

Perception of the social acceptability of e-cigarettes was significantly higher among participants who noticed advertisements about e-cigarettes and e-liquids on the Internet (adjusted OR_{yes vs no} 1.43, 95% CI 1.25, 1.63), outside stores that sell e-cigarettes and e-liquids (adjusted OR_{yes vs no} 1.31, 95% CI 1.14, 1.50), and in temporary outlets (adjusted OR_{yes vs no} 1.16, 95% CI

1.01, 1.34), after adjustment for covariates, including all other channels of exposure to e-cigarette advertisements (Table 2).

In a separate model that included the number of channels through which participants were exposed to e-cigarette advertisements (Table 3), participants who noticed advertisements in more places were more likely to perceive e-cigarettes

TABLE 3. Perception of smokers and e-cigarette users about the public's attitude towards e-cigarette use according to sociodemographic characteristics, smoking frequency, and marketing exposure, Mexico, 2018–2021

Variable	Some or high disapproval/neither approval nor disapproval/don't know (n = 4 041, 67.6%)	Some or high approval (n = 1936, 32.4%)	OR (95% CI)	Adjusted OR (95% CI)
	%	%		
Sex				
Female (n = 2 785)	69.0	31.0*	Reference	Reference
Male (n = 3 005)	66.4	33.6	1.09 (0.94, 1.26)	1.07 (0.95, 0.82)
Age group, in years				
18–29 (n = 2 073)	63.5	36.5**	Reference	Reference
30–39 (n = 1 771)	65.3	34.7	0.92 (0.77, 1.10)	0.95 (0.82, 1.10)
40–49 (n = 973)	71.5	28.5	0.60 (0.49, 0.75)**	0.83 (0.66, 1.00)*
≥ 50 (n = 973)	77.0	23.0	0.48 (0.39, 0.60)**	0.74 (0.61, 0.90)*
Education				
University of higher (n = 1 829)	63.0	37.0**	Reference	Reference
Middle school or less (n = 550)	71.6	28.4	0.98 (0.74, 1.30)	1.07 (0.85, 1.34)
High school/technical school/some college (n = 3 411)	69.5	30.5	0.89 (0.77, 1.04)	0.96 (0.84, 1.10)
Frequency and intensity of smoking				
Non-daily (n = 3247)	69.1	30.9*	Reference	Reference
Daily ≤ 5 cigarettes (n = 1 200)	66.0	34.0	1.39 (1.15, 1.68)*	1.20 (1.03, 1.40)*
Daily > 5 cigarettes (n = 1 343)	65.8	34.3	1.27 (1.06, 1.52)*	1.20 (1.03, 1.39)*
Frequency and intensity smoking/e-cigarette use				
Smoker only (n = 3318)	74.6	25.4**	Reference	Reference
Occasional dual user/e-cigarette use 1–2 days a week (n = 1 552)	62.4	37.6	1.87 (1.63, 2.15)**	1.14 (0.97, 1.34)
Frequent dual user/e-cigarette use 3 days a week to every day (n = 842)	50.5	49.5	2.96 (2.52, 3.47)**	1.47 (1.20, 1.79)**
Use of e-cigarettes by partner/family				
No (n = 4 417)	71.6	28.4**	Reference	Reference
Yes (n = 1 373)	54.8	45.2	1.22 (1.05, 1.43)*	1.24 (1.07, 1.44)*
Use of e-cigarettes by friends				
No (n = 3 641)	73.7	26.3**	Reference	Reference
Yes (n = 2 149)	57.5	42.5	1.59 (1.35, 1.88)**	1.14 (0.99, 1.31)
In the previous 30 days, in how many places have you noticed e-cigarette and e-liquid print advertising (e.g., stores, events, concerts and temporary outlets)?				
None (n = 1 939)	79.8	20.2**	Reference	Reference
1–2 (n = 1 998)	65.7	34.3	1.50 (1.25, 1.81)**	1.46 (1.24, 1.72)**
3–4 (n = 1 366)	58.8	41.2	1.88 (1.54, 2.29)**	1.58 (1.31, 1.91)**
≥ 5 (n = 487)	52.2	47.8	2.05 (1.58, 2.66)**	1.72 (1.33, 2.21)**
In the previous 30 days, have you noticed e-cigarette and e-liquid online advertising through e-mail or social media (e.g., Facebook, Twitter)?				
No (n = 2 896)	76.1	23.9**	Reference	Reference
Yes (n = 2 894)	59.2	40.8	1.75 (1.51, 2.02)**	1.28 (1.11, 1.48)*
In the previous 30 days, have you searched for information on and visited websites about e-cigarettes?				
No, I have not searched or visited/don't know (n = 2613)	77.9	22.1**	Reference	Reference
Yes, I have searched for information (n = 1455)	64.3	35.7	1.63 (1.36, 1.95)**	1.50 (1.28, 1.75)**
Yes, I have visited websites (n = 1 722)	54.9	45.1	2.41 (2.03, 2.86)**	1.48 (1.25, 1.76)**

OR, odds ratio; CI, confidence interval.

Note: Adjusted for wave and all variables in the table. *p < 0.05, **p < 0.001.

Source: table prepared by authors based on results.

use as socially acceptable. The magnitude of the association increased as the respondents noticed more traditional advertising (adjusted OR_{1-2 places vs none} 1.46, 95% CI 1.24, 1.72; adjusted OR_{3-4 places vs none} 1.58, 95% CI 1.31, 1.91; and adjusted OR_{≥ 5 places vs none} 1.72, 95% CI 1.33, 2.21). This positive association was also observed among participants who reported having noticed online marketing about e-cigarettes and e-liquids (adjusted OR_{yes vs no} 1.28, 95% CI 1.11, 1.48). In addition, respondents who searched online for information about e-cigarettes (adjusted OR_{yes, I have searched vs no, I have not searched or visited websites vs no, I have not searched or visited} 1.50, 95% CI 1.28, 1.75) and visited websites about e-cigarette use (adjusted OR_{yes, I have visited websites vs no, I have not searched or visited} 1.48, 95% CI 1.25, 1.76) were more likely to perceive public approval of e-cigarette use.

Respondents who smoked daily, whether fewer (adjusted OR_{daily ≤ 5 CPD vs non-daily} 1.20, 95% CI 1.03, 1.40) or more than 5 CPD (adjusted OR_{daily > 5 CPD vs non-daily} 1.20, 95% CI 1.03, 1.39), were more likely to perceive public approval of e-cigarette use compared to non-daily smokers. In addition, perceived social acceptability of e-cigarette use was higher among dual users who used e-cigarettes most often compared to exclusive smokers (adjusted OR_{frequent dual user vs exclusive smoker} 1.47, 95% CI 1.20, 1.79) and among respondents who had a family member or partner who used e-cigarettes (adjusted OR_{family/partner e-cigarette use vs non-use of e-cigarettes} 1.24, 95% CI 1.07, 1.44). Only age group was independently associated with perceived social acceptability of e-cigarette use, with older respondents less likely to perceive their use as socially acceptable (adjusted OR_{30-39 years vs 18-29 years} 0.83, 95% CI 0.66, 1.00) and (adjusted OR_{40-49 years vs 18-29 years} 0.74, 95% CI 0.61, 0.90).

DISCUSSION

This study of smokers and dual users of combustible cigarettes and e-cigarettes in Mexico, a low- and middle-income country where e-cigarettes are banned, found that self-reported exposure to e-cigarette advertising was highest for online channels (social media such as Facebook, Twitter, YouTube, or Instagram) and outside e-cigarette stores, followed by tobacco stores and temporary outlets. Three of these outlets (online channels, outside e-cigarette stores, and temporary outlets) were also the only channels of exposure to advertising that were significantly associated with a higher likelihood of perceiving e-cigarettes as socially acceptable. Compared with dual users, a higher percentage of exclusive smokers did not notice any e-cigarette advertising (44.4%). Among dual users who occasionally used e-cigarettes, the number of channels through which they were exposed to advertisements was one or two (38.7%) and among frequent dual users, 36.9% noticed advertisements in three or four channels. When exposure to traditional advertisements was treated as a summary index, a significant dose-response association was found with a greater likelihood of perceiving e-cigarettes as socially acceptable, the greater the exposure.

How a technology is perceived within a social context, i.e., its social acceptability, has an important role in its acceptance and use (12). Those who perceive a positive attitude to a behavior are more likely to engage in and maintain the behavior, including consumption of a product. Exposure to e-cigarette advertisements plays a major role in the awareness, popularity, and perception of these products (13). Our results show that the greater the number of physical channels where e-cigarette advertisements were noticed, the more positive the perception

of the acceptability of their use. This finding is consistent with a study in a cohort of university students (20–24 years) in the United Kingdom of Great Britain and Northern Ireland which found that exposure to e-cigarette advertisements increased the social acceptability of both e-cigarette use and smoking (14). Previous research has shown that e-cigarette advertisements as lifestyle marketing tend to be more effective when the advertisements feature characters who are similar to a person's peers (15), and such advertising could increase how socially acceptable or desirable these devices are, thus increasing their use or even functioning as a gateway to smoking initiation (16, 17).

E-cigarettes and their use have been widely promoted on the Internet, and e-cigarette users employ social media as an important information-sharing platform (18). We found that having noticed e-cigarette advertising on social media or receiving this type of advertising via email was positively associated with perceived social acceptability of e-cigarette use. These results concur with those of an Australian study, which found that people who searched for information on social media or who were exposed to e-cigarette advertising were more likely to report past or current e-cigarette use (19). Similar results have been found in the depiction of other psychoactive substances in social media, especially where celebrities' activities endorse the consumption of these substances (20).

Our results also show that searching for information online about e-cigarettes and visiting provaping websites are positively associated with perceived social acceptability of e-cigarette use. Similar associations were found in a study of young adults, which showed that the existence of provaping information in the public communication environment combined with information-seeking shapes the opinion of the seeker, creates curiosity, and leads to use (2). A meta-analysis in 2019 showed that online e-cigarette marketing affects the perception and trial of these devices; however, few studies have examined the effects of exposure to misleading or inaccurate information (21). We found that visiting provaping websites was the second strongest correlate of perceiving e-cigarette use as socially acceptable. This finding may be related to the composition of our sample; nicotine users as tobacco users appear more prone to exposure to e-cigarette information (13). Another possible reason for the association between visiting provaping sites and perceiving e-cigarette use as socially acceptable is the engagement generated by the provaping information and spokespersons, both for parasocial (feeling an actual interaction with media characters such as influencers, close enough to consider them as peers or close friends) and cultural or entertainment reasons (22). Finally, it is possible that these searches were based on positive expectancy about e-cigarette use that would be reinforced by the information found at provaping sites (23).

This study has several limitations. As a cross-sectional study, it is not possible to determine the direction of the associations we assessed. In particular, we were not able to determine if e-cigarette users were exposed to more advertising because they are more likely to seek out and listen to such advertising, or whether they started using e-cigarettes because of the advertising. However, our correlation study serves as a starting point for future studies on the impact of advertising on nicotine consumption behavior over time. Furthermore, our convenience sample comes from a non-probabilistic sample recruited from

an online marketing research panel that over-represents people from higher social economic strata; our sample also included quotas to oversample e-cigarette users. This sampling strategy was necessary to study e-cigarette users as they represent a relatively small population segment (1.2% of the general population, and 4.5% of smokers) (24). Therefore, our results probably cannot be generalized to the broader Mexican population. However, our approach gave us the statistical power required to study in greater detail the perception of e-cigarette users, a group that is difficult to study given its low prevalence, and who may be most influenced by advertising.

Conclusion

Being exposed to e-cigarette marketing, through online or regular channels, may positively affect and reinforce perceptions of the social acceptability of these products. However, searching for information on e-cigarettes and visiting pro-vaping sites have a stronger association. More research is therefore needed on the impact of the information available to those seeking to learn about e-cigarettes and these activities in starting or increasing the use of these devices. Given that the social acceptability of these products may be related to less support for restrictions on their sale and consumption, especially in measures such as smoke-free spaces, the possible impact of this advertising on public health should be studied.

Similarly, it is necessary to consider regulatory options to avoid the proliferation of promotional websites disguised as

opinion or user sites, as well as the use of influencers and celebrities in the promotion of e-cigarettes.

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REFERENCES

1. Becker TD, Rice TR. Youth vaping: a review and update on global epidemiology, physical and behavioral health risks, and clinical considerations. *Eur J Pediatr.* 2022 Feb;181(2):453–62.
2. Yang Q, Liu J, Lochbuehler K, Hornik R. Does seeking e-cigarette information lead to vaping? Evidence from a national longitudinal survey of youth and young adults. *Health Commun.* 2019;34(3):298–305.
3. Groom AL, Vu THT, Landry RL, Kesh A, Hart JL, Walker KL, et al. The influence of friends on teen vaping: a mixed-methods approach. *Int J Environ Res Public Health.* 2021;18(13):1–13.
4. Leavens ELS, Stevens EM, Brett EI, Leffingwell TR, Wagener TL. JUUL in school: JUUL electronic cigarette use patterns, reasons for use, and social normative perceptions among college student ever users. *Addict Behav.* 2019;99:106047.
5. Lin LF, Li YM, Wu WH. A social endorsing mechanism for target advertisement diffusion. *Information & Management.* 2015;52(8):982–97.
6. Cho YJ, Thrasher J, Cummings M, Yong HH, Hitchman SC, McNeill A, et al. Cross-country comparison of cigarette and vaping product marketing exposure and use: findings from 2016 ITC Four Country Smoking and Vaping Survey. *Tob Control.* 2020;29(3):295–304.
7. Mus S, Monzon J, Thrasher JF, Barnoya J. E-cigarette vending machines, the new access channel for youth in Guatemala City. *Tob Control.* 2022 Jan 21;tobaccocontrol-2021-057102 [online ahead of print].
8. Cho YJ, Thrasher JF, Reid JL, Hitchman S, Hammond D. Youth self-reported exposure to and perceptions of vaping advertisements: findings from the 2017 International Tobacco Control Youth Tobacco and Vaping Survey. *Prev Med.* 2019;126:105775.
9. Kong G, Kuguru KE, Bhatti H, Sen I, Morean ME. Marketing content on e-cigarette brand-sponsored Facebook profile pages. *Subst Use Misuse.* 2021;56(4):442–8.
10. Thompson ME, Fong GT, Hammond D, Boudreau C, Driezen P, Hyland A, et al. Methods of the International Tobacco Control (ITC) Four Country Survey. *Tob Control.* 2006;15(Suppl 3):iii12–8.
11. Global adult tobacco survey. Mexico 2015. Cuernavaca: Instituto Nacional de Salud Pública and Washington (DC): Pan American Health Organization; 2017.
12. Uhde A, Hassenzahl M. Towards a better understanding of social acceptability. In: Kitamura Y, Quigley A, editors. CHI EA '21: extended abstracts of the 2021 CHI Conference on Human Factors in Computing Systems. New York (NY): Association for Computing Machinery; 2021.
13. Emery SL, Vera L, Huang J, Szczypka G. Wanna know about vaping? Patterns of message exposure, seeking and sharing information about e-cigarettes across media platforms. *Tob Control.* 2014;23:iii17–25.
14. Ratneswaran C, Steier J, Reed K, Khong TK. Electronic cigarette advertising impacts adversely on smoking behaviour within a London student cohort: a cross-sectional structured survey. *Lung.* 2019;197(5):533–40.
15. Kim M, Olson S, Jordan JW, Ling PM. Peer crowd-based targeting in e-cigarette advertisements: a qualitative study to inform counter-marketing. *BMC Public Health.* 2020;20(1):1–12.
16. Schneider S, Diehl K. Vaping as a catalyst for smoking? An initial model on the initiation of electronic cigarette use and the transition to tobacco smoking among adolescents. *Nicotine Tob Res.* 2016;18(5):647–53.
17. Kim M, Popova L, Halpern-Felsher B, Ling PM. Effects of e-cigarette advertisements on adolescents' perceptions of cigarettes. *Health Commun.* 2019;34(3):290–7.
18. Kwon M, Park E. Perceptions and sentiments about electronic cigarettes on social media platforms: systematic review. *JMIR Public Health Surveill.* 2020;6(1):e13673.

19. Amin S, Dunn AG, Laranjo L. Exposure to e-cigarette information and advertising in social media and e-cigarette use in Australia: a mixed methods study. *Drug Alcohol Depend.* 2020;213:108112.
20. Ajilore K, Abdul O. Social media celebrities' depiction of psychoactive substance and the attitude of youths. *SAU J Manag Soc Sci.* 2020;5(1):175–85.
21. Collins L, Glasser AM, Abudayyeh H, Pearson JL, Villanti AC. E-cigarette marketing and communication: how e-cigarette companies market e-cigarettes and the public engages with e-cigarette information. *Nicotine Tob Res.* 2019;21(1):14–24.
22. Daniel ES, Crawford Jackson EC, Westerman DK. The influence of social media influencers: understanding online vaping communities and parasocial interaction through the lens of Taylor's six-segment strategy wheel. *J Interact Advert.* 2018;18(2):96–109.
23. Harrell PT, Brandon TH, England KJ, Barnett TE, Brockenberry LO, Simmons VN, et al. Vaping expectancies: a qualitative study among young adult nonusers, smokers, vapers, and dual users. *Subst Abuse.* 2019;13:1178221819866210.
24. Shamah-Levy T, Vielma-Orozco E, Heredia-Hernández O, Romero-Martínez M, Mojica-Cuevas J, Cuevas-Nasu L, et al. Encuesta Nacional de Salud y Nutrición 2018-19. Resultados nacionales [National survey of health and nutrition 2018-19. National results]. Cuernavaca: Instituto Nacional de Salud Pública;2020:1689–99.

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Exposición a la publicidad de cigarrillos electrónicos y sitios web que promueven el vapeo y la aceptabilidad social de su uso entre los consumidores de nicotina

RESUMEN

Objetivos. Evaluar la prevalencia de la exposición a las comunicaciones por Internet y la publicidad de los cigarrillos electrónicos (*e-cigarettes*), así como su asociación con las percepciones sobre la aceptabilidad social de los cigarrillos electrónicos en México.

Métodos. Se analizaron los datos de ocho encuestas (2018-2021) de una muestra en línea de adultos mexicanos (mayores de 18 años) fumadores y consumidores dobles (cigarrillos combustibles y cigarrillos electrónicos). Se evaluaron la exposición —referida por los propios encuestados— a la publicidad de cigarrillos electrónicos en varios canales de comercialización y las visitas a sitios web de cigarrillos electrónicos. Se realizó un análisis de regresión logística para evaluar la relación entre la percepción de aceptabilidad social del consumo de cigarrillos electrónicos, por una parte, y el nivel de exposición publicitaria y las visitas a sitios web de cigarrillos electrónicos, por la otra.

Resultados. La mayor exposición a la publicidad se dio en las tiendas virtuales y físicas donde se venden cigarrillos electrónicos, según lo notificado por 47,4% y 46,8% de los encuestados, respectivamente. Los encuestados que observaron anuncios de cigarrillos electrónicos en Internet (razón de probabilidades ajustada [*OR* ajustada] 1,43; intervalos de confianza [*IC*] del 95 %: 1,25; 1,63), en tiendas físicas de cigarrillos electrónicos (*OR* ajustada 1,31; *IC* del 95 %: 1,14; 1,50) y en puntos de venta temporales (*OR* ajustada 1,16; *IC* del 95 %: 1,01; 1,34), y los que visitaron sitios web de cigarrillos electrónicos (*OR* ajustada 1,48; *IC* del 95 %: 1,25; 1,76) fueron más propensos a percibir los cigarrillos electrónicos como socialmente aceptables. Asimismo, se asoció el hecho de observar anuncios en más canales con la percepción de una mayor aceptabilidad social del consumo de cigarrillos electrónicos.

Conclusiones. La exposición a la publicidad de los cigarrillos electrónicos, ya sea en línea o por los canales tradicionales, así como el contacto con sitios web que promueven el vapeo, se relaciona con la percepción acerca de la aceptabilidad social del consumo de cigarrillos electrónicos. Deberían considerarse alternativas regulatorias para evitar la proliferación de sitios web promocionales disfrazados de sitios de opinión o de usuarios.

Palabras clave

Sistemas electrónicos de liberación de nicotina; publicidad; mercadotecnia; vapeo; México.

Exposição a propaganda de cigarros eletrônicos e sites pró-vaping e aceitação social de seu uso entre usuários de nicotina

RESUMO

Objetivos. Avaliar a prevalência da exposição a comunicações e propagandas sobre cigarros eletrônicos na internet e sua associação com percepções de aceitação social dos cigarros eletrônicos no México.

Métodos. Foram analisados dados de oito pesquisas (2018 a 2021) de uma amostra on-line de adultos mexicanos (maiores de 18 anos) fumantes e usuários duais (de cigarros combustíveis e eletrônicos). Avaliou-se a exposição autorrelatada à propaganda de cigarros eletrônicos em diversos canais de marketing, além de visitas a sites de cigarros eletrônicos. Foi utilizada uma análise de regressão logística para avaliar a associação entre percepções de aceitação social do uso de cigarros eletrônicos e o nível de exposição a propagandas e visitas a sites de cigarros eletrônicos.

Resultados. A maior exposição a propaganda ocorreu na internet e no exterior de tabacarias que vendem cigarros eletrônicos, conforme relatado por 47,4% e 46,8% dos respondentes, respectivamente. Os respondentes que haviam notado propagandas de cigarros eletrônicos na internet (razão de chances [RC] ajustada: 1,43; intervalo de confiança [IC] de 95%: 1,25-1,63), no exterior de tabacarias que vendem cigarros eletrônicos (RC ajustada: 1,31; IC de 95%: 1,14-1,50) e em pontos temporários de venda (RC ajustada: 1,16; IC de 95%: 1,01-1,34), e os respondentes que visitavam sites de cigarros eletrônicos (RC ajustada: 1,48; IC de 95%: 1,25-1,76) eram mais propensos a achar que os cigarros eletrônicos eram socialmente aceitáveis. A observação de propaganda em um maior número de canais também estava associada à percepção de maior aceitação social do uso de cigarros eletrônicos.

Conclusões. A exposição ao marketing de cigarros eletrônicos, seja on-line ou por meio de canais tradicionais de marketing, está associada à percepção de aceitação social do uso de cigarros eletrônicos, assim como o contato com sites pró-vaping. Devem-se cogitar opções regulatórias para evitar a proliferação de sites promocionais disfarçados de sites de opinião ou de usuários.

Palavras-chave

Sistemas eletrônicos de liberação de nicotina; publicidade; marketing; vaping; México.