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Industry response to strengthened regulations: amount and themes of flavoured electronic cigarette promotion by product vendors and manufacturers on Instagram

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ABSTRACT

Background Social media discussion tends to follow news about proposed or enacted government policies. Thus, digital discourse surveillance may be an effective and unobtrusive way of understanding industry and public response to policies and regulations, including in the domain of tobacco control. Recently, the US Food and Drug Administration restricted sales of flavoured cartridge and disposable vape products. Historically, the tobacco industry used modification of product characteristics, labelling or packaging to work around flavour restrictions. We aimed to characterise strategies used by nicotine product manufacturers and vendors to promote flavoured products on Instagram and to identify policy workaround tactics.

Methods Keyword rules were used to collect flavoured electronic cigarette-related Instagram posts from CrowdTangle, from 1 January 2019 to 31 December 2021. Posts were coded for commercial content and promotional strategies using a combination of machine learning methods, keyword algorithms and human coding. Additional exploratory analyses were conducted to identify major discussion themes. Non-English posts were excluded from the analyses.

Results Keyword filters captured 113 393 relevant posts from 391 unique accounts, with 46 076 posts referencing flavour promotion (40.6%) and 2124 (2%) posts mentioning alternatives to restricted flavoured products or strategies to evade flavour sales restrictions. Promotional messages featured non-characterising flavour references, 'off-brand' product substitutes, promotion of new flavoured product technologies, innovation, do-it-yourself appeals, global promotion, international delivery and encouraged flavoured product stockpiling. In addition, promotion of refillable devices, e-juice, tank systems and 'box mod' vaporizers was present.

Conclusion Social media surveillance can enhance our understanding of public health needs and policy compliance, as well as inform strategies to prevent policy evasion. Examining evolving industry tactics to promote flavoured products in response to regulatory changes can help authorities and practitioners assess policy effectiveness and inform future design and implementation approaches.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Regulations of flavoured tobacco and nicotine products, including electronic cigarettes, have been evolving on the state and federal levels in the USA, as well as globally, to protect public health.
⇒ Marketing of flavoured electronic cigarette products on social media has not been extensively studied.
⇒ Surveillance of Instagram promotion of electronic cigarettes by vendors and manufacturers may be an effective way of understanding industry response to the rapidly changing regulatory environment.

WHAT THIS STUDY ADDS

⇒ This study reveals that a small but substantial proportion of posts by electronic cigarette vendors and marketers mentioned alternatives to restricted flavoured products or strategies to evade flavour sales restrictions.
⇒ Marketing messages on Instagram featured non-characterising flavour references, 'off-brand' product substitutes, promotion of new flavoured product technologies, innovation, do-it-yourself appeals, global contests and giveaways, offered international delivery, and encouraged flavoured product stockpiling, multiproduct promotion (eg, colour series).

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Social media promotion of flavour alternatives and discussion of policy workarounds by vendors and manufacturers may help preserve flavoured electronic cigarette sales in the context of strengthening marketing regulations and sales restrictions.

INTRODUCTION

Prior research demonstrates that topics discussed on social media tend to track with news about impending or enacted government policies.[1 2] As a result, social media discourse offers an unobtrusive way of understanding public response to policies and regulations, including in the domain of tobacco control.[2] Policies and regulations of flavoured tobacco and nicotine products, including electronic (e)-cigarettes, have been rapidly evolving on the state and federal levels in the USA to protect public health. In 2009, the Family Smoking Prevention and Tobacco Control Act prohibited all characterising flavours excluding menthol in cigarettes, as flavours make

cigarettes easier to smoke and increase youth appeal,[3] however, other tobacco products (ie, e-cigarettes and cigars) were not included in this regulation. A decade later, in October 2019, JUUL Labs, the manufacturer of the most popular e-cigarette among teens, halted sales of their flavoured pods, including mint, mango and cucumber, in retail stores and online (with the exception of menthol and tobacco).[4] This decision was made in response to public pressure due to the growing epidemic of e-cigarette use among youth and the outbreak of the lung disease associated with use of vape products (ie, vaping use-associated lung injury).[5–11]

In January 2020, the US Food and Drug Administration (FDA) implemented an enforcement policy to remove unauthorised flavoured cartridge or 'pod'-based vape products (other than tobacco or menthol vaporizers) from the market.[12–14] The enforcement policy had the effect of prohibiting the sale, marketing and distribution of these products. Over 350 local governments and state policies have been passed to ban flavoured vape and tobacco products as well due to their appeal to youth and vulnerable populations.[15 16] While youth current use of e-cigarettes generally declined in 2020 and 2021,[17 18] there was an increase in disposable e-cigarette use among youth[17] and in menthol-flavoured cartridges, open-system and disposable e-cigarette sales following the FDA flavoured cartridge enforcement policy.[19]

Social media may have played an essential role in promotion of alternatives to the prohibited e-cigarette products. Due to uneven implementation of regulatory oversight, tobacco manufacturers and vendors widely promote their products through social media.[20 21] In fact, prior research showed that tobacco marketing messages far outnumbered posts promoting tobacco control policy and education.[22] Furthermore, youth use of social media is disproportionately higher compared with the general population, which potentially multiplies the effects of exposure to this content among adolescents.[23 24] Thus, 53% of youth report exposure to tobacco marketing on social media in the past 30 days[25]; and 12% of US youth have engaged with at least one form of online tobacco marketing, and engagement was associated with increased tobacco product susceptibility among never users.[26] In particular, exposure to visual posts featuring e-cigarette products on social media, including promotional content, was associated with increased e-cigarette use among US adolescents,[27 28] more positive e-cigarette attitudes and lower perceived danger of e-cigarette use.[29]

Instagram has been an especially valuable tool for marketers for providing brand engagement and acquiring brand representatives (ie, influencers who are paid brand endorsers or promoters).[30] It is one of the most popular platform among teens, with approximately 72% of US adolescents using the social networking site.[31 32] Despite recent efforts by Instagram to self-regulate by restricting e-cigarette promotion,[33] tobacco and e-cigarette shops and vendors, as well as tobacco and nicotine product manufacturers (ie, independent and cigarette manufacturer-owned producers of e-cigarette and other electronic nicotine delivery system and e-liquid brands), affiliated marketers, sponsored content creators and promoters are present on the platform and their posts often do not feature age restriction warnings.[34]

Historically, tobacco industry used modification of product characteristics, labelling or packaging strategies to work around flavour restrictions.[35–37] Namely, to the tobacco industry's response to increased regulation imposed on cigarettes has been the development of little cigars and filtered cigars are almost physically indistinguishable from cigarettes, thus exploiting policy loopholes by offering these pseudo-cigarettes that are exempted from this regulatory oversight.[35–37] Concept flavour naming and using colours to denote flavours have also been used to evade restrictions of tobacco and nicotine products with characterising flavours.[38] However, little is known about the tactics used by nicotine product manufacturers and vendors to promote flavoured products on social media platforms, such as Instagram, in the context of regulatory changes. Current e-cigarette product landscape is highly dynamic and characterised by rapid emergence of new technologies, brands and flavours, which may not be covered by existing policies and fall under regulatory loopholes. For instance, e-cigarette vendors and promoters on social media could exploit gaps in policy coverage and promote alternatives to restricted flavoured products (eg, open-system or disposable vaping product brands) in anticipation or in the aftermath of policy enforcement. To understand the industry response to recent tobacco control developments in this domain, we aimed to characterise the amount and themes of Instagram posts discussing strategies used by vendors and manufacturers of flavoured e-cigarette products to promote flavoured alternatives to the prohibited products and to circumvent restrictions on flavoured e-cigarette sales in the USA by taking advantage of regulation loopholes.

METHODS

Data acquisition

We used two steps to identify and retrieve publicly available Instagram posts by e-cigarette vendors. First, data were gathered from the Instagram application programming interface (API) via Nuvi social data listening platform using hashtag-based keyword queries for the period of 1 July 2019 through 1 May 2020. Query terms included #tobaccoshop, #tobaccostore, #vapeshop, #vapestore. To exclude inactive Instagram accounts, users who posted at least 30 times during the period of observation were identified and retained (n=1038). This account inventory was then used to retrieve all publicly available English-language posts by these users between 1 January 2019 and 31 December 2021 from CrowdTangle—the licensed Instagram data provider that collects accounts representing public discourse, including all verified users, celebrities, athletes, sports teams, politicians, media and publishers, public figures and entities, excluding 'regular'/private Instagram user activity. The resultant raw dataset contained 268 453 primary posts from 417 unique accounts.

Data cleaning

In order to accurately determine the amount of relevant conversation and identify trends over time, these data were cleaned using a combination of human coding and supervised machine learning methods.[39] We followed rigorous procedures developed by our team (eg, Kim *et al*[40]) and others[41–43] to assess quality and validity of the retrieved data. A random sample of 400 posts was labelled by two trained coders to identify non-relevant content, for example, accounts and posts geolocated outside of the USA or including language other than English (intercoder reliability was high: α=93%). Non-English posts were excluded from the analyses. Human ratings were based on the visual and language component of the post. The text associated with each post, as well as the metadata, from the human-coded sample were used to train the machine learning classifier to distinguish the relevant posts from irrelevant posts. Linear support vector machine classifier with L1-norm regularisation was selected via grid search

due to its high performance. Ten-fold cross-validation was used to assess the accuracy of the classifier.[44] Classifier accuracy was validated using 10-fold cross-validation. Classifier accuracy was 0.93; classifier recall (sensitivity) was 0.92; precision (positive predictive value) was 0.92 (F1=0.92). Additional information on filter assessment metrics is presented in online supplemental table 1.

Content analysis

We used a search filter previously developed and validated by our team to identify *flavoured e-cigarette products* (ie, posts referencing flavours of e-cigarettes, other electronic nicotine delivery systems, e-liquids, e-juice, etc).[45] Sample search rules included "flavor OR flavors OR flavored OR flavorant OR flavorants OR flavoring OR flavoring", etc.

To identify and quantify posts referencing *alternatives to flavoured cartridge-based e-cigarette products and workarounds to policies restricting sales of flavoured e-cigarette products*, we used snowballing procedures to select relevant keywords. First, we identified the terms co-occurring with the start set of search rules that were previously developed and validated in our research identifying Instagram posts referencing flavoured e-cigarettes.[46] This process involved human review of n-grams (one-word, two-word and three-word combinations) most frequently occurring in the dataset related to flavoured e-cigarette discussion on Instagram. We used a keyword-based algorithm, with sample terms including "flavor*AND alternative*", "black market", "ship(ping) OR deliver(ing) OR get(ting) OR order(ing) AND flavor* AND pods AND abroad", etc. Filter recall (sensitivity) was 0.79 and precision was 0.83 (F1=.80) (online supplemental table 1). Additional exploratory analyses were performed to characterise trends in the amount of postactivity over time, identify popular content (eg, most frequently used hashtags) and to discover major discussion themes, that is, strategies to enhance engagement and reach of posts promoting alternative flavoured e-cigarette products and brands.

The post meta-data did not include comment text. However, the number of comments and the number of likes were used to assess *the level of post engagement* among other users or consumers.

RESULTS

Keyword filters captured 113 393 relevant publicly available primary Instagram posts from 391 unique accounts, generating 1 138 088 comments and 15 923 839 'likes' in total. The number of posts ranged from 952 to 5107 per month. A relatively large proportion of posts—40.6% (n=46 076)—referenced flavour promotion; these posts generated 582 823 comments and 4 871 529 likes and ranged from 31 to 2103 per month. Approximately 2% of all posts (n=2124) overtly mentioned alternatives to restricted flavoured products or strategies to evade flavour sales restrictions. This category of vendor messages garnered 23 943 comments and 215 962 likes.

Figure 1A displays the amount of posts referencing the alternatives to restricted products over time, as well as the amount of comments or engagement associated with the vendor posts. Figure 1B shows the same information but includes an adjusted scale to better visualise trends in the amount of primary posts over time. The number of primary posts referencing the flavour alternatives or restriction workarounds ranged from 16 to 123 and the number of comments generated by these posts ranged from 153 and 715 (figure 1).

Conversation spikes were observed following major news events related to vape product use and regulatory landscape changes, for example, after the outbreak of the vaping-related lung injury cases in September 2019; the withdrawal of mango, fruit and cucumber-flavour e-cigarette cartridges by JUUL in October 2019; the announcement and implementation of the FDA enforcement policy to remove sales of flavoured cartridge-based e-cigarettes (excluding menthol and tobacco flavours) from the market; the FDA order requiring 10 companies to withdraw disposable and e-juice products due to appeal to youth in July 2020 and finally a federal appeals court decision to uphold FDA regulation of e-cigarettes as tobacco products in December 2020.

Table 1 lists most frequently mentioned hashtags, accounts as well as users generating the greatest engagement by post (ie, average number of comments per post) by content category, including all vendor posts, posts referencing flavoured products and posts mentioning workarounds related to flavoured product sales restrictions. The top hashtags were similar across the three categories and referenced most popular e-cigarette-related terms (eg, #vape) and vape communities (#vapefam, #vapecommunity) to maximise searchability of terms (table 1). Flavour promotion and restriction workaround posts also included terms and hashtags related to proxy or non-characterising flavour references (eg, 'chill'), invitations to buy products in bulk in anticipation of upcoming bans, 'off-brand' product substitutes, 'global' brand promotion, delivery and influencer 'shout outs' (online supplemental figure 1).

Active consumer engagement strategies included global contests; giveaways requiring users to tag friends, follow brands and like promotional posts and do-it-yourself (DIY), technology and innovation appeals (eg, #giveaway, #DIY_fun, #toolkits, #digiflavor, #flavor_technology). In addition, marketing of refillable devices, e-juice, tank systems, atomizers and 'box mod' vaporizers, multiproduct promotion was present (eg, colour series; online supplemental figure 1). Most mentioned platform users included disposable e-cigarette and e-juice brand accounts (table 1).

DISCUSSION

The marketing strategies used by vendor accounts to promote e-cigarette and other vaping products on Instagram identified in this study align with historical industry tactics to counter regulation and policy changes. In this study, we see evidence in our social media surveillance that the industry responded to increased regulation by modifying product characteristics, labelling or packaging to subvert flavour restrictions and maintain sales.[35–37] A small but substantial number of posts referenced strategies to evade tobacco control policies, including references to non-characterising flavours, 'off-brand' product substitutes, promotion of new flavoured product technologies and alternatives to restricted products and brands, such as disposable, refillable device, e-juice, tank system brands and 'box mod' vaporizers that were not covered by flavour-related regulations. These findings are consistent with prior research showing increased discussion of disposable products and increased public interest and search activity related to disposables following the FDA announced enforcement policy of cartridge-based e-cigarettes.[47 48] Promotion of product 'families' or series that include devices based on different technologies to encourage multiple product use was also present. Our findings indicate that this is one of the tactics used to preserve sales in the context of strengthening regulation of content that may appeal to youth.

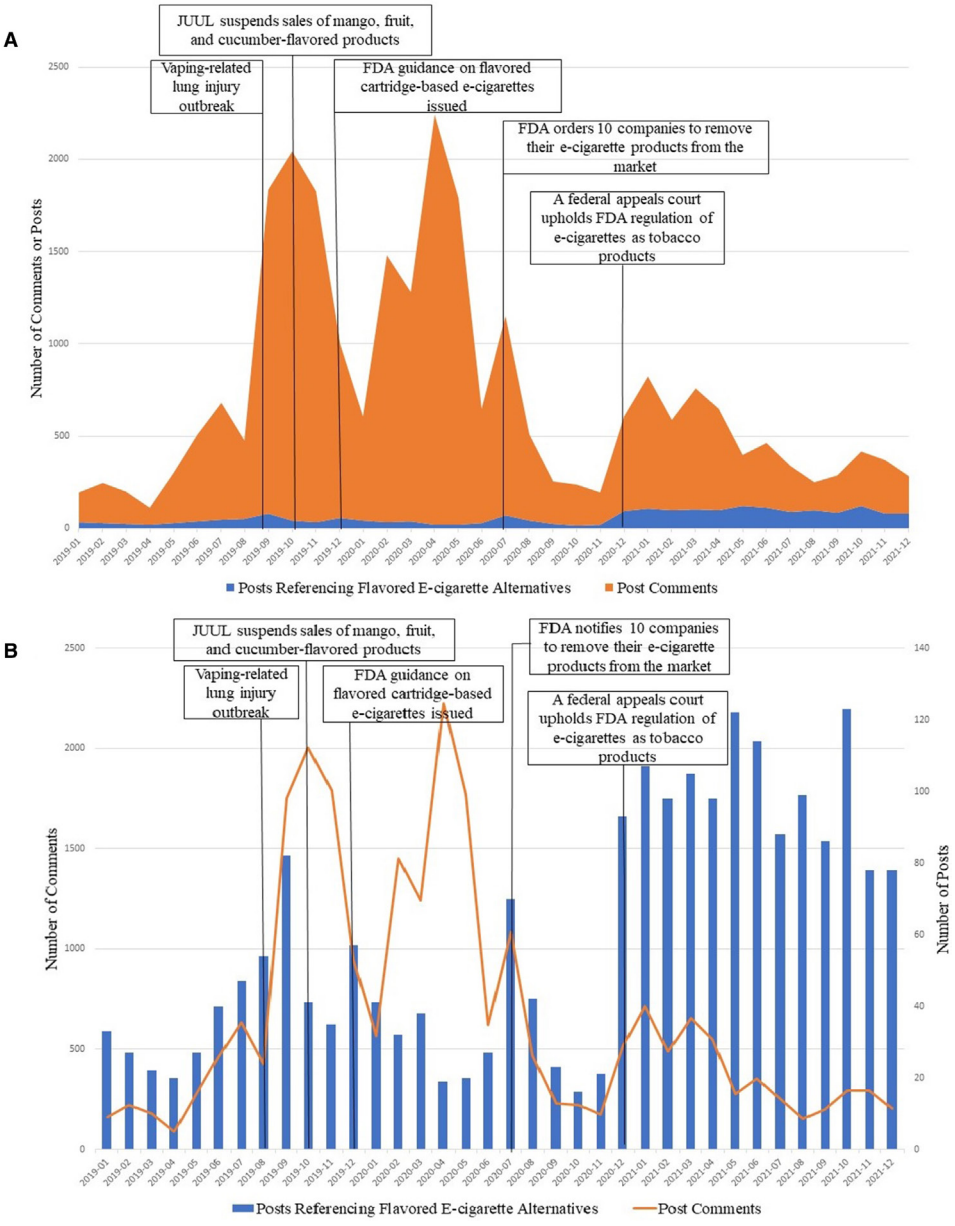

Figure 1 (A) Amount of posts referencing alternatives to restricted flavoured e-cigarette products by month. (B) Amount of posts referencing alternatives to restricted flavoured e-cigarette products by month with adjusted scale to better visualise the number of original posts. *The number of primary posts referencing the flavour alternatives or restriction workarounds ranged from 16 to 123 (right axis) and the number of comments generated by these posts ranged from 153 and 715 (left axis). FDA, Food and Drug Administration.

Our results also demonstrate that the e-cigarette brands and vendors on Instagram use strategies aimed at maximising brand visibility, searchability and virality, such as using popular vape community-related hashtags, incentivising consumer engagement and message dissemination with giveaways and pairing up with influencers or content creators to recruit consumers and promote products. Furthermore, the fact that brands and vendors described themselves as global, offered international delivery and featured global contests and giveaways demonstrates the potential for marketers to leverage global influencer and brand networks to help skirt more stringent local restrictions on flavoured products that impact cartridge-based, disposable and other e-cigarette device types. For instance, US-based influencers and online vendors may evade marketing regulations (local or federal level) by failing to disclose their geolocation on social media. Regulations requiring US-based vendors to disclose their geolocation if present on social networking platforms may facilitate monitoring their activity and compliance with local regulations to prevent evasion.

The study is not without limitations. CrowdTangle social media data capture publicly available posts by influential users (ie, verified users, public figures and entities) and not 'organic' or regular users, which may limit comprehensiveness of the retrieved data due to exclusion of vendor accounts with relatively few followers. However, to maximise retrieval of relevant data, the vape shop account inventory we used to collect CrowdTangle data was initially developed and triangulated using alternative data sources (ie, Nuvi).

Social media surveillance can enhance our understanding of public health needs and policy compliance, as well as inform regulatory strategies for preventing policy evasion. Examining evolving industry tactics to promote flavoured products in

Table 1 Most frequently used hashtags, most frequently mentioned account names and users with the highest post engagement

Users with the highest post engagement					
Vendor posts referencing flavour policy evasion	**Average number of comments per post**	**Vendor posts referencing flavoured e-cigarette products**	**Average number of comments per post**	**All vendor-related posts**	**Average number of comments per post**
vaping_dj	155.6667	elegomall_com	294.5	elegomall_com	412.7204
cloudy_adz	75	vaping_dj	136.448	ave40official	136.1898
geekvape_tech	69	ave40official	128.1585	vaping_dj	134.4679
the_stockwood_vape_reviews	61.96296	thatpinkgirl_x	76.73365	thatpinkgirl_x	86.77307
a_beautiful_mess_00	37.35294	vapingmedia	64.42105	vapingmedia	51.03804

Most frequently mentioned accounts					
Vendor posts referencing flavour policy evasion	**N**	**Vendor posts referencing flavoured e-cigarette products**	**N**	**All vendor-related posts**	**N**
@tubthumpingbrews	57	@fasteddiesvape	2475	@fasteddiesvape	2995
@innokintechnology	54	@flavortronics	1264	@innokintechnology	2057
@disposablevapes	42	@loaded_purge_fam	756	@flavortronics	1608
@xslayerx1985	35	@tubthumpingbrews	731	@purgemods	1591
@smok	34	@innokintechnology	629	@vapingjill	1364

Most frequently mentioned hashtags					
Vendor posts referencing flavour policy evasion	**N**	**Vendor posts referencing flavoured e-cigarette products**	**N**	**All vendor-related posts**	**N**
#vapecommunity	977	#vape	24 788	#vape	54 573
#vape	910	#vapecommunity	23 168	#vapeshop	47 695
#vapenation	790	#vapenation	22 441	#vapecommunity	46 477
#vapefam	756	#vapelife	21 718	#vapenation	46 458
#vapelife	746	#vapeshop	20 789	#vapelife	45 838

response to regulatory changes can help authorities and practitioners assess policy effectiveness and inform future design and implementation approaches.

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