Addictive Behaviors Reports 7 (2018) 8–13

Contents lists available at ScienceDirect

Addictive Behaviors Reports

journal homepage: www.elsevier.com/locate/abrep

Association between drug use and urban violence: Data from the II Brazilian National Alcohol and Drugs Survey (BNADS)

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ARTICLE INFO

Keywords:
Urban violence
Cocaine
Alcohol use disorder
Household survey
Epidemiology

ABSTRACT

Objective: To investigate the association of alcohol and cocaine use with urban violence (both as victim and as perpetrator) in a representative sample of the Brazilian population.
Method: The Second Brazilian Alcohol and Drugs Survey (II BNADS) interviewed 4607 individuals aged 14 years and older from the Brazilian household population including an oversample of 1157 adolescents (14 to 18 years old). The survey gathered information on alcohol, tobacco and illegal substances use as well as on risk factors for abuse and dependence, behaviors associated with the use of substances and the possible consequences, as urban violence indicators.
Results: Approximately 9.3% of the Brazilian population has been victim of at least one form of urban violence. This proportion increases to 19.7% among cocaine users and to 18.1% among individuals with alcohol use disorders (AUD). Perpetration of violence was reported by 6.2% of the sample. Cocaine use and AUD increased in almost four times the chances of being an aggressor. Being religious and married decreased the chances of being a victim and/or perpetrador of urban violence. Higher education also decreased the chances of involvement in both victimization or perpetration of violence. Both Parallel Mediation Models considering cocaine use as a predictor of urban violence (victimization or perpetration) were valid and alcohol consumption and depressive symptoms were mediators of this relationship.
Conclusions: This study presents relevant data of interest to Brazil as this country is one of the major consumer market of cocaine and also is among the most violent countries worldwide.

1. Introduction

The association between violence and the consumption of psychoactive substances has been extensively studied worldwide (WHO, 2005, 2009). The World Health Organization defines violence as “the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development or deprivation” (WHO, 2002). Degenhardt and colleagues suggested that the burden of disease attributable to illicit drugs consumption should take into account the consequences of violence associated with drug use (Degenhardt et al., 2013; Degenhardt, Whiteford, & Hall, 2014).

Alcohol and stimulants are known to be important contributors to many risk behaviors and a myriad of undesirable outcomes, such as mental and physical health complications, suicide, traffic accidents, injuries and violence (Gomez & Barrera, 2008; Proescholdt, Walter, & Wiesbeck, 2012; Sousa, Correia, Ramos, Fraga, & Barros, 2009). Some acute effects of alcohol and stimulants may act to increase the probability of certain injuries (Gillet, Polard, Mauduit, & Allain, 2001). Evidence shows that alcohol consumption reduces inhibitions and increases aggressive behaviors in men (Hoaken & Stewart, 2003). Cocaine and other stimulants also trigger impulsive behaviors and aggression (Anderson & Bokor, 2012), and these effects are magnified by the combination of these two substances, which commonly occurs among users (Macdonald, Erickson, Wells, Hathaway, & Pakula, 2008; Vitale & van de Mheen, 2006).

Urban violence has grown into a major public concern in Brazil, but studies measuring its social and economic burden are scarce. According to “Global Study on Homicide, 2013” Brazil had 50,108 homicides in

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https://doi.org/10.1016/j.abrep.2017.11.003
Received 23 August 2017; Received in revised form 10 November 2017; Accepted 11 November 2017
Available online 12 November 2017

2012, which represents just over 11% of all the 437,000 murders committed globally, harboring one in ten of all homicides committed in the world and placing the country as the 16th most violent (UNODC, 2013). It is estimated that murder rates reach 25.2 per 100 thousand inhabitants in the country, which is four times higher than the world average of 6.2 per 100,000 people (UNODC, 2013). Not surprisingly, a 2009 national survey estimated that 47.2% of Brazilians did not feel safe in the city where they lived (IBGE, 2009). In addition, deaths caused by firearms among people aged 15 to 29 years increased 414% in ten years (Waiselfisz, 2013) in Brazil, where close to 1 million people have died as a consequence of gunshot wounds between 1980 and 2014 (Waiselfisz, 2016).

The identification of violence predictors and correlates are essential to elaborate preventive initiatives (WHO, 2002). Combining the country's worrying rates of violence (J. Murray, Cerqueira, & Kahn, 2013), with the elevated alcohol and crack/cocaine use rates (Abdalla et al., 2014), it becomes indispensable to establish and understand the association between the use of these two drugs and urban violence. This study aims to estimate the rates of different indicators of urban violence in a nationally representative sample of Brazil. Further, it also aims to assess the association between violent behavior with the most consumed illicit substances in the country and alcohol use. We propose possible pathways linking cocaine and alcohol consumption to urban violence as well as depressive symptoms, since this comorbidity is frequent and may have common brain mechanisms (Arango-Lievano & Kaplitt, 2015) and for the fact that depression may be associated with physical and psychological aggression by substance misusers (R. L. Murray et al., 2008).

The hypothesis underlying our investigation are: 1) there is an association between alcohol and cocaine use and urban violence (victimization and perpetration); 2) these associations remain significant even when adjusting for all sociodemographic variables; 3) alcohol misuse and depressive symptoms will have a mediator effect in the path between cocaine use and urban violence.

2. Material and methods

2.1. Sampling and procedures

The Second Brazilian National Alcohol Survey (BNADS) was conducted in 2012. A multistage cluster sampling procedure was used to select 4607 individuals aged 14 years and older from the Brazilian household population including an oversample of 1157 adolescents (14 to 18 years old). The overall response rate was 77% and the adolescents oversample response rate was 79%. A complete description of the BNADS method was previously published by Abdalla et al. (2014).

2.1.1. Ethics

All respondents granted their informed consent and the interviews complied with all statements required by the Brazilian Ministry of Health Ethical Comitee Office (CAAE: 61909615.0.0000.5505) and the Ethics Committee of the Federal University of Sao Paulo.

2.2. Measurements

2.2.1. Sociodemographic variables

In this analysis, all the main sociodemographic variables were assessed - sex, age (used as continuous variable and as categoric: 0 = 15 to 24 years old (YO), 1 = 24 to 34 YO, 2 = 35 to 44 YO and 4 = 45 to 64 YO), education (schooling years, used as continuous variable and as categoric: 0 = up to 8 years 1 = 9 to 12 and 2 = 13 or more); personal income (used both as a continuous variable and categoric: 0 = up to three minimum salaries 1 = 3 to 4 MS and 2 = 5 or more MS); religion (yes/no binary variable) and marital status (binary variable: 0 = living alone (single or widowed or separated) and 1 = cohabiting (married or living with someone).

2.2.2. Substance use

In order to guarantee confidentiality, questions related to illicit drug use were not asked face-to-face, but self-reported separately by the participant alone, using a standard form, which was collected at the end of the interview and placed in sealed envelopes, which were then placed in sealed bags in front of the respondent. The questions used for this paper were:

Cocaine use – Previous year cocaine use (binary yes/no variable) was assessed using the sealed envelope method. All cocaine users were polydrug users.

Alcohol use – A continuous variable of number of drinks consumed in a typical day (in alcohol) units was measured with the assistance of a unit/drinks demonstration chart. This index was tested in the conditional model.

DSM-5 alcohol use disorder (AUD) - This was assessed with the Brazilian version of the Composite International Diagnostic Interview (CIDI 2.1) (Quintana, Jorge, Gasta, & Miranda, 2004). Although this survey pre-dates DSM-5, the questionnaire included a question about craving, which allowed for the creation of a diagnosis based on DSM-5 criteria, covering the eleven criteria included in the DSM-5. According to DSM-5 criteria, in the analysis herein, the presence of 2 or more criteria in the past 12 months was considered a positive diagnosis of AUD.

2.2.3. Urban violence (UV)

The assessment of urban violence was divided into two categories: victimization and perpetration. Each of these was composed by combining three indicators generating two dichotomic variables: UVV and UVP. A code of 1 was given when participants answered positively to at least one of the following violence related events.

Victimization (UVV): 1) being threatened by a weapon: "*In the last 12 months, did someone threatened or hurt you with a weapon as a gun or a knife*?; 2) Being the victim of assault: "*In the last 12 months, have you been victim of an assault*?" and 3) Being victim of rape: "*Have you ever been forced (a) to have sex with someone*?"

Perpetration (UVP): 1) being involved in fights with physical aggression: "*In the last 12 months, did you get into a fight with physical aggression in which you got hurt and had to be treated by a doctor or nurse*?" 2) Going out armed: "*Over the past 30 days, did you go out armed with a gun or a knife*?" and 3) being charged by police: "*In The last 12 months have you been detained by the police or have a police report*?"

2.2.4. Depressive symptoms

Assessed using the Brazilian validated version of the 20-item Center for Epidemiological Studies Depression Scale (CES-D) (Batistoni, Neri, & Cupertino, 2007). The CES-D Scale measures the experience of depressive symptomatology during the past week. The items assess cognitive, affective, behavioral, and somatic symptoms of depression, and positive affect. Each item is rated on a 4-point scale ranging from 0 = rarely or none of the time (less than 1 day) to 3 = most or all of the time (5–7 days). A total score is calculated by summing the responses after reversing the positive affect items. Higher scores reflect greater

levels of depressive symptomatology. Radloff (1977) reported good internal consistency for the measure, with Cronbach's alpha coefficients of 0.84–0.85 in white community samples and 0.90 in clinical samples. There also was strong evidence for validity. The CES-D discriminates between psychiatric inpatient and general population samples, and among levels of severity within patient groups; and is associated with other measures of depressive symptomatology. The sum of symptoms (ranging from 0 to 80) was considered as the index tested in the conditional model.

2.2.5. Control variables

All models (logistic regression and conditional analysis) were adjusted by sex and age.

2.3. Statistical analysis

The analysis was performed in STATA version 13 software (StataCorp., 2013) for the weighted prevalence rates estimations, individual associations and paths analysis. All the analysis accounted for the complex sampling characteristics of the data. Analyses were conducted on data weighted to correct for unequal probabilities of selection into the sample, and a post-stratification weight was applied to correct for non-response to known population distributions on demographic variables (education, age, sex and region of the country) according to the 2010 Brazilian Census. Cross-tabulations were used to examine the two urban violence types (UVV and UVP) by sociodemographic characteristics and substance use. We used multinomial regression to assess the unconditional associations between UVV and UVP and sociodemographic and substance use variables. All multinomial models were adjusted for sex and age.

2.3.1. Conditional modeling

The Conditional Analysis was performed using Process ("processmacro.org" macro v2.14.) installed in SPSS21. PROCESS is a computational procedure that implements moderation or mediation analysis as well as their combination in an integrated conditional process model. The framework used for this path analysis is similar to the approach described by Edwards and Lambert (Edwards & Lambert, 2007). The hypothesis was to determine whether the direct association between cocaine consumption and urban violence (perpetration and victimization) could be mediated by depressive symptoms (DS) and alcohol use (AU). To test this hypothesis we adopted the Parallel Multiple Mediator Model (PMM) from the Conditional Process Analysis algorithms. Cocaine use was considered the predictor (X), urban violence the outcome (Y) and the mediating variables were depressive symptoms (M1) and alcohol use (M2). Two models were constructed: one for the outcome of urban violence as victim and the other for the outcome of urban violence as perpetrator. All models were calculated as weighted linear composites of scale items. The mediations were conducted to estimate the effect of the two mediators in the relation between cocaine use and urban violence using the product of coefficients method (Mackinnon & Fairchild, 2009). For the serial mediation analysis the total effect of X on Y is equal to the direct effect of X plus the sum of the two specific indirect effects of the two mediators. All mediation effects were estimated in Process using a maximum likelihood estimator and 10,000 bootstrap draws to obtain confidence intervals for the indirect effect. All mediation models were evaluated using multiple indices of model fit: a non-significant chi-square statistic, comparative fit index (CFI) values greater than 0.95, and standardized root mean square residual (SRMR) values less than 0.08 (Hu & Bentler, 1999).

Regarding the use of conditional models to analyse cross-sectional data, it should be pointed out that recent studies have broadened the use of this tool, taking into consideration that isolated causal relationships is not the only goal of this statistical tool, and that the idea of cause and effect should be abandoned in the interpretation its results. The idea of predictors and outcomes should be adopted instead (Hayes, 2013; Pearl, 2001).

3. Results

3.1. Sample characteristics and descriptive analysis

Approximately 9.3% of the Brazilian population has been a victim of at least one form of urban violence. This proportion increases to 19.7% among those who used cocaine in the previous year. Over one in ten binge drinkers (10.7%) suffered at least one form of urban violence, the rate nearly doubled among individuals with alcohol use disorders (AUD) (18.1%). Both were significantly associated with violence victimization. Perpetration of violence was reported by 6.2% of the sample. Being religious and in a relationships also were protective factors for being victim and/or perpetrador of urban violence. Education decreased significantly the chances of involvement in both types of violence, with the bracket "13 years of education or more" reaching borderline statistical significance. Cocaine use and alcohol use disorder increased by almost four times the chances of participants engaging in violent behaviors (see Table 1).

Table 1
Descriptive prevalence rates of sociodemographic characteristics and associations with urban violence within the previous year.

General population		Urban violence victimization (UVV)			Urban violence perpetration (UVP)		
	% (95%CI)	% (95%CI)	OR (95%CI)	p	% (95%CI)	OR (95%CI)	p
Total (N = 4607)		9.3 (7.9–10.9)			6.2(5.1–7.4)		
Sex							
Men	48.4 (46.3–50.5)	8.9 (6.9–11.4)	1.00		8.7 (6.9–10.8)	1.00	
Women	51.6 (49.5–53.7)	9.6 (8.1–11.4)	1.16 (0.78–1.71)	0.466	3.8 (2.8–5.1)	0.46 (0.29–0.73)	0.001
Age							
15–24	25.5 (23.9–27.1)	9.6 (7.6–12)	1.00		8.8 (6.8–11.2)	1.00	
25–34	24.3 (22.8–25.9)	9.6 (7.2–12.7)	1.23 (0.71–2.13)	0.449	6.9 (4.6–10.3)	0.88 (0.45–1.71)	0.711
35–44	21 (19.1–23)	8.3 (6–11.3)	1.05 (0.59–1.87)	0.874	4.3 (2.9–6.5)	0.58 (0.32–1.04)	0.067
45–64	29.2 (27.2–31.4)	9.4 (6.9–12.6)	1.00 (0.58–1.76)	0.982	4.5 (3–6.9)	0.42 (0.21–0.81)	0.011
Education							
Up to 8	39.9 (37.1–42.7)	10.1 (7.9–12.6)	1.00		6.3 (4.7–8.5)	1.00	
9 to 12	31.8 (29.9–33.9)	8.5 (6.5–11)	0.50 (0.31–0.82)	0.007	5.6 (4.2–7.4)	0.54 (0.32–0.91)	0.022
13 or more	28.3 (26–30.6)	9 (6.6–12.2)	0.54 (0.29–1.00)	0.051	6.5 (4.9–8.5)	0.62 (0.37–1.04)	0.072

(continued on next page)

Table 1 (*continued*)

General population		Urban violence victimization (UVV)			Urban violence perpetration (UVP)		
	% (95%CI)	% (95%CI)	OR (95%CI)	p	% (95%CI)	OR (95%CI)	p
Income							
Until 3 MS	89.9 (87.6–91.8)	9.3 (7.7–11.1)	1.00		6.3 (5–7.9)	1.00	
3 to 4 MS	7.8 (6.4–9.6)	11.8 (6.8–19.6)	1.71 (0.94–3.09)	0.078	10.3 (4.9–20.6)	1.87 (0.87–4.04)	0.108
5 or more MS	2.3 (1.4–3.7)	8.6 (1.6–35.1)	1.56 (0.26–9.24)	0.622	4 (0.8–18.3)	0.86 (0.14–5.11)	0.867
Marital status							
Cohabiting	59.4 (57.7–61.2)	7.8 (6.1–9.8)	1.00		5.2 (4–6.8)	1.00	
Living alone	40.6 (38.8–42.3)	11.5 (9.7–13.5)	2.16 (1.48–3.15)	0.000	7.5 (5.8–9.6)	1.80 (1.06–3.05)	0.030
Religious							
No	14.4 (12.6–16.5)	12.1 (8.9–16.3)	1.00		11 (7.7–15.5)	1.00	
Yes	85.5 (83.5–87.4)	8.8 (7.3–10.4)	0.63 (0.41–0.99)	0.043	5.3 (4.2–6.7)	0.50 (0.28–0.90)	0.022
Substance consumption							
Binge drinking[a]	30.4 (28.1–32.9)	10.7 (8.5–13.3)	1.68 (1.114–2.46)	0.009	8.4 (6.6–10.5)	1.40 (0.91–2.15)	0.124
AUD[b]	11.1 (9.6–12.8)	18.1 (13.7–23.5)	3.65 (2.26–5.90)	0.000	17.1 (13.1–22.1)	3.87 (2.58–5.81)	0.000
Cocaine use[c]	1.9 (1.4–2.6)	19.7 (10.1–34.8)	2.61 (0.92–7.44)	0.071	23.9 (13.3–39.2)	3.66 (1.48–9.05)	0.005

[a] Binge drinking defined by ingestion of 4/5 alcohol units in 2 h.
[b] Alcohol use disorder: presence of 2 or more criteria on AUD scale, in the past 12 months.
[c] Used cocaine in the previous year (all cocaine users were polidrug users).

3.2. Paths analysis

3.2.1. Urban violence – victimization (UVV)

The path analysis demonstrated a direct effect of cocaine consumption (CC) on urban violence victimization (UVV), with indirect effects of alcohol consumption (AC) and depressive symptoms (DS) on UVV. All possible indirect paths were valid when controlling for sociodemographic variables (sex and age) as covariates (see Fig. 1).

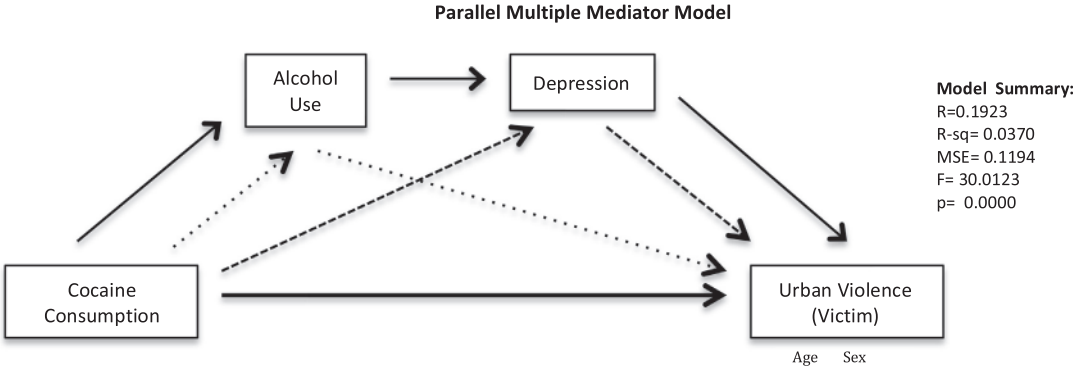
Indirect path1: CC → AC → UVV
Indirect path 2: CC → AC → DS → UVV
Indirect path 3: CC → DS → UVV

3.2.2. Urban violence perpetration (UVP)

The path analysis demonstrated a direct effect of cocaine consumption (CC) on urban violence perpetration (UVP) with indirect effects of alcohol consumption (AC) and depressive symptoms (DS). All possible indirect paths were valid even when controlling for the sociodemographic variables (sex and age) as covariates.

Indirect path1: CC → AC → UVP
Indirect path 2: CC → AC → DS → UVP
Indirect path 3: CC → DS → UVP

Both Parallel Mediation Models considering cocaine use as a predictor of urban violence (victimization or perpetration) were valid and



Direct Effect of Cocaine Use on Urban Violence (Victim)					
Effect	**SE**	**t**	**p**	**LLCI**	**ULCI**
0.0702	0.0426	1.6499	0.0990	-.0132	0.1537

Indirect Effect Of Cocaine Use on Urban Violence (Victim)				
	Effect	**Boot SE**	**Boot LLCI**	**Boot ULCI**
Ind 1	0.0312	0.0120	0.0131	0.0617
Ind 2	0.0018	0.0010	0.0004	0.0047
Ind 3	0.0216	0.0078	0.0084	0.0391
Total Indirect Effect Of Cocaine Use on Urban Violence (Victim)				
	0.0547	0.0154	0.0299	0.0911

Fig. 1. Paths analysis (structural equation modeling) – UVV.

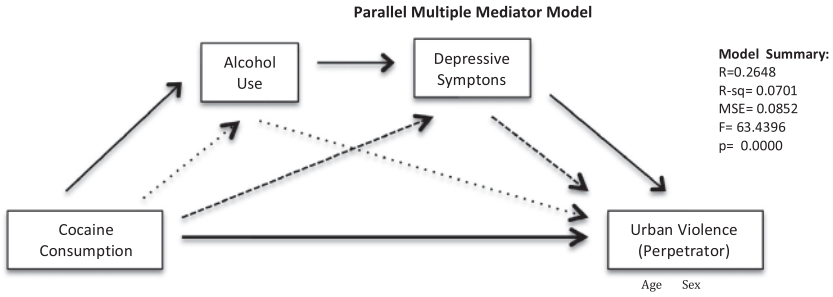


Fig. 2. Paths analysis (structural equation modeling) - UVP.

Direct Effect of Cocaine Use on Urban Violence (Perpetrator)					
Effect	**SE**	**t**	**p**	**LLCI**	**ULCI**
0.3589	0.0354	10.1387	0.000	0.2895	0.4283

Indirect Effect Of Cocaine Use on Urban Violence (Perpetrator)				
	Effect	**Boot SE**	**Boot LLCI**	**Boot ULCI**
Ind 1	0.0217	0.0080	0.0089	0.0411
Ind 2	0.0013	0.0007	0.0003	0.0032
Ind 3	0.0164	0.0055	0.0070	0.0287
Total Indirect Effect Of Cocaine Use on Urban Violence (Perpetrator)				
	0.0393	0.0102	0.0222	0.0628

alcohol consumption and depressive symptoms were mediators of this relationship (see Fig. 2).

4. Discussion

Our study describes urban violence rates in Brazil and investigates the associations between cocaine use with violence and the role of alcohol consumption and depressive symptoms as mediators of the association between cocaine use and violence. The results showed that nearly one in ten Brazilians reported having been a victim of at least one urban violence event, and more than one in twenty reported having been the perpetrator of at least one act of urban violence. Our results confirm the latest national report (Waiselfisz, 2014), which placed Brazil as the 7th most violent country in the world. AUD was highly associated with being a victim and a perpetrator of urban violence, whilst binge drinking was associated with victimization. Cocaine use was highly associated with perpetration.

Brazil is one of the countries with the highest rates of cocaine use in the world (Abdalla et al., 2014), and alcohol related problems are an public health problems in the country (Caetano & Laranjeira, 2006). According to the conditional models tested in the analyses, alcohol consumption alone and in combination with depressive symptoms has a mediating role in the association between cocaine use and urban violence. The relationship between substance use, depressive symptoms and violence has been extensively reported in the literature (Alison Rutherford et al., 2007; WHO, 2005). This study proposes an explanatory model for the possible paths of urban violence, highlighting the direct effect of cocaine use on both types of urban violence with or without the mediating effects of alcohol use or depressive symptoms.

Urban violence brings to a huge burden to people in Brazil, ranging from an overstrained justice system, overflowing public healthcare, deaths, and economic losses impacting productivity. The results presented here suggest that not only substance misuse prevention but also education could be used to underline prevention strategies to tackle urban violence.

4.1. Limitations

This study analyses cross-sectional data, which makes it impossible to establish causation. The use of conditional models to establish paths using cross-sectional data has been previously sustained by the literature (Mitchell & James, 2001). However, the paths proposed must be interpreted carefully avoiding conclusions based on causal or temporal relationships. Further, the possibility of under reporting is intrinsic to this type of study, as all the information on drug intake was based on self-report only. The same is true of the self-reporting of violence perpetration and victimization. However, previous studies have shown that drug users tend to provide reliable data about their consumption habits (Barrett, Gross, Garand, & Pihl, 2005). Finally, sample size is an important limitation to be considered, as the sample size was calculated considering rates of alcohol consumption and cocaine consumption rates are lower, weakening the power of the predictive models. This limitation could also have impacted the analysis identifying the association between education and violence, once the sample of individuals with 13 of more years of study could have been too small to allow the identification of the possible dose-response inverse relationship with violence. Nevertheless it is important to highlight that our data come from a probability sampling, which included all regions of the country. Also, data were collected by experienced and trained professionals, using reliable and validated measures and providing appropriate attention to confidentiality.

5. Conclusions

This study combines two extremely important issues: urban violence and substance use. We provide enough evidence to support that the implementation of effective universal and selective drug use prevention strategies, could have a positive impact in tackling urban violence.

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