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E-cigarette social norms and risk perceptions among susceptible adolescents in a country that bans e-cigarettes

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Abstract

Background: This study examined how risk perceptions and social norms around e-cigarettes are associated with susceptibility (i.e., openness to using the product in the next 12 months) of e-cigarettes and smoking among adolescents.

Methods: We analyzed data from a 2016 representative survey of 8718 middle-school students in Mexico. The study sample was restricted to students who had tried neither e-cigarettes nor cigarettes, (n=4471). Students reported on the risks of e-cigarettes compared to cigarettes, and product-specific norms were measured by assessing current use by family members, at least one close friend, and, for e-cigarettes, by perceived societal acceptability of use (i.e., acceptability among people in general). Adjusted prevalence ratios (APR) were estimated using generalized estimating equation (GEE) models that regressed e-cigarette societal acceptability on study variables. Adjusted GEE models also regressed susceptibility for each product on study variables.

Results: Susceptibility to both e-cigarettes and smoking was higher among students who reported that their family and friends used only cigarettes or both products when compared to students whose family and friends did not use either of these products. Friend use of e-cigarettes was associated with e-cigarette susceptibility (APR= 1.33), but not smoking susceptibility. Students who perceived that e-cigarettes were less risky than smoking were more susceptible to e-cigarette use (APR=1.45). The association between e-cigarette susceptibility and friend or family use was not mediated by societal acceptability.

Conclusions: E-cigarette use among family and peers appears associated with susceptibility to use e-cigarettes in a way that is similar to the patterns found for cigarettes. However, the influences appear somewhat specific to the type of product that network members use.

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Conflict of interest
No conflict declared.

INTRODUCTION

Electronic cigarettes (e-cigarettes) have been on the rise globally (Bhatnagar, Whitsel, & Ribisl, 2014), since first being introduced to the European and American market in 2006 and 2007, respectively (Noel, Rees, & Connolly, 2011). E-cigarettes are battery-powered devices that typically contain a liquid with nicotine that is aerosolized and inhaled by the user (Gostin & Glasner, 2014; Grana, 2013). These products are advertised as an advanced technology that is a relatively safe alternative to smoking (Berg et al., 2015; Gostin & Glasner, 2014; Grana, 2013). Indeed some research suggests that adolescents believe e-cigarettes to be safer, less addictive (Berg et al., 2015; Gorukanti, Delucchi, Ling, Fisher-Travis, & Halpern-Felsher, 2017; Margolis, Nguyen, Slavitt, & King, 2016; Noland et al., 2016; Roditis, Delucchi, Cash, & Halpern-Felsher, 2016) and more socially acceptable (Berg et al., 2015; Gorukanti et al., 2017; Noland et al., 2016; Trumbo & Harper, 2015) than cigarettes. Moreover, adolescents who perceive e-cigarettes to be less risky than smoking (Choi & Forster, 2013; Goniewicz, Lingas, & Hajek, 2013; Margolis et al., 2016; Thrasher et al., 2016) and who find them socially acceptable appear more likely to experiment with and become current users of e-cigarettes (Gorukanti et al., 2017; Noland et al., 2016). However, most studies to date have taken place in high-income countries where e-cigarettes are legally available. Furthermore, studies that have evaluated e-cigarette norms and their association with e-cigarette and smoking behavior have not evaluated both injunctive and descriptive norms. This study aimed to examine whether tobacco product specific social norms and risk perceptions are differentially associated with susceptibility to e-cigarettes and cigarettes.

The few previous studies that have examined e-cigarette social norms have focused on either *injunctive* or *descriptive norms*. Injunctive norms capture people's beliefs about what others think ought to be done (e.g., social acceptability), whereas descriptive norms are perceptions of actual behavior within a social group (e.g., behaviors of friends and family) (Lapinski & Rimal, 2005). Social norm theory posits that injunctive and descriptive norms influence behavior in different ways. In particular, injunctive norms should mediate the effects of descriptive norms on behavior (Lapinski & Rimal, 2005), although this has not been tested in prior research on e-cigarettes. Furthermore, no studies of which we are aware have examined whether the influence of social norms is specific to particular tobacco products or generalizes across products.

A number of cross-sectional studies suggest that more favorable social norms, whether injunctive or descriptive, are associated with both e-cigarette and cigarette use. For example, a US study among university students found that current tobacco users (combining those who used cigarettes, e-cigarettes or hookahs in the last 30 days), reported greater social acceptability for e-cigarettes compared to students who did not use any tobacco products (Noland et al., 2016). US high school students who reported that either their friends had a favorable perception of e-cigarettes or who reported having at least one friend who used e-cigarettes were more likely to be susceptible to smoking, but susceptibility to e-cigarettes was not evaluated (Barrington-Trimis et al., 2016). US high school students who reported more family and friend use of e-cigarettes were also more likely to have ever used e-cigarettes or smoked (Gorukanti et al., 2017), and having a higher percentage of friends who use e-cigarettes was associated with greater frequency of e-cigarette use and dependence

(Vogel, Ramo, & Rubinstein, 2018). Finally, studies of adolescents in Mexico (Thrasher et al., 2016) and Argentina (Morello et al., 2016) found that family and friend use of cigarettes was positively associated with e-cigarette trial, although network member use of e-cigarettes was not assessed. Results from these cross-sectional studies do not adequately account for potential selection effects (i.e., e-cigarette users are more likely become friends with people who use e-cigarettes). Furthermore, while the results generally indicate that norms around one product influence behavior associated with another product, they do not measure or assess the independent effects of each norm. Indeed, previous studies suggest that e-cigarettes may appeal to lower risk youth who would not have otherwise initiated nicotine product use (Thrasher et al., 2016; Wills, Sargent, Gibbons, Pagano, & Schweitzer, 2016). Hence, assessment of social norms that are specific to each product may be important to consider if e-cigarettes appeal to lower risk adolescents.

Evaluating the potential independence of e-cigarette and cigarette norms is also relevant to concerns that some have raised regarding how the increasing social acceptability of e-cigarettes may not only influence e-cigarette use but also smoking, thereby undermining “denormalization” policies and campaigns that have long targeted smoking (Abrams, 2014; Fairchild, Bayer, & Colgrove, 2014). Decades of public health campaigns and policy interventions, including smoke-free laws, advertising bans, and health warning labels on cigarette packaging (Fairchild et al., 2014; Gostin & Glasner, 2014), have made smoking less socially acceptable. These public health efforts could be reversed by the increasing popularity and favorable social norms towards e-cigarettes (Fairchild et al., 2014) if these norms increase use of both e-cigarettes and cigarettes (Barrington-Trimis et al., 2016). Indeed, this possibility is supported by longitudinal studies of adolescents and young adults in the US (Leventhal et al., 2015; Primack, Soneji, Stoolmiller, Fine, & Sargent, 2015; Soneji et al., 2017; Unger, Soto, & Leventhal, 2016; Wills, Knight, et al., 2016; Wills, Sargent, et al., 2016) and Mexico (Lozano et al., 2017), which have consistently found that e-cigarette trial and use are associated with subsequent cigarette smoking.

Mexican Study Context

Despite prohibiting the sale, importation, distribution, and marketing of e-cigarettes in Mexico (Artículo 16, 2008), a 2015 representative survey of first year middle-school students in the three largest cities in Mexico found that 10% had tried e-cigarettes. Furthermore, a 2016 nationally representative survey found that 7% of adolescents (12–17 years) had tried e-cigarettes and 1% were current users (Zavala-Arciniega et al., 2018). It is noteworthy that the prevalence of e-cigarette trial and use among Mexican adolescents is comparable to the prevalence of trial (11.9%) and use (3.5%) of e-cigarettes among US adolescents (12–17 years), where e-cigarette policies are relatively weak (Nicole, Snell, Morgan, & Andrew, 2017). It is unknown whether the relationships between social norms, risk perceptions, and use of e-cigarettes among adolescents varies across regulatory and sociocultural environments. Although in this study we did not directly compare data from countries with different e-cigarette regulations, we interpret the results in light of prior research that has almost exclusively been conducted in countries that have weaker regulations than Mexico

This paper is part of a larger study that has examined e-cigarette use among youth. Prior cross-sectional analyses of data from the first survey from this study suggest that awareness and trial of e-cigarette was high among first year secondary school adolescents in Mexico in spite of its e-cigarette ban (Thrasher et al., 2016). Moreover, we found that e-cigarette trial at baseline was associated with subsequent smoking initiation 20 months later (Lozano et al., 2017). At follow up, we asked more detailed questions about e-cigarette perceptions and use. The current study examines these more detailed questions amongst those who had not yet tried e-cigarettes in the follow-up survey. This study examined whether social norms (descriptive and injunctive) and risk perceptions that are specific to tobacco products are independently associated with e-cigarette and smoking susceptibility (i.e., openness to using the product in the next 12 months) (Figure 1). We focus on e-cigarette and smoking susceptibility among never users to help overcome concerns about selection effects that may have biased prior studies on the associations between norms and e-cigarette use. Based on norms theory (Lapinski & Rimal, 2005), we expect that perceived societal acceptability of e-cigarettes will mediate the effects of greater family and friend use of e-cigarettes on e-cigarette susceptibility. Based on prior research, we expect that family and friend use of e-cigarettes, as well as the social acceptability of e-cigarettes, will be independently associated with susceptibility to both smoking and e-cigarettes. Finally, we expect that perceived risk of e-cigarettes relative to cigarettes will be associated with e-cigarette susceptibility.

METHODS

Study Population

The data from this study were drawn from a school-based, representative survey of public middle-school students from the three largest cities in Mexico (Mexico City, Guadalajara, and Monterrey). Schools were selected using a stratified-random sampling scheme that considered: 1) high and low socioeconomic status, based on the census tracts where schools were located; and 2) city-specific tertiles of retail establishment density, which were estimated using an official database of commercial establishments likely to sell tobacco within school census tracts. A detailed description of school selection has been published elsewhere (Abad-Vivero et al., 2016).

The survey was conducted in October and November 2016 in 57 of the 60 schools that participated in a similar survey 18 months earlier. In both surveys, passive parental consent was used, with students providing active assent. Students completed a self-administered, Spanish-language questionnaire developed from prior, validated surveys and pretested to ensure student comprehension. Study protocols were approved by the IRB at the National Institute of Public Health in Mexico. Because questions on descriptive and injunctive social norms around e-cigarettes were not included in the 2015 survey, this study uses data only from the 2016 survey that included these questions.

Sample

Of 8718 students who participated in the survey, only 4,691 had never tried either e-cigarettes or cigarettes. Moreover, we excluded students with missing values from the dependent variables (current e-cigarette/cigarette susceptibility, N=12), primary independent

variables (descriptive/ injunctive e-cigarette/ cigarette social norms and perceived risk, N=96) and all covariates (N=124), to yield a final analytic sample of 4,471 students.

Measures

Questions on smoking and e-cigarettes were in separate questionnaire sections. The section on e-cigarettes began with a brief description of e-cigarettes accompanied by images of different e-cigarette types.

Descriptive Norms: To assess descriptive norms in the family, students were asked if any family members who lived at home used e-cigarettes (yes/no) or cigarettes (yes/no). Friend descriptive norms were measured by asking how many of their five best friends used e-cigarettes (none, 1 of 5, 2 of 5, 3 of 5, 4 of 5, 5 of 5), with a separate parallel question on friend use of cigarettes (Berg et al., 2015; Morello et al., 2016; Vogel et al., 2018). Response options were dichotomized to indicate that at least one of their friends used e-cigarette/ cigarettes vs. “none” of them. Responses to questions about both products were combined for product use among family (i.e., no family member who uses; only users of e-cigarettes; only cigarette smokers; users of both products) and friends (i.e., no friends who use; only users of e-cigarettes; only cigarette smokers; users of both products).

Injunctive norms: Injunctive norms were assessed with a question on e-cigarette societal acceptability: “In your opinion, do people approve or disapprove that other people use e-cigarettes?” Response options to this question included: “they completely disapprove”, “they disapprove”, “they do not approve or disapprove”, “they approve” and “they completely approve”. We dichotomized responses into “yes” (they approve/they completely approve) and “no” (other responses).

Risk of e-cigarettes compared to cigarettes: Students were asked how likely it would be for them to get a serious disease from using e-cigarettes if they used them for the rest of their lives. This question was also asked for cigarettes. Response options included: “it will not happen”, “not likely”, “likely”, “very likely”, “it will definitely happen”, “don’t know”. To examine the relative risk of e-cigarettes compared to cigarettes, responses were subtracted and categorized to yield the following response options: 1= “e-cigarettes are more risky/same”, 2= “e-cigarettes are less risky” and 3= “don’t know” (this category was determined before subtracting).

E-cigarette and smoking susceptibility: As in prior research, susceptibility to each product was assessed by asking students using a validated question: Do you think that you will [use e-cigarettes/smoke] sometime in the next 12 months? (Bold, Kong, Cavallo, Camenga, & Krishnan-Sarin, 2016; Krishnan-Sarin, Morean, Camenga, Cavallo, & Kong, 2014; Pierce, Choi, Gilpin, Farkas, & Merritt, 1996). Response options for this question included: “Definitely not”, “not likely”, “likely”, and “definitely”. As is commonly done in tobacco research, we dichotomized responses into not susceptible (“definitely not” response) and susceptible (all other responses) (Morello et al., 2018; Pierce et al., 1996).

Covariates: Sociodemographic characteristics included sex, age, parental education (highest level reported for either parent: primary, secondary, high school, university, unknown), and household wealth using the Family Affluence Scale (FAS) (i.e.; “How many cars does your family own?”; “Do you have your own room?”; “In the last 12 months how many times has your family gone on vacation?”; “How many computers are in your house?”) (Boyce, Torsheim, Currie, & Zambon, 2006). Personal characteristics included: a four-item scale of sensation seeking (e.g., “I like to do frightening things”; $\alpha=.80$), which has been validated previously for Mexican youth (Thrasher et al., 2016) and a four-level alcohol use variable: never tried; tried, but not in the last 30 days; current drinking in the last 30 days (but not binge drinking); and binge drinking (4 drinks or more within 2 hours) in the last 30 days. Frequency of exposure to internet advertisements in the last 30 days for: 1. any tobacco product and; 2. e-cigarette products was queried (Morello et al., 2016; Thrasher et al., 2016), with responses re-categorized due to their skewed distribution (Never=“I don’t use the internet” or “never”, Sometimes=“rarely” or “sometimes”; Frequently= “frequently” or “very frequently”).

Statistical analysis

We calculated descriptive statistics for all variables of interest. We used generalized estimating equations (GEE) with log-binomial models to account for the school-level nested structure of the data (Fleischer et al., 2014). Unadjusted and adjusted GEE models were used to regress perceived e-cigarette injunctive norms (i.e., societal acceptability) on descriptive social norms (family and friend use) for both e-cigarettes and cigarettes and other covariates. GEE models also regressed e-cigarette/smoking susceptibility on e-cigarette social norms (i.e., descriptive and injunctive), cigarette social norms (i.e., descriptive), perceived risk, and covariates. If a significant association was found between e-cigarette and cigarette descriptive norms and e-cigarette injunctive norms, we also planned to test whether societal acceptability for e-cigarettes mediated the effects of family and friend use of e-cigarette on e-cigarette susceptibility. All analysis were conducted using STATA 14.

RESULTS

Table 1 presents the characteristics of the analytic sample ($N=4,471$) and participants excluded due to missing data ($N=220$). Students in the analytic sample were equally likely to be male or female, with most being 14 years old (78%) and having parents with a high school education or less (75%). The prevalence for both e-cigarette and smoking susceptibility was 22%. The prevalence of family and friend use of e-cigarettes was lower than for cigarettes. Approximately 8% of students perceived e-cigarette societal norms as favorable and 38% of students believed e-cigarettes were less risky than cigarettes. In general, differences between the analytic sample and the excluded sample were not statistically significant, with the exception of sex, age and alcohol use.

In crude and adjusted GEE models, perceived social acceptability (Table 2) was associated with moderate exposure to online e-cigarette advertisements in the last month compared to students who reported no exposure (11% vs. 7%, respectively; $APR_{\text{sometimes v.s never}} 1.39$, 95% CI 1.12–1.73). Because friend and family use of e-cigarettes and cigarettes were not

independently associated with social acceptability of e-cigarettes, we did not test further for mediation effects on e-cigarette or smoking susceptibility.

In general, susceptibility to both e-cigarettes and smoking was higher among students who reported that their family and friends used either cigarettes only or both products compared to students whose family and friends did not use either of these products (Table 3). Students who reported that their friends only used e-cigarettes (but not cigarettes) were more likely to be susceptible to e-cigarettes than students with no friends who used either product (25% vs. 16%, respectively; $APR=1.33$, 95% CI 1.08–1.69). Having friends who only used e-cigarettes was not significantly associated with smoking susceptibility. Perceived social acceptability of e-cigarettes was independently associated with greater likelihood of e-cigarette susceptibility ($APR=1.17$, 95% CI 1.02–1.35) but not with smoking susceptibility. The belief that e-cigarettes are less risky than smoking ($APR=1.45$, 95% CI 1.29–1.64) was also associated with e-cigarette susceptibility, but not with smoking susceptibility. Common independent correlates for susceptibility to both smoking and e-cigarettes included stronger sensation seeking and binge drinking (compared to never drinkers). Independent associations that were unique to e-cigarette susceptibility included sex ($APR_{\text{male vs female}}=0.87$, 95% CI 0.79–0.96) and being exposed to online e-cigarette products ads ($APR_{\text{always vs never}}=1.31$, 95% CI 1.03–1.66). Furthermore, students with parents whose educational attainment was relatively high were less likely to be susceptible to cigarette use ($APR_{\text{university vs. primary school}}=0.73$, 95% CI 0.62–0.87).

DISCUSSION

Results from this study did not support our primary hypotheses, based in social norm theory (Lapinski & Rimal, 2005), around how family and/or friend use of e-cigarettes would influence social acceptability of e-cigarettes. In other words, students who reported that their friends and family used cigarettes and/or e-cigarettes, were no more likely to perceive e-cigarettes as socially acceptable than students that reported that their friends and family did not use either nicotine product. However, this lack of association may be due to how we measured social acceptability, which only referenced perceived opinions of other people in general. Future research should consider assessing social acceptability among more proximal social network members that are likely to influence behavior, such as friends and family. Indeed, a previous study that examined the correlates of e-cigarette social acceptability among family and friends found that being male, a current tobacco user (user of cigarettes, e-cigarettes or hookah) and being exposed to second hand cigarette smoking was associated with perceived social acceptability of e-cigarettes (Noland et al., 2016). However, this study did not examine family or friend use of e-cigarette as a correlate of social acceptability.

Our study found that perceived social acceptability of e-cigarettes was independently associated with e-cigarette susceptibility but not with smoking susceptibility. Hence, e-cigarette social acceptability may have a specific effect on e-cigarette susceptibility without influencing smoking behavior. This contrasts with a cross-sectional US study that found that perceived favorability of e-cigarettes among friends was associated with smoking susceptibility (Barrington-Trimis et al., 2016). However, this study did not examine the

relationship between social acceptability of e-cigarettes and e-cigarette susceptibility. It is possible that this relationship will be stronger in the US where e-cigarettes are not banned and therefore may be more easily accessible to youth.

Students who had family or friends who used both e-cigarettes and cigarettes or used just cigarettes were more likely to be susceptible to either product, when compared to students whose family or friends used neither product. This is consistent with other research among US adolescents, which found that secondhand cigarette smoke exposure in the home was a risk factor for e-cigarette susceptibility (Kwon, Seo, Lin, & Chen, 2018). Furthermore, receiving their first e-cigarette from a family member was associated with more frequent use of e-cigarettes among US adolescents who use them (Vogel et al., 2018). Nevertheless, we also found that having friends who only use e-cigarettes was associated with e-cigarette susceptibility, but not with smoking susceptibility and family e-cigarette use was not independently associated with susceptibility to either product. This raises the question of whether e-cigarette use among close network members will ultimately lead to cigarette use – a question that future longitudinal research should assess. In the end, e-cigarette use among friends may play a more important role in adolescent e-cigarette uptake compared to family e-cigarette use (Gorukanti et al., 2017).

Students who perceive e-cigarettes use to be less risky than smoking were more likely to be susceptible to e-cigarettes, as in prior research (Kwon et al., 2018). Thus, policies and public health programs that aim to inform youth about the dangers and harmfulness of e-cigarettes may be important for deterring e-cigarette initiation and use.

We found that exposure to online e-cigarette ads in the last 30 days was independently associated both with perceived social acceptability of e-cigarettes and with e-cigarette susceptibility. This finding is consistent with a cross-sectional study among undergraduate students that suggest that favorable injunctive norms around online video advertisement was positively associated to consumers' intention to watch online video ads on social media (Lee, Kim, Ham, & Kim, 2017). E-cigarette information is widely available online (Collins, Glasser, Abudayyeh, Pearson, & Villanti, 2018) and research indicates that e-cigarette advertisement may play a role in making this products more socially acceptable (Willis, Haught, & Morris Ii, 2017).. Difficulties with enforcing online ad restriction may lead to significant exposures even in countries where e-cigarettes are banned, such as Mexico and many other countries that have banned e-cigarette advertising (Institute for Global Tobacco Control, 2018). As such, online marketing may play an important role in forming perceptions about the social acceptability of e-cigarettes and in promoting their use among adolescents.

As expected, we found that sensation seeking and alcohol use were associated with susceptibility to e-cigarettes and cigarettes, both of which are establish risk factors for youth smoking (Tyas & Pederson, 1998) and e-cigarette susceptibility and trial (Kwon et al., 2018; Thrasher et al., 2016). Indeed, sensation seeking is a robust predictor of a variety of substance use and risk behaviors among adolescents. Because these youth also appear more likely to be open to e-cigarette use (Hughes et al., 2015), it may be possible to target prevention campaigns to youth in this group, as has been done for smoking and other

substance use behaviors (D'Silva, Harrington, Palmgreen, Donohew, & Lorch, 2001; Sargent, Tanski, Stoolmiller, & Hanewinkel, 2010)

Our study has some limitations. First, due to the cross-sectional nature of the data we cannot draw causal conclusions about the relationships between the primary study variables. Basing our study in a clear conceptual model helps address this concern to some extent, but future studies should examine these relationships longitudinally. However, in the absence of longitudinal data, susceptibility to future e-cigarette use helps to address concerns about the temporal relationship between behavior and psychosocial outcomes, and susceptibility is a reasonable proxy for future behavior, including for both e-cigarette initiation (Bold et al., 2016) and cigarette initiation (Morello et al., 2018; Pierce et al., 1996). Measurement of norms was somewhat limited, especially for social acceptability, and future research should consider assessing social acceptability among specific groups that are likely to influence behavior, such as friends and family. Moreover, the timeframe for reported e-cigarette use among family and friends was not specified, although this practice is standard and recommended in tobacco research (PhenX Toolkit, 2018; Press, 2013). Similarly, the e-cigarette susceptibility questions were pretested but not specifically validated – although their structure and content is based on standard, recommended questions for cigarettes and shown to have predictive validity among US youth (Bold et al., 2016). Future studies should validate these questions among youth across different sociocultural contexts. Although our sample was large and representative of public schools in the three largest cities in Mexico, results may not generalize to other populations in Mexico. However, more than 75% of Mexicans live in urban areas, and we expect the results are broadly representative. Finally, this study may have been susceptible to selection bias as 220 participants were excluded due to missing data. However, differences in the distribution of the variables in the study sample and the excluded sample were not statistically significant, with the exception of sex, age and alcohol use, for which we controlled in our analyses.

In conclusion, findings from this research are generally consistent with the body of research around the importance of social norms for promoting tobacco product use; although we provide some additional evidence that their effects are somewhat specific to the type of tobacco product used. Results around the association between risk perceptions and susceptibility to e-cigarette use suggest that communication campaigns about e-cigarettes may be necessary to inform youth about the dangers of use to deter youth e-cigarette uptake.

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Figure 1.

A conceptual model of the relationship between social norms and perceived risk and e-cigarette and cigarette use

Table 1.

Sample characteristics for adolescent middle school students in Mexico, 2016 (N=4,471)

Variables	Study sample [±] N=4,501	Excluded sample [±] N=220 (%)	p value
Sex			
Male	47%	56%	0.006
Female	53%	43%	
Age			
12 to 13	9%	10%	0.009
14	78%	70%	
15 or more	13%	20%	
Parental education			
Primary	13%	15%	0.957
Secondary	41%	41%	
High school	22%	21%	
University	19%	18%	
Unknown	5%	5%	
FAS[*] (mean)	3.97	4.19	0.64
Sensation seeking (mean)	3.68	3.87	0.777
Alcohol use			
Never used	51%	61%	0.033
Ever tried (not current)	33%	22%	
Current drinking (not bingeing)	13%	13%	
Current binge drinking	3%	4%	
Exposure to online e-cigarette ads			
Never	74%	70%	0.135
Sometimes	23%	24%	
Always	3%	6%	
Exposure to online cigarette ads			
Never	83%	87%	0.159
Sometimes	14%	11%	
Always	3%	2%	
Family use of nicotine products			
Neither product	43%	44%	0.235
E-cigarette only	2%	3%	
Conventional cigarette only	49%	46%	
Both	6%	6%	
Friend use of nicotine products			
Neither product	54%	65%	0.059
E-cigarette only	6%	8%	
Conventional cigarette only	22%	28%	
Both	17%	18%	

Variables	Study sample [±] N=4,501	Excluded sample [±] N=220 (%)	p value
Societal acceptability of e-cigarettes			0.513
Yes	8%	10%	
E-cigarette risk compared to cigarettes			
E-cigarettes are more risky/ same	41%	40%	0.9791
E-cigarettes are less risky	38%	39%	
Don't know	21%	20%	
E-cigarette susceptibility			
Yes	22%	15%	0.431
Smoking susceptibility			
Yes	22%	19%	0.203

*
FAS=Family affluence scale

Table 2.

Unadjusted and adjusted associations between societal acceptability of e-cigarettes and study variables among middle-school adolescents in Mexico, 2016 (N=4,471)

		Societal acceptability of e-cigarettes	
	%	PR 95% IC	APR 95% IC
Family use of nicotine products			
Neither product	8	1	1
E-cigarette only	10	1.26 (0.54 – 2.95)	1.10 (0.93 – 1.30)
Conventional cigarette only	9	1.13 (0.95 – 1.34)	1.23 (0.53 – 2.84)
Both	11	1.41 (0.99 – 2.01)	1.26 (0.86 – 1.84)
Friend use of nicotine products			
Neither product	8	1	1
E-cigarette only	11	1.37 (0.94 – 2.01)	1.26 (0.87 – 1.83)
Conventional cigarette only	7	0.90 (0.71 – 1.15)	0.85 (0.67 – 1.07)
Both	11	1.41 (1.13 – 1.75)	1.21 (0.95 – 1.55)
Sex			
Female	9	1	1
Male	9	0.92 (0.77 – 1.11)	0.95 (0.78 – 1.15)
Age			
12 to 13	7	1	1
14	8	1.18 (0.87 – 1.61)	1.19 (0.88 – 1.61)
15 or more	9	1.28 (0.82 – 1.99)	1.27 (0.82 – 1.99)
Parental education			
Primary	7	1	1
Secondary	9	1.35 (0.95 – 1.92)	1.35 (0.96 – 1.89)
High school	8	1.22 (0.87 – 1.73)	1.23 (0.87 – 1.73)
University	9	1.24 (0.90 – 1.70)	1.19 (0.86– 1.66)
Unknown	7	1.01 (0.63 – 1.63)	1.05 (0.65 – 1.70)
FAS [*] (mean)	4.12	1.03 (0.99 – 1.08)	1.02 (0.97 – 1.07)
Sensation seeking (mean)	3.75	1.11 (1.00 – 1.22)	1.04 (0.94 – 1.17)
Alcohol use			
Never used	8	1	1
Ever tried (not current)	8	1.01 (0.82 – 1.25)	0.95 (0.76 – 1.18)
Current drinking (not bingeing)	11	1.40 (1.02 – 1.93)	1.26 (0.91 – 1.75)
Current binge drinking	12	1.52 (0.88 – 2.61)	1.29 (0.75 – 2.22)
Exposure to online e-cigarette ads			
Never	7	1	1
Sometimes	11	1.51 (1.24 – 1.83)	1.39 (1.12 – 1.73)
Always	12	1.66 (0.98 – 2.78)	1.49 (0.86 – 2.58)

* FAS=Family affluence scale

Table 3.

Association between susceptibility to e-cigarettes, to cigarettes and study variables among Mexican middle school adolescents who have not used either product, 2016

Variables	E-cigarette susceptibility (n=4,471)			Cigarette susceptibility (n=4,471)		
	%	PR 95% IC	APR ^b 95% IC	%	PR 95% IC	APR ^b 95% IC
Family use of nicotine products						
Neither product	17	1	1	17	1	1
E-cigarette only	14	0.85 (0.48 – 1.49)	0.69 (0.41 – 1.19)	20	1.18 (0.73 – 1.90)	1.05 (0.66 – 1.68)
Conventional cigarette only	25	1.45 (1.29 – 1.63)	1.27 (1.14 – 1.43)	27	1.54 (1.39 – 1.72)	1.34 (1.20 – 1.49)
Both	32	1.82 (1.52 – 2.18)	1.38 (1.16 – 1.64)	33	1.87 (1.56 – 2.25)	1.50 (1.26 – 1.80)
Friend use of nicotine products						
Neither product	16	1	1	17	1	1
E-cigarette only	26	1.60 (1.29 – 1.99)	1.33 (1.08 – 1.63)	21	1.23 (0.98 – 1.55)	1.05 (0.83 – 1.33)
Conventional cigarette only	24	1.57 (1.34 – 1.83)	1.30 (1.12 – 1.51)	30	1.76 (1.54 – 2.00)	1.46 (1.28 – 1.65)
Both	38	2.45 (2.12 – 2.82)	1.80 (1.57 – 2.07)	34	2.00 (1.77 – 2.27)	1.06 (1.38 – 1.77)
Societal acceptability of e-cigarettes						
No	21	1	1	23	1	1
Yes	28	1.32 (1.13 – 1.54)	1.17 (1.02 – 1.35)	26	1.13 (0.96 – 1.34)	1.03 (0.86 – 1.24)
E-cigarette risk compared to cigarettes						
E-cigarettes are more risky/ same	18	1	1	21	1	1
E-cigarettes are less risky	29	1.56 (1.39 – 1.75)	1.45 (1.29 – 1.64)	28	1.33 (1.10 – 1.47)	1.25 (0.94 – 1.37)
Don't know	18	0.97 (0.81 – 1.15)	1.01 (0.84 – 1.20)	18	0.88 (0.75 – 1.03)	0.89 (0.76 – 1.04)
Sex						
Female	24	1	1	24	1	1
Male	20	0.81 (0.74 – 0.89)	0.87 (0.79 – 0.96)	22	0.81 (0.74 – 0.89)	0.99 (0.89 – 1.11)
Age						
12 to 13	23	1	1	22	1	1
14	22	0.98 (0.81 – 1.17)	0.94 (0.79 – 1.12)	23	1.04 (0.87 – 1.23)	1.02 (0.87 – 1.20)
15 or more	21	0.95 (0.73 – 1.23)	0.90 (0.70 – 1.17)	23	1.01 (0.79 – 1.30)	0.95 (0.74 – 1.20)
Parental education						
Primary	23	1	1	28	1	1
Secondary	22	0.91 (0.80 – 1.05)	0.92 (0.81 – 1.04)	24	0.85 (0.73 – 0.99)	0.88 (0.75 – 1.03)
High school	24	1.02 (0.86 – 1.21)	1.08 (0.89 – 1.30)	22	0.81 (0.69 – 0.95)	0.87 (0.74 – 1.03)
University	21	0.85 (0.72 – 1.02)	0.89 (0.75 – 1.05)	19	0.69 (0.58 – 0.82)	0.73 (0.62 – 0.87)
Unknown	18	0.75 (0.57 – 1.00)	0.93 (0.72 – 1.20)	20	0.73 (0.55 – 0.98)	0.90 (0.68 – 1.18)
FAS[±] (mean)	4.06	1.02 (0.99 – 1.05)	1.00 (0.97 – 1.03)	4.02	1.01 (0.98 – 1.04)	1.01 (0.98 – 1.04)
Sensation seeking (mean)	3.92	1.39 (1.31 – 1.48)	1.22 (1.15 – 1.30)	3.91	1.38 (1.28 – 1.49)	1.23 (1.14 – 1.34)
Alcohol use						
Never used	14	1	1	15	1	1
Ever tried (not current)	29	2.00 (1.72 – 2.32)	1.62 (1.41 – 1.86)	28	1.81 (1.62 – 2.03)	1.53 (1.37 – 1.71)
Current drinking (not binge)	32	2.28 (1.94 – 2.67)	1.68 (1.42 – 1.98)	36	2.36 (2.08 – 2.68)	1.83 (1.60 – 2.09)
Current binge drinking	39	2.73 (2.21 – 3.37)	1.70 (1.34 – 2.14)	52	3.42 (2.83 – 4.13)	2.35 (1.89 – 2.92)

Variables	E-cigarette susceptibility (n=4,471)			Cigarette susceptibility (n=4,471)		
	%	PR 95% IC	APR ^b 95% IC	%	PR 95% IC	APR ^b 95% IC
Exposure to online e-cigarette ads						
Never	20	1	1	20		
Sometimes	30	1.86 (1.66 – 2.09)	1.51 (1.34 – 1.71)	31		
Always	26	1.78 (1.39 – 2.28)	1.31 (1.03 – 1.66)	34		
Exposure to online tobacco ads						
Never					1	1
Sometimes					1.33 (1.16– 1.52)	1.10 (0.97 – 1.26)
Always					1.12 (0.79– 1.57)	0.80 (0.57 – 1.13)

* Analytical Sample: Adolescents who had not tried e-cigarettes or cigarettes

[±] FAS=Family affluence scale