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From Apple to Werewolf: A Content Analysis of Marketing for E-liquids on Instagram

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Abstract

Introduction: With the growing popularity of refillable e-cigarettes and recent FDA regulatory action on e-liquid warning labels, e-liquids are an increasingly important area of study. At present, however, little is known about how e-liquids are marketed. This study examined e-liquid marketing on the visual social media platform Instagram, on which users have created significant amounts of e-cigarette related content.

Methods: A systematic, random sample of Instagram posts with either #eliquid or #ejuice was collected from the Instagram API during one week in May 2017 and in October 2017 using the Netlytic application. A final sample of 1,000 posts was analyzed using qualitative content analysis to discern e-liquid themes, claims, promotions, and products promoted.

Results: Of the 1,000 posts, 61.1% promoted e-liquid. These posts were most frequently made by vape shops and brand ambassadors/representatives. Almost 80% of promotional posts featured a flavored e-liquid. Posts focused largely on e-liquids tasting good (35.4%) or being cool/edgy (19.0%). Many posts made use of Instagram's visual nature to share creative label designs. Just over a third of posts made some claim about e-liquid benefits or quality, with smokeless tobacco claims being most common. Although posts most commonly originated from the United States, posts made from Indonesia and the United Kingdom were also common.

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Contributors

LL designed the study and took the lead on manuscript development. LL and MW performed codebook development, qualitative coding, and analysis. YC conducted the statistical analysis and assisted with codebook development. PP assisted with manuscript development and interpretation of findings. All have approved the final manuscript.

Conflict of Interest

No authors have conflicts of interest to disclose.

Declarations of interest

None

Conclusions: E-liquid marketing on Instagram emphasizes positive experiences, personalization, and aspirational identities rather than explicit health and cessation claims. Appeal to youth is a significant concern based both on marketing strategies and the demographics of Instagram users.

Keywords

E-cigarettes; Social media; Marketing; E-liquid; Instagram

1. Introduction

Since their introduction to the U.S. in 2007, electronic cigarettes (“e-cigarettes”) have seen significant technological innovation. Advanced personal vaporizers (“APVs”) are now more popular among adolescents and young adults than first-generation disposable/cigalike e-cigarettes (Barrington-Trimis et al., 2018). APVs, also known as mods, are distinct from cigalikes in part because they have refillable tanks where nicotine e-liquid (or “e-juice”) can be added by users. This offers vapers the opportunity for customization of nicotine strengths and flavors (Barrington-Trimis et al., 2018). One early estimate suggested that there were over 7,000 flavors available for vapers to choose from online (Zhu et al., 2014). Although flavors appeal to all age groups, adolescents have been shown to favor flavored tobacco and have reported flavors as a motivation for e-cigarette use (Ambrose et al., 2015; Pepper, Ribisl, & Brewer, 2016).

To date, however, few studies have focused specifically on e-liquid marketing (Jackler & Ramamurthi, 2017; Zhu et al., 2014). E-liquids are purchased on a more regular basis than e-cigarette devices, have a lower price-point, and come in more varieties. Since e-liquids are the source of the aerosol that users inhale from APVs, they are a key site for locating claims about health benefits. E-liquids with nicotine are also key to addiction risks. The U.S. Food and Drug Administration’s (FDA) 2016 Deeming Rule allows the FDA to take enforcement action against e-liquid advertisers who make false, misleading, or unauthorized modified risk claims. Starting in August 2018, the FDA will also require warning statements about nicotine on e-liquid labels and visual advertising for e-liquids. The FDA has indicated that social media platforms are subject to the provisions and plans to develop guidance for compliance on “unique types of media” (Deeming Tobacco Products, 2016).

The present study examines e-liquid marketing on the social media platform Instagram. This platform was chosen in light of the large number of vape shops and small e-liquid brands that market there (Chu, Allem, Cruz, & Unger, 2017; Laestadius, Wahl, & Cho, 2016; Lee et al., 2017), initial evidence of e-liquid ads featuring youth friendly visuals such as unicorns (Jackler & Ramamurthi, 2017), and growing evidence that exposure to e-cigarette marketing on social media is associated with adolescent and young adult e-cigarette use (Pokhrel et al., 2018; Sawdey, Hancock, Messner, & Prom-Wormley, 2017). Instagram is used by 76% of adolescents and 64% of young adults (AP-NORC Center 2017; Pew Research Center, 2018), making youth exposure a particular concern. Findings from this study will help identify the e-liquid themes, claims, promotions, and products that youth and young adults are exposed to on Instagram.

2. Methods

2.1 Data Collection

Systematic random sampling was used to collect Instagram posts related to eliquid. Using Netlytic (Gruzd, 2018), an online software application that has authorized third-party access to the Instagram API, links to the most recent 100 public posts tagged with #eliquid were collected every hour for a one-week period. Data were simultaneously collected for #ejuice, which prior literature has shown to be more popular among Instagram users (Laestadius et al., 2016). Netlytic allows users to download links and descriptive metadata in an Excel format. As Instagram users frequently apply multiple hashtags to the same post (e.g. #ejuice and #eliquid together) and because Netlytic also collected comments made on Instagram posts, the two data sets were merged and all duplicate URLs removed. This process was completed during the first full week of May, 2017 and repeated again in October, 2017, collecting 22,293 and 23,245 unique post links respectively. Two data collection periods were used in order to better capture diversity and growth within in the e-liquid content that users post on Instagram.

For each period, a random sample of 500 posts was chosen for analysis. After waiting three weeks following the end of data collection to avoid capturing posts that users wanted to delete or make private (Laestadius, 2017), each post was manually screen-captured in order to create a static record for analysis. Where post links were dead (61 posts from the May period and 51 posts from the October period), additional links were drawn from a secondary random sample in order to maintain a sample size of 500 posts per period.

2.2. Codebook Development

A codebook was created using a joint inductive/deductive approach (Elo & Kyngäs, 2008). An initial set of codes was created to capture metadata and key marketing themes based on an examination of prior literature on self-reported motivations for ecigarette use (Patrick et al., 2016; Soule, Rosas, & Nasim, 2016), messages known to target youth (Jackler & Ramamurthi, 2017; Kong, Morean, Cavallo, Camenga, & Krishnan-Sarin, 2015), and themes common to e-cigarette advertising on social media (Klein, Berman, & Hemmerich, 2016; Padon, Maloney, & Cappella, 2017; Richardson, Ganz, Stalgaitis, Abrams, & Vallone, 2014; Zhu et al., 2014). Additionally, the FDA Deeming Rule and related guidance documents were examined to create codes that aligned with regulation of claims. A random sample of 50 posts was chosen for codebook development. The unit of analysis was each post, and posts were coded using a qualitative content analysis approach (Schreier, 2012) by LL, MW, and YC with a focus on refining existing codes and identifying novel codes based on themes in the data. Following this, the codebook was finalized and tested on another 50 posts. All posts were discussed, and good agreement was attained. The final codebook contained 54 non-mutually exclusive coding categories, and multiple mutually exclusive sub-codes within these. More broadly, the codebook focused on the following ten topics.

1) Descriptive Metadata—User names, number of followers and following, and likes and comment numbers for each post were recorded. For videos, the number of views was recorded.

2) User type—User type was determined by examining user-information, post content, and store links. Online and brick and mortar stores that sell e-liquid and/or ecigarettes were coded as vape shops, however, stores that also produce and market their own e-liquid were coded as brands/manufacturers of e-liquid. Users indicating that they were vape photographers, vape models, vape reviewers, or manufactures of e-cigarettes were coded as other vape industry. Private persons, vape shop employees, vape teams, and other vape industry users who listed a brand/store in their user-information were coded as ambassadors/representatives.

3) User Location and Language—User locations were discerned through geo-location data, user-information, store links, captions, and hashtags. When hashtag locations were conflicting and no other information was available, the location was recorded as "not specified." Language was coded as English or other. Posts that were partially in English were also coded for comprehension by English speakers.

4) Image Content—Content depicted in the post image/video was coded, including depiction of eliquids, people, and use of illustrations/cartoons.

5) Promotional Practices and Strategies—Posts were coded for promotion of e-liquid or specific e-liquid brands through images, captions, or hashtags. Posts by brand ambassadors/representatives were also coded for sponsorship disclosures. Contests and discounts were coded. Additionally, posts and user information were coded for statements/emoji indicating no sales to minors.

6) Product Information and Flavors—Specifics of the e-liquid product promoted, including flavors, brands, nicotine levels, and references to marijuana. Flavor codes were based on standardized categories from prior literature (Yingst, Veldheer, Hammett, Hrabovsky, & Foulds, 2017), with the addition of a code to capture breakfast food flavors. Flavors could receive multiple flavor codes when a combination of items were present (e.g. "banana pancakes" would be coded as breakfast foods, while "banana pancakes and coffee" would be coded as breakfast foods *and* coffee/tea). When flavors were not clear from the names of e-liquids, coders attempted to find them online in order to code the specific flavors of promoted e-liquids.

7) Marketing Themes—Themes including taste, pleasurable physical and emotional effects, cute, edgy/cool, and sex. Thematic codes were considered holistically, with images/videos, captions, and hashtags functioning as a whole to convey meaning.

8) Health and Product Claims—Cessation, health, modified risk, smokeless tobacco, quality and other claims were coded based on captions, e-liquid packaging depicted in images, and hashtags. This included hashtags that could be claims-making, such as #notblowingsmoke and #vapingsavedmylife.

9) Politics—U.S. focused political statements in opposition to or in favor of regulation were coded.

10) Community and Addiction Hashtags—General community and identity related hashtags, such as #vapefam, #vapelife, and #calivapers, were coded to capture evidence of e-cigarette consumption based sub-cultures (Laestadius 2017; Schouten and McAlexander 1995). Hashtags more narrowly expressing addiction to vaping were also coded.

2.3. Coding and Analysis

The final codebook was applied by LL and MW to the posts from both periods. Google translate was used as needed to translate captions and hashtags into English. Since the study focuses on e-liquid marketing, posts made by users with no ties to the e-cigarette industry (e.g. individual social media users who did not indicate any brand/store sponsorship or affiliation) and posts that did not promote e-liquid were excluded from further analysis. Given the possibility of purchasing e-liquids from abroad and the fact that exposure to social media marketing does not confine itself to national borders, promotional posts were coded regardless of country of origin. All final coding was performed using MAXQDA 2018 software. Coders held weekly meetings to discuss coding questions, refine definitions, and identify any new themes emerging during the coding process. A random sample of 10% of posts (n=100) were double coded by LL and MW across the two coding periods in order to ensure reliability. The estimated intercoder reliability coefficient (Cohen's Kappa) was on average 0.805, with 96.5% agreement between the two coders. In addition to qualitative analysis, we also conducted descriptive quantitative analysis using a robust F-test (using Stata "fstar" module) for continuous variables and Pearson Chi-square Test for categorical variables to explore differences in posting characteristics between different types of users. All quantitative analyses were done with STATA 14 (StataCorp. 2015).

3. Results

3.1 Characteristics of Posters

Of the sample of 1,000 posts with e-liquid related hashtags, 82.5% (n=825) were made by users with some tie to the vaping industry and 61.1% (n=611) promoted eliquid use or specific brands of e-liquid. The remainder of posts were either not promotional or focused on promotion of e-cigarette devices more generally. These posts were not coded on further measures. E-liquid promotion posts most commonly originated from vape shops (40.9%), followed by brand ambassadors/representatives (27.0%), and brands/manufacturers of e-liquid (20.9%). Other members of the vape industry, such as models, photographers, and magazines made up the remaining 11.1% of posts. There was no statistically significant difference in user type between the two sample periods. Although not a statistically significant difference, posts made by brand ambassadors/representatives had on average more comments and likes per post than other commercial user types, despite having fewer followers than other user types. Only 9.1% of posts made by ambassador/representatives disclosed sponsorship at the post level in addition to their user-information. See Table 1 for further detail.

Posts were most commonly made from the U.S. (38.5%), followed by Indonesia (14.6%), and the United Kingdom (9.3%). In total, location could be discerned for 86.4% of posts and 36 different countries were represented in the sample. Despite a broad range of post origins,

71.0% of posts were made entirely in English and another 13.9% of posts had sufficient English content to allow English users to understand post intent without translation.

3.2 Promotions and Products

As displayed in Table 2, posts focused heavily on products. E-liquid bottles/packaging were displayed in 74.3% of posts, compared to just 30.6% of posts depicting individual people. In those posts where people were depicted, it was most frequently through “handchecks,” in which a person holds up their e-cigarette and/or eliquid bottle to the camera (Figure 1). When people were more prominently featured, their faces were often obscured (Figure 2). Posts generally depicted multiple bottles, with a focus on label and packaging design. Over half of posts (53.4%) featured cartoons/illustrations in images or on labels (Figure 3). Flavors were also predominant, with 78.4% of posts depicting or mentioning a flavored e-liquid and 22.3% featuring more than one flavor of e-juice in the same post. No posts featured e-liquids that were determined to be unflavored. Names of flavors ranged from descriptive (e.g. Apple, Strawberry Milkshake, Cinnabomb) to conceptual and youth-/pop-culture derived (e.g. Trap Queen, Bae, Circle Pit, Werewolf). Sweet flavors were prevalent, with fruit (28.8%) and dessert (28.8%) flavors appearing in posts most frequently. By contrast, tobacco flavors were only present in 2.5% of posts. Several posts also mimicked the design of established brands of food products (Figure 1).

More explicitly promotional strategies such as contests, giveaways, celebrities, or discounts were relatively rare. Only six posts mentioned contests to win e-liquid. Thematically, posts focused on the e-liquids tasting good (35.4%) and providing pleasurable physical or emotional effects (13.1%), as well as cute (11.3%) or cool/edgy (19.0%) imagery. Creative ad and label design often worked with e-liquid names to create an element of immersive fantasy (Figure 4). Posts also made frequent use of hashtags to link posts to the broader vaping community, with 89.7% of posts applying community/identity hashtags such as #vapelife or #vapefamily (Figure 1). A smaller subset of posts applied addiction specific hashtags (8.8%), such as #vapeaddicts. Posters disclosed e-liquid nicotine content or featured bottles with printed nicotine content visible in 24.4% of posts, compared to 5.9% of posts with 0 mg nicotine e-liquid.

3.3 Claims and Political Statements

Just over a third of posts made some claim about e-liquid benefits or quality (Table 2). Smoking cessation, modified risk, health benefits, and quality claims were each present in 5% of posts or less. Additionally, claims were often made through somewhat ambiguous hashtags such as #vapeordie and #quitsmoking (Figure 1). The most frequently made claim related to the status of e-liquid and e-cigarettes as a smoke-free product (19.0%). Again, somewhat ambiguous hashtags were common, with #notblowingsmoke featured heavily. Overall, there was a statistically significant difference in use of claims across user types ($p=0.004$), with claims most common in posts from brand ambassadors/representatives (40.6%). US posters made 19 posts that expressed clear anti-regulatory sentiment (e.g. #fighttovape, #supporthr2058) (Figure 1).

4. Discussion

This content analysis of e-liquid marketing on Instagram found that posts have a strong emphasis on flavors and design rather than more explicit marketing strategies such as discounts or contests. Use of high production-value images and well-designed graphics made the most of Instagram as a visual platform. Paired with an emphasis on taste, pleasurable physical and emotional effects, and edgy/cool themes, e-liquid marketing appears to focus on offering consumers a positive experience and aspirational identity rather than practical or health benefits. These themes align closely with alcohol marketing strategies known to appeal to youth (Padon, Rimal, DeJong, Siegel, & Jernigan, 2018) and are also largely consistent with previously documented motivations for vaping among adolescents and young adults, including novelty, flavors, and enjoyment (Saddleson et al., 2016; Pokhrel, Herzog, Muranaka, & Fagan, 2015; Kong, Morean, Cavallo, Camenga, & Krishnan-Sarin, 2015). E-liquid marketing on Instagram is likely to be highly attractive to its large base of adolescent and young adult users.

Identity expression, which is important to youth in particular (Hoek et al. 2011), was perhaps most clearly manifest through the availability of multiple flavors with often youth and pop-culture laden references in flavor names and label designs. E-liquid flavors and marketing referencing Star Wars, zombies, unicorns, pin-up models, and fixed gear bicycles were just some of the interest-specific themes found. Expansive branding allows vapers to choose the e-liquid that best matches up with not just their taste preference, but also their emerging social identities and peer crowd affiliations (Lisha, Jordan, & Ling, 2016). Symbolic consumption theory suggests that vapers may be purchasing well-designed e-liquids as much to express their social identity as to obtain any physiological benefits (Hoek et al. 2011), making these features a key selling point for the e-liquid industry. The fact that almost 90% of posts used vape community or identity related hashtags also indicates that vaping itself has become the basis of a consumption-based subculture (Schouten and McAlexander. 1995). The emergence of vape enthusiasts who post almost entirely about vaping, as well as in person vaping conventions, offer further evidence of vapers as an emerging peer crowd (Laestadius, Wahl, & Cho, 2016; Ben Taleb and Ebrahimi Kalan 2018). The public health implications of vapers being a distinct social identity and peer crowd are an important subject for further study.

Images with people vaping in cool poses also helped convey aspirational identity markers of e-liquids. While the tobacco industry is known to use aspirational identity as a marketing strategy (Hendlin, Anderson, & Glantz, 2010; Toll & Ling, 2005), it is of note that the vast majority of Instagram users in the current sample appeared to be small shops and brands/manufacturers rather than major tobacco companies. Several users made use of hashtags such as #supportyourlocalvapeshop or #supportsmallbusiness to emphasize this point. Limited tobacco industry involvement with APVs, and by association e-liquids, has also been noted in prior research (Seidenberg, Jo, & Ribisl, 2016). This suggests that the e-liquid industry, although largely unaffiliated with the traditional tobacco industry, has learned from these marketing strategies. At the same time, the e-liquid industry appears to be making the most of its ability to fly under the radar of regulators and corporate lawyers by creating

branding that mimics popular brands such as Nilla Wafers, Snickers Bars, and Jack Daniels Whisky.

Another problematic feature of e-liquid marketing on Instagram is the heavy reliance on brand ambassadors/representatives. Almost a third of promotional posts were made by individual people who disclosed some link to the e-liquid/e-cigarette industry. Further, several of the users excluded from analysis due to a lack of brand affiliation indicated in their user-information that they were *looking* for sponsors. Outsourcing marketing in this way helps increase the reach of messages to new audiences and may also make messages more persuasive if they are seen as coming from peers rather than being paid advertising (Laestadius & Wahl, 2017; Nielsen, 2015). The large number of likes and comments on these posts suggests the strategy is effective at generating consumer interest. At present, little is known about these relationships, and the recruitment of individual social media users to market for commercial interests in return for free products or other compensation is an important area for future research. Very few of these users are currently mentioning their relationship with a brand or store at the individual post level in addition to their user-information. As per U.S. Federal Trade Commission (FTC) guidelines informed by deceptive advertising provisions in Section 5 of the FTC Act, disclosures about sponsorship must be clear and conspicuous, meaning they must be easily understood by the audience and located near the product in the post (FTC 2017a). While the FTC does not dictate exact wording of disclosures on social media, including #ad or #sponsored is recommended to indicate a business relationship. In 2017, the FTC sent warning letters to 90 online influencers and marketers about undisclosed material connections between endorsers and advertisers (FTC 2017b). However, given that these letters targeted major influencers and celebrities, it is not clear that ambiguous sponsorship posts made by vapers would attract the attention of the FTC.

Notably, brand ambassadors/representatives were more likely to make claims than vape shops. This may be a means of bypassing FDA regulations since individual citizens have greater protections under the First Amendment, although it is unclear how that right is altered if formal compensation is received by a brand or store (Ciolli, 2007). There does appear to be some precedent for action against these types posts. In 2015, the FDA issued a warning letter to the pharmaceutical company Duchesnay over an Instagram post made by Kim Kardashian where she promoted the company's drug Diclegis with no mention of its risks (FDA 2015). The post was subsequently removed. Even so, many e-liquid claims are vague. For example, it is not clear that #notblowingsmoke should be considered a prohibited claim regarding e-cigarettes as a smoke-free product or if #quitsmoking should be considered a claim about use for cessation. Vague health and cessation claims are also common on Facebook and Twitter (Ramamurthi, Gall, Ayoub, & Jackler, 2016). Further research is needed to determine how social media users actually interpret implicit claims about vaping and eliquid. In addition, the impact of pro-e-cigarette social media posts on implicit attitudes of youth and young adults needs to be examined. Recent research (Pokhrel, Herzog, Fagan, Unger, & Stacy, 2018) shows that even e-cigarette advertising that does not explicitly make health claims may influence non-smoking young adults to implicitly consider e-cigarettes as a safer alternative to cigarettes.

The emphasis on flavors rather than formal claims presents something of a regulatory challenge. While growing evidence suggests that e-cigarettes may be less harmful than cigarettes and may help facilitate adult smoking cessation, there is also a strong indication that e-cigarette use by youth and young adults may lead to smoking initiation (National Academies of Sciences, Engineering, and Medicine, 2018). Accordingly, it is not clear how regulators should balance the potential benefits of flavor choice as a cessation aid for adults (Chen, Zhuang, & Zhu, 2016; Farsalinos et al., 2013) with the fact that over 80% of adolescent e-cigarette users report availability of "flavors I like" as the primary reason for their continued vaping (Ambrose et al., 2015). By contrast, a desire to quit smoking appears to be a common driver of e-cigarette use among adults (Biener & Hargraves, 2015), but less common among youth (Lippert, 2015; Patrick et al., 2016). Yet, the lack of evidence-based FDA approved cessation claims, paired with the absence of a prohibition on flavored e-liquids, largely ensures that marketing will focus on flavors and continue to appeal to youth. While evidence on flavors and cessation continues to be evaluated, the scheduled implementation and enforcement of FDA requirements that nicotine warning statements comprise 20% of the area of any visual advertising should be an immediate priority (21 C.F.R. §1143.3).

In the longer term, the viability of regulating marketing for e-cigarettes on social media platforms should also be explored. This is a critical challenge not just for ecigarettes, but for tobacco more generally. Online marketing of tobacco products remains largely unregulated, in part because the Master Settlement Agreement was written well before the emergence of social media and in part because of First Amendment concerns (Soneji et al., 2018). Prior work has proposed that the restriction of tobacco advertising to only verified adult users may be constitutional, which may be one approach to consider (Soneji et al., 2018; Lindbloom, 2015). To date, social media platforms have struggled with enforcing their own age gates policies for tobacco related pages (Jackler, Li, Cardiff & Ramamurthi, 2018). Instagram does allow for age gates (with age information drawn from both Instagram and Facebook), however, account owners must choose if they want to ask Instagram to restrict their content (Instagram, 2018). Additionally, users may lie about their true ages. Given these difficulties, it would appear that creative and collaborative approaches will be needed to successfully reduce youth exposure to e-liquid content on social media. Finally, the large number of international retailers with English language marketing indicates that further attention should also be paid to the import of e-liquids.

4.1 Limitations

Our findings should be considered with some limitations. First, qualitative content analysis involves some level of subjectivity. This was minimized through use of two trained coders, ongoing coding meetings, and the use of double coding, however, some variation between coders is inherent. Second, data reflect e-liquid posts at specific moments in time and may not be fully generalizable to the complete body of e-liquid posts. The collection of data every hour over a full week at two different time periods helps to strengthen the data in this regard. Out of concern for social media research ethics, data were also limited to public posts and posts that remained online three weeks after posting. Additionally, posts without either the #eliquid or #ejuice hashtags were not captured for analysis. Finally, not all e-

liquids in the sample may be available for purchase by U.S. residents despite posts being primarily written in English.

5. Conclusions

E-liquid marketing emphasizes positive experiences, personalization, and aspirational identities, with an emphasis on fruit and dessert/sweet flavors, visually pleasing designs, and immersive branding. Appeal to youth is a significant concern based both on marketing strategies and the demographics of Instagram users. Strategies to reduce youth exposure to tobacco product marketing on social media remain critical.

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Highlights

- E-liquid marketing on Instagram emphasizes positive experiences and personalization
- Marketing posts made the most of Instagram as a visual platform
- Fruit and dessert/sweet flavors of e-liquid are commonly promoted
- Individual social media users are serving as brand ambassadors
- Posts were most commonly made by users based in the United States, but posts made from Indonesia and the United Kingdom were also common

Figure 1.
Instagram post using promotional and political messages

Figure 2.
Images from Instagram posts depicting vaping

Figure 3.
Instagram post depicting illustrations on e-liquid packaging

Figure 4.
Images from Instagram posts using creative branding to promote eliquid

Table 1.

Descriptive statistics of Instagram e-liquid marketing posts by user type

	Mean (SD) or Percent					
	Total	**Ambassador/ Represent.**	**Brand/ Manuf.**	**Vape shop**	**Other vape industry**	**P[a]**
N	611	165	128	250	68	
Post metadata						
Views	795.1 (12823.5)	292.9 (1523.4)	3.3 (25.2)	1815.7 (20561.3)	38.3 (140.8)	0.617
Likes	127.9 (413.6)	150.6 (268.7)	81.6 (75.0)	132.9 (596.6)	141.1 (203.8)	0.506
Comments	7.6 (121.5)	21.8 (233.6)	2.7 (3.5)	2.2 (6.6)	2.5 (2.6)	0.350
Posts	1072.5 (2335.4)	1022.1 (1584.1)	844.9 (1730.5)	916.9 (2324.1)	2195.4 (4035.7)	0.014
Followers	9916.2 (36178.7)	5731.3 (15247.9)	8365.7 (15336.4)	10660.1 (47198.8)	20254.0 (49644.0)	0.162
Following	1872.4 (2139.4)	2377.4 (2248.3)	1880.4 (2092.7)	1599.1 (2103.9)	1636.6 (1893.4)	0.001
Geographical area						<0.001
Africa	0.5%	0.0%	0.8%	0.8%	0.0%	
Asia/Pacific	21.3%	4.2%	20.3%	35.6%	11.8%	
Europe	17.7%	19.4%	14.1%	18.4%	17.7%	
Latin America	1.5%	1.2%	1.6%	2.0%	0.0%	
Middle East	2.6%	0.6%	1.6%	5.2%	0.0%	
North America	42.9%	47.9%	55.3%	33.6%	39.7%	
Not Specified	13.6%	26.7%	5.5%	4.4%	30.9%	
Language						<0.001
English	71.0%	91.5%	82.0%	46.8%	89.7%	
Other (English Comprehension)	13.9%	5.5%	8.6%	25.2%	2.9%	
Other (No English Comprehension)	15.1%	3.0%	9.4%	28.0%	7.4%	
Media type						<0.001
Images	93.9%	85.4%	97.7%	97.6%	94.1%	
Video	6.1%	14.6%	2.3%	2.4%	5.9%	

[a]Statistical significance tests were based on the robust F-test (using Stata, fstar) for continuous variables and Pearson Chi-square Test for categorical variables.

Table 2.

Instagram e-liquid marketing practices by user type

	Mean (SD) or Percent					
	Total	**Ambassador/ Represent.**	**Brand/ Manuf.**	**Vape shop**	**Other vape industry**	**p[a]**
Promotion type						
Eighteen and over	22.3%	18.8%	24.2%	24.0%	20.6%	0.576
Discount/sale	6.7%	8.5%	6.3%	6.8%	2.9%	0.490
Celebrities	0.2%	0.0%	0.8%	0.0%	0.0%	0.286
Image content						
E-liquid bottle	74.3%	63.6%	73.4%	84.4%	64.7%	<0.001
Cartoons/illustrations	53.4%	37.6%	50.8%	65.6%	51.5%	<0.001
Exhaling	9.7%	18.8%	10.2%	3.2%	10.3%	<0.001
Person						<0.001
Female	7.0%	11.5%	7.0%	2.8%	11.8%	
Male	9.2%	15.8%	8.6%	5.2%	8.8%	
Mixed	1.3%	0.6%	3.9%	0.0%	2.9%	
Handcheck	13.1%	18.8%	16.4%	8.4%	10.3%	
No Person	69.4%	53.3%	64.1%	83.6%	66.2%	
U.S. Political Statement						<0.001
Anti-regulation	3.1%	4.9%	4.7%	2.0%	0.0%	
Other/unclear	0.5%	0.0%	2.3%	0.0%	0.0%	
No U.S. pol. statement	34.9%	35.8%	45.3%	28.4%	36.8%	
Non-US posts	61.5%	59.4%	47.7%	69.6%	63.2%	
Flavor						
Tobacco	2.5%	2.4%	3.1%	2.8%	0.0%	0.557
Menthol/mint	7.2%	4.9%	6.3%	10.0%	4.4%	0.154
Fruit	28.8%	20.6%	31.3%	34.4%	23.5%	0.015
Dessert/sweets	28.8%	27.9%	28.1%	32.4%	19.1%	0.188
Alcohol	2.3%	0.6%	3.9%	2.8%	1.5%	0.253
Nuts/spices	0.8%	0.6%	0.0%	1.6%	0.0%	0.309
Candy	11.3%	10.3%	9.4%	12.4%	13.2%	0.755
Coffee/tea	3.8%	1.2%	7.0%	4.0%	2.9%	0.075
Other beverage	13.4%	12.1%	7.0%	17.2%	14.7%	0.048
Breakfast/foods	8.5%	5.5%	7.0%	11.2%	8.8%	0.198
Other flavor(s)	11.5%	16.4%	9.4%	10.0%	8.8%	0.142
Any flavor	78.4%	67.9%	80.5%	88.0%	64.7%	<0.001
Product description						
Nicotine	24.4%	15.2%	18.8%	34.4%	20.6%	<0.001
Nicotine free	5.9%	5.5%	5.5%	7.2%	2.9%	0.585
Marijuana	1.3%	1.8%	1.6%	0.8%	1.5%	0.823
Themes						

	Mean (SD) or Percent					
	Total	**Ambassador/ Represent.**	**Brand/ Manuf.**	**Vape shop**	**Other vape industry**	**P[a]**
Taste	35.4%	29.1%	43.8%	39.6%	19.1%	0.001
Pleasurable effects	13.1%	7.9%	17.2%	16.8%	4.4%	0.004
Community/social	4.1%	4.9%	5.5%	1.6%	8.8%	0.034
Cute	11.3%	6.1%	7.0%	17.6%	8.8%	0.001
Edgy/cool	19.0%	23.0%	16.4%	18.4%	16.2%	0.438
Sex	3.8%	4.9%	3.1%	3.2%	4.4%	0.807
Humor	1.6%	1.2%	1.6%	0.8%	5.9%	0.031
Tricks	5.1%	11.5%	3.9%	1.2%	5.9%	<0.001
Any theme	63.8%	64.2%	74.2%	61.6%	51.5%	0.012
Claims						
Cessation	5.4%	3.0%	7.8%	6.8%	1.5%	0.099
Modified risk	3.0%	4.9%	0.8%	2.8%	2.9%	0.240
No smoke	19.0%	29.7%	17.2%	11.6%	23.5%	<0.001
Health benefits	5.1%	6.7%	2.3%	6.0%	2.9%	0.268
Quality	4.3%	1.8%	9.4%	3.6%	2.9%	0.011
Other claims	3.4%	3.0%	7.0%	2.8%	0.0%	0.051
Any claim	32.7%	40.6%	39.1%	25.6%	27.9%	0.004
Hashtags						
Addiction hashtags	8.8%	11.5%	8.6%	6.8%	10.3%	0.400
Other community-identity hashtags	89.7%	97.0%	93.8%	82.0%	92.7%	<0.001

[a]Statistical significance tests were based on Pearson Chi-square Test.