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## Prevalence and determinants of resistance to use drugs among adolescents who had an opportunity to use drugs\*

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### Abstract

**Background**—As drugs remain ubiquitous and their use increasingly viewed as socially normative, vulnerable population groups such as adolescents face continued and growing risk. A better understanding of the factors that discourage individuals from initiating drug use, particularly in enabling scenarios, is therefore needed. This study aims to identify individual, interpersonal and school-contextual factors associated with resistance to using drugs in the presence of a drug use opportunity among adolescents in Bogotá, Colombia.

**Methods**—Data are analyzed from 724 school-attending adolescents (15.1 years, SD=1.3) who have had an opportunity to use drugs. Schools were selected in a multistage probability cluster sample. Random intercept multilevel logistic regression models were implemented to estimate the effect of individual, interpersonal and school-contextual level variables on the likelihood of resisting using drugs.

**Results**—Drug use resistance was observed in less than half (41.4%) of those students who experienced an opportunity to use drugs. Drug use resistance was strongly associated with having experienced a passive drug use opportunity (AOR=3.1, 95% CI=2.0, 4.9), the number of drugs offered (AOR=0.7, 95% CI=0.6, 0.8) and family factors such as not having a drug-using first-

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#### Contributors

Lopez-Quintero C and Neumark Y designed the study and wrote the first draft of the manuscript, Lopez-Quintero C undertook the statistical analyses. All authors read and approved the final version of the manuscript.

#### Conflict of Interest

The authors declare that they have no conflicts of interest.

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degree relative (AOR=2.3, 95%CI=1.2, 4.3) and a high degree of parental supervision (AOR=1.9, 95%CI=1.0, 3.2).

**Conclusions**—A large proportion of students who experienced a drug-use opportunity did not initiate drug use despite living in a context of high drug availability and social disorganization. The findings highlight the need for effective family-based drug use prevention interventions within the Colombian context.

### Keywords

drug use resistance; cannabis; multilevel analyses; transition to drug use; Colombia

## 1. INTRODUCTION

Worldwide, drugs remain ubiquitous despite intensive military, legal and political efforts to reduce their production, trafficking and commercialization over the last decades. Today, it is estimated that globally between 167 and 375 million people aged 15 to 64 years old use drugs at least once a year (United Nations Office on Drugs and Crime, 2013). Worryingly, the drug use phenomenon is shifting towards new markets and novel drugs, with an increasing use of drugs in developing countries and a growing demand for amphetamine-type stimulants and prescription drugs everywhere (United Nations Office on Drugs and Crime, 2013).

Globalized drug markets have primarily affected young populations (United Nations Office on Drugs and Crime, 2013). According to the World Mental Health Survey Initiative the risk of drug use initiation at any given age is consistently higher in more recent cohorts than in older cohorts (Degenhardt et al., 2008). Moreover, many of these new drug markets emerge in the context of poverty, where youth experience limited opportunities to develop, drug policy lacks scientific support, and social practices and environmental cues that enable and reinforce drug use behaviors prevail (Singer, 2008; United Nations Office on Drugs and Crime, 2013).

In Colombia, drug production, trafficking, and use pose a tremendous social burden by fueling armed conflict, transforming moral values, and promoting corruption, individualism, and mistrust (Brook et al., 2007; Ministerio de la Protección Social, 2005; Siqueira and Brook, 2003; Thoumi, 2002). Results from the first comparative study among school adolescents in nine South-American countries organized by the Inter-American Drug Abuse Control Commission showed that the rate of drug use among youth in Colombia exceeds rates observed in other Latin American countries (Inter-American Drug Abuse Control Commission, 2004). Analyses of the 2008 Colombian National Survey on Psychoactive Substance Use (Ministerio de la Protección Social and Dirección Nacional de Estupefacientes, 2008) and the 2011 National Survey on Psychoactive Substance Use in School Population (Ministerio de Justicia y del Derecho, 2011) also indicate a significant decline in the age of drug use onset. For instance, while the mean age of drug use onset was 23 years old for the 1943-1949 Colombian birth cohort, the mean age of drug use onset was 16 for the cohort born between 1985 and 1991 (Camacho et al., 2010).

Early drug use initiation and regular drug use during adolescence affects critical neurodevelopmental processes that can lead to multiple immediate and long term consequences. For example, early onset of drug use has been linked to an increased risk for development of drug dependence syndromes (Chen et al., 2009; Grant and Dawson, 1998). Furthermore, longitudinal studies have shown higher risks of cognitive impairments in adults who used drugs regularly during adolescence, compared to those who abstained or were experimental users (Meier et al., 2012). In seeking to understand the mechanisms involved in drug use initiation among adolescents, previous studies have identified factors associated with transition from experiencing a drug use opportunity to drug use onset. Such factors include: male sex, late adolescence, school drop-out, low parental monitoring, smoking, alcohol consumption, low religious devotion or lack of religious affiliation, peer drug use, type of school, and county of origin (Benjet et al., 2007a; Caris et al., 2009; Chen et al., 2004; Dormitzer et al., 2004; Pinchevsky et al., 2012; Van Etten and Anthony, 2001; Wagner and Anthony, 2002; Wells et al., 2011; Wilcox et al., 2002).

Bearing in mind the multiple socio-cultural and political forces driving the drug market and drug use in Colombia, and the pressing need to identify specific factors that contribute to drug abstinence among adolescents, the present study aims to elucidate the role that individual, interpersonal and contextual factors play in promoting drug use resistance among high school students in Bogotá, Colombia. In keeping with the comprehensive ecological model proposed by McLeroy and colleagues (1988), individual and contextual level factors evaluated in this study were organized in levels of influence. Widely recognized health behavior theories (Ajzen and Fishbein, 1980; Bandura, 1986; Jessor and Jessor, 1977) guided the selection of covariates known to predict drug use. The results of this study may enhance our understanding of the phenomenon of drug use involvement in a context of high drug availability and help establish local priorities for primary prevention and intervention.

## 2. METHODS

### 2.1. Sampling methods and study participants

We collected data from a multi-stage cluster sample of 2,279 8<sup>th</sup>–10<sup>th</sup> grade students in 23 schools in Bogota, Colombia (Lopez-Quintero and Neumark, 2010, 2011; Neumark et al., 2012). The sample was selected to reflect the socio-economic characteristics of adolescents registered in Bogotá's school-system. In this report we analyze data from a subsample of 724 students who experienced an opportunity to use drugs such as marijuana, inhalants (e.g., gasoline, ether, glue or "boxer" as its commonly called), cocaine, bazuco (a semi-processed coca-paste mixed with other ingredients) or ecstasy.

Parental consent was requested by sending letters to the parents or legal guardians explaining the study's purpose and content and asking them to return the letter signed if they refuse the student's participation in the survey. Regardless of parental approval, only students assenting to complete the questionnaire participated in the study. Among the total sample, twelve parents refused their child's participation in the study, 44 students declined to participate, and 88 were absent on the day of the survey and on subsequent survey days. Eighty-two students returned incomplete questionnaires or provided incoherent or haphazard responses, or endorsed the opportunity to use a bogus drug ("Cadrina", included as a quality

control measure) and were excluded from the analyses. The research protocol was approved by university-based research committees in Colombia and Israel. The subsample of students who experienced a drug use opportunity was selected based on the question “How old were you when you first had an opportunity to try [drug]?” These drug use opportunities were further classified as “passive” or “active” by asking the students “Who provided you with the opportunity to use (drug) for the first time?” with options that included: (1) I never had the opportunity, (2) I sought it myself, (3) a parent, (4) a sibling, (5) other family member, (6) a friend, (7) another person. Students who answered “I sought it myself” for any drug were classified as having experienced an “active” opportunity, and options 3 to 7 were classified as having experienced a “passive” opportunity. Any “active” opportunity for any of the five drugs was classified as an “active” opportunity regardless of having experienced a “passive” opportunity for the other drugs.

## 2.2. Data collection methods

A standardized confidential questionnaire was administered to the students during a one-hour session by a research assistant who answered students’ questions about the survey. The research assistant also read each question aloud which helped mitigate reading and literacy barriers, maintain order in the classroom, and enhance confidentiality. The questionnaire was constructed using items from the Drug Use Screening Inventory (DUSI; Tarter, 1990), the Youth Risk Behavior Survey (YRBS; Centers for Disease Control and Prevention, 2003), and particularly the questionnaire used in the multinational PACARDO research project (Dornitzer et al., 2004). Adjustments were made to the questionnaire based on the results of a pilot test and focus group sessions conducted to assess the suitability of the questionnaire with regard to duration, language appropriateness, construct comprehensiveness and answerability. YRBS test-retest reliability estimates were fair to good for self-reported life-time prevalence of legal and illegal drug-use ( $K=0.45-0.89$ ), last-moth use ( $K=0.42-0.83$ ), age at-first use ( $K=0.66-0.71$ ) and offered/sold drugs on school premises ( $K=0.52$ ) (Brener et al., 2002).

## 2.3. Study variables

The outcome variable, “drug use resistance”, was assessed based on the question “How old were you when you first tried (drug)?”. Response options included the age in years at which each specific drug was first used or an option that indicated that the student never used the drug. Students were classified as resistant to drug use when they indicated never having used the drug despite having had an opportunity to do so. A final “drug use resistance” variable was constructed summarizing the responses for the five individual drugs assessed (i.e., marijuana, inhalants, cocaine, bazuco and ecstasy), so that any student who indicated use of any drug given an opportunity were classified finally as non-resistant.

Numerous individual (e.g., socio-demographic, cognitive and psychosocial factors), interpersonal (e.g., family and peer factors) and contextual (e.g., school socio economic status - SES) factors were also assessed.

Socio-demographic and constructs of health behavioral theories [e.g., Theory of Reasoned Action and Planned Behavior; Ajzen and Fishbein, 1980), the Social Learning Theory

(Bandura, 1986), and the Problem Behavior Theory (Jessor and Jessor, 1977)] that have been widely recognized as predictors of drug-use opportunity and drug use onset among adolescents were included as intrapersonal (socio-demographic and psychosocial and behavioral factors) and interpersonal level covariates (e.g., family and peer factors). These factors included: sex (male, female), age (<14, 14-16, >16 years), level of knowledge regarding physical and psychological harms of illegal drugs (tertiles), perceived risk of regular drug use (low/high), attitudes towards using illegal drugs (favorable/unfavorable), degree of problematic behavior (tertiles), monthly smoking in the past year (yes/no), lifetime drunkenness (yes/no), degree of parental supervision (quartiles), past-year illegal drug use among first-degree relatives (yes/no), number of drug using friends (0, 1, >1).

Level of knowledge was assessed by 6 questions [e.g., “Does illegal drug use lead to memory loss?” and analyzed in tertiles corresponding to all 6 questions answered correctly (high), 4-5 correct answers (medium) and <4 correct (low)]. Perceived risk of regular drug use was assessed by asking “To what extent do you think people risk harming themselves physically or psychologically, if they use [drug] weekly?”. “No risk” or “slight risk” responses for any given drug were recoded as “low perceived risk” and “moderate risk” and “great risk” were recoded into “high perceived risk”. Attitudes towards using illegal drugs were assessed with 5 questions such as “Do you think laws against the use of illegal drugs should be stricter?”; respondents who answered any of the questions positively were categorized as having unfavorable attitudes towards drug use. The “degree of problematic behavior” scale was composed of 9 items [(e.g., “During the last 12 months have you hit someone in a fight?”, and recoded into tertiles - low (0-2), medium (3-4) and high (5-9)]. Monthly smoking was determined if the student smoked cigarettes at least once a month every month in the past year. Degree of parental supervision was determined by 6 items [(e.g., “Are your parents or guardians often aware of where you are and what you are doing?”. The cumulative parental supervision scale was recoded in quartiles as 1<sup>st</sup> quartile or low parental supervision (0-3), 2<sup>nd</sup> (4), 3<sup>rd</sup> (5), and 4<sup>th</sup> quartile or high parental supervision (6)]. A detailed description of these scales including Cronbach alpha coefficients for internal reliability is presented as supplemental material<sup>1</sup>.

School SES, average drug use at school and exposure to school-based drug prevention programs were included as contextual (school)-level variables. School SES was determined by the Bogotá’s District Authority’s stratification (Departamento Administrativo Nacional de Estadística, 2005) and recoded as low - strata 1 and 2, medium - strata 3, and high - strata 4 to 6. Level of drug use at school was a derived variable computed by calculating the proportion of students using drugs in each school, comparing this proportion with the proportion for all participating schools, and recoded as “at/below average” or “above average”. Level of exposure to school-based drug prevention programs was a derived variable reflecting the proportion of students in each school who were exposed to drug prevention programs at school. Schools in which 75% or more of students were exposed to such programs were classified as high exposure.

## 2.4. Analyses

Descriptive statistics were performed to characterize the sample, and ascertain the prevalence of drug use resistance by type of drug. Cross tabulation analyses and appropriate statistical measures (chi-square, t-test) were applied to assess the relationships between resistance to use drugs and individual, interpersonal and contextual independent factors. Random intercept multilevel logistic regression models (Goldstein, 2003) were implemented to estimate the effect of individual and interpersonal characteristics at level-1 (e.g., socio-demographic, psychosocial, family and peer factors) and contextual level variables at level-2 (e.g., school SES, drug use at school) on the likelihood of resisting drug use given an opportunity. Associations are expressed as unadjusted odds ratios (OR) and adjusted odds ratios (AOR) with corresponding 95% confidence intervals (CI). Associations and correlations between independent variables and multicollinearity diagnostic statistics were examined. Tolerance values  $<0.1$  and Variance Inflation Factor values  $>2.5$  were regarded as indicating multicollinearity, which precluded inclusion of related independent variables in the models (Allison, 1999). The school effects on the outcomes of interest were evaluated by means of the median odds ratio (MOR), which is defined as the median value of the odds ratio between higher propensity respondents and lower propensity respondents, when randomly picking two individuals (with the same covariates) from two different clusters (e.g., schools, neighborhoods; Larsen and Merlo, 2005). The MOR converts school-level variance to the OR scale with a MOR value of 1 indicating no school variance. By contrast, the higher the MOR, the more important are the school effects for understanding the individual probability of experiencing any of the outcomes assessed. Additional details on these measures are provided elsewhere (Larsen and Merlo, 2005; Merlo et al., 2005). The analyses were performed using Stata, version 13.0 (StataCorp, 2013. College Station, TX) and MLwiN version 1.10.0007 (Centre for Multilevel Modelling, Institute of Education, London, UK).

## 3. RESULTS

### 3.1. Socio-demographic and drug use resistance related characteristics

The average age of participants was 15.1 years ( $SD=1.3$ ) and nearly 60% were male. Other socio-demographic, individual, interpersonal and contextual characteristics of the study population are presented in Table 1.

Less than half of the students (41.4%) who experienced an opportunity resisted drug use. Rates of drug use resistance varied by drug, being higher for those who experienced an opportunity to use bazuco (69.3%), followed by ecstasy (55.5%), marijuana (48.8%), cocaine (42.8%), and inhalants (40.4%). Significant sex differences in drug use resistance were noted only for marijuana (Table 2).

Rates of drug use resistance were two-fold higher among students who experienced a passive drug-use opportunity (46.4%) than among those who experienced an active opportunity (23.8%; Table 2). The rate of drug use resistance given an active opportunity was highest for ecstasy (50.0%) and lowest for marijuana (15.2%). The rate of drug use resistance given a passive opportunity was highest for bazuco (71.4%) and lowest for

cocaine (43.4%). Most transitions from opportunity to use occurred within the same year an opportunity presented itself (79.9% for inhalants and to 91.7% for Bazuco).

### 3.2. Factors associated with drug use resistance

**3.2.1 Individual-level factors**—As shown in Table 3, multiple cognitive and behavioral factors showed to be associated with drug use resistance after controlling for confounding effects. For instance, those students who experienced a passive drug use opportunity were more likely to resist using drugs than those who experienced an active drug use opportunity (AOR=3.1, 95% CI=2.0,4.9). As the number of drugs offered increased the likelihood to resist using drugs decreased (AOR=0.7, 95% CI=0.6,0.8). Also, students perceiving the regular use of drugs as a highly risky behavior were more likely to resist using drugs given an opportunity (AOR=1.8, 95% CI=1.2,2.7) as were non-smoking students compared with students who smoked (AOR=1.7, 95% CI=1.2,2.5). Compared with students reporting a high degree of problematic behavior, those students reporting a low degree of problematic behavior also had a two-fold greater likelihood to resist drug use given an opportunity (AOR=2.3, 95% CI=1.3,4.1).

**3.2.2 Interpersonal-level factors**—Not having any first-degree relatives who use drugs was strongly associated with drug use resistance given an opportunity (AOR=2.3, 95% CI=1.2,4.3; Table 3). Parental supervision was also strongly associated with drug use resistance. Specifically, the adjusted model reveals that compared with students in the lowest (1<sup>st</sup>) quartile of parental supervision, those in the highest (4<sup>th</sup>) quartile were more likely to resist using drugs given an opportunity (AOR=1.9, 95% CI=1.0,3.2; Table 3).

**3.2.3 Contextual level factors**—Students from schools in which 75% of students were exposed to drug prevention education were more likely to resist using drugs given an opportunity (AOR=1.7, 95% CI=1.1,2.7) than students from schools in which <75% of the students received drug prevention education, as shown in the adjusted models presented in Table 3. Neither school SES nor level of drug use at the school were found to be associated with drug use resistance.

A median odds ratio (MOR) of 1.2 was observed in the null model and inclusion in the models of individual (MOR=1.1), interpersonal (MOR=1.3) and school-level covariates (MOR=1.3) moderately strengthened the size of these between-schools variations (Table 3). The results indicate that if a student moves to another school with a higher probability of resisting using drugs given an opportunity, his/her likelihood of resisting drug use will (in median) increase by 10% to 30%.

## 4. DISCUSSION

This study on the early stages of drug use involvement reveals that drug use resistance was observed in less than half (41.4%) of those students who experienced an opportunity to use drugs. The rate of marijuana use resistance observed in Bogotá, was comparable to the rate observed among school adolescents in Guatemala (40%) and adolescents in the general population in Mexico (38%; Benjet et al., 2007b; Dormitzer et al., 2004); lower than the drug use resistance rate found among school adolescents in Costa Rica (47%), Nicaragua

(54%), Dominican Republic (71%) and Honduras (73%) and among adolescents in the general population in the US (60%; Dormitzer et al., 2004; Van Etten and Anthony, 2001); and higher than the drug use resistance rates found among school adolescents in El Salvador (22%), Panama (25%), and Chile (30%; Caris et al., 2009; Dormitzer et al., 2004).

Compared with students who experienced an active drug use opportunity, those who experienced a passive opportunity were more likely to resist using drugs. The number or opportunities experienced also showed to be associated with drug use resistance. Deciding whether to use a drug or not once an opportunity to do so presents itself has been explained based on principles of psycho-social theories that focus on the process of decision-making among adolescents (Dillon et al., 2007), such as the self-regulatory theory (Kanfer and Karoly, 1972; Karoly, 1993) and the self-efficacy theory (Bandura, 1986). According to the self-regulatory theory, internal and external processes motivate individuals to select, plan and evaluate goal-focused actions and consequently inhibit or acquire new behaviors in order to achieve these goals (Karoly, 1993). Thus, adolescents may refuse using drugs given one or multiple drug-use opportunities if they perceive drug use as incompatible with their goals. Alternatively, based on self-efficacy theory, adolescents with strong beliefs about their capabilities of putting their decision not to use drugs into practice (strong sense of self-efficacy), who are assertive, and who possess functional problem-solving skills, can more easily refuse to use drugs even under peer pressure, and accurately judge the consequences of using drugs. Among those students who experienced an active opportunity, a small, but significant proportion (23.6%) did not initiate drug use, perhaps due to social or environmental pressures preventing them from starting to use the drug (e.g., presence of adults, affordability of the drug) or self-regulatory mechanisms. This finding emphasizes the importance of investigating the acquisition and development of neurocognitive skills and abilities within an ecological framework. Research on the practical implications of the self-regulatory and the self-efficacy theories emphasizes the importance of providing adolescents with accurate, credible and updated information and strengthening their life-skills in order to help them achieve life goals and develop a strong sense of self-efficacy (Dillon et al., 2007).

Interpersonal factors, such as no drug use among first-degree relatives and parental supervision were found to be the most important interpersonal factors associated with drug use resistance given an opportunity. Students experiencing low levels of parental supervision were less likely to resist using drugs given an opportunity than those experiencing higher levels of parental supervision. Emerging evidence suggests that parental supervision decreases the likelihood of experiencing a drug use opportunity (Chen et al., 2005; Neumark et al., 2012), drug use onset (Chilcoat and Anthony, 1996; Denton and Kampfe, 1994; Graves et al., 2005; Mulhall et al., 1996), and level of drug use (Graves et al., 2005; Kung and Farrell, 2000). Children and adolescents whose parents are less involved in their care tend to associate with deviant or drug-using peers, be less informed about the hazardous effects of drugs, normalize drug-taking behavior, adopt favorable drug use attitudes, or to have drugs readily available (Burlew et al., 2009; Chilcoat and Anthony, 1996; Hawkins and Fitzgibbon, 1993; Kung and Farrell, 2000; Kerr and Stattin, 2000; Lloyd and Anthony, 2003; Montgomery et al., 2008). By restricting the analyses to a sub-sample of adolescents who already had experienced a drug-use opportunity, this study was able to confirm an association between parental supervision and drug use onset that goes beyond the



social and environmental influences of parental supervision on experiencing an opportunity to use drugs. These results suggest that emotional connections and cognitive processes within the family dynamics that manifest themselves through parental involvement in their children's lives from early stages of psychological development to adolescence (Erikson, 1993; Piaget, 1970), might contribute to reduce the likelihood that the adolescent will transition from opportunity to use. The rapid shift from a traditional agricultural-based lifestyle to an urban industrial lifestyle, the entry of women into the labor market, and other macro-social shifts, have brought about a change in family structure and child-rearing practices in Colombia (Echeverry-Angel, 2004), with potential effects on adolescents' behaviors. Moreover, the weakening of traditional family values, and the rise in the proportion of single and stepparent families might have resulted in decreased parental time and consequently lower levels of parental supervision (Gauthier et al., 2004). The findings highlight the need to explore the effectiveness of family-based interventions to prevent drug use among Colombian adolescents. In this regard, one intervention of particular relevance for the Colombian context is "Familias Unidas", an eco-developmental family-based program designed to increase positive parenting, family support of the adolescent, parental involvement, general parent-adolescent communication and parent-adolescent communication specific to substance use, and to prevent unsafe sexual behavior and HIV (Pantin et al., 2004). This intervention has demonstrated its efficacy in preventing both substance use and unprotected sexual behavior among Hispanic youth (including Colombian immigrant adolescents; Prado and Pantin, 2011).

Our finding that perception of regular drug use as a high risk behavior increased the likelihood to resist using drugs is consistent with previous studies assessing the role or risk perception on drug use initiation (Johnston et al., 2005; Morrell et al., 2010). Experimental and population based studies indicate that perception of risk is affected by knowledge (e.g., of hazardous effects), vicarious learning, and experience, and that risk perception beliefs originating from vicarious learning are less strong, less stable over time, and less influential over behavior performance (Agostinelli et al., 1995, Ajzen, 2001, Morrell et al., 2010). Thus, to avoid cognitive dissonance, individuals who initiate drug use tend to modify their risk perception beliefs by using mechanisms such as denial, normalization of the risk, reinterpretation of the negative information and/or attribution of the consequences to factors beyond their own control (Agostinelli et al., 1995, Gerrard et al., 1996, Halpern-Felsher et al., 2004; Wolfson, 2000).

Results of this study also reveal that a high degree of exposure to school-based drug use prevention programs increased the likelihood of resistance to use drugs. This finding highlights the important role of schools in shaping adolescent's attitudes and behaviors and the need to develop a culture of drug use prevention. Converging evidence provides support of the effectiveness of school-based preventive strategies to deter drug use onset and progression along the drug use continuum among adolescents and young adults in North-America and Europe (Agostinelli et al., 1995; Botvin, 2004; Botvin and Griffin, 2007; Faggiano et al., 2005; Tobler, 1997). The extent to which such preventive strategies may be effective in other settings remains to be demonstrated. Implementation of intervention trials and translational public health research (Ogilvie et al., 2009) in Colombia is urgently needed.

MOR values observed in the null and adjusted models indicate that inclusion of intrapersonal, interpersonal and school-level covariates moderately increases the between-schools variations. A large proportion of the total variance in drug use resistance can be attributed to intrapersonal and interpersonal factors, rather than to school level factors.

#### 4.1 Study limitations

The above findings should be interpreted in light of the following limitations: 1) Assessment of drug use is based on self-report, which is highly prone to social desirability bias (Anthony et al., 2000). Thus, we anticipate that any bias in the reporting of drug use would be toward under-reporting. 2) The results are not generalizable to all adolescents in Bogotá, but only to those currently enrolled in the school system and who likely represent the least problematic population with regards to drug use. Absenteeism rates observed in this study were probably slightly higher than in previous years, due to the city-wide public school renovation program that caused disruption in academic activities of many schools during the data collection phase. 3) A more comprehensive approach in the conceptual assessment of drug use resistance (for instance with regards to the frequency and context in which drug use opportunities occur) is needed to capture the complexity of this phenomenon. 4) The study did not investigate the role of personality traits, impulsivity, and response inhibition on resistance to use drugs given an opportunity. Future studies should address the role of these and other indicators of disinhibiting behaviors on the likelihood to resist using drugs. 5) This baseline survey addressed risk perception at the time the questionnaire was applied and not at the time of the first or last drug use opportunity nor at the time of first drug use. We believe that recalling a particular risk perception at the time at which each of those events occurred may not be accurate, especially if time had passed between events. A longitudinal study design would be needed to better assess the associations between event-specific risk perception and drug use resistance.

#### 4.2 Conclusions

Despite these possible limitations, our results extend the current level of knowledge about the epidemiology of drug use involvement among school-attending adolescents and provide important information for the design of drug use prevention interventions for adolescents in a context where drugs are widely available. This paper focuses on the process of drug involvement among adolescents in Bogota, Colombia, yet we believe our results are relevant for other communities where drug production and trafficking represent a significant social threat. By analyzing data from a representative sample of school adolescents in Bogotá, we found that a large proportion of students (41.3%) who experienced a drug-use opportunity did not initiate drug use despite living in a context of social disorganization and high drug availability. Type and number of drug use opportunities experienced, as well as degree of parental supervision and no drug use among relatives were the strongest determinants of drug use resistance. Testing the effectiveness and efficacy of family-based drug use prevention interventions that employ interactive teaching strategies and concentrate on normative re-education strategies, training in refusal, development of parent-child interaction, communication, child management and family management skills is a priority strategy for decreasing the impact of drug use among youth in high risk context.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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### Highlights

- A large proportion of school adolescents who experience a drug-use opportunity do not initiate drug use despite living in a context of high drug availability and social disorganization, such as the Colombian context.
- Rates of drug use resistance varied by drug, being higher for those who experienced an opportunity to use bazuco (69.3%), followed by ecstasy (55.5%), marijuana (48.8%), cocaine (42.8%), and inhalants (40.4%).
- Drug use resistance was strongly associated with having experienced a passive drug use opportunity (AOR=3.1, 95%CI=2.0, 4.9) and the number of drugs offered (AOR=0.7, 95% CI=0.6, 0.8).
- Drug use resistance is also strongly associated with not having a drug-using first-degree relative (AOR=2.3, 95%CI=1.2, 4.3) and a high degree of parental supervision (AOR=1.9, 95%CI=1.0, 3.2).
- A large proportion of the total variance in drug use resistance among school adolescents can be attributed to intrapersonal and interpersonal factors, rather than to school level factors.

**Table 1**

Socio-demographic, individual, interpersonal and school-contextual characteristics of the study population (n=724), Bogotá, Colombia, 2006.

Characteristic	Total	
	n	% <sup>a</sup>
<b><i>Socio-demographic</i></b>		
Sex		
Male	421	58.2
Female	303	41.8
Age group (years)		
<14	60	8.3
14-16	565	78.1
>16	98	13.6
Missing	1	
<b><i>Intrapersonal</i></b>		
Level of knowledge of drug use harms (tertiles)		
Low	184	36.0
Medium	278	38.5
High	260	25.5
Missing	2	
Perceived risk of regular drug use		
High	526	73.6
Low	189	26.4
Missing	9	
Attitudes towards drug use		
Favorable	102	14.3
Unfavorable	609	85.7
Missing	13	
Degree of problematic behavior (tertiles)		
High	168	34.3
Medium	298	42.0
Low	243	23.7
Missing	15	
Smoking monthly in the past year		
Yes	373	52.2
No	342	47.8
Missing	9	
Ever got drunk		
Yes	571	78.9
No	153	21.1
Missing		
Number of drugs offered (Mean, SD)	1.71	1.04



Characteristic	Total	
	n	% <sup>a</sup>
Type of drug use opportunity		
Active	161	22.2
Passive	563	77.8
<i>Interpersonal</i>		
Parental supervision (quartiles)		
1 <sup>st</sup> (Low)	248	35.0
2 <sup>nd</sup>	186	26.3
3 <sup>rd</sup>	168	23.7
4 <sup>th</sup> (High)	106	15.0
Missing	16	
Past-year illegal drug use among first-degree relatives		
Yes	84	11.7
No	635	88.3
Missing	5	
Number of drug using friends		
0	177	25.0
1	95	13.3
>1	442	61.9
Missing	10	
<i>Contextual</i>		
School SES		
Low	334	46.1
Medium	248	34.3
High	142	19.6
Level of drug use at school		
At/below average	393	54.3
Above average	331	45.7
Level of exposure to school-based drug prevention programs		
Low	168	23.2
High	556	76.8

<sup>a</sup>Total percentage excluding missing values

Drug use resistance rates by sex and type of drug use opportunity among school adolescents who experienced an opportunity to use drugs (N=724), Bogotá, Colombia, 2006.

**Table 2**

	Total	Males	Females	p-value	% Drug Use Resistance	
					Given an Active opportunity	Given a Passive opportunity
Marijuana	48.8	44.3	55.7	0.02	15.2	51.6
Inhalants	40.4	37.8	43.9	0.2	32.0	45.1
Cocaine	42.8	41.0	47.5	0.5	33.3	43.4
Bazuco	69.3	66.0	75.0	0.4	40.0	71.4
Ecstasy	55.5	51.8	60.0	0.2	50.0	55.8
Any drug	41.4	38.5	45.4	0.1	23.8	46.4

Intrapersonal, interpersonal, and contextual factors associated with resistance to use drugs. Results from random intercept multilevel logistic regression models. Bogotá, Colombia, 2006.

Table 3

Characteristic	n	%a	Drug Use Resistance		
			OR	95%C.I.	AOR 95%C.I.
<b>Sex</b>					
Male	166	39.1	1		1
Female	137	45.8	1.4	0.9-1.8	1.2 0.8-1.7
<b>Age group (years)</b>					
<14	34	56.7	<b>2.7</b>	<b>1.4-5.4</b>	<b>1.5</b> 0.7-2.0
14-16	232	41.1	1.4	0.9-2.3	1.2 0.7-2.0
>16	32	32.7	1		1
<b>Level of knowledge of drug use harms (tertiles)</b>					
Low	63	34.2	1		1
Medium	117	42.1	1.4	0.9-2.1	1.3 0.8-2.0
High	118	45.4	<b>1.6</b>	<b>1.1-2.4</b>	<b>1.6</b> <b>1.0-2.5</b>
<b>Perceived risk of regular drug use</b>					
Low	50	26.5	1		1
High	244	46.4	<b>2.4</b>	<b>1.7-3.5</b>	<b>1.8</b> <b>1.2-2.7</b>
<b>Attitudes towards drug use</b>					
Favorable	228	37.4	1		1
Unfavorable	63	61.8	<b>2.7</b>	<b>1.8-4.2</b>	1.2 0.7-2.1
<b>Degree of problematic behavior (tertiles)</b>					
High	38	22.6	1		1
Medium	117	39.3	<b>2.2</b>	<b>1.4-3.4</b>	1.5 0.9-2.5
Low	136	56.0	<b>4.4</b>	<b>2.8-6.8</b>	<b>2.2</b> <b>1.2-3.8</b>
<b>Smoked monthly in the past year</b>					
Yes	109	29.2	1		1
No	186	54.4	<b>2.9</b>	<b>2.1-4.0</b>	<b>1.7</b> <b>1.2-2.5</b>
<b>Ever got drunk</b>					
Yes	208	36.4	1		1

Characteristic	Drug Use Resistance				
	n	% <i>a</i>	OR	95% C.I.	AOR 95% C.I.
No	91	59.5	2.6	1.8-3.7	1.3 0.8-2.1
Number of drugs offered (mean, SD)	1.4	0.8	0.6	0.5-0.7	0.7 0.6-0.8
Type of drug use opportunity					
Active	38	23.6	1		1
Passive	261	46.4	2.9	1.9-4.3	3.1 2.0-4.9
Parental supervision (quartiles)					
1 <sup>st</sup> (Low)	86	34.7	1		1
2 <sup>nd</sup>	68	36.6	1.1	0.8-1.6	0.9 0.6-1.4
3 <sup>rd</sup>	70	41.7	1.4	0.9-2.1	0.8 0.5-1.3
4 <sup>th</sup> (High)	66	62.3	3.2	2.0-5.2	1.9 1.0-3.2
Past-year illegal drug use among first-degree relatives					
Yes	17	20.2	1		1
No	277	43.6	3.0	1.7-5.3	2.3 1.2-4.3
Number of drug using friends					
>1	157	35.5	1		1
1	43	45.3	1.5	0.9-2.4	1.3 0.8-2.2
0	94	53.1	2.1	1.4-2.9	1.1 0.7-1.8
School SES					
Low	145	43.4	1		1
Medium	91	36.7	0.8	0.5-1.1	0.8 0.5-1.2
High	63	44.4	1.1	0.7-1.7	1.1 0.7-1.9
Level of drug use at school					
At/below the average	147	37.4	1		1
Above the average	152	45.9	1.4	1.1-1.9	1.2 0.9-1.8
Level of exposure to school-based drug prevention programs					
Low	62	36.9	1		1
High	237	42.6	1.3	0.9-1.9	1.7 1.1-2.7
Between-school variance components			$\sigma^2$	SE	$\sigma^2$ SE
Median Odds Ratio (MOR)			0.03	0.18	0.02 0.15
			1.2		1.1

Row percentages  
AOR= Adjusted Odds Ratio, 95% C.I.= 95% Confidence Interval

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