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Heating Up: How Early Twitter Marketing Gave Rise to Organic Word-of-Mouth About Heated Tobacco Products

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Abstract

Social media are an important marketing platform for emerging tobacco products. Heated tobacco products (HTPs) have been introduced in a limited number of local test markets in the United States as potentially reduced-exposure tobacco products. HTPs can be used to heat tobacco as well as marijuana. However, due to growing digital media promotion of these products, it is possible that public knowledge and purchasing opportunities extend beyond test markets. Research on HTP social media promotion is sparse. The objective of the present study is to assess the amount and characterize the content of HTP-related messages on Twitter. We used keyword rules to collect HTP-related posts from the Twitter Historical Powertrack from 1 August 2016 to 31 July 2021. Posts were coded for type (organic, commercial), promotional strategies (e.g., discounts, event promotion), and marijuana co-use mentions using a combination of machine learning methods and human coding. Keyword filters captured 121,012 relevant tweets posted over the period of data collection, with 46,013 (38.02%) tweets featuring commercial content. Findings revealed that there was a two-fold increase in the monthly volume of messages from August 2016 to July 2021. The proportion of organic tweets increased from 29% of all tweets in August 2016 to 73.5% in July 2021. Approximately 20.6% of tweets included mentions of marijuana, and 5,243 posts (4.3%) contained links to online retailers. Promotional tweets featured event promotion, discounts, reduced harm appeals, and fashion appeals. Tobacco control and substance use prevention initiatives should include efforts to monitor the role of social media in promoting organic word-of-mouth and normalizing novel tobacco products.

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Declaration of Conflicting Interests

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Supplemental Material

Supplemental material for this article is available online.

Keywords

social media; advertising and promotion

Introduction

Heated tobacco or “heat-not-burn” products (HTPs) have been introduced in a limited number of local test markets in the United States. However, it is likely that public knowledge and curiosity of HTPs extend far wider than these limited sale locales (Churchill et al., 2020). Extensive digital media promotion is likely to have raised awareness about these products nationwide and globally, particularly among young people. Unlike electronic cigarettes which do not contain tobacco leaves, HTPs heat the tobacco plant matter soaked in glycerol and propylene glycol up to 500°F to create an inhalable aerosol (Centers for Disease Control and Prevention, 2022). Some HTPs use an electronic heating element, which is a specially designed stick, plug, or capsule containing tobacco that heated aerosol passes through to absorb the flavor and nicotine from the tobacco. Other products contain a sealed element within the device that heats loose tobacco, either alone or together with flowers from the marijuana plant (Centers for Disease Control and Prevention, 2022). A third category of HTPs comes in a similar size and shape as a regular cigarette, with a carbon tip wrapped in glass fibers that the user heats with a lighter or match (Centers for Disease Control and Prevention, 2022).

Several HTP brands are available worldwide. In August 2018, the US Food and Drug Administration (FDA) announced approval of Eclipse, a non-combusted cigarette manufactured by R. J. Reynolds (Abcede, 2018). In April 2019, the FDA also authorized the marketing of a tobacco heating system manufactured by Philip Morris called IQOS (US FDA, 2019b), which had been available in several other countries for over 5 years (Truth Initiative, 2020). PMI manufactures and sells the IQOS device and compatible tobacco sticks, known as Heatsticks separately, and a ruling in 2020 allowed these products to be sold in the United States with a claim that the product reduces user’s exposure to harmful or potentially harmful chemicals (US FDA, 2019a). It is note-worthy that PMI’s IQOS, the US market leader, has been banned from sales starting from 29 September 2021, due to patent infringement accusation from RJR (Balji, 2022; Lucas, 2021). PMI is appealing the court ruling and their return to the US market is probable, although uncertain, according to recent reports (Balji, 2022). Another device named Glo is manufactured by British American Tobacco and was released in Russia, Romania, Canada, Switzerland, Japan, and South Korea in 2017. In addition, companies in the United States such as Pax Labs have launched a series of devices, such as Ploom, that heat loose tobacco and marijuana.

The health implications and prevalence of HTP use have not yet been thoroughly studied. Current prevalence is still relatively low and estimated to be approximately 0.7% among the general US population and 2.7% among smokers (Marynak et al., 2018). Early research found lower levels of the most toxic compounds in IQOS emissions compared with cigarette emissions, but cautioned against use due to the significant emission of several organic compounds from product use (Ruprecht et al., 2017). A 2019 review of the literature by

Simonavicius et al. (2019) found that HTPs emitted lower levels of nicotine, tar, carbon monoxide, and harmful or potentially harmful constituents compared to cigarettes. However, recent research studies documented adverse effects of HTP aerosol on lung cells (Leigh, Palumbo, et al., 2018; Leigh, Tran, et al., 2018). The true impact of HTPs cannot yet be known due to the presence of constituents not found in traditional cigarettes that are released during the heating process, and there is a growing scientific consensus that further research is needed to examine the long-term impact of HTP use (St Helen et al., 2018).

HTPs are also not currently subject to many of the regulations on cigarette sales and marketing in the United States. The provision of the 2009 Family Smoking Prevention and Tobacco Control Act (FSPTCA) which banned characterizing flavors (except menthol) in cigarettes, do not apply to non-cigarette tobacco products like heated tobacco (FDA, 2016; Lundeen, 2009), and the presence of flavored HTP varieties raises concerns about youth initiation (Pechacek, 2010).

Recent reports show that HTPs are aggressively marketed to youth and may serve as a means to introduce youth to tobacco (Kirkham, 2019; Myers, 2019) via marketing claims that suggest these products are healthier alternatives to combustible tobacco (McKelvey et al., 2020; Popova et al., 2018). In addition, the restrictions on branded sponsorship of athletic and social or cultural events for cigarettes and smokeless tobacco do not apply to tobacco products like HTPs (Redhead & Garvey, 2010; Singh et al., 2016; Tobacco Control Legal Consortium, 2009; U. S. Department of Health and Human Services, & FDA, 1996), and the FDA has not yet taken action to regulate flavors and sponsorships of these devices (Department of Health and Human Services, & Food and Drug Administration, 2016).

Although there are limited restrictions on all digital marketing of all tobacco products, as of April 2019, paid digital product marketing of newly introduced HTPs (such as IQOS) faces some restrictions. HTP marketers are not allowed to target youth and are required to share strategies used to limit social media exposure among youth with the FDA. Nonetheless, digital influencer promotion of existing HTPs, such as Ploom or Pax, continues to occur (US FDA, 2019c), and the current lack of sufficient oversight may provide an opportunity for the industry to market HTPs more aggressively than cigarettes.

Digital influencer promotion is one example of the “social selling” tactics used by HTP brands to increase “virality” of HTP-related content. Viral marketing is a promotional strategy that “relies on an audience to generate the message of a product or service” (Barnhart, 2020; De Bruyn & Lilien, 2008). Brand social media accounts actively employ strategies to transform communication networks, including networks on digital media, into influence networks to maximize visibility, searchability, and dissemination of brand-related messages (Barnhart, 2020; Berger & Schwartz, 2011; De Bruyn & Lilien, 2008; Erz et al., 2018; Karczmarczyk et al., 2018; Leskovec et al., 2007, 2009; Lin, 1971; Rogers, 2003; Weimann, 1983; Yang & Leskovec, 2011). These tactics include prompting message sharing by incorporating “contagious” social media content, such as popular culture-related references or hashtags, memes, jokes, as well as use of influencer, celebrity, and event promotion (e.g., music event sponsorship) to boost exposure and sharing among potential consumers who are susceptible to or already interested in the product category that the brand

operates in (Barnhart, 2020). Thus, these viral marketing strategies aim to enhance consumer generated shares of official branded content and to promote word-of-mouth (WOM) and brand awareness among organic social media users.

In the past, marketing researchers identified the power of WOM, showing that WOM determines both the flow (or reach) of information and the influence (or perceived credibility) of that information (Lin, 1971; Rogers, 2003; Weimann, 1983). The more personal the connection, the greater the credibility and impact of a message in gaining the viewer's attention, making a favorable impression and ultimately influencing attitudes and adoption of a behavior or purchase of a product (Granovetter, 1973).

More recently, researchers have described WOM that occurs on digital platforms as electronic WOM, or eWOM. Empirical studies have shown that, in fact, eWOM may have a significantly greater effect than any other source of influence on attitudes toward a brand and ultimately purchases (Godes & Mayzlin, 2004). While early research on eWOM established that generally eWOM can cause purchase of products or change of behavior (Leskovec et al., 2007), Berger and Schwartz elaborated on the factors that drive immediate and ongoing WOM, finding that products that "are cued by the environment or are more publicly visible receive more WOM both right away and over time" (Berger & Schwartz, 2011). Environmental cues can include highly effective promotional campaigns. Such cues are frequent reminders of the brand and product, and that individuals want to associate themselves with the brand or product by sharing their knowledge and/or appreciation of that product via eWOM. Thus, it is the perceived independence from a brand's advertising that makes peer-to-peer communication about the brand powerful. The increased trustworthiness of communications within a social network gives the messages greater credibility and impact on behavior (e.g., tobacco use) than traditional advertising (Karczmarczyk et al., 2018).

Since exposure to tobacco marketing on social media has been linked to tobacco use among adolescents and young adults (Evans et al., 1995; Pierce et al., 1998; Soneji et al., 2017), it is critical to determine the amount and characterize the content and sources of HTP-related messages. However, limited information is available on the amount of commercial content and organic eWOM about this emerging product category on social networking sites. The objective of the present study was to fill this research gap. Specifically, the research questions guiding this study are the following:

RQ1. How much commercial and organic content about HTPs is there on Twitter?

RQ2. How did the proportion of commercial and organic messages about HTPs change over time?

Furthermore, with increased liberalization of marijuana use, modalities for administering cannabis are converging with those for tobacco (Hammond et al., 2021). For instance, HTPs are being used to aerosolize marijuana (e.g., PAX brands), and some emerging cannabis products mirror contemporary HTP technologies (Spillane et al., 2021), which emphasizes the importance of capturing information not only about commercial and organic discussion of product types and brands on social media but also about the substances being referenced. Therefore, we posed the following research question:

RQ3. How much commercial and organic content about co-use of cannabis and HTPs is there on Twitter?

Methods

Twitter Data Collection and Cleaning

Keyword rules were used to collect HTP-related posts from the Twitter Historical Powertrack from 1 August 2016 to 31 July 2021. We purchased HTP-related tweets from Gnip, Inc, the official Twitter data provider. A tweet was included in the dataset if it matched one or more of the keyword rules chosen based on the trends, prior literature, and research team expert consensus based on knowledge of HTP-related terminology and brands (Corey et al., 2014). We used Boolean rules rather than individual keywords to make our search filter more efficient, minimize the amount of irrelevant tweets captured, and reduce the number of duplicates. Sample search rules were “Heat not burn,” heatnotburn, “heated tobacco,” “dry herb vape,” dry vape, “dry herb vaporizer,” iqos, iqos heets, heets, iqosus, iqosusa, iqosstore, iqoscommunity, iqosholder, “heet stick,” “heatsticks,” iqosstyle, iqosmag, myiqos, “glo mini,” myglo, neosticks, neostiks, “discover glo,” “glo team,” healcier, kandypensmiva, “vape leaf,” minivap, pax2, “ploom tech,” ploom, and so on. The Gnip Historical Powertrack delivered a collection of posts (in .json format) containing one or more search terms; the resultant data were stored in a NoSQL database, MongoDB, and cleaned using python programming language to create analytic data.

Relevance.—Two coders rated a random sample of 3,451 tweets (sample was stratified by search rule) as relevant and non-relevant to HTPs. The two coders achieved notably high agreement ($\alpha = .95$) on a sample of 300 tweets. This human-coded sample was used to train the machine learning classifier to clean the entire corpus of the tweets. Linear support vector machine (SVM) classifier with L1-norm regularization was selected due to its high performance. Ten-fold cross-validation was utilized to test the accuracy of the classifier (Hastie, 2009). Classifier accuracy was 0.95; classifier recall (sensitivity) was 0.96; classifier precision (positive predictive value) was 0.96 ($F1 = 0.96$).

Twitter Content Coding

An iterative process of combining human coding and machine learning was used to classify all collected tweets. First, we classified the relevant tweets as either *organic/eWOM* or *commercial*. Organic/eWOM posts were those deemed non-sponsored; they reflected individual opinions or experiences or linked to non-promotional content. Commercial posts were defined by presence of any of the following: branded promotional messages; URLs linking to commercial websites; usernames indicating affiliations with commercial sites; or user’s account page consisting only of promotional posts (i.e., spammer accounts).

Two human coders reviewed all tweets posted by a sample of 7,000 Twitter accounts (inter-coder reliability was high: $\alpha = 93\%$). Human coders were used to train linear SVM classifier. Classifier accuracy was validated using 10-fold cross-validation. Classifier accuracy was 0.87; classifier recall (sensitivity) was 0.82; precision (positive predictive value) was 0.82 ($F1 = 0.82$).

A search algorithm was developed to identify tweets as those referencing *co-use of tobacco and marijuana* and those referencing *tobacco use only*. Co-use posts were defined by presence of any references to using HTPs for the purpose of marijuana consumption; any terms referring to marijuana strains; marijuana slang terms such as loud, green, purp, mid, and so on; and any references to being under the influence (“high”) due to marijuana use. Tobacco use-only posts contained references to heated tobacco use exclusively. To describe the posts and account users that saturated HTP-related communication environment, most popular content (top 20 retweets comprised of posts generating 115 retweets and above; 20 accounts with highest posting activity, that is, accounts generating more than 200 posts during the study period, top 20 most frequently mentioned URLs and hashtags) was further reviewed by the research team.

Twitter post metadata were analyzed to assess user geolocation and language of the message. Non-English-language tweets and tweets geo-located outside of the United States were excluded from analyses.

Results

Keyword filters captured 121,012 relevant tweets posted by 48,563 unique users over the period of data collection (Figure 1), with 46,013 (38.02%) tweets identified as commercial and over one third of accounts or 18,333 (34.8%) labeled commercial. There was a spike in HTP-related content in January 2018 when the US expert panel rejected the proposal from PMI to sell its HTP device as a safer alternative to cigarettes. Another sharp increase in online conversation occurred when the FDA approved IQOS for sale in the United States in April 2019. There was another peak in the amount of HTP content on Twitter during IQOS’ launch in test markets in Atlanta, GA, and Richmond, VA, in August 2019 and the outbreak of vaping-induced lung injury from August 2019 to December 2019. In addition, there was a conversation spike when the FDA approved the marketing of IQOS as a “reduced exposure” product in July 2020. Overall, between August 2016 and July 2021, there was a two-fold increase in the monthly volume of messages. The proportion of organic eWOM increased over time, with 29.6% of tweets identified as organic in the first month of data collection versus 73.5% in July 2021.

Most popular hashtags featured in HTP-related tweets included brand mentions (e.g., #iqos, #paxera), product or behavior mentions (e.g., #vape, #cannabis, #herb, #heatnotburn), as well as harm reduction mentions (e.g., #harmreduction) and hashtags denoting opposition to HTP use, health risks, and smoking cessation appeals (e.g., #quitfakesmoking, #endvaping) (Table 1). Popular hashtags also included references to online communities and vaping or smoking lifestyle (e.g., #vapelifewas mentioned in 1,001 posts, #pax-life in 811 posts, #vapers was featured in 497 tweets, #vape-fam in 358 tweets, #vapecommunity received 329 mentions; #cannabiscommunity was referenced in 304 posts). Conversation spikes had to do with HTP-related events, for instance, the FDA approval of IQOS generated a large amount of HTP posts (Figure 1). HTP-related tweets were most frequently geo-located in California, followed by New York, Colorado, and Florida.

HTP brands, news agencies, government organizations, and e-cigarette use advocates were frequently mentioned in relevant tweets. In regard to most active users, e-cigarette advocates were among the most active organic users posting about HTPs on the platform (Table 1). A review of top 20 retweets revealed that most popular retweets included organic user reposts of promotional posts which featured branded product discounts, links to brand websites, and event promotion (Figure 2, Supplemental Appendix 1). Popular retweets also included posts by e-cigarette advocates. Review of these tweets revealed how these users included contradicting information on relative health effects of HTPs and often characterized the products as either cigarettes or electronic nicotine delivery devices (Figure 2; Supplemental Appendix 1). Namely, a subgroup of e-cigarette use advocates referred to HTPs as reduced harm products and promoted their use, while other proponents of e-cigarette use likened HTPs to cigarettes and opposed the introduction of HTPs in the United States as a “conspiracy” to overtake the electronic cigarette market. Most linked content contained online retailer, news, and e-commerce website-related URLs. For instance, relevant tweets included 1,133 links to [Ebay.com](https://www.ebay.com); 1,104 links to the EVape Authority website (<http://www.evapeauthority.com/vaping/pax-ploom/>); and 6,869 links to Reuters new website.

A large proportion of tweets featured mentions of marijuana: 24,893 posts (20.06% of overall content or 36.2% of commercial content) referred to marijuana co-use. There were two spikes in the amount of conversation in February to March 2017 and in December 2017 to January 2018 and the overall increase in the amount of conversation after the vaping-related lung injury outbreak in August 2019 (Figure 3). The earlier conversation spikes occurred largely due to the bot promotion of Pax products (i.e., automated posting activity by robotic account on Twitter disseminating Pax-related promotional posts). The proportion of marijuana-related posts decreased over time for commercial and organic posts as more heated tobacco-only products, including IQOS, were introduced.

Discussion

This study characterizes the promotion of novel HTPs on social media platforms. Many of the appeals found in the HTP social media content examined in this research echo those traditionally used for other tobacco products (i.e., aspirational glamor or style, flavors, sponsored events) (Anderson et al., 2005; Jiang & Ling, 2011; Toll & Ling, 2005). In addition, a substantial proportion of posts about HTPs featured marijuana. While combustible tobacco products have long been adapted by users to facilitate smoked marijuana use (i.e., blunts), to our knowledge, HTPs are the first type of tobacco products to be promoted by commercial entities as being compatible with marijuana, and openly discussed as a delivery system within the marijuana vaping community. Future research should monitor tobacco companies’ strategic expansion into marijuana products in anticipation of marijuana legalization in the United States.

A notable proportion of the social media conversation around HTPs observed in the early years of this study was driven by commercial accounts. This is not surprising given the fact that the product is relatively novel and unknown to many consumers. Social media is a particularly relevant platform for companies to use to teach consumers about new products and coach prospective users in the adoption of HTPs through product demonstration

videos and access to online retail sites for immediate purchase. However, proportion of commercial tweets decreased over time, where over 70% of tweets in August 2016 were commercial versus 26.5% of posts by July 2021. This may indicate that viral marketing and the initial push by commercial accounts to saturate the communication environment on Twitter with HTP-related messages was effective in raising awareness about these products and generating viral organic user WOM content about HTPs, with relatively few initial promotional posts giving rise to sustained organic eWOM.

These marketing strategies are parallel to the approaches previously employed to promote electronic nicotine delivery systems on social media and JUUL electronic cigarettes in particular in recent years, with similar trends in eWOM being observed, where promotional social media content gave way to organic content about the new product category, as well as newly introduced brands overtime (Binns et al., 2014; Huang et al., 2016, 2019). Furthermore, similar tactics were employed by cigarette manufacturers to promote cigarettes among youth and new users in the past (Johnston, 1981; Burrows, 1984; Teague, 1973). One of such strategies was creating a “bandwagon effect” defined by the tobacco industry as the development of the first brand that achieves a 30% share among underage audience (Burrows, 1984; Haugtvedt et al., 2008) by using advertising elements of a brand that would attract young users, such as participation, togetherness and membership in a group, peer pressure, relying on irrational or aspirational appeals, which emphasized that by selecting a product as a usual brand, youth will project an image that will enhance their acceptance among their peers (Kwechansky Marketing Research, 1977; Burrows, 1984; Spitzer et al., 1977).

Social media conversations about HTPs also spiked at distinct periods, which appeared to coincide with regulatory decisions surrounding product availability or promotional activity. The growth in content during these periods could serve as “earned media” for marketers because interest is generated through widely disseminated news stories at no cost to the company. Such coverage could amplify exposure to information around how to use and purchase HTPs among novice consumers.

Even though much of the HTP-related social media content on Twitter included in this study was posted by commercial entities, a substantial amount was also posted by private citizens and self-described advocates. In fact, the amount of organic conversation eventually exceeded the number of commercial tweets (Feng et al., 2015). The diversity in sources of content suggest that even if regulations were effective in restricting direct advertising by tobacco companies on social media platforms, online conversations among individuals who are ostensibly unaffiliated with tobacco companies cannot be similarly regulated.

As a potentially rich avenue for tobacco advertising in an increasingly restricted environment, viral marketing of HTPs promoting branded content dissemination among organic users requires ongoing surveillance by tobacco control researchers. These efforts will be key in ensuring current guidelines are enforced and strengthened if needed to prevent the use of this product by non-tobacco users and young people.

In addition, study findings revealed that conflicting and potentially misleading information on relative health effects of HTPs was present on Twitter. There appeared to be discordant messages within the e-cigarette advocacy community, with a subgroup of e-cigarette use advocates referring to HTPs as reduced harm products and promoting their use and others opposing the introduction of HTPs on the US market and equating them with cigarettes in regard to health risks. Some posts referred to HTPs as e-cigarette products, indicating potential confusion among consumers due to similarities between a growing variety of electronic inhalable nicotine product subtypes. The conflation of these products can have implications not only for the users, but also for policymakers and public health researchers as it may affect the accuracy of surveillance of electronic inhalable product promotion and use in a diverse and expanding market.

While the IQOS product has been removed from the US market and its future uncertain, the industry is likely to continue to innovate in this area. Thus, monitoring HTP-related online discussion and promotion and understanding how digital marketing contributes to HTP use will continue to be important. The current ban of the market leader of HTPs, IQOS, offers an opportunity to reduce the impact of these products over time. Stronger restrictions in marketing will further decrease popularity of the product type as the gap in the market invites other brands to compete.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Biographies

Ganna Kostygina, PhD, is a Senior Research Scientist at the Social Data Collaboratory, NORC at the University of Chicago. Her research agenda centers on advancing communication science and technology for tobacco control and health promotion. Specifically, she has conducted research on topics related to tobacco use prevention and counter-marketing on traditional and digital media channels.

Hy Tran, MS, is a Data Scientist at the Social Data Collaboratory, NORC at the University of Chicago. His research interests include employing natural language processing and machine learning to extract insight from social media and other unstructured data sources. In addition, his work involves data management through creation and automation of data collection, extract-transform-load (ETL), and monitoring pipeline for structured and unstructured data sources, and database administration for data in SQL, MongoDB, and Elasticsearch.

Yoonsang Kim, PhD, is a Senior Research Scientist with NORC at the University of Chicago, and a lead Biostatistician for the Social Data Collaboratory at NORC. She has been conducting methodological research to filter social media data and quantify the assessment of data quality. She is interested in developing measures using social media data to understand public sentiment and social environment around topics such as particular health behavior, health policy, and marketing of health-related products. She is also leading the analyses for the projects that evaluate televised anti-smoking media campaigns and electronic cigarette advertising, and that examine the relationship between exposure to social media related to tobacco smoking and individual's smoking behavior.

Lauren Czaplicki, PhD, is an Assistant Scientist in the Department of Health, Behavior, and Society at Johns Hopkins University. She received her PhD from Johns Hopkins Bloomberg School of Public Health and MPH from Tulane University. Prior to joining the faculty within the Department of Health, Behavior, and Society, she worked as a research investigator at Truth Initiative in Washington, D.C. Her research broadly focuses on corporate influence on population health outcomes and the health policy development process.

Elexis Kierstead, MPH, is a Research Associate at Truth Initiative with a Master's of public health in epidemiology from the George Washington University. She works on the Schroeder Institute policy team to assist in tobacco policy research efforts. Her research interests include the rise of novel e-cigarette products, the intersection of tobacco and health disparities, and relationship between place and tobacco use disparities.

Jennifer Kreslake, PhD, MPH, is a Director at Schroeder Institute, Truth Initiative. She is a public health scientist conducting social and behavioral research on emerging health issues in the United States. Her interests include the health impacts of climate change, with an emphasis on populations at increased risk due to geographic, medical, or socioeconomic factors; social and behavioral dynamics of emerging infectious diseases, including immunization behaviors and adoption of nonpharmaceutical interventions (NPIs); and tobacco control, with an emphasis on product design and perceptions of menthol and emerging tobacco products among high-risk populations.

Sherry Emery, PhD, is a senior fellow at the Social Data Collaboratory, NORC at the University of Chicago. Her interdisciplinary research applies the approaches of health communication, economics, and public policy to understand how both traditional and new media influence health behavior. For over two decades, she focused primarily on the roles that tobacco control and other tobacco-related advertising play in shaping attitudes, beliefs, and tobacco use behaviors among youth and adults.

Barbara Schillo, PhD, is a Senior Vice President, Schroeder Institute at Truth Initiative in Washington, D.C., where she provides leadership for research that examines the impact of tobacco-related policies on youth and young adults. Her research interests focus on research that advances tobacco control policy and practice, including tobacco taxes and local and state point of sale restrictions.

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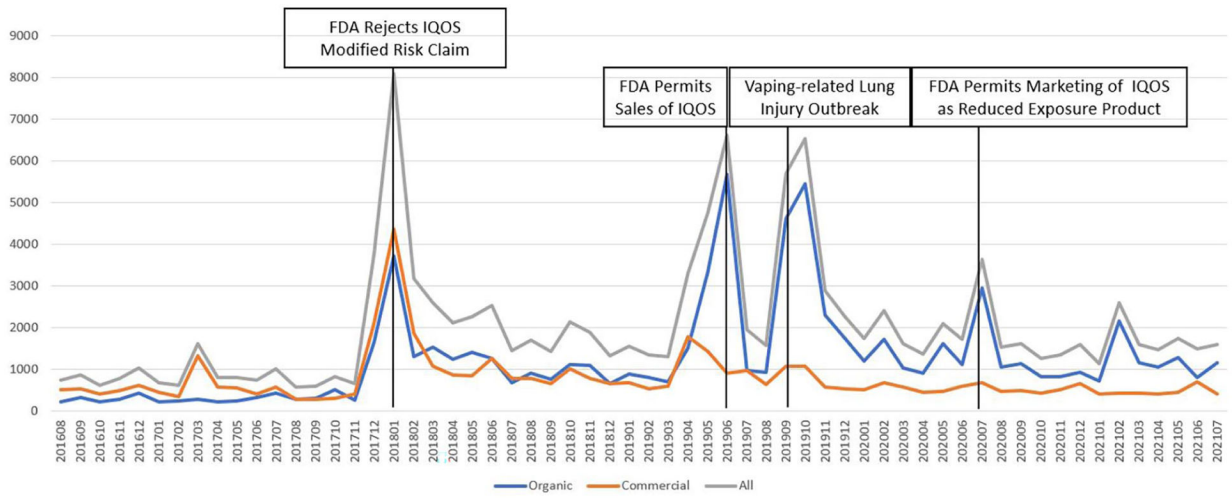


Figure 1. Amount of heated tobacco product tweets by month of data collection.

What IQOS doesn't want you to know

#lvapelvote



It's a war of words and verbiage. Don't be fooled, the IQOS IS #VAPING. It vaporizes tobacco. It is a vaporizer that is vaporizing tobacco. Vaping is a verb. People are scared of a verb.



2:01 PM · Oct 5, 2019 · Twitter for iPad

291 Retweets and comments 541 Likes

Eaze @eaze · Feb 22, 2017
 Tonight only, get a @PaxVapor Era for 50% off on #Eaze! The Era is only compatible with @BloomFarms pods. Limit 1 #Pax #Vaporizer per order.



1 890 41

PAX @PAXvapor · Aug 11, 2015
 @jenszetoWQ is getting a #PAX2 for this shot from our #PartyWithPAX event. Stay tuned for more #PAX events soon!



Got my limited edition #xo PAX signed by The Weeknd. Grab your sign #TheWeekndPAX at Nomad. [instagram.com/p/9r3FD6jG3G/](https://www.instagram.com/p/9r3FD6jG3G/)



I just started watching this is sooooo good!! Thank you @Sethrogen and @PAXvapor for making everyone funny!! #paxvapor #vaping #netflix #comedy

Seth Rogen @Sethrogen · Apr 14, 2018

Learn all about the rarest subspecies of Jewish Cannabis addict, the Stono-Judaicus, on my new Netflix comedy special. Available now!



Figure 2. Sample e-cigarette use advocate tweets opposing heated tobacco products (HTPs) and comparing HTPs to electronic and combustible cigarettes (top row); discount and event promotion (middle row), and celebrity promotion (bottom row).

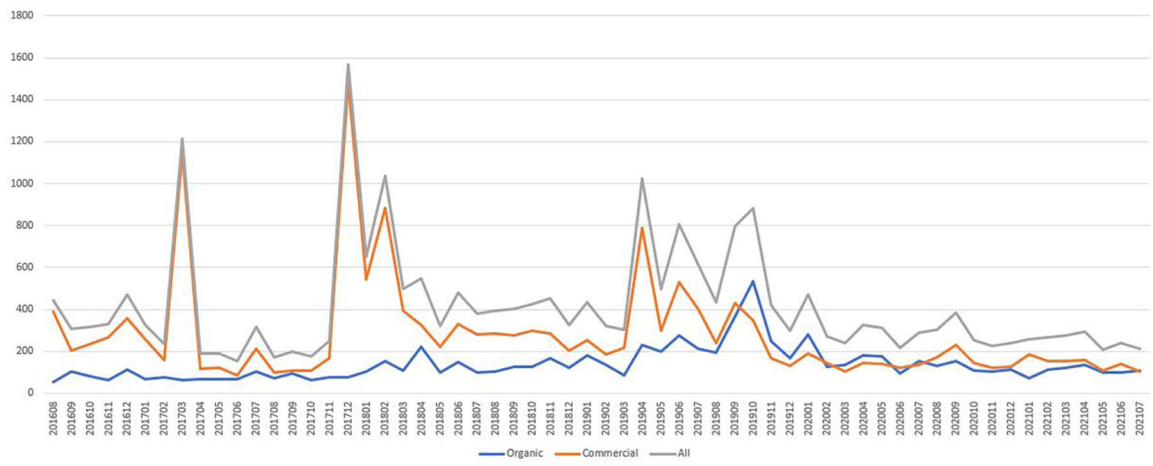


Figure 3.
Amount of marijuana-related tweets by month of data collection.

Table 1.

Popular Twitter Users and Hashtags.^a

	Tweet number	Most popular hashtags	Tweet number	Most mentioned users	Tweet number
HeatNotBurn	1,795	Iqos	8,623	PAXvapor	15,168
BreedersLove	1,090	Vape	4,299	Reuters	2,482
ElixinolCbdOil	1,031	Heatnotburn	3,101	FDAtoBacco	1,790
zamuzal256	606	Cannabis	2,577	InsidePMI	1,713
Net2Ayurveda	572	Herb	2,182	GregTHR	1,370
vapedeals1	510	Vaporizer	2,098	DrGilchrist	1,161
vapechannel	456	Vaping	1,883	US_FDA	993
PAXvapor	407	Harmreduction	1,557	BloomFarms	920
GregTHR	333	Marijuana	1,376	Eaze_Team	871
VapingAve40	320	Quitfakesmoking	1,158	HeatNotBurn	837
[redacted, e-cigarette use advocate]	286	Paxera	1,134	OCCRP	836
[redacted, e-cigarette use advocate]	258	Tobacco	1,113	iqos_support_uk	822

^aNon-corporate individuals' names are redacted.