 2012). Thus violence and crime not only influence people but also all community spaces, by reducing safe leisure and sociocultural areas that could serve as protective factors for youths and their families.

As regards the family, a link was found between parents' tolerance of drug use and marijuana use. It should be noted, however, that the reported level of tolerance is very low in Mexico, with a perceived rate ranging between 12% and 21% for high school boys. Despite these low percentages, the literature underlines the significant effect of parents' and families' acceptance of marijuana use, on both onset of use and continued use (Ellickson et al., 2004; Peñafiel, 2009; López et al., 2010; Nuño et al., 2004; Roditis et al., 2016).

Moreover, interacting with peer users can make it easier for drug use to appear normal, and the risk perception of substance use decreases, as noted by other authors (Neighbors et al., 2008; Chomynova et al., 2009; Jiménez-Muro et al., 2009; Peñafiel, 2009; Pedersen et al., 2013). This is particularly important among older students, since they are generally more exposed to use and its associated risks (Morales et al., 2011), in addition to the fact that they wish to experience new feelings and may have to cope with adverse situations (Sierra et al., 2005; Duarte et al., 2012).

In short, this study shows that there are modifiable factors relating to marijuana use among Mexican adolescents (drug availability, social tolerance and risk perception), which can play an important role in prevention programs and specific actions in public and crime policies.

In this context, where part of the international debate on the use of medicinal marijuana in various countries has not clearly defined its medicinal benefits or indicated that smoking it can harm the health of users and third parties (Sierra et al., 2005), further studies are required to consolidate these results and ensure that prevention actions include simple information on the action mechanism of the substance and short-, medium- and long-term effects on the user and his or her environment.

Work must be done to strengthen the educational, social, government and public security institutions to support prevention schemes, improve citizen surveillance and recover community spaces that provide safe recreation areas for families (Neumark et al., 2012).

Public policies must also be strengthened to provide options for development and employment, with benefits for new generations, in order to reinforce prevention targeting children and their caregivers and teachers, to enable individuals to develop with greater opportunities and provide drug users with options for integral treatment. Broad efforts should also be made to decriminalize drug use.

Finally, since this is a transversal study, the relationships indicated are correlational rather than causal. It studies the school population, meaning that specific studies must

be conducted with youths not attending school in order to learn about how these relationships take place in the latter group. Lastly, regular nationwide studies must be carried out to evaluate the evolution of the phenomenon more precisely.

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Conflicts of interest

The authors state that they have no conflicts of interest.

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