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Exposure to e-cigarette posts across social media platforms and its associations with susceptibility and e-cigarette use: a comparison of high schoolers in Jalisco, Mexico, and Southern California

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Abstract

Background: Adolescents' exposure to e-cigarette content through social media platforms (SMPs) influences their perceptions and behaviors, though cross-country analyses are scarce.

Objective: This study evaluated the association between e-cigarette exposure on SMPs and e-cigarette susceptibility and use in Jalisco, Mexico and Southern California (SoCal), U.S.

Methods: In 2022-23, students from 23 high schools in Jalisco (n=1,417) and 11 in SoCal (n=3,573) were surveyed with harmonized measures on past-month frequency of SMPs use (i.e., YouTube, Instagram, TikTok, Snapchat, WhatsApp, Facebook, Twitter, and Twitch) and seeing e-cigarette posts on each SMP used; which were recoded to 5-point scores (range 0-4) for SMP use and e-cigarette posts exposure. Country-stratified logistic models regressed e-cigarette susceptibility (among non-current users) and past-month use on SMP scores, adjusting for age, sex, family affluence, and friends' e-cigarette use.

Results: Past-month e-cigarette use was higher in Jalisco (17.5%) than SoCal (5.3%, p<.001). SMP use and e-cigarette exposure on each SMP differed across samples (p-values <.001). In SoCal, more frequent SMP use was positively associated with e-cigarette susceptibility (AOR=1.83, 95%CI[1.48-2.25]), whereas in Jalisco, higher frequency of exposure to e-cigarette content was associated with susceptibility (AOR=1.21, 95%CI[1.02-1.43]). Higher frequency of SMP use and exposure to e-cigarette content were both positively associated with past-month e-cigarette use in SoCal; in Jalisco, greater SMP exposure to e-cigarette content was associated with past-month use.

Conclusions: Frequent SMP use and e-cigarette exposure through SMPs appear to be associated with e-cigarette susceptibility and use across contexts. Stronger policies to limit and enforce online exposures are needed.

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Declaration of Interest: The authors have no conflict of interest to declare

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Conclusion: Frequent SMP use and e-cigarette exposure through SMPs appear to be associated with e-cigarette susceptibility and use across contexts. Stronger policies to limit and enforce online exposures are needed.

Keywords: Social media; E-cigarettes/Electronic Nicotine Delivery Systems (ENDS); Survey research; Adolescents

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Introduction

Over the last decade, adolescent cigarette use has significantly decreased in many countries around the world that have adopted strong tobacco control policies, including bans of cigarette advertising through traditional media channels.[1], [2] In contrast, adolescents' use of e-cigarettes has increased as countries have been slower to adopt strong e-cigarette regulations. Moreover, increases in e-cigarette use have coincided with and appear to be partly explained by the growing and widespread use of social media platforms (SMP) that is often the primary means of adolescent exposure to e-cigarette marketing.[3]

E-cigarettes were first introduced to help adult smokers quit,[4] yet they have become increasingly popular among adolescents in both high and middle-income countries with different regulatory frameworks. In the United States (U.S.), for example, adolescent e-cigarette use rapidly increased in 2017-2018, which prompted policy actions, including federal prohibition of e-cigarette sales to anyone under 21 on December 2019.[5] Furthermore, in 2020 the U.S. Food and Drug Administration (FDA) banned cartridge-based e-cigarette with any flavors except tobacco or menthol, and the FDA has also denied marketing applications for the vast majority of e-cigarette products.[6] Despite some loopholes and enforcement issues for some e-cigarette types (e.g., disposables), these measures appear to have decreased current e-cigarette use among high-schoolers from 20.8% in 2018 to 10% in 2023.[7], [8] However, e-cigarettes remain the most commonly used tobacco product among U.S. adolescents.[7] These trends generally characterize adolescents in the U.S. state of California, though the prevalence of e-cigarette use is lower there than in other U.S. states.[9]

In Mexico, the 2008 General Tobacco Control Law (GTCL) stipulated that no new tobacco products or any products that resembles tobacco products could be introduced or sold in the country. [10] Regulators interpreted this legislation as a de-facto ban on e-cigarette marketing and sales, with a 2020 Presidential Decree specifically banning their importation and clarifying that the GTCL banned e-cigarette marketing and sales.[11] However, the national prevalence of past-month e-cigarette use among 15-18 year olds increased from 2.0% in 2021 to 3.3% in 2022.[12] Even though the prevalence is relatively small compared to the U.S., the increase from 2021 to 2022 represents a 65% growth in use. Furthermore, representative data from urban public schools in large Mexican cities suggest that e-cigarette use is substantially higher than these estimates [13], perhaps due to reduced bias from adolescents' self-administering surveys in schools compared to the national surveys that involve survey administration in households. Importantly, despite Mexico's e-cigarette ban, e-cigarettes are accessible through a variety of venues in both the formal and informal economy due to lack of enforcement.[14], [15] Illegal marketing through SMP –which is particularly

challenging to enforce – may also contribute to Mexican adolescents' e-cigarette use.

The growth in internet access has been accompanied by increasing use of SMPs worldwide.[16] In Mexico, 96% of adolescents and young adults reported using SMPs in 2021[17], and in 2022, 97% of U.S. adolescents between ages 13 and 17 reported using them.[18] Furthermore, in 2023 it was estimated that 77% of high school students used SMP several times a day.[19] Among youth in Canada, England, and the U.S., those in the U.S. reported the greatest increase in noticing e-cigarette marketing from 2017 to 2019, with "websites or social media" being the second most reported channel of marketing exposure.[20] Additionally, a 2021 survey among middle and high school students found that 73.5% of social media users reported having ever seen e-cigarette related content in SMPs.[21] To our knowledge, there are no studies in Latin American countries that have assessed exposure to e-cigarette content online or its associations with susceptibility or use of these products.

E-cigarette advertisements on SMPs usually portray the devices and their use as desirable, trendy, and fashionable, which likely appeals to adolescents.[22] Indeed, exposure to e-cigarette advertisements has been associated with more positive perceptions of vaping, lower harm perception, change in perceived norms,[23] as well as with greater susceptibility to and current use of e-cigarettes among both adolescents and young adults.[24], [25] To maximize attention and engagement, many e-cigarette brands use social media *influencers* or celebrities to promote their products.[22] Even though advertisements in SMPs can be targeted to specific population groups (i.e. ≥18), one study found that more than 60% of the e-cigarette brands and *influencers* on Instagram had no age-gating restrictions for followers, although their posts were intended only for adult users.[26] A key feature of SMPs concerns its transnational reach across jurisdictional borders, making it possible for adolescents in one country to access content from other countries, even if the content contains marketing that is illegal in their home countries.

California has a high proportion of Mexican American[27] making comparisons with Mexican adolescents especially relevant. Cross-country comparisons can offer valuable insight into how differences in context and social media use relate to susceptibility and use of electronic cigarettes. This study examined similarities and differences in use of SMPs, exposure to e-cigarette posts on SMP, and their associations with e-cigarette susceptibility and use among high schoolers from the southern part of Jalisco in Mexico and Southern California in the U.S. We expected that greater exposure to e-cigarette posts on SMPs would be positively associated with susceptibility and use, even after adjusting for overall SMP use. We also expected lower exposure and use among Mexican adolescents due to the national e-cigarette ban. To our knowledge this is the first study comparing adolescent exposure to e-cigarette content in specific SMPs and the association with

susceptibility and use across countries.

Methods

Population

Data for Mexico comes from the 2022-2023 Mental Health, Addiction, and Violence Survey in the state of Jalisco (ESMAV-Jalisco). A convenience sample of high schools (n=23) in 16 municipalities of the Southern part of Jalisco answered an online, self-administered survey from November 2022 to February 2023 (n=1,418). U.S. data comes from the ADVANCE cohort[28] in Southern California, participants were recruited as 9th grade students in either 2020 (class of 2024) or 2021 (class of 2025) from 11 high-schools. To harmonize survey timing with Mexico, we analyzed data only from the February to June 2023 survey (n=2,953), when the SoCal students were in 10th or 11th grade. Both studies obtained students' assent and ADVANCE also obtained parental consent. Protocols were approved by the Institutional Review Board and Ethics Committee of Ministry of Health of Ciudad Guzmán, Jalisco, Mexico (103/RVI/2021) and, for SoCal, by the IRB of University of Southern California (HS-19-00682).

Measurements

SMP-related variables: to assess general social media engagement students were asked "How often do you visit the following social media sites?" for each of the following social media platforms: Facebook, Instagram, WhatsApp [Jalisco only], Snapchat [SoCal. only], Twitter, YouTube, TikTok, and Twitch. Response options were: 0="I don't use this social media", 1="once a month or less", 2="weekly", 3="daily", 4="several times a day", 5="I don't know".

Next, to assess exposure to e-cigarette content on social media students were asked: "How often do you see posts about e-cigarettes and nicotine vaping products on the following social media sites (same as above)?". (In Jalisco responses ranged from: 1="I don't use this social media" to 6="several times a day"; while in SoCal responses ranged from : 0="never" to 4="several times a day" and 5=" I don't know") To harmonize responses across samples, first we recoded "I don't use this social media"[Jalisco] and "don't know" [SoCal] and as 0 indicating no exposure, then we rescaled all remaining responses to a 0-4 scale for comparability. Finally, we calculated two continuous scores 1) social media use score and 2) e-cigarette post exposure score by averaging responses across platforms (range=0 to 4) to reflect students' average frequency of social media use and exposure to e-cigarette related content, respectively

E-cigarette use and susceptibility: Students reported their frequency of using e-cigarettes in the prior 30 days ("In the last 30 days, how many total days have you used any electronic cigarette with nicotine"). Responses were re-coded into a dichotomous variable (0=No use in the past 30 days [non-current users], 1=any use in the past 30 days). Susceptibility to use e-cigarettes was assessed with the

question “Do you think that at some point during the next 12 months, you will use an e-cigarette?” with responses recoded as a dichotomous variable based on prior research on susceptibility among youth [29] (0=“definitely not; 1="probably not,” “probably yes,” or “definitely yes”).

Covariates

Sociodemographic variables included age (12, 13, 14, 15, 16, 17, 18, 19 or older), sex (female and male), and household wealth, using the Family Affluence Scale (FAS). The FAS includes the following questions: 1) how many cars or trucks does your family own (0, 1, 2 or more), 2) do you have a room for yourself? (0, 1), during the last 12 months, how many times did you go on vacation with your family? (0, 1, 2, 3 or more), how many computers does your family have? (0, 1, 2, 3 or more). As is standard practice and validated for Mexican youth[30], the FAS items were summed (range=0 to 9), with higher scores indicating higher family affluence. Friend use of e-cigarettes was also assessed (Jalisco: “Of your five best friends, how many use electronic cigarettes?”; SoCal: “How many of your five (5) closest friends use electronic cigarettes for vaping nicotine?”) with responses dichotomized to indicate having any friends who use (0=none; 1=1-5).

Analyses

For descriptive analyses, datasets were combined to allow comparison of sample characteristics using Pearson’s chi-squared tests for categorical variables and independent sample t-tests for the continuous variables. We used Pearson’s chi-squared tests to assess if there were any differences in the frequency of SMPs use and frequency of exposure to e-cigarette content through SMPs across countries. Then, for each country, crude and adjusted logistic regression models clustered by school were estimated for each of two outcomes: 1) susceptibility to use e-cigarettes (analytic sample=non-current users [Jalisco n=1,170; SoCal n=2,695]); and 2) current e-cigarette use (analytic sample=entire sample [Jalisco n=1,418; SoCal n=2,953]). Independent variables included the index of frequency of exposure to e-cigarette posts on social media, as well as the frequency of social media use index and other covariates. Due to potential different effects per SMP[29], sensitivity analyses were conducted by analyzing one SMP at a time adjusted by the frequency of SMP use (see Appendix). All analyses were conducted using Stata v.18.

Results

Compared to the SoCal sample, the Jalisco sample was younger, more likely to be male, and had lower family affluence (Table 1). Susceptibility and past-month e-cigarette use were higher in Jalisco (vs. SoCal), as were number of friends using e-cigarettes, frequency of SMP exposure, and frequency of e-cigarette exposure on SMPs.

Table 1. Sample characteristics, high school students in Jalisco, Mexico, and Southern California (SoCal), United States.

	Jalisco (N = 1,418*)	SoCal (N = 2,953*)	P-value
Age (mean, SD)	15.9 (0.97)	16.7 (0.58)	<.001
Sex			
Male	62.5%	56.1%	<.001
Female	37.5%	43.9%	
Family Affluence Scale (0-9)	4.10 (2.10)	5.60 (1.81)	<.001
E-cigarettte use			
Not current, not susceptible	58.5%	84.0%	<.001
Not current, susceptible	24.0%	11.5%	
Past-month use	17.5%	4.5%	
Best friend(s) use e-cigarettes	55.4%	24.7%	<.001
Frequency of using social media (range = 0-4)	2.1 (0.77)	1.6 (0.66)	<.001
Frequency of e-cigarette exposure on social media (range = 0-4)	0.66 (0.83)	0.36 (0.56)	<.001

***Sample for Jalisco included 23 high-schools; SoCal included 11 high-schools.**

WhatsApp was the most frequently used platform reported in Jalisco (but was not asked in SoCal), with 67% of students reporting its use several times a day. Of the SMPs queried in both countries (Figure 1a), the frequency of use reported was significantly different between countries for YouTube, Instagram, TikTok, Facebook, Twitter, and Twitch (p-values: <.001). YouTube was the most frequently used in both SoCal and Jalisco; however, most SoCal students reported using it once a day (31%) or several times a day (31%) while fewer Jalisco students reported the same (17% once per day; 28% several times per day). Facebook was frequently used in Jalisco (50% at least once a day), while fewer than 30% of students reported any use of that platform in SoCal. Twitch was the least used platform in both samples.

The frequency of e-cigarette exposure on each SMP differed across samples, except for Instagram (Figure 1b). TikTok was the platform through which Jalisco students reported the greatest exposure, with 25% reporting seeing e-cigarette content at least weekly (11% weekly, 5% once per day, 9% several times per day). Instagram had the highest self-reported exposure to e-cigarette posts in SoCal with at least 21% reporting weekly exposure (11% weekly, 6% once per day, 6% several times per day). The lowest frequency of e-cigarette exposure for SoCal was through Twitch and Facebook, and exposure was lowest through Twitch and Twitter in Jalisco.

For each sample, separate bivariate and multivariate adjusted logistic regression models were estimated for e-cigarette susceptibility among high schoolers who did not use e-cigarettes in the last month (Table 2). In unadjusted and adjusted models for both Jalisco and SoCal, females had lower odds of being susceptible than males (AOR=0.62 95%CI[0.47-0.83]; AOR=0.60 95%CI[0.52-0.71], respectively), and those whose best friends used e-cigarettes had higher odds of susceptibility (AOR=3.80 95%CI[2.87-5.03]; AOR=3.35 95%CI[2.48-4.52, respectively). In bivariate models for

both samples, higher frequency of social media use and of exposure to e-cigarette content via social media were positively associated with susceptibility; however, in adjusted models, more frequent social media use was positively associated with susceptibility in SoCal (AOR=1.83 95%CI[1.48-2.25]) but not Jalisco. In adjusted models, greater frequency of exposure to e-cigarette content on social media was independently associated with susceptibility only in Jalisco (AOR=1.21 95%CI[1.02-1.43]).

Table 2. Unadjusted and adjusted models for susceptibility to use e-cigarettes (among those with no e-cigarette use in the past 30 days), high school students in Jalisco and Southern California, 2022-2023.

	Jalisco, Mexico (n=1,170)				Southern California (n=2,695)			
	OR (95% CI)	***P-value***	**AOR (95% CI)**	***P-value***	**OR (95% CI)**	***P-value***	**AOR (95% CI)**	***P-value***
Frequency of using social media, index†	1.28 (1.08-1.51)	<.001	1.13 (0.94-1.36)	.157	2.08 (1.72 – 2.51)	<.001	1.83 (1.48-2.25)	<.001
Frequency of e-cigarette exposure on social media, index±	1.31 (1.12-1.52)	.002	1.21 (1.02 – 1.43)	.028	1.52 (1.33 – 1.75)	<.001	1.15 (0.98 – 1.32)	.182
Age	1.06 (0.93-1.20)	.407	1.06 (0.92 – 1.21)	.453	1.08 (0.82 – 1.42)	.452	1.02 (0.79 – 1.31)	.849
Sex								
Male	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Female	0.55 (0.43-0.74)	<.001	0.62 (0.47 – 0.83)	.001	0.52 (0.46 – 0.58)	<.001	0.60 (0.52 – 0.71)	<.001
Family affluence scale (0-9)	0.95 (0.90-1.01)	.094	0.98 (0.92 – 1.05)	.635	1.06 (0.98 – 1.15)	.070	1.06 (0.98 – 1.15)	.101
Best friend(s) use e-cigarettes								
No	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Yes	4.09 (3.11-5.39)	<.001	3.80 (2.87 – 5.03)	<.001	3.98 (2.94-5.37)	<.001	3.35 (2.48 – 4.52)	<.001

AOR: Adjusted Odds Ratio from model that includes all variables shown in table.
† Frequency of using social media index represents the average of the reported frequency of using each social media platform, it ranges from (0-4).
± Frequency of seeing e-cigarette posts on social media index represents the average of the reported frequency of seeing e-cigarettes posts in each social media platform, ranges (0-4)

In unadjusted and adjusted models for past-month e-cigarette use in both samples (Table 3), higher frequency of exposure to e-cigarette content on social media (Jalisco AOR=1.49 95%CI[1.27-1.74]; SoCal AOR=1.51 95%CI[1.15-1.73]) was positively associated. Elevated odds were also observed for higher frequency of social media use (Jalisco AOR=1.21; 95%CI[0.99-1.47]; SoCal AOR=1.41; 95%CI[1.15-1.97]), though results for Jalisco were not statistically significant. Having best friends who used e-cigarettes (Jalisco AOR=6.46 95%CI[4.38-9.54]; SoCal AOR=11.24 95%CI[6.94-18.22]), was associated with higher likelihood of using e-cigarettes and, in SoCal only,

cis female (AOR=0.50 95%CI[0.34-0.72]) had lower likelihood of using e-cigarettes.

Table 3. Unadjusted and adjusted models for past-month e-cigarette use, high school students in Jalisco and Southern California, 2022-2023.

	Jalisco, Mexico (n=1,418)				Southern California (n=2,953)			
	OR (95% CI)	**P-value**	**AOR (95% CI)**	**P-value**	**OR (95% CI)**	**P-value**	**AOR (95% CI)**	**P-value**
Frequency of using social media, index†	1.44 (1.20-1.72)	<.001	1.21 (0.99-1.47)	.051	2.00 (1.68-2.38)	<.001	1.41 (1.15-1.97)	.037
Frequency of e-cigarette exposure on social media, index±	1.62 (1.40-1.87)	<.001	1.49 (1.27-1.74)	<.001	1.94 (1.61-2.34)	<.001	1.51 (1.15-1.73)	.003
Age	1.09 (0.95-1.25)	.221	1.09 (0.94-1.27)	.305	1.24 (0.80-1.92)	.157	1.14 (0.79-1.64)	.449
Sex								
Male	*Ref*		*Ref*		*Ref*		*Ref*	
Female	0.86 (0.65-1.15)	.321	1.03 (0.76-1.40)	.828	0.34 (0.25-0.47)	<.001	0.50 (0.34-0.72)	.002
Family affluence scale (0-9)	0.99 (0.94-1.07)	.968	1.04 (0.97-1.12)	.388	0.94 (0.85-1.03)	.176	0.94 (0.85-1.04)	.224
Best friend(s) use e-cigarettes								
No	*Ref*		*Ref*		*Ref*		*Ref*	
Yes	6.86 (4.67-10.07)	<.001	6.46 (4.38-9.54)	<.001	14.35 (9.01-22.87)	<.001	11.24 (6.94-18.22)	<.001

AOR: Adjusted Odds Ratio from model that includes all variables shown in table.
† Frequency of using social media represents the average of the frequency of using each social media platform, it ranges from (0-4)
± Frequency of seeing e-cigarette posts on social media index represents the average of the reported frequency of seeing e-cigarettes posts in each social media platform, ranges (0-4)

Models by each specific SMP showed that only Instagram and TikTok were significantly associated for susceptibility in Jalisco whereas, TikTok was the only significantly associated in SoCal. In Jalisco, the exposure to e-cigarette posts across all SMPs were independently associated with past-month use, while for SoCal the exposure to e-cigarette posts on Instagram, TikTok, Snapchat, and Twitter were associated (Multimedia Appendix).

Discussion

Aligned with our first hypothesis, we found high levels of self-reported use of and exposure to e-cigarette content through SMPs in samples of high schoolers in Jalisco, Mexico and Southern California, US, particularly for YouTube, Instagram, and TikTok. However, these findings were surprising and contrary to our second hypothesis, given that Mexico bans commercial advertising for e-cigarettes across all channels, including SMPs.[31] California has no prohibitions regarding online marketing, however, marketing and sales of all flavored tobacco products, except menthol, are

prohibited and, starting in 2025, this ban is planned to be extended to online sales and include fines to ensure age verification.[32], [33] We also found that past month use of e-cigarettes was significantly lower in SoCal (4.5%) than in Jalisco (17.5%), where the prevalence was substantially higher than in national surveys[34] though more consistent with prior research in urban areas of Mexico.[13] More research is needed to understand the factors driving the difference in e-cigarette use prevalence between samples; better law enforcement paired with media campaigns and prevention programs in schools could play an important part in California.

Adolescents' frequency of using specific SMPs differed across the two samples, with more sizeable differences for Facebook, Snapchat, and WhatsApp. Facebook and WhatsApp use was higher in Jalisco, while Snapchat was higher in SoCal. However, in both samples, the frequency of exposure to e-cigarette content through these three platforms was low compared to TikTok, Instagram, and YouTube. A meta-analysis that examined associations between social media use and risky behaviors found that SMPs that were introduced relatively early, like Facebook, had weaker associations than contemporary SMPs.[35] In the past, Facebook has faced scrutiny for their impact on promoting unhealthy behaviors and targeting youth with advertisements, and in 2021 the platform limited the targeting options to 18 and older.[36] That policy along with Facebook use declining among the U.S. youth[18] and other measures taken by California could help explain the relatively low exposure reported in the SoCal sample. Additionally, the user guidelines across SMPs prohibit any marketing and sales of any tobacco products in both countries; however, posts alluding to e-cigarettes and other substances can still be found. Studies are needed to characterize the content of posts on e-cigarettes across SMPs, not only to prevent dissemination of pro-e-cigarette content, but some content may also prevent e-cigarette use. For example, predominant topics in e-cigarette posts on Snapchat, one of the less popular SMPs we studied, included messages about 'health consequences and 'quitting'.[37]

Higher exposure to e-cigarette posts was associated with higher use in both samples, as observed in prior studies. A meta-analysis that reviewed cross-sectional cohort studies and longitudinal studies found that those exposed to e-cigarette posts during the last 30-days are more likely to report current use.[38] Also consistent with other studies [39], [40], we found that higher exposure to e-cigarette posts was associated with susceptibility to use e-cigarettes among students in both samples; however, the adjusted association remained statistically significant only for Jalisco. There are several possible explanations for the lack of association in SoCal, first there was heterogeneity in effects across SMPs (Multimedia Appendix); when examined individually, only TikTok had a significant association with susceptibility. Additionally, SoCal had a higher percentage

of non-susceptible students (SoCal=84.0% vs Jalisco=58.5%), and possibly broader social norms against e-cigarette use exist there. Indeed, fewer students reported having best friends who used e-cigarettes in SoCal compared to Mexico (24.7% vs 55.4%, respectively), which may have resulted in lower exposure to e-cigarette posts from their best friends that may have a greater impact on susceptibility than posts from people who they do not know. Indeed, high-school students in SoCal who had more friends who posted pictures of themselves partying or drinking alcohol online (Facebook or MySpace) were more likely to report that they smoked and used alcohol.[41] Future research should try to understand whether sources of exposure to posts varies across different groups, cities or countries, as this may help identify strategies to prevent such posts.

Although our data cannot ascertain the nature of the e-cigarette-related posts adolescents viewed on SMPs, explicit and implicit promotion of e-cigarettes abound. E-cigarette marketing through SMPs presents challenges for regulation. The World Health Organization recommends a comprehensive ban on Tobacco Advertising, Promotion, and Sponsorship (TAPS), including efforts to limit digital content created in one country being broadcast in others.[42], [43], [44] However, for this to be effective, countries must be actively engaged and willing to collaborate. Differences in regulatory frameworks across and within countries pose a significant challenge. Additionally, only some content posted on SMPs comes directly from the tobacco and vaping industry, and *influencer*- and user-generated content [45] will likely be harder to regulate, though requiring content moderation and age gates for specific types of content may help. Knowing that exposure to e-cigarette posts on SMPs is associated with higher e-cigarette use among adolescents, countries should collaborate to protect their youth.

Peer influence is one of the most common drivers for substance use among adolescents, including for e-cigarettes.[46], [47], [48] Similar to other studies, having friends who use e-cigarettes was associated with a higher likelihood of susceptibility to and use of e-cigarettes in both samples, with stronger associations for students in SoCal. The lack of association we found between family affluence and either susceptibility or use has been observed in other middle-income countries.[49], [50] One possible explanation comes from diffusion of innovations theory[51], where, when a product is first introduced, those in a higher socioeconomic status groups are more likely to know about and can afford it; however, as the product becomes more popular, costs come down and adoption extends across socioeconomic status groups. Indeed, as e-cigarettes became more popular, the global market transitioned from refillable devices to relatively cheaper pod systems to disposable devices, the last of which is now the most commonly used e-cigarette device among youth.[52] Additionally, in Mexico these devices can be found on sale for $100 Mexican pesos (≈$5 USD) on

street markets or *tianguis*, which makes them affordable even to adolescents in lower socioeconomic status groups.

This first study to compare SMP use, exposures to e-cigarette content, and their associations with e-cigarette susceptibility and use among adolescents in Mexico and the U.S. has limitations. First, our cross-country comparisons using harmonized measures appear reasonably valid; however, the temporal relationship between these SMP use, exposure to e-cigarette content, and susceptibility and use could not be determined. Selective attention to e-cigarette content is less likely to explain results around susceptibility than current use, and our results align with prior cross-sectional and longitudinal studies, as well as with a large body of research showing tobacco marketing effects on youth.[53] Furthermore, our subsequent cognitive interviews with adolescents in Jalisco confirmed their confidence in distinguishing e-cigarette exposures by SMPs. Second, unmeasured confounders, such as mental health or other substance use, including among parents, were not included in the analyses due to lack of harmonization. Third, from the use of convenience samples from schools in SoCal and Cd. Guzman, Jalisco, limits generalizability and restricts broader cross-national inference, however, these findings offer valuable preliminary insights into potential cross-country patterns of susceptibility and use that warrant further investigation using population representative data.

Exposure to social media and social media posts about e-cigarettes was high in both samples of high school students and associated with susceptibility to and use of e-cigarettes. Despite Mexico having banned the sales and importation of e-cigarettes, susceptibility and current use were higher among adolescents in Jalisco than in SoCal, demonstrating that the ban alone is insufficient without proper enforcement. This cross-country comparison contributes to the literature highlighting how differences in regulatory environments and enforcement can influence youth exposure and behavior, reinforcing the need for coordinated, cross-border tobacco control strategies. Cross-national collaboration may be needed to limit adolescents' exposure to pro-e-cigarette content and reduce use in both countries. Future research should prioritize population-based studies to monitor trends in youth exposure and use across diverse SMPs and settings and evaluate the impact of enforcement strategies and digital marketing regulations to inform more effective public health policies.

Conflict of interest:
None declared

Data availability:
Data will be made available at reasonable request to the corresponding author (Dr. James F. Thrasher)

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Abbreviations:
e-cigarettes = electronic cigarettes
SMPs = Social Media Platforms
SoCal = Southern California

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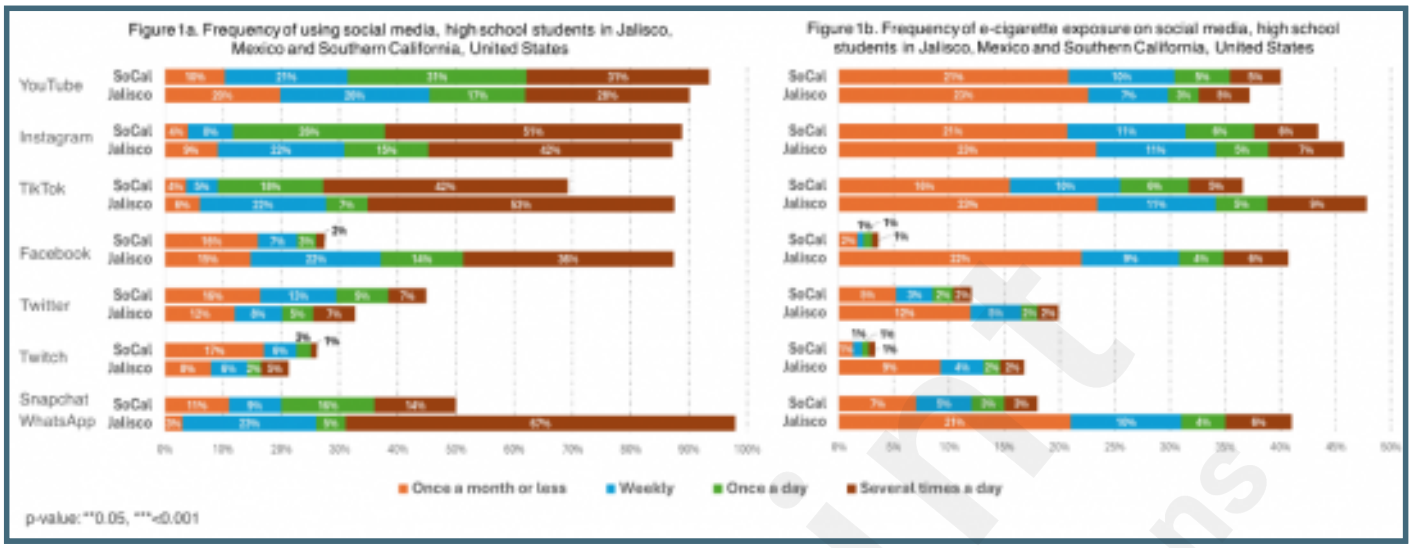
Supplementary Files

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Figures

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Frequency of social media use and e-cigarette posts exposure among high-school students in Jalisco, Mexico and Southern California.



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Multimedia Appendixes

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Sensitivity analyses analyzing one social media platform individually time adjusted by the frequency of social media platform use for high-school students from Jalisco, Mexico and Southern California, U.S.
URL: http://asset.jmir.pub/assets/31fed0de81f5b9c4aff347d7b99d0a6f.xlsx

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