Characteristics of messages in Spanish-language vaping messages about vaping shared on X (Twitter) social network X (Twitter) (2020-2021)

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Abstract

Introduction: X, formerly known as Twitter, is a social media platform where topics of public interest are disseminated, including the use of electronic nicotine delivery systems. This study aims to analyze the characteristics of messages in Spanish about vaping shared on social network X (Twitter).

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Methods: A descriptive, observational, cross-sectional, and correlational study was conducted. Messages in Spanish published on X (Twitter) between March 1, 2020, and September 1, 2021, were retrieved using Twitter's advanced search function with keywords and hashtags related to vaping. Data were collected using Microsoft Excel, and sentiment analysis was performed using the Azure Machine Learning add-in for the program. Descriptive and inferential analysis was carried out using SPSS Version 28 statistical software.
Results: A total of 54 messages comprised the complete universe of vaping-related tweets in Spanish meeting the inclusion criteria during the study period. The messages were predominantly pro-vaping (88.9%) with a positive emotional tone (80.0%), with individual and corporate authors each representing 48.1% of the senders. Notably, no messages from healthcare organizations were identified, and anti-vaping messages with a positive tone represented only 3.6% of the total. A significant positive correlation was found between the use of external links and retweets ($r = 0.457$; $p = 0.001$), while significant negative correlations were observed between retweets and message length ($r = -0.468$; $p = 0.001$), hashtag use ($r = -0.578$; $p = 0.001$), and images ($r = -0.425$; $p = 0.001$).
Conclusions: Messages about vaping shared on the social network X (Twitter) are disseminated by both individuals and companies, and are characterized by a predominantly pro-vaping stance and a positive emotional tone, favoring the promotion of vaping. The complete absence of healthcare organizations as broadcasters and the minimal presence of anti-vaping messages with a positive emotional tone reveal a significant gap in public health communication in this digital space.

Key words: Vaping; Electronic Nicotine Delivery Systems; Social Media; Sentiment Analysis

Características de los mensajes en español sobre vapeo compartidos en la red social X (Twitter) (2020-2021)

Resumen

Introducción: X, anteriormente conocido como Twitter, es una plataforma social donde se difunden temas de relevancia pública, incluyendo el uso de sistemas electrónicos de administración de nicotina. El objetivo de este estudio es analizar las

características de los mensajes en español relacionados con el vapeo compartidos en la red social X (Twitter).

Métodos: Se llevó a cabo un estudio descriptivo, observacional, transversal y correlacional. Se recuperaron los mensajes en español publicados en X (Twitter) entre el 1 de marzo de 2020 y el 1 de septiembre de 2021 utilizando la función de búsqueda avanzada de Twitter con palabras clave y hashtags relacionados con el vapeo. Los datos se recopilaron utilizando Microsoft Excel y se realizó un análisis de sentimientos utilizando el complemento Azure Machine Learning para el programa. Se llevó a cabo un análisis descriptivo e inferencial utilizando el software estadístico SPSS Versión 28.

Resultados: Un total de 54 mensajes constituyeron el universo completo de tweets en español relacionados con el vapeo que cumplieron los criterios de inclusión durante el período de estudio, lo que refleja la escasez de este contenido en la plataforma. Los mensajes fueron predominantemente pro-vapeo (88.9%) con tono emocional positivo (80.0%), con autores individuales y corporativos representando cada uno el 48,1% de los emisores. Cabe destacar que no se identificaron mensajes de organizaciones sanitarias. Se encontró una correlación positiva significativa entre el uso de enlaces externos y los retuits ($r = 0,457$; $p = 0,001$), mientras que se observaron correlaciones negativas significativas entre los retuits y la longitud del mensaje ($r = -0,468$; $p = 0,001$), el uso de hashtags ($r = -0,578$; $p = 0,001$) y las imágenes ($r = -0,425$; $p = 0,001$).

Conclusiones: Los mensajes sobre vapeo compartidos en la red social X (Twitter) son difundidos tanto por individuos como por empresas, y se caracterizan por una postura predominantemente pro-vapeo y un tono emocional positivo, lo que favorece la promoción del vapeo. La ausencia total de organizaciones sanitarias como emisoras y la mínima presencia de mensajes anti-vapeo con tono emocional positivo revelan una brecha significativa en la comunicación de salud pública en este espacio digital.

Palabras clave: vapeo, sistemas electrónicos de administración de nicotina, redes sociales, análisis de sentimiento.

Introduction

Social networks are a set of digital platforms that allow people to interact with each other, and because of their broad reach, are often used by the business sector as spaces for promotion, information, and marketing (Jancey et al., 2024). Social media emerged in the late 1990s and early 2000s*. The boom occurred with platforms such as MySpace in 2003, followed by Facebook in 2004, LinkedIn in 2003, and Twitter in 2006 (Boyd & Ellison, 2007). According to recent reports, people spend at least 2 hours and 30 minutes a day on social media, with the most popular platforms being YouTube, Instagram, Facebook, TikTok, and X (Twitter) (Datareportal, 2024).

X (Twitter) is a platform that allows users to create messages of up to 280 characters, called "tweets", accompanied by complementary elements such as URLs, hashtags, photos, videos, and mentions (Pérez-Curie & García-Gordillo, 2018). These messages can be retweeted, saved, and shared on other social networks. The commercial approach of this social network includes advertising, content promotion, data analysis services, and audience monetization. A topic or hashtag that is widely discussed and mentioned by users at a given time is called an "X (Twitter) Trend", allowing it to reach a massive audience. One of the topics addressed on X (Twitter) is vaping, promoted by consumers, by people who find the information appealing, and by production and distribution companies that sell this product, fostering a width social acceptance (Botero-Rodríguez et al., 2019).

Although electronic nicotine delivery systems (ENDS) were introduced as smoking cessation strategies, there is no clear consensus on their effectiveness in smoking cessation (Famiglietti et al., 2021). These devices can equal or exceed the risk of conventional cigarettes due to the chemicals and toxins they contain. At the respiratory system level, these devices trigger a various inflammatory reactions that lead to shortness of breath, coughing, wheezing, bronchial and pulmonary irritation, impaired lung function, decreased immunity, and an increased risk of respiratory infection (Botero-Rodríguez et al., 2019; Ghosh et al., 2019; Kaslow et al., 2021; Seiler-Ramadas et al., 2021).

ENDS have also been associated with oral and gastrointestinal effects such as gingival inflammation, sore throat, nausea, vomiting, and diarrhea. Neurologically, they may cause headaches, irritability, anxiety, dependence, and insomnia (Seiler-Ramadas et al., 2021). In the cardiovascular system, they are associated with tachycardia,

increased blood pressure, and myocardial infarction (Navas-Acien et al., 2020). Furthermore, they can induce an inflammatory response in corneal epithelial cells (Martheswaran et al., 2021). The use of these devices during pregnancy is associated with adverse obstetric and perinatal outcomes with an increased risk of congenital malformations (Ponciano-Rodríguez & Chávez Castillo, 2020)

However, these devices are perceived as less harmful or addictive and enjoy greater social acceptance (Liquete Arauzo et al., 2017). The low perception of risk among young people in the United States, California, and Australia regarding the use of these devices is concerning (Klein et al., 2020). This concern exacerbated by their widespread promotion on social media, where favorable opinions predominate, thus encouraging irresponsible use (Zheng et al., 2021). These findings highlight the importance of regulating online e-cigarette advertising and developing of strategies to counteract their advertising and promotion (McCausland et al., 2020).

Globally, the use of ENDS has grown exponentially, driven primarily by social media marketing strategies that present vaping as a harmless or attactive alternative. In the Latin American context, evidence about how these messages are communicated remains limited despite unique regulatory challenges and growing curiosity among young people (Lee et al., 2024). Beyond polarity of sentiment, understanding whether messages promote or discourage vaping, and the emotional tone with which they do so is essential to assess their influence on public health attitudes. Therefore, this study aims to analyze the characteristics of vaping-related messages shared on X (Twitter).

Methods

A descriptive observational cross-sectional study with correlational scope was conducted, analyzing messages posted on X (Twitter) in Spanish. Data collection took place during the COVID-19 pandemic, a period in which restrictions on face-to-face fieldwork led research teams to adopt social media data as a methodological alternative, an approach widely implemented in public health research during this period.

Messages were retrieved through the X (Twitter) advanced search function. Inclusion criteria were: (1) presence of the keywords “vapeo”, “vaping”, or “vape”; (2) use of the hashtags #vapeo, #vaping, or #vape; (3) written in Spanish; and (4) published

between 1 March 2020 and 1 September 2021. Both the original tweets and replies containing external links were included. Messages in languages other than Spanish and duplicate posts were excluded. The variables of the study are defined in Table 1.

Table 1. *Definition of variables*

Variable	Definition
Sender characteristics	
Sender	Person or institution that creates and publishes the message. Classification was based on the account name and profile description on the platform. Four categories were established: (1) individual author: private user; (2) corporate author: companies producing, distributing, or selling electronic nicotine delivery systems; (3) non-profit foundation; and (4) media.
Message characteristics	
Sentiment	Quantitative measure of the emotional tone of a message, assessed on a continuous scale from 0 to 1. Scores close to 1 indicate positive sentiment, scores around 0.5 indicate neutral sentiment, and scores close to 0 indicate negative sentiment. Calculated using the Azure Machine Learning add-in for Excel.
Text length	Total number of characters, including spaces, contained in the message. Used as a proxy for argument elaboration.
External link	Presence of URLs linking to external information sources within the message (yes/no).
Hashtags	The number of words or phrases preceded by the # symbol included in the message. Hashtags categorize content and increase message visibility and diffusion on the platform.
Images	Presence of visual content accompanying the message (yes/no).
Interaction metrics	
Number of retweets	Number of times the message was shared by other users on the platform.
Number of likes	Number of positive reactions received by the message on the platform.

Note. ENDS = Electronic Nicotine Delivery Systems. Sentiment scores were calculated using the Azure Machine Learning add-in for Excel (Microsoft Corporation, 2021).

Given the need to characterize these digital interactions, this study employed a data mining and sentiment analysis approach to examine the nature of vaping messages shared on X (Twitter) in Spanish. Sentiment analysis is a natural language processing technique widely used in social media analytics to determine whether the content of a text is positive, negative, or neutral (Harfoushi et al., 2018). Tweet texts were preprocessed by removing URLs, punctuation marks, and functional words without semantic value. The polarity score of each message was then calculated using the Azure Machine Learning add-in for Excel (Microsoft Corporation), which has been validated for sentiment analysis on social media data (Harfoushi et al., 2018), and grouped into three categories: positive (score close to 1), neutral (score around 0.5), and negative (score close to 0). To further characterize the discourse, messages were additionally classified by two dimensions: message position (pro-vaping vs. anti-vaping), determined through content analysis by the research team, and emotional valence, derived from the Azure Machine Learning sentiment scores. Manual adjustment was applied to 7 tweets where the algorithm did not accurately capture the tone of the message due to its inability to distinguish linguistic tone from communicative intent in health-related content.

Data were collected in a Microsoft Excel database. For descriptive and inferential analysis, the statistical software SPSS, version 28, was used. Quantitative variables were expressed as mean and standard deviation, while categorical variables were presented as absolute frequencies and percentages. Correlation analyses were carried out using Spearman's test. Statistical significance was *set at* $p < 0.05$.

Results

The advanced search on X (Twitter) returned 54 messages constituting the complete universe of posts meeting the inclusion criteria during the 18-month study period. This limited volume reflects the scarcity of vaping content in Spanish on the platform, which is itself a relevant finding in the Latin American public health context. Regarding sender type, individual and corporate authors each represented 48.1% of messages. Non-profit foundations and media accounted for 1.9% each. No messages from health organizations were identified during the study period.

Messages showed a mean sentiment score of 0.67 ± 0.12. To characterize the discourse, messages were classified by position (pro-vaping vs. anti-vaping) and emotional valence (Azure Machine Learning with manual adjustment in 7 tweets). Of the 54 messages, 48 (88.9%) were pro-vaping and 6 (11.1%) anti-vaping. Positive

tone was predominant (80.0%), followed by neutral (12.7%) and negative (5.5%) tones. Pro-vaping messages were predominantly positive in tone (76.4%), while anti-vaping messages showed mainly negative tone (5.5%). Notably, the combination considered most effective for public health communication, anti-vaping messages with a positive emotional tone, accounted for only 3.6% of the total. These results are presented in Table 2.

Table 2. *Classification of vaping messages on X (Twitter) by message position and emotional valence*

	Positive tone	Negative tone	Neutral tone	Total
Pro-vaping	42 (76.4)	0 (0.0)	6 (10.9)	48 (88.9)
Anti-vaping	2 (3.6)	3 (5.5)	1 (1.8)	6 (11.1)
Total	44 (80.0)	3 (5.5)	7 (12.7)	54 (100)

*Note***.** n (%). Message position identified through content analysis. Emotional valence obtained using Azure Machine Learning sentiment scores

The following messages illustrate the predominant discourse identified in the analyzed content. In compliance with ethical principles of data protection and user privacy, the messages are presented in paraphrased form. Corporate authors predominantly shared promotional messages classified as pro-vaping with a positive tone, associating vaping with healthy lifestyles and responsible behaviors during the pandemic (corporate author, retweets: 0, likes: 0). Individual authors, on the other hand, tended to share advocacy and activism messages classified as pro-vaping with positive tone, presenting vaping as an alternative that improved their quality of life (individual author, retweets: 39, likes: 28), this being the most widely shared message in the dataset. Similarly, collective activism messages were identified that called for mobilization in favor of vaping across different Spanish-speaking countries, also classified as pro-vaping with a positive tone (individual author, retweets: 19, likes: 25).

On average, posts are of moderate length (244.88 ± 53.08 characters) and use hashtags for categorization (9.95 ± 4.91 hashtags per post). In addition, 55.6% of the posts include external links to additional information about vaping. Half of the posts (50%) contain images, while the level of interaction is moderate, with an average of 1.62 ± 6.00 retweets and 2.11 ± 5.66 likes per post. These results are shown in Table 3.

Table 3. *Descriptive statistics*

Variable	Messages n=54
Sender characteristics	
Sender ++	
Individual author	26 (48.1)
Corporate author	26 (48.1)
Non-profit foundation	1 (1.9)
Media outlet	1 (1.9)
Message characteristics	
Sentiment. Score +	0.67 ± 0.12
Sentiment. Category ++	
Positive	42 (77.8)
Neutral	8 (14.8)
Negative	4 (7.4)
Text length +	244.88 ± 53.08
External link ++	
Yes, External URL	30 (55.6)
No external URL	24 (44.4)
Hashtags +	9.95 ± 4.91
Images ++	
With image	27 (50)
No image	27 (50)
Interaction metrics	
Number of retweets +	1.62 ± 6.00
Number of likes +	2.11 ± 5.66

Note. ENDS = Electronic Nicotine Delivery Systems. + Mean ± Standard deviation. ++ n (%).

Correlation analyses revealed that the inclusion of external links was the only variable positively and significantly associated with both retweets (r= 0.457, p= 0.001) and likes (r= 0.428, p= 0.001). Conversely, text length (r= -0.468, p= 0.001), hashtag use (r= -0.578, p= 0.001), and image use (r= -0.425, p= 0.001) showed significant negative correlations with retweets. Similar negative associations with "likes" were observed for text length (r= -0.344, p= 0.009), hashtag use (r= -0.405, p= 0.002), and image use (r= -0.334, p= 0.011). Correlation results are presented in Table 4.

Table 4. *Correlation test.*

Variable	Retweets	Likes
Sender characteristics		
Sender	r= -0.208, p= 0.121	r= -0.240, p= 0.73
Message characteristics		
Sentiment Score	r= -0.150, p= 0.264	r= -0.224, p= 0.094
Text length	r= -0.468, p= 0.001*	r= -0.344, p= 0.009*
External link	r= 0.457, p= 0.001*	r= 0.428, p= 0.001*
Hashtags	r= -0.578, p= 0.001*	r= -0.405, p= 0.002*
Images	r= -0.425, p= 0.001*	r= -0.334, p= 0.011*

Note. r = Correlation coefficient. *p < 0.05

These findings reveal a communication landscape in the Spanish social network X (Twitter) in which vaping is predominantly presented in positive terms, driven largely by individual and corporate actors in the absence of health institutions, which justifies a deeper analysis in the context of public health policies.

Discussion

This study found a high prevalence of messages with a positive emotional valence promoting vaping. The discrepancy between promotional discourse on social media and scientific reality regarding vaping products represents a significant public health problem. The unregulated promotion of these products, through messages that appeal to positive emotions and normalize their use, contributes to the normalization of vaping among the population, especially among young people (Lee et al., 2024). It is important to highlight that, ENDS use among young adults is alarmingly high (Evans et al., 2024), a situation exacerbated by the association demonstrated between promotional content and increased ENDS consumption (Rutherford et al., 2023). Research has indicated that users tend to share messages with positive emotional valence more frequently, which facilitates the viral spread of information promoting vaping and its reach to a wider audience (McCausland et al., 2019; Zheng et al., 2021).

The COVID-19 pandemic likely increased the interaction of adolescents with social media due to restrictions on in-person activities and schooling, thus expanding their exposure to e-cigarette-related content. Consequently, platforms such as X functioned not only as spaces for peer interaction but also as channels for promotional and normative messages about vaping that can influence beliefs and behaviors, consistent with evidence linking online exposure to increased tobacco use among young people (Smith et al., 2023).

In light of the above, it is necessary to consider regulatory frameworks and government resources to monitor, enforce, and penalize social media companies that do not comply with regulations (Jancey et al., 2024). Social media is a key element in the development of these regulations, since several studies have shown how government agencies have used tobacco-related social media research to inform the policymaking process over the past decade (Beard et al., 2024). Strict regulatory measures have begun to be observed, such as the case of Australia, which prohibits the sale of nicotine vaping products unless prescribed by a physician. Regarding social media posts related to ENDS, the development of more effective systems to identify and flag content related to e-cigarettes is proposed (Lim et al., 2024).

Analysis of X (Twitter) posts revealed that the main creators of content about vaping are individual users who support ENDS and companies that use this network to market their products. This finding is consistent with other research examining tobacco industry marketing practices and user experience with tobacco products through social media content analysis (Beard et al., 2024; Donaldson et al., 2024). A recent study assessing the perceived credibility of social media posts by the sender found that experts have greater credibility among the audience compared to friends or influencers. This finding opens up an important opportunity for health professionals to disseminate accurate and reliable information about the harmful health effects of vaping (Lee et al., 2024).

This study identified a significant positive correlation between X (Twitter) posts with external links and the increase in engagement metrics such as retweets and likes. This finding is in line with prior research that indicates that tweets containing external URLs tend to be perceived as more credible, thereby fostering greater user interaction (Slimi et al., 2019; Z. Zhang & Ahmed, 2019). In the context of social media interventions aimed at preventing vaping, strategic URL selection and sharing can effectively guide users to authoritative information on ENDS, which potentially improves the acceptance and impact of tweets among the target audience.

A notable finding of this research *was* that X (Twitter) messages with a moderate length, around 244 characters, tend to generate a better reception by the audience. It is important to consider that the platform sets a maximum limit of 280 characters, encouraging the use of concise messages (De la Peña Sarracén, 2019). Previous research indicated that many users interact with topical issues and hashtags on social networks. However, not all X (Twitter) users use hashtags in their online communications (Tahamtan et al., 2021). The inclusion of hashtags in a message strongly influenced the likelihood that the message will be retweeted (Mackenzie et al., 2020). However, the present study found that excessive hashtags decrease the likelihood of getting likes and retweets (J. Zhang et al., 2021). Given the above, it is important to use only the most relevant hashtags in social media health campaigns.

Regarding the use of images, the results of this study indicated that tweets containing an image are less retweeted. This finding, which has also been observed in other research (Mitchell et al., 2017), may be due to the nature of X (Twitter), a platform where text predominates over images, as opposed to other social networks such as Instagram, where images are more relevant. Given the above, health campaigns on X (Twitter) must prioritize concise text-based messages over image-heavy content.

Overall, these findings suggest that creating concise, informative, and externally validated content with a positive tone, can increase the likelihood that a tweet will be well received and shared by users on X (Twitter). These characteristics can be leveraged in interventions on this social network to prevent vaping. In this regard, interventions to prevent vaping on social media have been conducted and have concluded that they are a promising approach and that more research is needed on how to optimize the dosage of such interventions and to what extent prolonged exposure may affect vaping over time (Evans et al., 2024).

The findings of this study reveal that 88.9% of messages were pro-vaping with a predominantly positive tone 76.4%, while anti-vaping messages represented only 11.1% of the total and, paradoxically, did not use a positive tone as their predominant communicative strategy. From a health communication perspective, messages that combine a preventive stance with a positive emotional tone are considered the most effective for changing attitudes and behaviors, as they associate prevention with empowerment rather than fear (Ma et al., 2023; Wu et al., 2024) In this study, positive anti-vaping messages represented only 3.6% of the total, which suggests that the few preventive messages identified not only reflect the absence of health organizations

as senders but also fail to leverage the persuasive potential of positive emotional framing to counteract the dominant pro-vaping discourse (Liu et al., 2025).

The prominence of positive e-cigarette messages identified in this study reflects trends documented in broader social media research. Research on social platforms have shown that pro-vaping narratives tend to dominate user-generated content, a phenomenon exacerbated by algorithmic amplification and the appeal of short, engaging content formats (Smith et al., 2023). Within the Latin American context, these trends may be particularly consequential given rising adolescent susceptibility to e-cigarette use.

The prevalence of e-cigarette use among Latin American adolescents has been documented as being considerable and highly variable across countries, with estimates ranging from 2.6 % to 64.2 % and an average combined prevalence of approximately 18.9 % (Izquierdo-Condoy et al., 2024). These figures highlight the importance of monitoring vaping-related discourse on widely used platforms like X which can shape norms, beliefs, and perceived risks among young audiences. The association between online content exposure and vaping behavior in adolescents is further supported by evidence that online advertising and peer influences are key factors linked to initiation and continued use (Izquierdo-Condoy et al., 2024).

In Colombia, specifically, population-based data indicate that approximately 4.4 % of individuals aged 12–68 reported e-cigarette use in 2019, with higher prevalence among younger age groups and associations with other substance use and markers of social vulnerability (Urrutia-Pereira et al., 2025). These findings highlight the intersection between sociodemographic factors and vaping behaviors, reinforcing the need to understand how digital media discourse can intertwine with social determinants of health to influence risk behaviors.

This study has several limitations that should be considered when interpreting the results. The sample consists of 54 messages, representing the entire universe of tweets in Spanish that met the inclusion criteria during the 18-month study period, rather than a statistical sample. While this reflects the scarcity of content about vaping in Spanish on X (Twitter) at that time, the limited volume restricts the generalization of results and the strength of statistical inferences.

In terms of the collection context, the data were obtained during the COVID-19 pandemic (March 2020–September 2021), a period characterized by increased overall

activity on social media. Paradoxically, despite this increased digital activity, only 54 messages that met the inclusion criteria were identified, reinforcing the finding of a genuine scarcity of content on vaping in Spanish on X (Twitter). However, the pandemic context may have influenced the nature and emotional tone of the messages found, which may limit the transferability of the findings to other periods.

Sentiment analysis was carried out using the Azure Machine Learning add-in for Excel, an automated tool validated for social media data (Harfoushi et al., 2018). Subsequent comparative studies have identified more accurate tools for sentiment classification tasks (Qorib et al., 2023), which should be considered when evaluating the accuracy of the scores reported in this study.

Future research should consider multi-platform approaches to gain a more comprehensive view of the discourse on vaping in Spanish contexts, including platforms such as Instagram, Facebook, or TikTok. Additionally, longitudinal studies examining the evolution of vaping-related content in Spanish over time would contribute to a deeper understanding of communication trends and their potential impact on public health in Latin America.

Conclusions

Messages about vaping shared on the social network X (Twitter) are posted by both individuals and companies, characterized by a predominantly pro-vaping stance (88.9%) and a positive emotional tone (80.0%). The complete absence of health organizations as senders and the minimal presence of anti-vaping messages with a positive emotional tone (3.6%) reveal a significant gap in public health communication in this digital space. Therefore, it is essential to implement educational campaigns on this social network that include short anti-vaping messages with a positive emotional tone, accompanied by relevant hashtags and links to scientific evidence on the harmful health effects of vaping. These characteristics will encourage user interaction through retweets and likes, maximizing the reach and effectiveness of preventive interventions. This experience can inform the integration of digital surveillance methods into public health, epidemiology, and health communication curricula

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Conflict of interest

The authors declare that they have no conflicts of interest.

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References

Beard, T. A., Donaldson, S. I., Unger, J. B., & Allem, J.-P. (2024). Examining Tobacco-Related Social Media Research in Government Policy Documents: Systematic Review. *Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco*, *26*(4), 421–426. doi.org/10.1093/ntr/ntad172

Botero-Rodríguez, F., Marroquín Rivera, A., Leal Jaramillo, A., Cabarique Mendez, C., & Gómez-Restrepo, C. (2019). Sistemas electrónicos de administración de nicotina: ¿una amenaza para el neurodesarrollo de los adolescentes? *Universitas Médica*, *60*(4), 1–8. . doi.org/10.11144/Javeriana.umed60-4.sean

Boyd, D. M., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication*, *13*(1), 210–230. doi.org/10.1111/j.1083-6101.2007.00393.x

Datareportal. (2024). *Time spent using social media*. https://datareportal.com/reports/digital-2024-global-overview-report

De la Peña Sarracén, G. L. (2019). *Análisis y detección de odio en mensajes de Twitter* [Universitat Politècnica de València] URL: .https://riunet.upv.es/entities/publication/ec12a1ad-323f-4555-8f3c-f761b02b772e

Donaldson, S. I., Dormanesh, A., Majmundar, A., Pérez, C., Lopez, H., Saghian, M., Beard, T. A., Unger, J. B., & Allem, J.-P. (2024). Examining the Peer-Reviewed Literature on Tobacco-Related Social Media Data: Scoping Review. *Nicotine & Tobacco Research : Official Journal of the Society for Research on Nicotine and Tobacco*, *26*(4), 413–420. doi.org/10.1093/ntr/ntad186

Evans, W. D., Bingenheimer, J., Cantrell, J., Kreslake, J., Tulsiani, S., Ichimiya, M., D'Esterre, A. P., Gerard, R., Martin, M., & Hair, E. C. (2024). Effects of a Social Media Intervention on Vaping Intentions: Randomized Dose-Response Experiment. *Journal of Medical Internet Research*, *26*, e50741.doi: 10.2196/50741

Famiglietti, A., Memoli, J. W., & Khaitan, P. G. (2021). Are electronic cigarettes and vaping effective tools for smoking cessation? Limited evidence on surgical outcomes: A narrative review. *Journal of Thoracic Disease*, *13*(1), 384–395.doi: 10.21037/jtd-20-2529

Ghosh, A., Coakley, R. D., Ghio, A. J., Muhlebach, M. S., Esther, C. R., Alexis, N. E., & Tarran, R. (2019). Chronic E-cigarette use increases neutrophil elastase and matrix metalloprotease levels in the lung. *American Journal of Respiratory and Critical Care Medicine*, *200*(11), 1392–1401. doi.org/10.1164/rccm.201903-0615OC

Jancey, J., Crawford, G., Bowman, E., Wolf, K., Leaver, T., Bialous, S., & McCausland, K. (2024). Perceptions of social media harms and potential management strategies: vaping case study. *BMC Public Health*, *24*(1), 876. doi.org/10.1186/s12889-024-18362-8

Kaslow, J. A., Rosas-Salazar, C., & Moore, P. E. (2021). E-cigarette and vaping product use-associated lung injury in the pediatric population: A critical review of the current literature. *Pediatric Pulmonology*, *56*(7), 1857–1867. doi.org/10.1002/ppul.25384

Klein, E. G., Czaplicki, L., Berman, M., Emery, S., & Schillo, B. (2020). Visual attention to the use of# ad versus# sponsored on e-cigarette influencer posts on social media: A randomized experiment. *Taylor & FrancisEG Klein, L Czaplicki, M Berman, S Emery, B SchilloJournal of Health Communication, 2020•Taylor & Francis*, *25*(12), 925–930. doi.org/10.1080/10810730.2020.1849464

Lee, D. N., Liu, J., Stevens, H., Oduguwa, K., & Stevens, E. M. (2024). Does source matter? Examining the effects of health experts, friends, and social media influencers on young adult perceptions of Instagram e-cigarette education messages. *Drug and Alcohol Dependence*, *258*, 111270. doi.org/10.1016/j.drugalcdep.2024.111270

Lim, C. C. W., Sun, T., Vu, G., Chan, G. C. K., & Leung, J. (2024). The underbelly of E-cigarette advertising: regulating online markets on social media platforms. *Harm Reduction Journal*, *21*(1), 105. doi.org/10.1186/s12954-024-01027-5

Liquete Arauzo, L., Pérez Ruiz, E., Marugán de Miguelsanz, J. M., Rodríguez Molinero, L., de Uribe Ladrón de Cegama, F., Ugidos Gutiérrez, M. D., García Cantalapiedra, M. J., & Elizo, A. I. (2017). Riesgo percibido sobre el consumo ocasional de tabaco tradicional y electrónico en adolescentes. *Pediatria de Atencion Primaria*, *19*(74), 127–136. URL https://scielo.isciii.es/scielo.php?pid=S1139-76322017000200005&script=sci_arttext&tlng=en

Liu, J., Wang, Y., Fabbricatore, J. L., Norton, E., Markey, C. E., McMains, J. T., Worsdale, A., Ye, T., Shi, Z., & Sweet, L. H. (2025). Neural predictors of vaping: Covert emotional engagement versus reactance to overt emotional appeals in vaping prevention message processing. *American Journal of Preventive Medicine*, *68*(3), 108194. https://doi.org/10.1016/j.amepre.2025.108194

Ma, H., Kieu, T. K.-T., Ribisl, K. M., & Noar, S. M. (2023). Do vaping prevention messages impact adolescents and young adults? A meta-analysis of experimental studies. *Health Communication*, *38*(8), 1709–1722. https://doi.org/10.1080/10410236.2023.2185578

Mackenzie, D. G., Ong, D. S., & Ashiru-Oredope, D. (2020). World Antibiotic Awareness Week and European Antibiotic Awareness Day, November 2018: An analysis of the impact of Twitter activity. *International Journal of Antimicrobial Agents*, *56*(6). doi.org/10.1016/j.ijantimicag.2020.106209

Martheswaran, T., Shmunes, M. H., Ronquillo, Y. C., & Moshirfar, M. (2021). The impact of vaping on ocular health: a literature review. *International Ophthalmology*, *41*(8), 2925–2932. doi.org/10.1007/s10792-021-01842-w

McCausland, K., Maycock, B., Leaver, T., & Jancey, J. (2019). The messages presented in electronic cigarette–related social media promotions and discussion: Scoping review. *Journal of Medical Internet Research*, *21*(2). doi.org/10.2196/11953

McCausland, K., Maycock, B., Leaver, T., Wolf, K., Freeman, B., & Jancey, J. (2020). E-cigarette advocates on twitter: Content analysis of vaping-related tweets. *JMIR Public Health and Surveillance*, *6*(4). doi.org/10.2196/17543

Mitchell, B. G., Russo, P. L., Otter, J. A., Kiernan, M. A., & Aveling, L. (2017). What Makes a Tweet Fly? Analysis of Twitter Messaging at Four Infection Control Conferences. *Infection Control and Hospital Epidemiology*, *38*(11), 1271–1276. doi.org/10.1017/ice.2017.170

Navas-Acien, A., Martinez-Morata, I., Hilpert, M., Rule, A., Shimbo, D., & LoIacono, N. J. (2020). Early Cardiovascular Risk in E-cigarette Users: the Potential Role of Metals. *Current Environmental Health Reports*, *7*(4), 353–361. doi.org/10.1007/s40572-020-00297-y

Pérez-Curie, C., & García-Gordillo, M. (2018). Influence politics and "fake" trend on twitter. 21D post-election effects within the procés in Catalonia. *Profesional de La Informacion*, *27*(5), 1030–1040. doi.org/10.3145/epi.2018.sep.07

Ponciano-Rodríguez, G., & Chávez Castillo, C. A. (2020). Efectos en la salud de los sistemas electrónicos de administración de nicotina (SEAN). *Revista de La Facultad de Medicina*, *63*(6), 7–19. doi.org/10.22201/fm.24484865e.2020.63.6.02

Rutherford, B. N., Lim, C. C. W., Cheng, B., Sun, T., Vu, G. T., Johnson, B., Daniel Paul Ashley, Chung, J., Huang, S., Leung, J., Stjepanović, D., Connor, J. P., & Chan, G. C. K. (2023). Viral Vaping: A systematic review and meta analysis of e-cigarette and Tobacco-Related social media content and its influence on youth behaviours and attitudes. *Addictive Behaviors*, *147*, 107828. doi.org/10.1016/j.addbeh.2023.107828

Seiler-Ramadas, R., Sandner, I., Haider, S., Grabovac, I., & Dorner, T. E. (2021). Health effects of electronic cigarette (e-cigarette) use on organ systems and its implications for public health. *Wiener Klinische Wochenschrift*, *133*(19–20), 1020–1027. doi.org/10.1007/s00508-020-01711-z

Slimi, H., Bounhas, I., & Slimani, Y. (2019). URL-based tweet credibility evaluation. *Proceedings of IEEE/ACS International Conference on Computer Systems and Applications, AICCSA*, *2019-Novem*. doi.org/10.1109/AICCSA47632.2019.9035255

Tahamtan, I., Potnis, D., Mohammadi, E., Miller, L. E., & Singh, V. (2021). Framing of and attention to covid-19 on twitter: Thematic analysis of hashtags. *Journal of Medical Internet Research*, *23*(9). doi.org/10.2196/30800

U.S. Department of Health and Human Services. (2023). *Social media and youth mental health: The U.S. Surgeon General's advisory*. Office of the Surgeon General. https://www.hhs.gov/sites/default/files/sg-youth-mental-health-social-media-advisory.pdf

Wu, J., Benjamin, E. J., Ross, J. C., Fetterman, J. L., & Hong, T. (2025). Health messaging strategies for vaping prevention and cessation among youth and young adults: A systematic review. *Health Communication*, *40*(3), 531–549. https://doi.org/10.1080/10410236.2024.2352284

Zhang, J., Wang, Y., Shi, M., & Wang, X. (2021). Factors driving the popularity and virality of Covid-19 vaccine discourse on Twitter: Text mining and data visualization study. *JMIR Public Health and Surveillance*, *7*(12). doi.org/10.2196/32814

Zhang, Z., & Ahmed, W. (2019). A comparison of information sharing behaviours across 379 health conditions on Twitter. *International Journal of Public Health*, *64*(3), 431–440. doi.org/10.1007/s00038-018-1192-5

Zheng, X., Li, W., Wong, S. W., & Lin, H. C. (2021). Social media and E-cigarette use among US youth: Longitudinal evidence on the role of online advertisement exposure and risk perception. *Addictive Behaviors*, *119*, 106916. doi.org/10.1016/j.addbeh.2021.106916