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# PERCEPTION OF RISK AND DRIVING UNDER THE EFFECTS OF ALCOHOL AND MARIJUANA ON UNIVERSITY STUDENTS IN A MULTICENTER STUDY: COLOMBIA

**Juan David Moncaleano**[1]
**Bruna Brands**[2,3]

[1]Ministerio de Relaciones Exteriores de Colombia. Bogota, Colombia.
[2]University of Toronto. Toronto, Canada.
[3]Centre for Addiction and Mental Health. Toronto, Canada.

## ABSTRACT

**Objective:** analyze the relationship between the perception of risk and the behavior of driving under the influence of alcohol or marijuana or getting into a vehicle driven by someone under the effects of these substances in order to identify risk factors and protective factors.
**Method:** multicenter study *cross sectional survey* with students from a University in Colombia (n = 493) completed a survey prepared during the International Program of Training in Research for Health Professionals and Related Areas to Study the Drug Phenomenon in Latin America and the Caribbean.
**Results:** an inverse relationship was observed between each of the three levels of risk perception: detection (p<.001), punishment (p<.05) and harm (p<.001), and driving behaviors with alcohol. This same type of relationship is observed with marijuana in terms of perceived risk of being involved in an accident (p<.05). However, regarding to marijuana, there is not enough evidence of an association with the perceived risk of being arrested or punished. The results show that there is an inverse relationship between what the students' relatives and friends think and do and the perception of risk of being arrested (p<.001), punished (p<.001) or of being involved in an accident (p<.001) for driving under the influence of alcohol and marijuana at the same time.
**Conclusion:** the results suggest that there are risk factors and protective factors that can be intervened to prevent injuries or fatal events associated with driving under the influence of alcohol or marijuana.

**DESCRIPTORS:** Car driving. Traffic accidents. Ethanol. Cannabis. Risks assumption.

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## PERCEPCIÓN DE RIESGO Y CONDUCCIÓN BAJO LOS EFECTOS DEL ALCOHOL Y LA MARIHUANA EN ESTUDIANTES UNIVERSITARIOS EN UN ESTUDIO MULTICÉNTRICO: COLOMBIA


### RESUMEN

**Objetivo:** analizar la relación entre la percepción de riesgo y el comportamiento de conducir bajo los efectos del alcohol o marihuana o subirse a un vehículo conducido por alguien bajo los efectos de estas sustancias con el fin de identificar factores de riesgo y factores protectores.
**Método:** estudio multicéntrico *cross seccional survey* con estudiantes de una Universidad en Colombia (n=493) que diligenciaron una encuesta elaborada durante el Programa Internacional de Capacitación en Investigación para Profesionales de la Salud y Áreas Relacionadas para Estudiar el Fenómeno de las Drogas en América Latina y El Caribe.
**Resultados:** se observó una relación inversa entre cada uno de los tres niveles de percepción de riesgo: detección (p<.001), sanción (p<.05) y daño (p<.001), y los comportamientos de conducción con alcohol. Este mismo tipo de relación se observa con marihuana en términos de percepción de riesgo de verse involucrado en un accidente (p<.05). Sin embargo, con respecto a la marihuana, no existe suficiente evidencia de una asociación con la percepción de riesgo de ser detenido o sancionado. Los resultados muestran que existe una relación inversa entre lo que piensan y hacen los familiares y amigos de los estudiantes y la percepción de riesgo de ser detenido (p<.001), sancionado (p<.001) o de verse involucrado en un accidente (p<.001) por conducir bajo los efectos de alcohol y marihuana al mismo tiempo.
**Conclusión:** los resultados sugieren que existen factores de riesgo y factores protectores que pueden ser intervenidos para prevenir lesiones o hechos fatales asociados a la conducción bajo los efectos de alcohol o marihuana.



**DESCRIPTORES:** Conducción de automóvil. Accidentes de tránsito. Etanol. Cannabis. Asunción de riesgos.


## PERCEPÇÃO DE RISCO E DIREÇÃO SOB EFEITOS DO ÁLCOOL E DA MACONHA EM ESTUDANTES UNIVERSITÁRIOS EM UM ESTUDO MULTICÉNTRICO: COLÔMBIA


### RESUMO

**Objetivo:** analisar a relação entre a percepção de risco e o comportamento na direção sob os efeitos do álcool ou da maconha, ou subir em um veículo dirigido por alguém sob os efeitos dessas substâncias, com o objetivo de identificar fatores de risco e fatores de proteção.
**Método:** estudo multicéntrico *cross seccional survey* com estudantes de uma Universidade na Colômbia (n=493) que participaram de uma pesquisa elaborada durante o Programa Internacional de Treinamento em Pesquisa para Profissionais da Saúde e Áreas Afins para Estudar o Fenômeno de Drogas na América Latina e no Caribe.
**Resultados:** observou-se relação inversa entre cada um dos três níveis de percepção de risco: detecção (p<0,001), punição (p<0,05) e danos (p<0,001), e os comportamentos na direção com álcool. Esse mesmo tipo de relação pôde ser observado com a maconha em termos de risco percebido de estar envolvido em um acidente (p<0,05). Porém, em relação à maconha, não há evidências suficientes de associação com o risco percebido de ser preso ou punido. Os resultados mostram que existe uma relação inversa entre o que pensam e fazem os parentes e amigos dos estudantes e a percepção de risco de serem presos (p<0,001), punidos (p<0,001) ou de estarem envolvidos em um acidente (p<0,001) por dirigirem sob os efeitos do álcool e da maconha ao mesmo tempo.
**Conclusão:** os resultados sugerem que existem fatores de risco e fatores de proteção que podem ser intervencionados para evitar lesões ou eventos fatais associados à condução sob a influência do álcool ou da maconha.



**DESCRITORES:** Direção de veículo. Acidentes de trânsito. Etanol. Cannabis. Tomada de riscos.

## INTRODUCTION

According to the World Health Organization (WHO), each year, traffic accidents cause the death of 1.24 million people worldwide.[1] It also points out that injuries caused by these accidents are the main cause of death in the group of 15 to 29 years of age, and has identified driving under the influence of alcohol as one of the risk factors. Like alcohol, driving after having used marijuana is associated with a higher probability of traffic accidents.[2] However, it has been reported that marijuana users do not consider driving under the effects of this substance as particularly dangerous or that its consumption affects their ability to operate a vehicle.[3–4] In this sense, driving under the effects of these substances is a public health problem, whose approach requires knowing the risk factors associated with this behavior.

The National Study of Consumption of Psychoactive Substances of 2013, compared to 2008, revealed a stabilization of alcohol consumption and an increase in the use of illicit drugs, in particular marijuana.[5] In the university population, the II Andean Epidemiological Study on Drug Consumption (hereinafter PRADICAN, Anti-Illicit Drugs Program in the Andean Community) found that 84.8% of university students reported having consumed alcohol in the last 12 months and 61.1% in the last month.[6–7] Regarding this last indicator, significant differences are observed between men and women: 66.6% and 56.1%, respectively. On the other hand, marijuana is the illicit substance most used among university students in Colombia. Last year prevalence of marijuana use in this population increased from 11.2% in 2009 to 15.0% in 2012.

In the Americas region, traffic accidents accounted for 150,000 deaths in 2010.[8] Particularly in Colombia, during that year there were 5502 deaths due to traffic accidents, of which 80% corresponded to male victims. In these cases, 18% involved alcohol consumption. While alcohol consumption has been studied as a risk factor for traffic accidents, in many countries the concern of driving under the influence of other drugs has grown.[9] Surveys and laboratory tests in several countries have shown that the use of psychoactive substances is frequently reported by drivers or detected in biological fluids of injured or dead drivers. According to the WHO global health estimates for 2016, the use of illicit drugs was responsible in 2013 for just over 39,600 deaths due to traffic accidents in the world.[10] It is estimated that the use of amphetamines was responsible for 51% and marijuana for 22% of these deaths. Although deaths from alcohol and driving were higher in the same year, the risk of deaths from driving under the influence of other drugs remains high.

In relation to marijuana, its consumption has been related to the increase in the incidence of traffic accidents, due to the different effects it has on the brain and that affect the ability to drive,[9] which are magnified when combined with intoxicating doses of alcohol.[11] However, the information on the prevalence of driving after consuming marijuana has been reported in countries such as United States, United Kingdom, Australia, New Zealand and some European countries, mainly from questionnaires, police or hospital records, and forensic data on drivers involved in accidents.[11]

Evidence has shown that it is possible to reduce road crashes and deaths when drivers of motor vehicles meet a blood alcohol limit of ≤ 0.05 g / dl.[12] According to the Pan American Organization of Health,[8] 14 of the 32 participating countries in the survey in the Americas region have established national alcohol limits ≤ 0.05 g / dl. In Colombia, Law 1696, of December 19, 2013, tightened penal and administrative sanctions for driving under the influence of alcohol and other psychoactive substances. Under this Act, driving under the effects of these substances is considered an aggravating circumstance of culpable homicide and monetary penalties are applied for drivers who have a blood alcohol concentration greater than 0.02 g / dl.[13–14] However, the law aims to establish criminal and administrative penalties for driving under the influence of alcohol or other psychoactive substances, only refers to sanctions and blood alcohol levels and does not establish blood or saliva thresholds for drugs such as cannabis. In this regard, it has been difficult to correlate a plasma concentration of Tetra-hydrocanabiol (THC) or another cannabinoid, or its metabolites, against any particular effect, taking into account the variability between these concentrations and the presentation of effects in different subjects.[15]

Research has shown that an approach focused on risk factors and protective factors that influence the attitudes and behaviors of adolescents and young adults in relation to drug use has proven to be effective in designing strategies to prevent drug use and its consequences adverse.[16–18] A risk factor is any factor associated with an increase in the probability of a behavior that usually has negative consequences. For example, in Colombia, the early onset of alcohol consumption has been reported as a risk factor that increases the likelihood of using alcohol and some illicit drugs in adulthood.[19] On the other hand, a protective factor reduces the impact of the risk factors, helping the individual not to engage in risky behaviors and to promote an alternative path.[18] For example, various factors such as social ties, external coercion and the establishment of a good affective relationship between parents and children have been described as protective factors that not only prevent the early consumption of alcohol but also control the development of antisocial behaviors.[20]

Based on this conceptual axis, it has been described that the objectives of a risk-based prevention strategy can be achieved through efforts aimed at eliminating or reducing risk factors or mediating or moderating their effects through the increase of protective factors.[16] For the purposes of this investigation, the risk perception is understood as the level of identification that a person makes of the potential dangers of carrying out a behavior, in this case of driving under the influence of alcohol or marijuana.[20] In this sense, in order to identify risk factors or protective factors for the design of strategies for the prevention of traffic accidents associated with driving under the influence of alcohol or marijuana, this study seeks to analyze the relationship between the perception of risk and the behavior of driving under the influence of alcohol or marijuana or getting into a vehicle driven by someone under the effects of these substances.

## METHOD

This quantitative cross-sectional study uses a questionnaire designed to collect data on university students participating in the framework of the International Program of Training in Research for Health Professionals to Study the Drug Phenomenon in Latin America and The Caribbean of CICAD/OAS.[21]For the purposes of this study, the dependent variable will be driving behaviors under the influence of alcohol or marijuana and it is divided into two categories: a) driving under the influence of alcohol or marijuana, and b) getting into a vehicle driven by someone under the influence of alcohol or marijuana, in the last twelve months.

The first independent variable corresponds to Perception of risk and refers to the perception of risk of: a) being detected while driving or driving under the influence of alcohol or marijuana, b) being punished by driving under the influence of these substances, and c) be involved in a motor vehicle accident while driving or driving under the influence of these substances.

The second independent variable corresponds to the behavior of driving under the effects of alcohol or marijuana of the relatives and friends of the students. Refers to whether friends of students or family members approve or not to drive under the influence of alcohol or marijuana and participate in behaviors such as a) driving under the influence of alcohol or marijuana, and b) boarding a vehicle driven by someone under the influence of alcohol or marijuana.

The problematic and non-problematic use of alcohol and marijuana is defined based on the scores students obtain in instruments specifically designed to evaluate the use of those substances. Finally, the prevalence of alcohol and marijuana use refers to the use of these substances within the prior 12 months and 30 days to the application of the survey.

The study population includes 22,437 undergraduate and graduate students, between the ages of 18 and 29 who are enrolled in the face-to-face programs of a university in Colombia. The sample size corresponded to 378 students, calculated by using a confidence interval of 95% and a 5% margin of error.

The research was approved by the Ethics Committee of CAMH and the University where the study was conducted, which included ethical issues related to the voluntary and informed participation

of students, anonymity, confidentiality and data storage, as well as risks and benefits associated with participation.

## RESULTS

### Characterization of the sample and consumption of alcohol and marijuana

A total of 493 students were surveyed in the University, distributed in a representative way in the different Faculties according to the information of the statistical bulletin of the University, published in 2015, on the number of enrolled students.

Demographic data show that 68.2% of the students surveyed are between 18 and 21 years old, while 25.6% are between 22 and 25 years old. Only 6.1% of students are between 26 and 29 years old. Regarding to the students' gender, the sample comprises 55.8% of female students and 43.6% of male students.

In contrast to the recent use of alcohol, table 1 shows that 87.3% of students reported having consumed alcohol in the last 12 months. In relation to current alcohol consumption, 74.2% of students said they had consumed alcohol in the last 30 days.

The probable problematic use of alcohol was determined through the application of the AUDIT instrument in students who reported having consumed alcohol in the last year. The results show that 37.2% of the students who recently consumed alcohol present problematic use of this substance. When disaggregate this result by gender, it is observed that men present more problematic alcohol use than women, being 41.5% and 34.2%, respectively.

**Table 1** – Prevalence of alcohol or marijuana use in the group studied and probable problematic use of these substances. COLOMBIA, 2016 (n=493)

| | Alcohol (%) | Marijuana (%) | Alcohol and marijuana (%) |
|---|---|---|---|
| Recent consumption | 87.3 | 35.5 | 22.1 |
| Current consumption | 74.2 | 21.5 | 13.2 |
| Women | 70.2 | 15.3 | |
| Men | 79.5 | 29.8 | |
| Probable problematic use | 37.2 | 47.6 | |

In relation to current alcohol consumption, 35.5% of students said they had consumed alcohol in the last 12 days. When disaggregating the recent consumption of marijuana by gender, it is observed that 42.8% of men and 29.1% of women reported having used marijuana in the last 12 months. Table 1 also shows that 21.5% of students reported having used this substance in the last 30 days, corresponding to 29.8% of men and 15.3% of women.

The CAST scale (Cannabis Abuse Screening Test, for its acronym in English) was used to measure the likely problematic use of marijuana in students. The results indicate that 47.6% of the students who used marijuana in the last 12 months presented a probable problematic use of marijuana, of which 59.1% were men and 34.2% were women.

### Driving behavior under the influence of alcohol or marijuana

In relation to the behaviors of driving under the influence of alcohol, table 2 shows that 25.7% of students who consume alcohol have driven a motor vehicle in the last 12 months, after 2 hours of having consumed this substance. This behavior occurs mostly among men, with 32.3%, compared to women, with 19.9%. In relation to the behavior of getting into a vehicle driven by someone under the

influence of alcohol, the proportion of students increases. The results show that 40.2% of the students have boarded into a vehicle driven by someone who had consumed alcohol in the last 2 hours.

**Table 2** – Driving behaviors under the influence of alcohol or marijuana in university students. Colombia, 2016. (n=493)

| | Alcohol (%) | Marijuana (%) | Alcohol and marijuana (%) |
|---|---|---|---|
| Driving | 25.7 | 31.3 | 21.2 |
| Women | 19.9 | 21.3 | |
| Men | 32.3 | 39.6 | |
| Passenger | 40.2 | 29.4 | 18.5 |
| Women | 41.6 | 24.0 | |
| Men | 38.6 | 35.8 | |

In relation to marijuana, 31.3% of students who have used this substance have driven a vehicle 2 hours after having consumed it. This behavior is also greater among men (39.6%) than among women (21.3%). Unlike alcohol, the proportion of students who have climbed into a vehicle driven by someone who has used marijuana is maintained. The results show that 29.4% of the students have boarded into a vehicle driven by someone who had consumed alcohol in the last 2 hours.

Faced with the consumption of both substances when driving, 21.2% of students who consumed alcohol or marijuana at the same time, drove a vehicle 2 hours after having consumed them. On the other hand, 18.5% of the students boarded into a vehicle driven by someone who had consumed alcohol and marijuana.

## Risk perception

In relation to the perception of risk, table 3 shows that 53.4% of students perceive as very likely that a police officer will identify a driver who drives under the influence of alcohol. In the same sense, 56.2% of the students consider that a driver be punished (arrested, imprisoned or fined) for driving under the influence of alcohol. On the other hand, 80.9% of the students perceive as very probable that a driver who has been consuming alcohol is involved in an accident with his vehicle.

**Table 3** – Perception of risk of driving under the effects of alcohol or marijuana in university students. Colombia, 2016. (n=493)

| | Alcohol (%) | Marijuana (%) | Alcohol and marijuana (%) |
|---|---|---|---|
| Be identify | 53.4 | 17.0 | 56.6 |
| Suffer a penalty | 56.2 | 25.6 | 60.7 |
| Be involved in an accident | 80.9 | 49.6 | 72.9 |

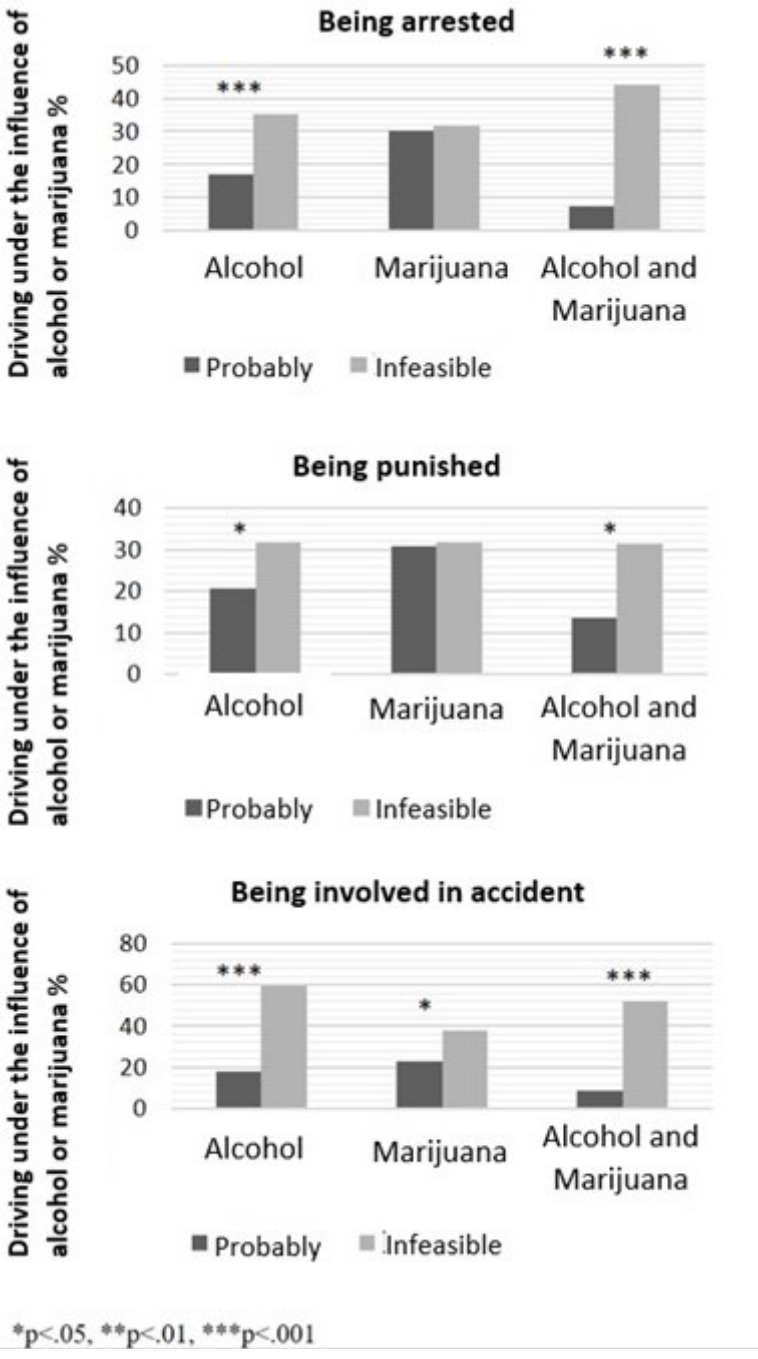
On the other hand, 49.6% of the students perceive as very probable that a driver who has been consuming alcohol is involved in an accident with his vehicle. Similarly, 83.0% and 74.4% perceive as very unlikely that a driver is identified by the police or sanctioned, respectively, for driving under the influence of marijuana.

Regarding to driving under the effects of alcohol and marijuana, the perception of risk of being arrested or sanctioned increases with respect to driving only with alcohol, but decreases in relation to the perception of risk of being involved in an accident.

When disaggregating these data by gender, it is not possible to observe a difference in the perception of risk of being arrested, sanctioned or of having an accident with alcohol or marijuana, between men and women.

## Driving behavior under the influence of alcohol or marijuana

Regarding the relationship between perception of risk and driving behavior under the influence of alcohol or marijuana, figure 1 shows that there is a statistically significant relationship between the perception of risk of being arrested, punished or being involved in an accident and the behavior of students related to driving a vehicle under the influence of alcohol or getting into a vehicle driven by someone under the effects of this substance.




*p<.05, **p<.01, ***p<.001

**Figure 1** – Relationship between perception of risk of being arrested, punished or being involved in an accident and driving under the influence of alcohol or marijuana

In contrast, in relation to marijuana, the results show that there is not enough evidence to suggest an association between the perception of risk of being arrested or punished for driving under the influence of marijuana or getting into a vehicle driven by someone under the effects of this substance.

However, there is a significant association between the perception of risk of being involved in an accident and driving or getting into a vehicle driven by someone under the influence of marijuana.

### Students' relatives and friends and perception of risk and behaviors of the students

Figure 2 shows that there is not enough evidence to suggest an association between what students' friends and relatives think and do and the perception of risk that students have of being arrested, punished or being involved in an accident due to driving under the effects of alcohol. In relation to the perception of risk of being arrested for driving under the influence of marijuana, there is also no evidence to suggest an association with what the students' friends and relatives think and do.

However, there is a significant association between what students' relatives and friends think and do and the perception of risk of being sanctioned or having an accident due to driving under the influence of marijuana. Similarly, the perception of risk of being arrested, punished or being involved in an accident due to driving under the influence of alcohol and marijuana has a significant association with what relatives and friends of the students think and do.

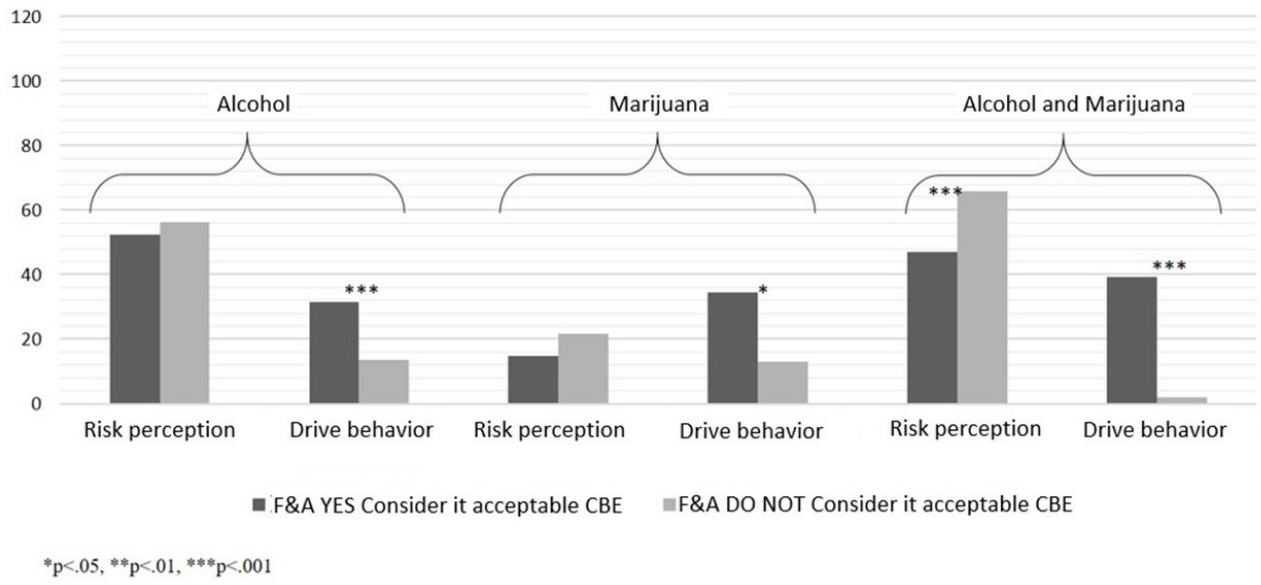



**Figure 2** – Relationship between behaviors of students' relatives and friends and their perception of risk of being arrested, punished or having an accident and driving behavior under the influence of alcohol or marijuana.

F&A= Relatives and friends; CBE= driving under the effects

## DISCUSSION

When estimating the annual prevalence of alcohol use in the target population, the results are maintained in comparison with the reference study in the university population (PRADICAN). However, the last month prevalence results show that current alcohol consumption (74.2%) increases in comparison with the data from the University that were sent to the PRADICAN project (69.1%).[22] With regard to the PRADICAN study, it is also observed that the current alcohol consumption in women (70.2%) has increased. It should be mentioned that the comparison with the PRADICAN

study has limitations, taking into account that the methodology for data collection is different in both cases. However, the increase in alcohol consumption in the last month in women may be related to the results of the recent study in the general population in Colombia, which reported an increase in current alcohol consumption in women, among the age groups from 18 to 24 and 25 to 34 years old.[5]

In relation to marijuana consumption, the results show a recent and current use of marijuana of 35.5% and 21.5%, respectively. These findings contrast with what the PRADICAN study reported, which places these prevalence respectively at 15% and 7.1%. The increase in the marijuana consumption was reported in the 2013 study with general population, which observed a significant increase of the use of marijuana at the country level, which manifests itself in both men and women and especially in the group from 18 to 24 years old.[5] According to this national report, the rise resulted from increased consumption among young people, a higher proportion of women, and a higher marijuana use report in the states of the country.[15] Although it is not the purpose of this paper to determine the causes of the cannabis use increasing in young people, it has been reported that the use of marijuana can be perceived as relatively harmless, when compared to the use of other controlled psychoactive substances or in relation to with the use of tobacco or alcohol.[23–24]

Specifically in the university environment, it has been reported that students perceive a high accessibility to psychoactive substances, mainly marijuana, whose consumption they consider to be normalizing.[22] In this study, students recognized the university context as conducive to start consumption due to the dynamics of interaction between peers that are mediated by the search for identity and recognition, as well as the search for reference groups, called “patches” or groups of friends.

It has been reported that in countries such as the United States, the perception of young people against the risks of marijuana use has diminished in the last decade, possibly related to the increase in public debate about legalization or less restrictions on marijuana. medicinal or recreational use.[25] In this regard, in recent years the debate has opened in Colombia on the use of marijuana for medical and scientific purposes, which was materialized with Law 1787 of July 16, 2016, which aims to create a regulatory framework that allows safe and informed access to the medical and scientific use of cannabis and its derivatives. However, to date there is no evidence of a relationship between the increase in marijuana use in Colombia or changes in the perception of this substance and the debates about its use regulation, for example, for medical and scientific purposes.

In order to measure the probable problematic use of marijuana in students, the CAST scale was used, which is the most widely disseminated instrument internationally to measure the problematic use of marijuana in school and university population.[26] The results show that 47.6% of students who used marijuana in the last 12 months presented a probable problematic use of marijuana, in 59.1% of men and 34.2% of women. This result is greater regarding to the PRADICAN study, which observed that 27.1% of the students qualify for abuse or dependence criteria.

This comparison has its limitations, in the sense that the PRADICAN study did not use the CAST scale, even though both evaluations take into account the criteria of abuse or dependence according to CIE 10 and DSM IV. On problematic consumption, university students identify it as frequent and uncontrolled consumption, in addition to situations such as “filling gaps”.[22] Students consider that a person needs help when they lose functionality, that is, when he stops satisfying its responsibilities and when consumption affects his interpersonal relationships. These results of probable problematic use of marijuana in students would require further study and follow-up, taking into account the adverse effects on health and that may be increased by harmful patterns of marijuana use, including the high frequency of use of the substance and the consumption of marijuana with high THC content.[24] On the latter, it has been reported that marijuana consumed in cities such as Bogotá contains high THC contents, between 5.1 and 20.5%.[27]

The next goal of this study was to evaluate behaviors associated with driving a vehicle under the influence of alcohol or marijuana and getting into a vehicle driven by someone under the influence of these substances. The results of table 2 show that while 25.7% of students have driven a vehicle after consuming alcohol, 31.3% did so under the effects of marijuana and in both cases, this behavior is greater in the men than in women. Studies in other latitudes have shown that the proportion of university students who report having driven after using alcohol is between 15-43% and for marijuana in 13-53%.[28] In some cases, driving rates after marijuana use are equal to or higher than driving after drinking alcohol.[29] In relation to gender, it has been reported that men are more likely to report the use of marijuana and driving after using alcohol or marijuana.[28]

In relation to the behavior of getting into a vehicle driven by someone under the influence of alcohol or marijuana, It has been reported that a person who consumes these substances and has the behavior of driving under their effects is more likely, in a risky way, to get into a vehicle driven by a person in a drunken state.[30] Likewise, drivingafter consumption of psychoactive substances is associated with an increase in at least twice the risk of being a passenger with another consumer.[28] In this regard, the results of this study show that students who drive under the influence of alcohol or marijuana have also get into a vehicle driven under the effects of these substances. The results also show that, unlike alcohol, the proportion of students who have driven after consuming marijuana is similar to those who have boarded into a vehicle under the effects of this substance. This could also be related to a lower risk perception of marijuana with respect to alcohol, as will be discussed later.

Faced with the consumption of both substances, the results show that 21.2% of students drove a vehicle after consuming alcohol and marijuana, and in a similar proportion (18.5%), they got into a vehicle driven by someone under the effect of these substances. As a whole, these percentages are lower than those found with the substances separately, which may be related to a higher risk perception of the use of both substances. Some studies have found that alcohol consumption combined with marijuana increases the risk of harm and therefore has important implications for safety. When marijuana is used combined with alcohol, the risk of an estimated accident is higher than that of any of these substances separately, which may suggest a synergistic effect.[31] This is particularly important for drivers using these substances at low levels: these drivers may believe they are using them in moderation, but the deterioration is more acute when the substances are combined.[11] The combined use of alcohol and marijuana seems to be fairly common, although more research is needed in the field.

When evaluating the perceptions of risk of a police officer identifying a driver driving under the influence of alcohol and a driver being punished (arrested, incarcerated or fined) for driving under the influence of this substance, the results in table 3 indicate that 53.4% and 56.2% of students perceive these situations as very probable, respectively. On the contrary, the results show that 17.0% and 25.6% of students perceive as very probable that a driver is identified by the police or sanctioned, respectively, for driving under the effects of marijuana. Another goal of this paper was to examine the association between risk perception and driving under the influence of alcohol or marijuana. Figure 1 shows an inverse relationship between each of the three levels of risk perception: detection ($p$<.001), punishment ($p$<.05) and harm ($p$<.001), and driving behaviors with alcohol. This same type of relationship is observed with marijuana in terms of perceived risk of being involved in an accident ($p$<.05). However, regarding to marijuana, there is not enough evidence of an association with the perceived risk of being arrested or punished. In relation to these legal situations (detention and punishment), the results of the present study coincide with the evidence that young adults who drive after consuming marijuana believe that they are less likely to experience such negative consequences, compared with driving under the effects of alcohol.[4] In countries like the United States, it has been reported that these discrepancies may not simply be a result of excessive use of marijuana, but a reflection of the decriminalization of medicinal use consumption and the difficulties faced by law

enforcement officials in identifying marijuana. Faced with this last aspect, there are limitations for the implementation of policies regarding the identification of marijuana in drivers, related to the feasibility of detection technology and the difficulty of relating the concentration of cannabinoids in the blood and the degree of impairment of driving skills.[9] In addition, in these countries, the marijuana detection tools currently available to law enforcement officials are considered ineffective by the population.[31] In Colombia, there are currently no standardized tests for the detection of marijuana in drivers. Also, unlike alcohol, the law 1696/13 does not establish penalties according to defined ranges concentrations of cannabinoids in blood, which may influence the differences observed in relation to alcohol and the perception of being arrested or punished for driving under the effects of marijuana.

Results also show a difference compared to the perception that a driver who has been consuming alcohol (80.9%) or marijuana (49.6%) is involved in an accident with his vehicle. In this regard, it has been reported that many young adults claim that smoking marijuana before driving does not affect their ability to operate a vehicle.[4] This is remarkable since research has shown that people with lower levels of risk perception are more likely to drive under the influence of marijuana.[33] Similarly, recent evidence has also shown that marijuana users do not consider their drug use or driving under the influence of psychoactive substances as particularly dangerous.[3]

The next goal was to analyze the relationship between relatives and friends' behaviors and students' perception of risk and behavior towards driving under the effects of alcohol or marijuana. An inverse relationship was identified between what students' relatives and friends think and do and the perception of risk of being arrested ($p<.001$), punished ($p<.001$) or being involved in an accident ($p<.001$) for driving under the influence of alcohol and marijuana at the same time. Regarding the substances separately, only a significant and inverse relationship was observed regarding to the perception of risk of being sanctioned or being involved in an accident after consuming marijuana. Overall, these results show that acceptability or practicing behaviors by those who can understand the closest core of students decreases their perception of risk from being detected, receiving a sanction or having an alcohol and marijuana accident, and their perception of risk from receiving a sanction or having a marijuana-only accident. In contrast, when analyzing the relationship between the students' relatives and friends behaviors and the adoption by students of these same behaviors, it is possible to say that in all cases there is a significant association (mostly $p<.001$). These results can be explained d in part by what has been reported on the contribution of regulatory beliefs,[34] defined as the perception of friends' behavior or acceptance of a friend's behavior, a higher risk of driving under the effects of marijuana, or being a passenger with someone driving under the effects of this substance.[35] Evidence has also shown that young people perceive driving under the effects of marijuana as acceptable among their peers and consider that the negative consequences are less than those associated with driving under the influence of alcohol.[28]

## CONCLUSION

The results of this study allowed us to identify risk factors (alcohol consumption, present in both men and women, marijuana use, which occurs mostly in men, behaviors of driving under the influence of alcohol or marijuana and getting on a vehicle driven by someone who has consumed these substances, and the low perception of risk of being arrested, punished or being involved in an accident due to driving under the influence of marijuana) and protective factors (the influence that relatives and friends have on the conduct of students related to driving under the influence of alcohol or marijuana) that can be intervened to prevent injuries or fatal events associated with driving under the influence of alcohol or marijuana.

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## NOTES

### CONTRIBUTION OF AUTHORITY

Study design: Moncaleano JD, Brands B.
Data collect: Moncaleano JD.
Data analysis and interpretation: Moncaleano JD, Brands B.
Discussion of the results: Moncaleano JD, Brands B.
Writing and / or critical review of content: Moncaleano JD, Brands B.
Review and final approval of the final version: Moncaleano JD.

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### ETHICS COMMITTEE IN RESEARCH

The research was approved by the Ethics Committee of CAMH and the University where the study was conducted.

### CONFLICT OF INTEREST

There is no conflict of interest.

### HISTORICAL

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### CORRESPONDENCE AUTHOR

Juan David Moncaleano
juan.moncaleano@cancilleria.gov.co

# ERRATUM: PERCEPTION OF RISK AND DRIVING UNDER THE EFFECTS OF ALCOHOL AND MARIJUANA ON UNIVERSITY STUDENTS IN A MULTICENTER STUDY: COLOMBIA

Regarding the article “PERCEPTION OF RISK AND DRIVING UNDER THE EFFECTS OF ALCOHOL AND MARIJUANA ON UNIVERSITY STUDENTS IN A MULTICENTER STUDY: COLOMBIA”, with DOI number http://dx.doi.org/10.1590/1980-265x-tce-cicad-24-28, published in Texto & Contexto Enfermagem, vol 28 Special Issue, elocation e2428:

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