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Publication Date

2015-11-01

DOI

10.1016/j.drugalcdep.2015.08.032

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Exploring the e-cigarette e-commerce marketplace: Identifying Internet e-cigarette marketing characteristics and regulatory gaps[☆]



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ARTICLE INFO

Article history:

Received 1 April 2015

Received in revised form 24 August 2015

Accepted 28 August 2015

Available online 26 September 2015

Keywords:

Electronic cigarettes

e-Cigarettes

Nicotine delivery

Internet sales

Vaping

Regulatory science

ABSTRACT

Background: The electronic cigarette (e-cigarette) market is maturing into a billion-dollar industry. Expansion includes new channels of access not sufficiently assessed, including Internet sales of e-cigarettes. This study identifies unique e-cigarette Internet vendor characteristics, including geographic location, promotional strategies, use of social networking, presence/absence of age verification, and consumer warning representation.

Methods: We performed structured Internet search engine queries and used inclusion/exclusion criteria to identify e-cigarette vendors. We then conducted content analysis of characteristics of interest.

Results: Our examination yielded 57 e-cigarette Internet vendors including 54.4% ($n = 31$) that sold exclusively online. The vast majority of websites (96.5%, $n = 55$) were located in the U.S. Vendors used a variety of sales promotion strategies to market e-cigarettes including 70.2% ($n = 40$) that used more than one social network service (SNS) and 42.1% ($n = 24$) that used more than one promotional sales strategies. Most vendors (68.4%, $n = 39$) displayed one or more health warnings on their website, but often displayed them in smaller font or in their terms and conditions. Additionally, 35.1% ($n = 20$) of vendors did not have any detectable age verification process.

Conclusions: E-cigarette Internet vendors are actively engaged in various promotional activities to increase the appeal and presence of their products online. In the absence of FDA regulations specific to the Internet, the e-cigarette e-commerce marketplace is likely to grow. This digital environment poses unique challenges requiring targeted policy-making including robust online age verification, monitoring of SNS marketing, and greater scrutiny of certain forms of marketing promotional practices.

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1. Introduction

Electronic cigarettes (e-cigarettes) were virtually unknown ten years ago, but are now rapidly growing in popularity in various countries (Ayers et al., 2011). This novel electronic consumer product, first introduced in the United States in 2007, converts concentrated liquid nicotine (e-liquid) into a vapor, which is then inhaled, or “vaped” by the user through different delivery systems

(e.g., look-alikes, pen-style, “Mods”, and disposables; Farsalinos and Polosa, 2014; Huang et al., 2014b; Yamin, 2010). The growing popularity of e-cigarettes can be measured by their burgeoning sales in countries such as the U.S., a primary market for e-cigarettes. In 2007, U.S. sales brought in a modest \$5 million per annum with sales now estimated at some \$2.2 billion as of May 2014 accompanied by rapid increases in promotional expenditures (Herzog et al., 2014a; Kornfield et al., 2015). The product landscape is wide and varied, with an estimated 460 brands and thousands of flavors available for sale in brick-and-mortar “vape” shops, in chain convenience stores, as well as from online vendors (Herzog et al., 2014a; Zhu et al., 2014).

Historically, the e-cigarette industry has not been subject to regulation or advertising restrictions, which has encouraged uncontrolled market expansion. As a result, advertising expenditures

[☆] Supplementary materials for this article can be found by accessing the online version of this paper.

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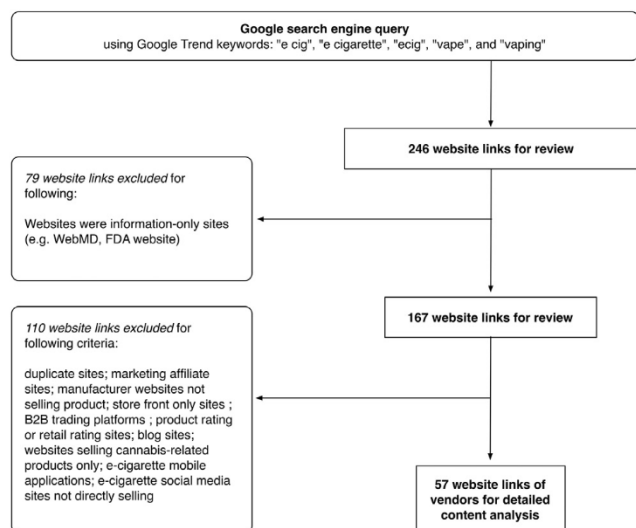


Fig. 1. Study website inclusion and exclusion protocol and Google trends electronic cigarette key search terms.

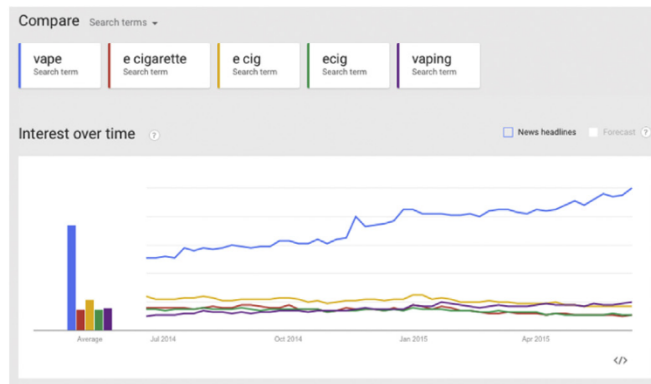
tripled from 2011 to 2012, when the industry spent \$18.3 million on magazine, television, newspaper and Internet ads (Kim et al., 2014). Although e-cigarette Internet advertising expenditures are lower than expenditures in traditional media formats (i.e., print, TV), the Internet's growth potential as a cheap and accessible marketing tool to promote e-cigarette uptake needs to be examined. In fact, industry analysts now estimate that online sales make up approximately 25–30% of the \$2.2B e-cigarette market, though exact figures are difficult to track (Herzog et al., 2014a,b). Another study examining tobacco and e-cigarette online banner/video advertisements in the USA and Canada found that an estimated \$2 million was spent by the industry between 2012 and 2013 on the web (Richardson et al., 2015).

As e-cigarette sales have increased, so have calls for Federal regulation of this new nicotine delivery technology. In April, 2014, the U.S. Food and Drug Administration (FDA) proposed regulations that for the first time would govern the use, sale, marketing, and manufacturing of e-cigarettes, and will likely establish a minimum purchasing age, require product package warnings, and set product standards once promulgated (Cobb et al., 2015; "Deeming Tobacco Products To Be Subject to the Federal Food, Drug, and Cosmetic Act," 2014). Importantly, the proposed regulations do not specifically regulate or prohibit online e-cigarette sales, though their general requirements could be interpreted as applicable to online vendors ("Deeming Tobacco Products To Be Subject to the Federal Food, Drug, and Cosmetic Act," 2014). Hence, given the growth of the e-cigarette market and ubiquitous access online, a more detailed assessment of the e-cigarette e-commerce marketplace is critical to inform interpretation of FDA regulations as well as in guiding future regulatory science.

To date, a handful of studies have attempted to describe e-cigarette Internet vendors and their online marketing by focusing on: the number of product brands; presence of flavors, nicotine strengths and ingredients; product claims; representation of health claims; volume and topic areas/themes of online marketing; assessing characteristics of online banner/video advertisement; and examining the relationships between affiliate networks and Internet vendors (Cobb et al., 2015; Grana and Ling, 2014; Richardson et al., 2015; Zhu et al., 2014). Expanding on this research, this study describes additional e-cigarette Internet vendor characteristics not previously explored, including vendor geographic locations, use of online sales promotion strategies, use of social networking platforms for marketing, and reexamining age

Google Trends E-Cigarette Key Search Terms (past 12 months)

We first identified 13 keywords used in prior research on e-cigarette Internet marketing (Zhu S-H, et al, 2014 and Grana & Ling, 2014). We then identified a subset of these keywords that were the top five search terms based on "interest over time" results from Google Trends. Analysis of keywords using Google Trends was conducted prior to start of structured Internet search engine queries in beginning of June 2015. See below comparison in search interest over time for top five keywords identified used in this study



verification processes in order to further inform future policy making on this issue.

2. Methods

2.1. Structured web searches and vendor identification

The first phase of this study involved conducting structured Internet search engine queries using the five most popular e-cigarette-related key search terms "e cig", "e cigarette", "ecig", "vape" and "vaping" based on results from Google Trends on search term interest over the past 12 months. We then used Google search engine to query these popular e-cigarette-related search terms based upon Google's overwhelming popularity among English-speaking Internet users and its large volume of global users/traffic (Sullivan, 2013). Google Chrome browser (with all Google user accounts deactivated) was used to conduct searches in the "incognito" browser mode in order to minimize the influence of browser history, user cookies, and search history when performing searches. We then collected the website addresses for the first five pages of organic search results (i.e., not including sponsored links) which is a sampling methodology consistent with prior studies indicating Internet users rarely access websites beyond these search results (Liang et al., 2011, 2012; Lorigo et al., 2008). Using results from our search engine queries, we then constructed a list of websites to be analyzed in the study.

2.2. Website content analysis

In the second phase we reviewed the content of each website and applied an inclusion and exclusion criteria (see Fig. 1) to identify e-cigarette Internet vendors (defined as websites actively engaged in the sale of e-cigarettes or liquid nicotine direct-to-consumer) similar to a methodology utilized by Zhu et al. (2014). Following identification of sites we categorized as e-cigarette Internet vendors, we then conducted content analysis, whereby we coded characteristics of interest. Characteristics reviewed included information on the location of e-cigarette Internet vendors (specifically primary business address and IP address location geocoded and visualized using ArcGIS, Redlands, CA: ESRI); use of different sales promotion strategies (i.e., social media marketing and promotional incentives); use of age verification procedures; and representation of product safety and health warnings.

The first author and second author independently reviewed website content and coded website characteristics. Inter-coder reliability between reviewers was high for both the inclusion criteria for websites (0.98) and for coding of all categories measured (with all Cohen's kappas greater than 0.85 and with a mean score of $k = 0.93$.) All three authors received identical training for applying website inclusion/exclusion criteria and for coding website characteristics. When there was a discrepancy between the first and second authors, all three trained authors revisited the sites and agreed upon the best decision. A detailed description of the review and coding procedures is provided in the Supplementary Table.¹ SPSS v.20 (IBM: Armonk, NY) was used for all data analyses.

¹ Supplementary material can be found by accessing the online version of this paper.

2.3. Period

Structured search engine queries were conducted in a one-week period in June 2015 to minimize potential variation in search query results. Following this initial identification of search engine results, we applied our inclusion/exclusion criteria and conducted content analysis from end of June, 2015 – middle of July, 2015. This time period is prior to the FDA finalizing its e-cigarette rules/regulations.

3. Results

Applying our search query strategy yielded a total of 246 website links for review. Websites featuring news articles (e.g., Reuters), reference sites (e.g., Wikipedia) or that constituted health or information-only sites (e.g., WebMD, FDA website) were excluded ($n=79$), leaving 167 remaining websites for further in-depth review. An additional 110 websites were excluded due to the following criteria: duplicate sites; marketing affiliate sites not directly selling e-cigarettes but that provided a link to an e-cigarette vendor (e.g., product review site with links to products/vendors for sale); corporate e-cigarette industry or manufacturer websites (i.e., not selling product); e-cigarette store front only sites (i.e., do not sell online); links to wholesale B2B trading platforms (i.e., that do not directly sell product but offer a marketplace for other vendors to sell products); product rating or e-cigarette retail rating sites (e.g., Yelp, “The Best Electronic Cigarette Guide for 2015); blog sites; websites that only sold cannabis-related products; websites advertising e-cigarette mobile applications; and e-cigarette-related social media sites not directly selling online (e.g., YouTube Channel, reddit search results, Twitter hashtag site, user forums, etc.). Applying this methodology, 57 of the 246 (23.2%) websites met our inclusion criteria as e-cigarette Internet vendors and were further examined for characteristics of interest described below. Key findings are summarized in Table 1.

3.1. Geographic locations and business models

Of the 57 Internet e-cigarette vendors reviewed, the vast majority (96.5%, $n=55$) listed a primary business address in the United States, including the states of California (29.3%; calculated based on subset of websites listing a USA address), Florida (12.1%), New York (6.9%) and Texas (6.9%) (see Fig. 2). Only two vendors were based outside of the USA: one in Hong Kong and one in China. We confirmed by proceeding through the ordering process that both of these international sites sell to U.S. and other international customers. Additionally, 86.0% ($n=49$) of IP addresses associated with these sites were located in the United States with the remaining eight located in Canada ($n=7$) and Germany ($n=1$). The registrars for these websites included several large domain name and web hosting companies, with GoDaddy.com, LLC, acting as the registrar for 64.9% ($n=37$) of all online vendors.

From a business model standpoint the majority (54.4%, $n=31$) of observed vendors operated and sold products exclusively online. The remaining 45.6% percent ($n=26$) were hybrid vendors that operated both an online store and had a retail establishment(s) to sell and market their products (e.g. a vape shop.) Additionally, 59.6% ($n=34$) offered wholesale opportunities for their products to third-party vendors and distributors and 35.1% ($n=20$) actively offered affiliate marketing opportunities to increase their Internet presence.

3.2. Sales promotion strategies

E-cigarette Internet vendors actively used social network services (SNS) by placing links to social media-related promotional content on their vendor websites and posting multimedia content on SNS platforms (e.g., sales promotion offers, product reviews, videos/pictures positively depicting vaping lifestyle). Of the

Table 1
Select electronic cigarette Internet vendor marketing characteristics.

	Age verification?	Wholesale distribution	Affiliate marketing	Consumer warning > 1	Promotional strategies		SNS marketing use			
					Promo codes	Reward system	New customer	Facebook	Twitter	Instagram
Internet only vendors ($n=31$)	20 (64.5%)	20 (64.5%)	14 (45.2%)	23 (74.2%)	19 (61.3%)	8 (25.8%)	2 (6.5%)	15 (48.4%)	18 (58.1%)	13 (41.9%)
Hybrid vendors ($n=26$)	17 (65.4%)	14 (53.8%)	6 (23.1%)	16 (61.5%)	11 (42.3%)	5 (19.2%)	4 (15.4%)	15 (57.7%)	18 (69.2%)	11 (42.3%)
Total ($n=57$)	37 (64.9%)	34 (59.6%)	20 (35.1%)	39 (68.4%)	30 (52.6%)	13 (22.8%)	6 (10.5%)	30 (52.6%)	36 (63.2%)	24 (42.1%)

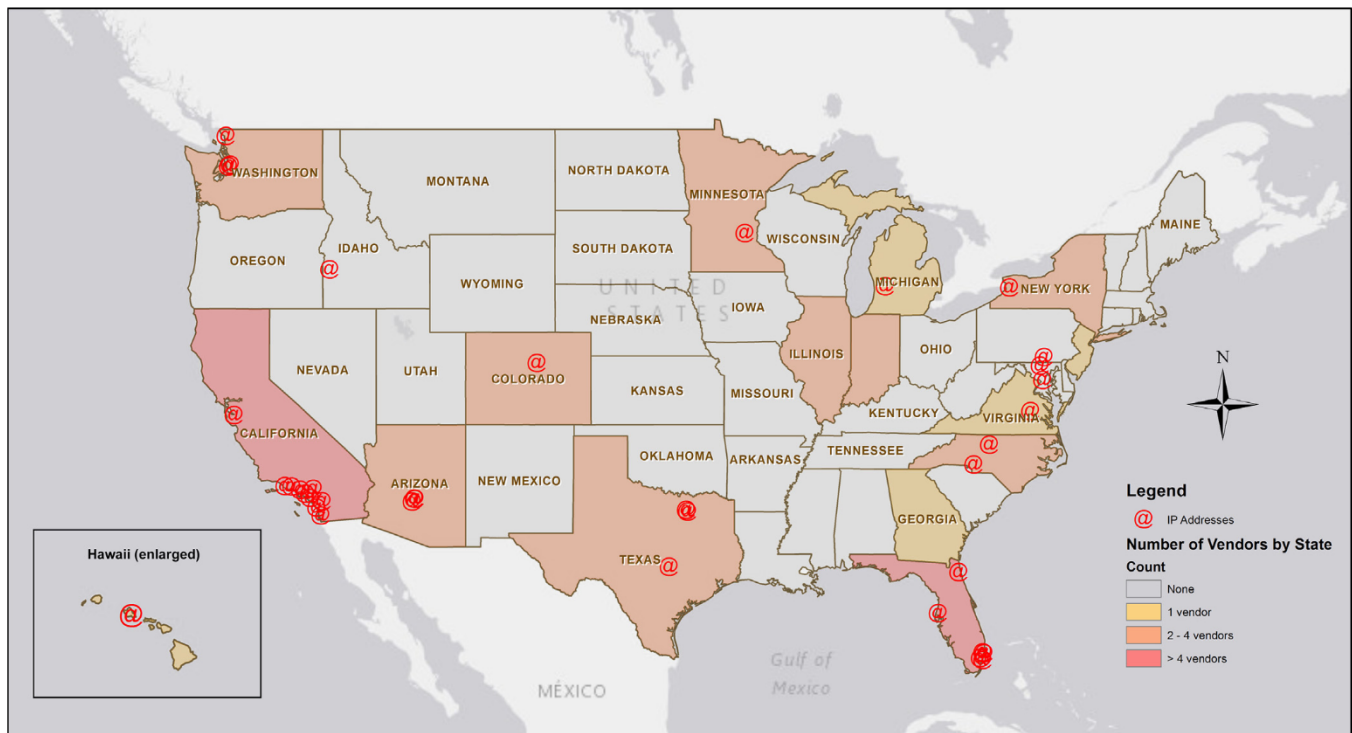


Fig. 2. Map of USA-based electronic cigarette vendors and their associated IP addresses.

fifty-seven vendors, 70.2% ($n = 40$) had more than one SNS link with Twitter (63.2%) Facebook (52.6%), and Instagram (42.1%), the three most commonly utilized platforms. There was an average of 2.6 SNS platforms utilized per site, reflecting active SNS engagement. Additionally, 42.1% ($n = 24$) used more than one promotional strategy to attract customers. The use of “Promo codes” was quite prevalent, with 52.6% ($n = 30$) of vendors offering promo/discount codes to be applied at checkout; followed by 22.8% ($n = 13$) offering either a reward point system or loyalty program discount; and 10.5% ($n = 6$) offering discounts for referring new customers. Of the two international vendors, both used multiple forms of SNS and one used multiple sales promotion strategies.

3.3. Age verification

Of all the e-cigarette Internet vendors reviewed, 64.9% ($n = 37$) used a form of age verification. The vast majority of these sites (61.4%, $n = 35$) required users to simply click a pop-up or dialog box self-verifying a user's age as above 18-years or the permitted age of e-cigarette use in the users' jurisdiction. Conversely, 35.1% ($n = 20$) had no detectable age verification at any point during the purchasing process. Of the international sites reviewed, one had age verification while the other did not. The most robust age verification observed was from two USA-based sites that required users to enter their date of birth or to verify DOB via a Facebook SNS login prior to viewing products (though verification of DOB did not appear to be confirmed through a reliable third-party data source.)

3.4. Product and safety warnings

Only 68.4% ($n = 39$) of all vendors posted more than one consumer health-related warning. Ten (17.6%) of the vendors, including one of the international sites located in Guangdong, China, surprisingly posted no detectable health warnings. Warnings prominently displayed on vendors' websites included those against underage use (78.9%, $n = 45$) and health risks associated

with use by pregnant or breastfeeding women (59.6%, $n = 34$). Warnings discouraging underage use included various non-standardized phrases: “underage”; “children”; “under 18”; “under 21”; or “under the legal smoking age where you live”. Other warnings were product specific, including that “e-cigarettes had not been evaluated by the FDA” (43.9%, $n = 25$), were not smoking cessation devices (54.4%, $n = 31$), and describing nicotine as an addictive substance (59.6%, $n = 34$). Warnings appeared in several disparate locations, including the footer of the web page, the frequently asked questions section, About Us or in the Terms and Conditions of the website. Warnings in footers appeared in smaller font compared to other website text and were generally much less prominent than promotional messaging.

4. Discussion

The aim of this study was to expand understanding of the e-cigarette Internet vendor environment in order to identify unique marketing characteristics utilized by this alternative form of access. The results of this study also inform the applicability of proposed FDA e-cigarette rules in the context of online sales, identify possible regulatory gaps, and may aid in the development of future regulatory science mechanisms to address unique challenges of online promotion and sale of e-cigarettes.

To begin, accurate estimates of the exact number of e-cigarette Internet vendors are difficult to quantify, but examining their geographic location provides insight regarding where the industry is currently concentrated. From the perspective of a USA-based consumer using a search engine to query popular e-cigarette key terms, the vast majority of English-language e-cigarette Internet vendor search results we found were located in the United States. However, we also identified two vendors operating outside the U.S., raising questions of whether FDA rules provide sufficient regulatory authority/oversight over these international-based websites and their importation of e-cigarette and e-liquid products. This is particularly important given reports and scientific studies identifying

the presence of hazardous particles and safety issues (overheating, etc.) in poor quality e-cigarettes manufactured by smaller Chinese firms (Barboza, 2014; Williams et al., 2013). A possible mechanism to regulate these international sites was our finding that the IP location for the Chinese vendor was located in the United States and its web hosting company was GoDaddy.com, indicating that legal action could potentially be taken against a website's physical infrastructure in the event of a violation of applicable law.

The majority of the e-cigarette Internet vendors reviewed sold exclusively online with many companies appearing to have started operating within the past 5 years and owned by self-employed owners/operators. The high presence of small businesses indicates that this industry may be attractive to entrepreneurs due to its lower-than-retail operating expenses (no storefront rental fees, minimal sales employees), opportunity for high mark-ups, the ease of "starting-up" online, and the fact that the product is not subject, in most states, to an excise tax (Gourdet et al., 2014; Klein, 2013). However, we also note the presence of large, multinational firms active in e-cigarette e-commerce, including Blu eCigs (owned by Lorillard Tobacco Company, acquired by Reynolds American Inc.), which operates a direct-to-consumer retail website (www.store.blucigs.com), utilizing a robust set of promotional strategies and product offerings in addition to their commercial retail distribution channels. Importantly, given that the majority of vendors reviewed operate exclusively online, the utility of local and state e-cigarette legislation/policies may be limited as online vendors may simply operate in a state with the least restrictive laws or could also migrate their virtual businesses to unregulated overseas markets ("Regulating Electronic Cigarettes and Similar Devices," 2014).

Although a relatively nascent industry, e-cigarette Internet vendors displayed sophisticated business acumen in employing multi-channel marketing for their products, including widespread use of affiliate marketing agreements (to increase online presence), offering wholesale opportunities (to maximize sales through third parties), and enticing consumers with various promotional strategies common in retail e-commerce (lowering product cost at point-of-sale). Use of affiliate marketing is particularly important, as these marketing networks that run content websites expand the online presence of their affiliated e-cigarette Internet vendors and have been identified through forensic analysis as making misleading health claims (Cobb et al., 2015).

Internet e-cigarette vendors also recognize the potential for SNS to promote their products beyond the confines of a vendor website given its relative low cost, accessibility, and influence on peer-to-peer networks (Freeman and Chapman, 2008; Liang and Mackey, 2011). Since 74% of online adults and 81% of online teens use some form of SNS, these channels open up a broad market demographic of potential e-cigarette users (Madden et al., 2013; "Social Networking Fact Sheet," 2013). In most cases the distribution of SNS in the sample of e-cigarette Internet vendors tracked with overall SNS popularity: 71% of online adults are Facebook users, 91% of Internet e-cigarette vendors had a presence on Facebook ("Social media sites, 2012-2013," 2014). Similarly, our finding that 63.2% of sites used Twitter is consistent with a recent study that found the vast majority (90%) of tweets related to e-cigarettes were commercial in nature, further indicating the importance of this medium for e-cigarette marketing (Huang et al., 2014a). An alarmingly high percentage of vendors also used Instagram (42.1%), a SNS that has recently replaced Facebook in popularity among 13–17 year olds, and one that should be closely monitored for its possible influence on youth e-cigarette behavior and uptake (Smith, 2014). Instagram-linked e-cigarette content is potentially a powerful medium to attract youth given that many of the images we observed depicted attractive people, desirable lifestyles and "hip" communities promoting the culture and use of e-cigarettes. Further, SNS platforms that engage consumers in multimedia experiences, such as the

popular video-sharing site YouTube, used by 38.6% of the vendors we observed, should also be closely monitored given that that content on these sites has been previously identified as predominantly sponsored by marketers, may highlight economic and social benefits of e-cigarettes, and make unsubstantiated health claims (Paek et al., 2014).

Adolescent use of e-cigarettes is specifically a concern because of the potential negative effects of nicotine on brain development, its addictive nature, and the possibility that e-cigarette use may act as a "gateway" to other tobacco or substance abuse (Dutra and Glantz, 2014; Leventhal et al., 2015). In recognition of these concerns, the FDA proposed regulations would establish a minimum purchasing age of 18-years for e-cigarettes (same as tobacco products). However, despite several states establishing their own purchase age restrictions, middle and high-school students still gain access to these products (Bunnell et al., 2014). Hence, robust efforts to enforce the FDA's minimum purchase age are needed by sellers, whether in person or online. However, only 64.9% of e-cigarette vendors we reviewed used some form of age verification, which in most cases involved simply clicking a button to self-report age compliance. Overall, the lack of sufficient age verification for e-cigarette online access is troubling and points to similar lax verification reported for online sales by tobacco cigarette and alcohol vendors, resulting in sales to underage buyers (Fix et al., 2006; Williams and Ribisl, 2012). Hence, youth and adolescents who are already actively engaged online may be exposed to e-cigarette marketing and also gain access to a convenient pathway for purchasing e-cigarettes as has been shown in other studies that found minors are easily able to purchase e-cigarettes from the Internet (Williams et al., 2015). To better prevent youth access, close surveillance and standardization of online vendor age verification practices, not just website policies, will be needed.

Other studies have identified that some e-cigarette Internet vendors have made direct and indirect claims about the product's efficacy as a smoking cessation method (Cobb et al., 2015; Zhu et al., 2014). Perhaps due to the FDA's proposed rules and warning letters, the majority of vendors we observed made no direct claims regarding e-cigarettes' efficacy as a smoking cessation device though many utilized their own affiliated blog sites and SNS platforms to promote the use of e-cigarettes as a safer alternative to combustible tobacco products and/or were members of social groups advocating for "vaper's rights." Instead, most vendors displayed more than one consumer warning with the most frequent warnings associated with a minimum purchase age (despite the absence of robust age verification). The FDA does not require, nor set a standard for safety and health warnings on websites, as will likely be required on e-cigarette product packaging. In fact, legislation to require Internet tobacco cigarette vendors to display warning labels on websites was attempted in 1999, but did not survive beyond committee review by the then U.S. House of Representatives (Ribisl et al., 2001). Hence, the current gap in regulating combustible tobacco cigarette online product marketing is contributing to an inability to justify regulation of e-cigarette Internet vendors. This discrepancy is now being leveraged by the e-cigarette industry in their own marketing strategies, presentation of warnings, and age verification processes.

As a result of this regulatory gap, online vendors are left to determine the type, size, wording, location and prominence of warnings. In most cases in this study, the impact of e-cigarette-related warnings was significantly diminished due to size and location, usually in small font in the webpage footer or hidden discreetly within legalistic Terms and Conditions of the website. Complicating the unevenness of health warning representation by vendors was also our observation (during phase 1 of our methodology involving vendor inclusion/exclusion) that the highest percentage of health promotion information sites (e.g., FDA

website, NIH Site DrugAbuse.gov, USA DHHS site smokefree.gov) were detected using the keyword search term “e cigarette”. This is important as “e cigarette” is the least popular of the Google search terms that we used, indicating that public health agencies could do a better job utilizing search engine marketing and search engine optimization in order to ensure dissemination of their health promotional messaging.

Collectively, these attributes, coupled with the fact that the FDA has not specifically proposed a ban or direct regulatory oversight of e-cigarettes online sales in its proposed rules, suggests that the number of Internet vendors will continue to proliferate. In fact, in its proposed rules, the FDA fails to specifically restrict advertising in any medium (including Internet) despite bans on various forms of tobacco advertising since 1971, given significant evidence that exposure to advertising increases use (Borland, 2003; Centers for Disease Control and Prevention, 2012; “Deeming Tobacco Products To Be Subject to the Federal Food, Drug, and Cosmetic Act,” 2014; Mackey et al., 2014). Though various state and local legislation/policies may attempt to fill this regulatory gap, Internet sales of e-cigarettes may pose significant challenges compared to regulation of brick-and-mortar establishments, given the virtual nature of the web where vendors can be located anywhere including multiple places or in other countries (“Regulating Electronic Cigarettes and Similar Devices,” 2014).

In response, we advocate for the FDA and the U.S. Federal Trade Commission (FTC) to specifically be given the joint statutory authority and mandate to actively monitor and regulate the online marketing and sale of e-cigarettes in the USA. With its existing powers to protect consumers and enforce violations of fraudulent or deceptive marketing practices, FTC is well suited to partner with the FDA to implement marketing regulations in alignment with the FDA rules when finalized. Specifically, the FDA’s proposed rule calls for minimum age and identification restrictions, prohibition on free samples, use of certain health warnings, and requirements to prevent access to minors. In order to ensure that these critical concepts and others are appropriately applied and followed by e-cigarette Internet vendors, we propose some policy recommendations summarized in Table 2. Based on results contained in this study, we estimate that none of the e-cigarette Internet vendors reviewed would be in compliance with our policy recommendations due to their current lack of adequate age verification and some would also be in violation of our proposal to prohibit providing free product/samples or products at zero cost which we separately observed. Together, the FDA and FTC should actively monitor e-cigarette Internet vendors, act upon violations and/or use of false and misleading advertising, and work with Internet Service Providers (such as Godaddy.com) hosting these websites to ensure they comply with state and Federal law.

4.1. Limitations

This study has certain limitations that may impact the validity and generalizability of results. Specifically, the results are limited by the sampling and search methodology used in the study, which relied on a popular search engine that returns non-random search results that prioritize websites based on the Internet search engine’s own propriety algorithm that determines the relevance and popularity of search results. Website sampling was also limited to a specific point in time, five popular search terms, and was restricted to the first five pages of search results in comparison to other studies that included a larger number of search terms and up to 30 pages of search results. Additionally, though we utilized the “incognito” browser mode to minimize the influence of individual Internet user information on search results, we were not able to disable location-based services in the Internet browser by changing web-browser settings, using IP blocking software or using an

Table 2
Recommendations for regulating Internet electronic cigarette vendors.

Regulatory category	Policy proposal
International e-cigarette vendors	Sales of e-cigarettes to U.S. consumers from internationally-based e-cigarette Internet vendors should be subject to pre-approval by FDA in order to ensure websites and tobacco products sold are in compliance with state and Federal law prior to importation. They should also be required to have appropriate contact information for customer complaints and reporting of adverse events. This requirement should include a U.S.-based physical business presence or service agent of process.
Online age verification	The FDA and FTC should finalize guidance on the necessary technology parameters to ensure age verification through online vendors in order to prevent use and access by minors. This should include identifying minimum standards of online age verification tools (such as government verified e-ID schemes; data from third-parties [e.g., credit-rating agencies]; and other innovations [e.g., OpenID with age attributes/identifiers]) while also meeting user privacy requirements. Importantly, vendors should be audited for compliance and subject to fines for violations. Lessons from age verification in the online gambling industry should be explored.
Website health warnings	All Internet e-cigarette vendors should be required to prominently display health warnings to consumers in a fair and balanced manner compared to other marketing claims. This should include at a minimum text that is prominently displayed on the home page and all sub-pages of the website warning that nicotine is an addictive substance and that e-cigarettes have not been approved by the FDA as a cessation device.
SNS marketing	Internet e-cigarette vendors should not be allowed to directly market to minors via SNS platforms. Vendors should be required to self-certify (under penalty of perjury) that their SNS content does not target youth and adolescents (under age 18), should be required to post health warnings about their products, and should monitor and remove content from their SNS pages that promotes use and access by minors.
Free samples and discounts	Internet e-cigarette vendors should be prohibited from using marketing practices (e.g., sales promos; reward programs; free samples) that effectively reduce the cost of an e-cigarette product to no cost or minimal cost (i.e., <\$1.) This includes promotions that only charge the cost of shipping and handling, taxes or other fees associated with purchasing.

anonymous search engine (such as the shut down Scroogle platform used in the study by Grana and Ling or the un-validated DuckDuckGo platform.) Hence, these factors may affect the generalizability of results and limits our assumptions and applicability of our findings to Internet users primarily located in the USA.

4.2. Conclusions

The recent decision by Oxford Dictionaries to name “vape” the 2014 Word of the Year is an indication of the increasingly popularity of e-cigarettes and their strong market potential. This is despite ongoing concerns regarding the addictiveness and long-term safety implications of e-cigarette use (Hajek et al., 2014; Jensen et al., 2015). Though the FDA is attempting to regulate e-cigarettes, its current proposed rules appear to fall short in addressing an important channel of promotion and access: the Internet. Specifically, e-cigarette e-commerce poses unique and unaddressed challenges that require more targeted regulation and policymaking in order to prevent inappropriate promotional strategies, avert underage targeting and use, and communicating adequate health and safety

warnings. In response, we call for regulatory agencies and policymakers to enact rules and regulations specific to e-cigarette Internet vendors and to recognize the unique challenges faced by a growing digital landscape populated by consumers searching for their first virtual access to “vaping.”

Role of funding source

Nothing declared.

Authors' contribution

We note that with respect to author contributions, Tim K. Mackey (TM) and Angela Miner (AM) jointly conceived the study, TM, AM, and Raphael Cuomo (RC) jointly wrote the manuscript, TM, AM, and RC jointly edited the manuscript, TM, AM, and RC jointly conducted the data analyses, and TM supervised its legal and policy analysis.

Conflict of interest

Nothing declared.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.drugalcdep.2015.08.032>.

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