Published in final edited form as:

Health Behav Policy Rev. 2018 May ; 5(3): 91–99. doi:10.14485/HBPR.5.3.9.

Parent Education and Substance Use among Latin-American Early Adolescents

Adriana Pérez, MS,

Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina.

Amira Osman, MS,

Department of Health Promotion, Education, and Behavior, University of South Carolina, Columbia, USA.

Lorena Peña., BS,

Centro de Estudios de Estado y Sociedad (CEDES), Buenos Aires, Argentina.

Erika N. Abad-Vivero, BS,

Departamento de Investigación para el Control del Tabaco, Centro de Investigación en Salud Poblacional, Instituto Nacional de Salud Pública, Cuernavaca, México.

James W. Hardin, PhD,

Department of Epidemiology & Biostatistics, University of South Carolina, Columbia, USA.

James Sargent, PhD,

Department of Pediatrics, Geisel School of Medicine at Dartmouth, Lebanon, New Hampshire, USA.

James F. Thrasher, PhD, and

Thrasher, Department of Health Promotion, Education, and Behavior, University of South Carolina, Columbia, USA.

Raúl Mejía, PhD

Centro de Estudios de Estado y Sociedad (CEDES), Buenos Aires, Argentina

Abstract

Objective: To examine the relationship between parent education, at individual- and school-level, and substance use behaviors (smoking, alcohol drinking, binge drinking, and illicit drug use) among young adolescents from Argentina and Mexico.

Methods: A cross-sectional, school-based survey of middle-school early adolescents from Mexico (N=10,123) and Argentina (N=3,172) queried substance use.

Results: After adjusting for age, sex and individual-level parent education, students from Mexican schools with lower parent education had higher likelihood of current smoking and drug

Human Subjects Approval Statement

Study protocols were approved by the human subjects research board at the Centro de Educación Médica e Investigaciones Clínicas, Buenos Aires, Argentina, and the ethics committee at the Mexican National Institute of Public Health (INSP), Mexico.

Conflict of Interest Declaration

All authors of this article declare they have no conflicts of interest.

use than those from schools with higher parent education. In Argentina, lower parent education at school-level was positively associated with all outcomes.

Conclusion: Disadvantageous contextual school characteristics contributes to substance use among early adolescents in Mexico and Argentina.

Keywords

adolescent; substance use; parent education

Most health-risk behaviors are initiated and developed in childhood and adolescence,¹⁻³ including tobacco, alcohol, and drug use. Although trajectories of substance use in Latin America have not received much research attention, it is estimated that 37% to 68% of adolescents in that region have used tobacco, 43% to 80% have used alcohol, and 4% to 23% have used marijuana.⁴ These prevalence rates are higher than in the previous decade, demonstrating their growing public health significance in the region.

During adolescence, the family and the school are two dominant social contexts in which personal and social development occurs; however, the role of the broader socioeconomic context in accounting for substance use is unclear. Although lower socioeconomic status (SES) among adults is associated with poorer health outcomes and higher prevalence of risk behaviors,⁵ findings among adolescents are more mixed. While studies generally show a negative association between adolescent smoking and family SES, alcohol and illicit drug use appear to have more inconsistent associations.⁶⁻¹² Studies on the association between school-level SES and substance use are scarce, with evidence for null to inverse associations between school-level SES and prevalence of current tobacco and alcohol use,¹³⁻¹⁸ and null or positive associations with cannabis use.^{13, 15}

Most studies of SES and adolescent substance use have been conducted in high-income countries,⁶⁻⁸ and to inform policy development, these relationships should be explored amongst low- and middle-income countries (LMICs) at different stages of economic development. In contrast to most HIC research, studies among urban, Mexican adolescents has mostly found higher risk for tobacco, alcohol, and drug use in students from higher-SES families.¹⁹⁻²¹ However, higher risk of tobacco use has been found among Mexican adolescents from low-SES schools¹⁷ as well as amongst Argentinean students from schools that received social assistance.¹⁴ Since data were collected for these studies, a broad range of tobacco control policies have been implemented in Mexico and Argentina (ie, taxes, smoke-free policies, prominent pictorial warnings, advertising bans),²² and it is important to examine whether these policies have impacted youth tobacco use disparities by SES. A clearer understanding of how SES influences adolescent substance use behavior in LMICs is particularly important for informing policy and programmatic strategies to address the social determinants of health, to reduce non-communicable disease, and reach the United Nations' 2030 Sustainable Development Goals.²³

Traditional SES measures in youth include parental income, education and occupation.²⁴ Of these indicators, we chose parent education as a proxy of adolescent's SES because is more

likely to be known and accurately reported by early adolescents,²⁵ and has been used as an indicator of SES in previous studies on adolescent substance use.^{10–12}

Our objective was to examine the relationship between parent education, at individual- and school-level, and substance use behaviors (smoking, alcohol drinking, binge drinking, and illicit drug use) among young adolescents from two upper-middle-income countries, Argentina and Mexico. Based on previous studies, we hypothesize that: (1) parent education at individual-level is positively associated with adolescents' substance use, and (2) parent education at school-level is negatively associated to adolescents' tobacco use. Additionally, we propose a moderating role of parent education at school-level on the relationship between individual parent education and adolescents' substance use.

METHODS

This study is part of a project to assess the relationship between media and adolescent substance use in Mexico and Argentina. In each country, a cross-sectional survey was conducted among first-year students in secondary schools. In Mexico, a stratified random sample of 60 public secondary schools were randomly selected from the three largest cities (Mexico City, Guadalajara and Monterrey, N=10,123 students). Sampling strata were based on levels of SES (high vs low) for the census tract where the school was located.²⁶ In Argentina, a sample of 18 public and 15 private secondary schools was purposively selected to capture the range of SES diversity in three of the largest Argentine cities (Buenos Aires, Córdoba and Tucumán, N=3,172 students). Passive consent was requested from parents or caretakers, and students signed an active consent form (more detailed methods are described elsewhere).²⁷ Data were collected May to June 2014 in Argentina and in February to March 2015 in Mexico. Participation rate was 84% in Mexico and 83% in Argentina.

Measures

Parent education measures.—Individual-level parent education: Students reported the highest educational attainment of both parents. Six response options ranged from non-completion of primary school to completion of university degree or higher. Since mother's and father's educational levels were significantly correlated (Spearman's rank correlation coefficient= 0.62 and 0.57 for Mexico and Argentina, respectively; $p < 0.001$), we used the highest educational attainment of either parent as our measure of individual parent education. To avoid small cell sizes, parent education was then collapsed into three categories: 7 years of school, between 8–12 years of school, and more than 12 years of school. Missing responses (ie., unknown educational level for both parents or no parents) were coded as separate category.

School-level parent education: Individual-level parent education for all students surveyed was aggregated to the school-level. For each school, we calculated the percentage of students with individual-level parent education higher than 12 years of education.

Substance use.—Respondents were considered to be current smokers if they reported smoking one or more cigarettes during the past 30 days. Current alcohol use was defined as any use of alcoholic beverages during the past 30 days. Binge drinking was defined as ever

drinking 5+ alcoholic drinks in a row for boys and 4+ drinks for girls. Lifetime illicit drug use was defined as an affirmative response to the question, “Have you ever used marijuana, cocaine or crack?”

Statistical analysis

Data analyses were conducted using Stata V.13.0 (Stata Corp, College Station, TX, USA). Analysis for Mexico and Argentina were performed separately due to concerns that educational systems have slightly different meanings and consequences across countries, given different histories of economic development and patterns of substance use.

First, we examined the distribution of all variables, including individual- and school-level parent education. To estimate the proportion of variance of each outcome explained by the variation between schools, intra-class correlation coefficients (ICC) were calculated, using the latent variable method. Multilevel logistic regression models with random intercepts for school were estimated separately for each substance use outcome (ie, current smoking; current drinking; binge drinking; illicit drug use), regressing these outcomes on individual-level parent education, school-level parent education, and student sex and age; in models for Argentina, school type (ie, public vs. private) was also included as a control variable (not included in Mexico, because only public schools were surveyed). Next, a cross-level interaction between individual- and school-level parent education was added to the model to investigate whether school-level parent education moderated the relationship between individual parent education and substance use.

Sensitivity analyses

To explore if educational attainment of mother had a different association with outcomes compared to that of the father, we re-estimated all models using only mother’s and, separately, only father’s educational level for both individual- and school-level parent education. To examine whether missing data on parent education may have biased our results we also conducted sensitivity analyses using multiple imputations at individual-level (# of imputations = 20) using multinomial logistic regression. We then re-estimated all analyses presented in this paper using the *mi* estimate function in Stata.

RESULTS

In each country, the amount of missing data on all variables except parental education was low (< 1%). Parental education data were missing for 8.6% and 10.3% of students in Mexico and Argentina, respectively. In the Mexican sample, there were no significant differences in age, sex, tobacco and alcohol use between students who reported parent education compared to those who did not ($p > .10$); however, students with missing values on parent education were less likely than those without missing to have used drugs in their lifetime (10.48% versus 13.29%, $p=.01$). In Argentina, students with missing data on parent education were slightly older (mean 12.98 years versus 12.81 years) and more likely to be tobacco users compared to students with no missing data (13.6% versus 9.45%, $p=.01$); there were no other significant differences. Mean age was 12.43 years in Mexico and 12.83 years in Argentina (Table 1). With respect to parent education, 16% and 41% of students and in

Mexico and Argentina respectively had at least one parent with > 12 years of formal education.

Substance use and parent education

Alcohol was the most commonly used substance (current drinking rates were 18% in Mexico and 25% in Argentina, followed by current smoking (9% in Mexico and 10% in Argentina). Ever use of illicit drugs was 13% and 8% in Mexico and Argentina respectively.

In both countries, prevalence of substance use varied significantly across schools for all three substances; the magnitude of the ICCs for substance use outcomes ranged from 0.07 to 0.26 (Table 2 and 3 for Mexico and Argentina, respectively). Higher values were obtained for Argentina than for Mexico, indicating greater between-school variability in the prevalence rates of substance use in Argentina. ICCs were reduced after including individual-level variables in the models, but still remained significant, indicating residual variability across schools. There was a positive correlation among substances of the school prevalence of substance use (Mexico r range 0.58–0.74; Argentina r range 0.66–0.87; all $p < .001$).

In main effect multilevel models for Mexico (Table 2), compared to students whose parents had lower education (< 7 years of school), students whose parents had higher education (> 12 years of school) had lower likelihood of current smoking (OR = 0.40; 95% CI = 0.30 – 0.53), current drinking (OR = 0.44; 95% CI: 0.36–0.53), binge-drinking (OR = 0.56; 95% CI = 0.37 – 0.86), and illicit drug use (OR = 0.28; 95% CI: 0.22–0.36), in a consistent relationship, except for binge drinking. After adjusting for individual-level parent education associations, students from schools with higher parent education had lower likelihood of current smoking (OR = 0.85; 95% CI: 0.74–0.97) and drug use (OR = 0.79; 95% CI: 0.70–0.90) than those from schools with lower parent education. Parent education at school-level was not associated with current alcohol drinking or binge drinking, over and above individual-level associations.

In Argentina (Table 3), no significant associations were found between individual parent education and any outcome. Parent education at school-level, however, was negatively associated with all outcomes (OR = 0.79; 95% CI: 0.71–0.89 for current smoking; OR = 0.89; 95% CI: 0.83–0.95 for current drinking; OR = 0.84; 95% CI: 0.74–0.95 for binge drinking; and OR = 0.82; 95% CI: 0.71–0.93 for drug use). Also, in models for Argentina, school type (ie, public vs. private) was not significantly associated with any outcome ($p > .05$, data not shown). In models for both countries, we found no statistically significant interaction between individual- and school-level parent education for any outcome ($p > .05$, data not shown in tables).

Results from the sensitivity analyses showed similar patterns with regard to the strength and direction of the coefficients to those presented in this paper and would have not change our conclusions.

DISCUSSION

Our results show an inverse association between parent education at individual-level and smoking, alcohol drinking, and drug use among young adolescents in Mexico but not in Argentina. However, in both countries, there was an inverse relation between parent education at school-level and most substance use outcomes, even controlling for individual-level parent education. These results support prior studies in Mexico and Argentina that have shown significant effects of school-level SES indicators on adolescent tobacco use, but without controlling for individual-level SES.^{14, 17} The variation conditioned by school context, ICC, was similar to that found in previous studies in HIC,²⁸ and varied by country, being greater for Argentina, probably due to in Mexico only public schools were sampled. The inclusion of individual-level variables to the models decreased ICCs, which is expected if compositional factors explain differences between schools.^{29, 30} However, we were able to detect a significant parent education effect at school-level after statistical control for parent education at individual-level, suggesting that contextual characteristics of schools, beyond individual characteristics, could help explain the substance use behaviors we studied.

The positive correlation between tobacco, alcohol and drug use at school-level suggest that students attending at schools with low parent education are at risk of polysubstance use rather than single substance use, regardless of their parent education. Early users of multiple substances have a higher risk of young adult substance use problems than early users of single substances,³¹ which suggests the potential importance of targeting schools with low parent education for prevention efforts.

There are many potential mechanisms through which school context could affect adolescents' health behavior.^{28–32} Schools in communities with less educated parents probably have less material or structural resources and lower level of human capital, which in turn can be associated with poor educational environment, community norms favorable to substance use, or absence of effective policies. Additionally, the adverse effects of lower parent education schools could actually reflect the impact of the less advantaged neighborhoods where students live in or move. For example, disadvantaged neighborhoods have higher availability of tobacco points-of-sale, advertising and promotion,³³ which in turn have been associated with smoking in adolescents.³⁴

Individual and contextual socio-economic factors can interact with one another to effect health.³⁰ However, our data provide no support for a moderating effect of parent education at school-level on the relationship between individual parent education and substance use among Mexican or Argentinian adolescents. This contrasts with other studies that have found that school SES buffers the effects of low individual SES on substance use.¹⁶¹² This issue should continue to be explored in LMICs, perhaps using stronger measures of SES and more heterogeneous schools, while also considering stages of economic development and strength of the policy environment.

Our findings regarding the inverse association between parent education at individual-level and substance use in Mexico are consistent with prior studies conducted in high income countries,^{10–12} while contrasting with our hypothesis based on prior Mexican studies that

found a positive association.^{20, 21} This change may be explained by economic development in Mexico, as well as policies and secular trends that have made substance use relatively less socially acceptable in higher SES groups. Indeed, all these studies are before the implementation of the General Law for Tobacco Control, which entered into force on 2008, and some evidence suggest that population-level tobacco control interventions may have differential effects on social inequalities.³⁵ Hence, these policies may have shifted the burden of tobacco use to lower SES groups. Nevertheless, the pattern of results was similar for alcohol and marijuana, as well, and no similar raft of policies was implemented to reduce use of these substances. Hence, longitudinal research that spans periods before and after implementation of different policies is necessary to better understand the apparent process of substance use being concentrated in disadvantaged groups.

In Argentina, the findings with respect to tobacco use are consistent with the only prior study on this topic.¹⁴ Although the lack of association in Argentina between substance use and parent education at individual-level could be attributed to the smaller sample size there than in Mexico, the estimated strength of association in Argentina is weaker than in Mexico. The differential effects of individual parent education on substance use could be attributed to cultural differences. Mexico is viewed as a society that values collectivism, with a strong familial orientation, while Argentina is viewed as a more individualist society,³⁶ probably due to its stronger European ties. Alternatively, if the higher prevalence of substance use among lower parent education adolescents in Mexico responds to the tobacco control policies implemented, it can be speculated a change over time in that direction in Argentina. Several mechanisms can account in Mexico for the relationship between low individual parent education and unhealthy behaviors among adolescents, such as modeling of parental substance use behaviors,³⁷ poor parental monitoring, lower knowledge and access to information about health risks, and lower access to preventive health services.³⁸

This study has several limitations. First, the cross-sectional design limits inferences regarding causality, although we suggest that substance use amongst youth is unlikely to account for low parent education. Nevertheless, parental use may account for both low education and child substance use; hence, future research should measure parental use, as we only assessed parental tobacco use. Second, although students were surveyed from a wide range of schools located in the three major cities in Mexico and Argentina, our sample may not be representative of schools located in other urban areas or in rural areas. In Argentina, although the schools included in the study were not randomly selected, the observed prevalence of substance use was similar to that reported in other Argentinian national surveys,³⁹ suggesting that our findings are not likely to be substantially biased.

A third limitation is that the questionnaire only asked about marijuana, cocaine, and crack use, and it is possible that relationships with SES indicators will be different for other illicit drugs, such as inhalants and ecstasy. Future research should examine these outcomes. Finally, our proxy for SES at the individual and school-level assessed a single facet of SES (ie., parent education) and was self-reported by the students; hence our primary variable may be biased due to recall difficulties or social desirability. SES is a complex construct that is only partly captured by single measures of parent education.⁴⁰ Furthermore, different SES indicators may have varying effects on the same outcome.⁴¹ However, although parent

education describe the family basic structural position in socioeconomic hierarchy, also influence family's access to material resources,⁴² so we can reasonably assume that schools in communities with more highly educated parents will be schools attending to students from families with higher SES. Secondary data sources for enriching SES measures, such as census data, have limitations; a school's census tract may not be isomorphic with the census tracts where students live, particularly in larger cities, like those in our study. Although missing data for parent education was the highest among study variables, sensitivity analyses did not show evidence of any associated biases. Besides, the results for Argentina are congruent with a previous study using school receipt of social assistance¹⁴. Future research should consider other approaches to assess adolescent SES, such as the individual affluence scale.⁴³

Our findings suggest that lower parent education contributes to substance use among adolescents in Mexico and in Argentina. SES is a fundamental cause of health inequalities,⁴⁴ and substance use behaviors account for a substantial amount of the preventable disease burden around the world. Identifying individual and school-level social and economic factors driving substance use is imperative if we hope to offset the rising prevalence of tobacco, alcohol, and drug use in these populations. School-based risk-reduction programs and broader policies that target specific substances (eg, raising taxes, banning marketing) should be adopted if they reduce substance use disparities across SES groups.

IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

This study finds that student tobacco, alcohol and drug use vary significantly across schools, and that schools with lower parent education show higher likelihood of youth use of all these substances, whether in Mexico and Argentina. This suggests the potential importance of targeting lower SES schools for prevention efforts, as well as interventions to address social determinants of health, in general, which will presumably influence an array of health risk factors amongst youth.

Nevertheless, little is known about policies and interventions that aim to specifically reduce adolescent initiation and substance use in Latin American countries. Because of the large social inequalities in some of these countries, any intervention should be effectively reach lower SES adolescents in order to reduce health disparities. Our findings provide a justification for further monitoring the differential impacts of interventions by SES, mainly in developing countries that increasingly must address non-communicable diseases, including those caused by substance use.

Acknowledgements

This research was supported by the National Cancer Institute and the Fogarty International Center of the National Institutes of Health under award numbers TW009274 (MPI Sargent & Thrasher) and CA077026 (PI Sargent).

References

- [1]. Chassin L, Presson CC, Rose JS, Sherman SJ. The natural history of cigarette smoking from adolescence to adulthood: demographic predictors of continuity and change. *Health Psychol* 1996; 15(6): 478. [PubMed: 8973929]

- [2]. Marmot M, Allen J, Goldblatt P, Boyce T, McNeish D, Grady M. Strategic review of health inequalities in England post 2010 (Marmot review). 2010.
- [3]. Patrick ME, Schulenberg JE. Prevalence and predictors of adolescent alcohol use and binge drinking in the United States. *Alcohol Res* 2014; 35(2): 193.
- [4]. (ONUDD) OdINUclDyeD Informe subregional sobre uso de drogas en población escolarizada 2009/2010. 2010.
- [5]. Cutler DM, Lleras-Muney A, Vogl T. Socioeconomic status and health: dimensions and mechanisms. National Bureau of Economic Research; 2008.
- [6]. Daniel JZ, Hickman M, Macleod J, et al. Is socioeconomic status in early life associated with drug use? A systematic review of the evidence. *Drug Alcohol Rev* 2009; 28(2): 142–153. [PubMed: 19320699]
- [7]. Hanson MD, Chen E. Socioeconomic status and health behaviors in adolescence: a review of the literature. *J Behav Med* 2007; 30(3): 263–285. [PubMed: 17514418]
- [8]. Lemstra M, Bennett NR, Neudorf C, et al. A meta-analysis of marijuana and alcohol use by socioeconomic status in adolescents aged 10–15 years. *Can J Public Health*. 2008: 172–177. [PubMed: 18615935]
- [9]. World Health Organization. Global status report on alcohol and health, 2014. 2014.
- [10]. Goldade K, Choi K, Bernat DH, Klein EG, Okuyemi KS, Forster J. Multilevel predictors of smoking initiation among adolescents: findings from the Minnesota Adolescent Community Cohort (MACC) study. *Prev Med* 2012; 54(3): 242–246. [PubMed: 22245269]
- [11]. Lowry R, Kann L, Collins JL, Kolbe LJ. The effect of socioeconomic status on chronic disease risk behaviors among US adolescents. *JAMA*. 1996; 276(10): 792–797. [PubMed: 8769588]
- [12]. Mathur C, Erickson DJ, Stigler MH, Forster JL, Finnegan JR Jr. Individual and neighborhood socioeconomic status effects on adolescent smoking: a multilevel cohort-sequential latent growth analysis. *Am J Public Health*. 2013; 103(3): 543–548. [PubMed: 23327273]
- [13]. Ennett ST, Flewelling RL, Lindrooth RC, Norton EC. School and neighborhood characteristics associated with school rates of alcohol, cigarette, and marijuana use. *J Health Soc Behav* 1997: 55–71. [PubMed: 9097508]
- [14]. Linetzky B, Mejia R, Ferrante D, De Maio FG, Diez Roux AV. Socioeconomic status and tobacco consumption among adolescents: a multilevel analysis of Argentina's Global Youth Tobacco Survey. *Nicotine Tob Res* 2012; 14(9): 1092–1099. [PubMed: 22394595]
- [15]. Simetin IP, Kern J, Kuzman M, Pförtner T-K. Inequalities in Croatian pupils' risk behaviors associated to socioeconomic environment at school and area level: A multilevel approach. *Soc Sci Med* 2013; 98: 154–161. [PubMed: 24331894]
- [16]. Moore GF, Littlecott HJ. School- and family-level socioeconomic status and health behaviors: multilevel analysis of a national survey in Wales, United Kingdom. *J Sch Health*. 2015; 85(4): 267–275. [PubMed: 25731201]
- [17]. Bird Y, Moraros J, Olsen LK, Forster-Cox S, Buckingham RW, Staines-Orozco H. Smoking practices, risk perception of smoking, and environmental tobacco smoke exposure among 6th-grade students in Ciudad Juarez, Mexico. *Nicotine & tobacco research*. 2007; 9(2): 195–203. [PubMed: 17365750]
- [18]. Mrug S, Gaines J, Su W, Windle M. School-Level Substance Use: Effects on Early Adolescents' Alcohol, Tobacco, and Marijuana Use. *J Stud Alcohol Drugs*. 2010; 71(4): 488–495. [PubMed: 20557827]
- [19]. Arillo-Santillan E, Lazcano-Ponce E, Hernandez-Avila M, et al. Associations between individual and contextual factors and smoking in 13,293 Mexican students. *Am J Prev Med* 2005; 28(1): 41–51. [PubMed: 15626554]
- [20]. Benjet C, Borges G, Medina-Mora ME, et al. Prevalence and socio-demographic correlates of drug use among adolescents: results from the Mexican Adolescent Mental Health Survey. *Addiction*. 2007; 102(8): 1261–1268. [PubMed: 17624976]
- [21]. Rittnerman ML, Fernald LC, Ozer EJ, Adler NE, Gutierrez JP, Syme SL. Objective and subjective social class gradients for substance use among Mexican adolescents. *Soc Sci Med* 2009; 68(10): 1843–1851. [PubMed: 19342140]

- [22]. Sebríé EM, Schoj V, Travers MJ, McGaw B, Glantz SA. Smokefree policies in Latin America and the Caribbean: making progress. *Int J Environ Res Public Health*. 2012; 9(5): 1954–1970. [PubMed: 22754484]
- [23]. Nations U. Transforming our world: the 2030 agenda for sustainable development General Assembly UN, 70th Session, ed A/RES/70/1 Geneva, Switzerland; 2015.
- [24]. Ensminger ME, Forrest CB, Riley AW, et al. The validity of measures of socioeconomic status of adolescents. *Journal of Adolescent Research*. 2000; 15(3): 392–419.
- [25]. Wardle J, Robb K, Johnson F. Assessing socioeconomic status in adolescents: the validity of a home affluence scale. *J Epidemiol Community Health*. 2002; 56(8): 595–599. [PubMed: 12118050]
- [26]. Abad-Vivero EN, Thrasher JF, Arillo-Santillán E, et al. Recall, appeal and willingness to try cigarettes with flavour capsules: assessing the impact of a tobacco product innovation among early adolescents. *Tob Control*. 2016: tobaccocontrol-2015–052805.
- [27]. Mejia R, Pérez A, Abad-Vivero EN, et al. Exposure to alcohol use in motion pictures and teen drinking in Latin America. *Alcoholism: Clinical and Experimental Research*. 2016; 40(3): 631–637.
- [28]. Sellström E, Bremberg S. Is there a “school effect” on pupil outcomes? A review of multilevel studies. *J Epidemiol Community Health*. 2006; 60(2): 149–155. [PubMed: 16415266]
- [29]. Aveyard P, Markham WA, Cheng K. A methodological and substantive review of the evidence that schools cause pupils to smoke. *Soc Sci Med* 2004; 58(11): 2253–2265. [PubMed: 15047082]
- [30]. Diez-Roux AV. Multilevel analysis in public health research. *Annu Rev Public Health*. 2000; 21: 171–192. [PubMed: 10884951]
- [31]. Moss HB, Chen CM, Yi H-y. Early adolescent patterns of alcohol, cigarettes, and marijuana polysubstance use and young adult substance use outcomes in a nationally representative sample. *Drug Alcohol Depend* 2014; 136: 51–62. [PubMed: 24434016]
- [32]. Bisset S, Markham WA, Aveyard P. School culture as an influencing factor on youth substance use. *J Epidemiol Community Health*. 2007; 61(6): 485–490. [PubMed: 17496256]
- [33]. Lee JG, Henriksen L, Rose SW, Moreland-Russell S, Ribisl KM. A systematic review of neighborhood disparities in point-of-sale tobacco marketing. *Am J Public Health*. 2015; 105(9): e8–e18.
- [34]. Robertson L, Cameron C, McGee R, Marsh L, Hoek J. Point-of-sale tobacco promotion and youth smoking: a meta-analysis. *Tob Control*. 2016: tobaccocontrol-2015–052586.
- [35]. Thomas S, Fayter D, Misso K, et al. Population tobacco control interventions and their effects on social inequalities in smoking: systematic review. *Tob Control*. 2008; 17(4): 230–237. [PubMed: 18426867]
- [36]. Association WVS. World Values Survey wave 6 2010– 2014. Retrieved from www.worldvaluessurvey.org; 2014.
- [37]. White HR, Johnson V, Buyske S. Parental modeling and parenting behavior effects on offspring alcohol and cigarette use: A growth curve analysis. *J Subst Abuse*. 2000; 12(3): 287–310. [PubMed: 11367605]
- [38]. Pampel FC, Krueger PM, Denney JT. Socioeconomic disparities in health behaviors. *Annu Rev Sociol* 2010; 36: 349. [PubMed: 21909182]
- [39]. SEDRONAR. Observatorio Argentino de Drogas. Quinta Encuesta Nacional a Estudiantes de Enseñanza Media 2011 Informe final de resultados. Buenos Aires <http://scripts.minplan.gob.ar/octopus/archivos.php?file=42012012>.
- [40]. Shavers VL. Measurement of socioeconomic status in health disparities research. *J Natl Med Assoc* 2007; 99(9): 1013. [PubMed: 17913111]
- [41]. Braveman PA, Cubbin C, Egerter S, et al. Socioeconomic status in health research: one size does not fit all. *JAMA*. 2005; 294(22): 2879–2888. [PubMed: 16352796]
- [42]. Laaksonen M, Rahkonen O, Karvonen S, Lahelma E. Socioeconomic status and smoking: analysing inequalities with multiple indicators. *The European Journal of Public Health*. 2005; 15(3): 262–269. [PubMed: 15755781]

- [43]. Currie C, Molcho M, Boyce W, Holstein B, Torsheim T, Richter M. Researching health inequalities in adolescents: the development of the Health Behaviour in School-Aged Children (HBSC) family affluence scale. *Soc Sci Med* 2008; 66(6): 1429–1436. [PubMed: 18179852]
- [44]. Phelan JC, Link BG, Tehranifar P. Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications. *J Health Soc Behav* 2010; 51(1_suppl): S28–S40. [PubMed: 20943581]

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1.

Characteristics of the Samples from Mexico and Argentina

Variable	Mexico n (%)	Argentina n (%)
At individual-level	10123 (100)	3172 (100)
Sex		
Male	5049 (50.0)	1817 (57.7)
Age (years)		
mean (SD)	12.43 (0.60)	12.83 (0.95)
Highest parent education		
7 years	1317 (13.1)	214 (6.87)
8–12 years	6279 (62.6)	1289 (41.35)
>12 years	1573 (15.7)	1292 (41.45)
Don't know	858 (8.6)	322 (10.33)
No parent	91 (0.9)	12 (0.4)
Substance use		
Current smoking	869 (8.6)	315 (9.9)
Current drinking	1,822 (18.11)	801 (25.4)
Binge drinking	323 (3.2)	187 (6.0)
Illicit drug use	1,319 (13.0)	260 (8.2)
At school-level		
Schools, n	60	33
% with parents with >12 y of education, median (range)	11.3 (2.8–59.5)	37.6 (14.3–98.4)
% Current smoker, median (range)	8.5 (2.4–31.3)	8.9 (0–26.7)
% Current drinkers, median (range)	17.5 (4.2–38.8)	22.9 (0–53.6)
% Binge drinkers, median (range)	2.7 (0 – 10.4)	4.4 (0 – 18.5)
% Illicit drug use, median (range)	14.5 (1.7–31.6)	5.6 (0–30.7)

Table 2.

Multilevel Logistic Regression Models for Tobacco, Alcohol and Drug use among Adolescents in Mexico (N=10123)

Variable	Current smoking		Current drinking		Binge drinking		Drug use	
	Prevalence (%)	aOR (95% CI)	Prevalence (%)	aOR (95% CI)	Prevalence (%)	aOR (95% CI)	Prevalence (%)	aOR (95% CI)
Parent education at individual-level								
Parent education								
7 years	16.3	1	30.9	1	5.5	1	28.9	1
8-12 years	7.8	0.51 (0.42 – 0.61)	16.9	0.51 (0.45 – 0.59)	2.9	0.57 (0.43 – 0.77)	11.6	0.40 (0.34 – 0.46)
> 12 years	5.4	0.40 (0.30 – 0.53)	13.6	0.44 (0.36 – 0.53)	2.6	0.56 (0.37 – 0.86)	7.1	0.28 (0.22 – 0.36)
Missing	8.0	0.54 (0.40 – 0.72)	15.3	0.48 (0.38 – 0.60)	2.9	0.62 (0.39 – 1.00)	9.8	0.34 (0.26 – 0.44)
Parent education at school-level *								
% with parents with >12 y of education		0.85 (0.74 – 0.97)		0.92 (0.82 – 1.03)		0.91 (0.76 – 1.10)		0.79 (0.70 – 0.90)
ICC								
Unconditional model		0.086		0.070		0.100		0.094
Model with individual-level variables		0.067		0.056		0.087		0.065
Model with individual and school-level variables		0.057		0.054		0.085		0.050

aOR = adjusted odds ratio; all models adjusted for sex and age; CI = confidence interval; ICC = Intraclass correlation coefficient;

* scaled at 10% increments; in bold: $p < .05$

Table 3.
Multilevel Logistic Regression Models for Tobacco, Alcohol and Drug use among Adolescents in Argentina (N=3172)

Variable	Current smoking		Current drinking		Binge drinking		Drug use	
	Prevalence (%)	aOR (95% CI)	Prevalence (%)	aOR (95% CI)	Prevalence (%)	aOR (95% CI)	Prevalence (%)	aOR (95% CI)
Parent education at individual-level								
Parent education								
7 years	16.0	1	31.3	1	10.8	1	13.1	1
8-12 years	10.8	0.81 (0.52 – 1.25)	28.4	0.99 (0.71 – 1.37)	6.9	0.77 (0.46 – 1.28)	9.2	0.80 (0.50 – 1.29)
>12 years	7.0	0.79 (0.50 – 1.26)	20.4	0.83 (0.59 – 1.17)	4.4	0.75 (0.43 – 1.30)	5.7	0.77 (0.47 – 1.29)
Missing	13.1	0.80 (0.47 – 1.36)	28.4	0.88 (0.59 – 1.31)	5.7	0.45 (0.23 – 0.88)	9.7	0.63 (0.35 – 1.15)
Parent education at school-level *								
% with parents with >12 y of education		0.79 (0.71 – 0.89)		0.89 (0.83 – 0.95)		0.84 (0.74 – 0.95)		0.82 (0.71 – 0.93)
ICC								
Unconditional model		0.174		0.077		0.197		0.264
Model with individual-level variables		0.038		0.026		0.071		0.033
Model with individual and school-level variables		0.012		0.016		0.000		0.021

aOR = adjusted odds ratio; all models adjusted for sex and age; CI = confidence interval; ICC = Intraclass correlation coefficient;

* scaled at 10% increments; in bold: $p < .05$