Published in final edited form as:

J Subst Use. 2016 ; 21(6): 614–619. doi:10.3109/14659891.2015.1118565.

Depiction of Health Effects of Electronic Cigarettes on YouTube

Ashley L. Merianos, PhD, CHES¹, Olivia E. Gittens², and E. Melinda Mahabee-Gittens, MD, MS³

¹ School of Human Services; University of Cincinnati; Cincinnati, OH

²William Mason High School; Mason, OH

³Division of Emergency Medicine; Department of Pediatrics; Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, Ohio

Abstract

Background—This study was conducted to assess the quantity, quality, and reach of e-cigarette health effects YouTube videos, and to quantify the description of positive and negative e-cigarette health effects and promotional content in each video.

Method—Searches for videos were conducted in 2015 using the YouTube search engine, and the top 20 search results by relevance and view count were identified. Videos were classified by educational/medical news, advertising/marketing, and personal/testimonial categories. A coding sheet was used to assess the presence or absence of negative and positive health effects, and promotional content.

Results—Of the 320 videos retrieved, only 55 unique videos were included. The majority of videos (46.9%) were educational/medical/news, 29.7% were personal/testimonial, and 23.4% were advertising/marketing. The three most common negative health effects included discussing nicotine, e-cigarettes not being FDA regulated, and known and unknown health consequences related to e-cigarette use. The top positive health effects discussed were how e-cigarettes can help individuals quit smoking, e-cigarettes are healthier than smoking, and e-cigarettes have no smoke or secondhand smoke exposure.

Conclusions—It is critical to monitor YouTube health effects content and develop appropriate messages to inform consumers about the risks associated with use while mitigating misleading information presented.

Keywords

prevention; substance-use; smoking

Electronic cigarettes, also called e-cigarettes, have grown in popularity worldwide with the support of the Internet (Yamin, Bitton, & Bates, 2010). E-cigarettes are battery-operated products that vaporize a nicotine solution, flavor and other chemicals through a device that

Correspondence, Ashley Merianos, PhD, CHES, Assistant Professor, School of Human Services, University of Cincinnati, 6315A CRC Residence Hall, PO Box 210068, Cincinnati, OH 45221, ashley.merianos@uc.edu, Phone: 513-556-6753.

Conflict of Interest: The authors have indicated that they have no conflicts of interest relevant to this article.

looks like a conventional cigarette, cigar or pipe. The e-cigarette was first introduced by the Ruyan Group as an alternate nicotine delivery device to the Chinese market in 2004 followed by the United States' (US) market in 2007, and is currently sold in stores and online (Yamin et al., 2010). The global market for e-cigarettes is currently worth \$6 billion. In the US, sales have nearly doubled since e-cigarettes became available on the market from 2007 to 2013, are projected to grow at a rate of 24.22% from 2014 to 2018 (Technavio, 2014), and anticipated to surpass cigarette consumption by 2023 (Herzog, 2013). Global surveillance of use is lacking, but US research indicates 6% of the adult population and an estimated one in five cigarette smokers have tried e-cigarettes (Centers for Disease Control and Prevention [CDC], 2013). Further, use tripled from 2013 to 2014 among US middle and high school students (CDC, 2015). Despite high prevalence rates of use and no signs of slowing down, the population health impact of this emerging product is conflicting and understudied (Pisinger & Døssing, 2014).

To date, e-cigarettes remain controversial since the health benefits and risks, if any, remain unknown (U.S. Food and Drug Administration, 2015). Recent studies have sought to gain an understanding of related health effects by investigating acute effects, nicotine delivery (Yan & D'Ruiz, 2015), and consumer response to e-cigarettes (Etter, 2010). Further, e-cigarettes are marketed as a smoking cessation product and a healthier alternative to smoked tobacco (Cahn & Siegel, 2011). However, these claims have not been approved by a governmental agency (World Health Organization, 2014). Since health effects of e-cigarettes are not well understood, there is a concern of gateway and renormalization effects that may attract youth and former smokers due to marketing e-cigarettes as starter products and devices that may be used in places where smoking is banned (Cobb & Abrams, 2011; World Health Organization, 2014). Thus, knowledge of how information on health effects are being communicated to consumers is needed to fully inform responses from regulatory authorities, clinicians, researchers, and tobacco users.

The online interest of e-cigarettes has exceeded the interest of some tobacco products that have been on the market for a long time (Ayers, Ribisl, & Brownstein, 2011). A Google Trends (2015) analysis revealed e-cigarette online searches have grown dramatically over the past seven years, suggesting the Internet provides a platform to market and convey information about these products. The Internet has more than three billion worldwide users (Internet World Stats, 2015) and is a frequent source of health information (Pew Research Center, 2015), but is unregulated by a global governing body. Social media websites are recognized as a helpful tool in disseminating health messages based on the low cost and rapid transmission of information, but posts often lack citations and present opinions or incorrect information as facts (Vance, Howe, & Dellavalle, 2009). Due to the shortage of empirical evidence on the health risks associated with e-cigarette use, it is paramount to monitor health-related messages delivered on the Internet about this emerging product.

YouTube, created in 2005, is a popular social media site that has over one billion users and generates millions of video views daily (YouTube, 2015). With YouTube localized in 75 countries and available in over 60 languages, this site has a global mass audience. However, YouTube lacks content control since anyone can upload videos to the website. Thus, misleading and incorrect information may be presented. Health professionals need to

understand video messages related to health, including tobacco initiation and maintenance of use (Charlesworth & Glantz, 2005; Sargent et al., 2005). Studies have examined tobacco-related health video messages on YouTube (Carroll, Shensa, & Primack, 2013; Seidenberg, Rodgers, Rees, & Connolly, 2012). Additionally, YouTube videos have been analyzed to compare puff and exhalation duration of electronic nicotine delivery system use and conventional cigarettes (Hua, Yip, & Talbot, 2013) and the portrayal of e-cigarette messages (Luo, Zheng, Zeng, & Leischow, 2014), but studies have not focused specifically on e-cigarette videos related to health effects.

Strong evidence indicates that information on the health effects of substances shape an individual's perception of potential harm and benefit, and patterns of use (Berg et al., 2015; Shadur, Felton, MacPherson, & Lejuez, 2015). Therefore, an understanding of how e-cigarette health effects messages are being presented on YouTube is critically needed to determine the type of information that is potentially being accessed by current or potential future consumers. This study was conducted to 1) assess the quantity, quality, and reach of e-cigarette health effects YouTube videos and 2) to quantify the description of positive and negative e-cigarette health effects and promotional content in each video.

Method

Sampling Method

Before conducting the present study, the institutional review board determined this study as “not human subjects” research and was exempt from review. The sampling methodology we used was similar to previous studies (Bromberg, Augustson, & Backinger, 2012; Luo et al., 2014; Richardson & Vallone, 2014). Searches for e-cigarette videos using YouTube's search engine (<http://www.youtube.com>) were conducted from May 21-22, 2015. The sample of videos was identified from the top search results for these terms: “electronic cigarette health effects”, “e-cigarettes health effects”, “ecigarettes health effects”, “ecigs health effects”, “smoking electronic cigarette health effects”, “smoking e-cigarettes health effects”, “smoking ecigarettes health effects”, and “smoking ecigs health effects”. The e-cigarette health effects search terms were selected based on a Google Insights for Search analysis that found there is a higher proportion of web traffic searching for these terms than other terms. An initial search of e-cigarette health effects in YouTube videos also indicated that these terms would retrieve more applicable and popular videos than other terms. Two searches were performed for each term: (a) by relevance and (b) by view count. The methodology was chosen to imitate user behavior by using common search terms and conducting the search using the default relevance search strategy and by watching videos with the highest view counts. The top 20 results for each search were included in the video sample. Limiting our search to the top 20 results for each term was in accordance with previous methodology and based on prior research on Internet browsing behavior that indicated most users only view search results on the first page (Jansen & Spink, 2006), which is 20 video results on YouTube. Searching YouTube by relevance and view count for eight key terms yielded an initial sample of 320 videos.

Exclusion Criteria

Videos were excluded (n=265) if they were not in English (n=1), >10 minutes long (n=8) (Steinberg, 2010), and no longer available to view during coding (n=1). Duplicate videos (n=247) that were retrieved while using different search strategies and terms were eliminated. Videos were also excluded if e-cigarettes were not central to the content of the video (n=8). A total of 55 videos were coded and analyzed after applying the exclusion criteria.

Coding

The videos were independently rated by two separate reviewers. They were classified by video genres including 1) educational/medical/news (videos that state facts about e-cigarettes, results of research, addictive nature of e-cigarettes and nicotine, news clips, and statistics) 2) advertising/marketing (videos that promote a specific e-cigarette brand or product), and 3) personal/testimonial (videos that share personal experience or tips including testimonials). These genres were chosen based on recurring themes in the 55 videos.

Similar to the methods by Richardson and Vallone (2014) and Luo et al. (2014), two reviewers rated the videos on whether they had content that were “pro e-cigarettes”, “anti e-cigarettes” or “neutral to e-cigarettes”. The two reviewers were trained on how to analyze video content before beginning the coding process. Videos were considered “pro” if they discussed positive health benefits (e.g., help to quit smoking, healthier than cigarettes, no smoke exposure, and improved ability to sleep). Videos were considered “anti” if they discussed negative consequences and negative feedback or warnings associated with using e-cigarettes (e.g., effects of nicotine, health consequences, lack of FDA regulation, exposure to vapor, addictive potential, lack of evidence to help quit smoking, respiratory symptoms, and gateway drug effects). Videos were considered “neutral” if they could not be easily classified as either “pro” or “anti” or could be viewed as either category based on the perspective of the viewer” (Luo et al., 2014). If the two reviewers rated videos differently, a third reviewer reviewed the material and classified the videos accordingly. Then, the reviewers came to a consensus decision on the appropriate classification for video content that was hard to classify or ambiguous in nature. Reviewer agreement on classifying videos was very high at 98.18%.

We extracted basic information from each video including title; date uploaded; uploader username; amateur or professional production quality of the videos; length; number of views, likes, dislikes and text comments. In order to understand the detailed health effects messages conveyed through these videos, a coding sheet was used to assess each video on the presence or absence of negative health effects, positive health effects, and promotional content. Specifically, the negative health effects included: 1) unknown/unregulated nicotine levels or the biological effects of nicotine, 2) known and unknown health consequences, 3) lack of FDA regulation, 4) exposure to vapor and/or unknown chemicals, 5) addictive potential, 6) lack of proof as a smoking cessation aid, 7) respiratory symptoms, and 8) e-cigarettes as a gateway drug and/or addictive potential in youth. Positive health effects included: 1) help to quit smoking, 2) healthier alternative to smoking, 3) absence of smoke or secondhand smoke exposure, 4) help to sleep better, 5) help to breathe better, and 6) help

to feel better. Promotional content included mention of the use of e-cigarettes: 1) to enjoy the flavors and taste, 2) brands, 3) absence of or minimal associated e-cigarette smells, 4) to save money, 5) as being similar to real cigarettes, 6) as being environmentally friendly, and 7) anywhere. The above list was developed based on other studies (Etter, 2010; Richardson & Vallone, 2014).

Results

Among the 55 unique e-cigarette health effects videos, some were classified under both advertising/marketing and personal/testimonial categories ($n=8$) and both educational/medical/news and advertising/marketing categories ($n=1$). Therefore, 46.9% ($n=30$) of e-cigarette videos were educational/medical/news, 23.4% ($n=15$) were advertising/marketing, and 29.7% ($n=19$) were personal/testimonial. Collectively, e-cigarette health effects videos were viewed 13 million times. Table 1 presents the statistics associated with the videos by category. In total, the educational/medical/news videos received nearly 7 million views versus the 5.7 million views and nearly 3 million views of the personal/testimonial and advertising/marketing videos, respectively. The personal/testimonial videos had the highest average number of views ($M=317,189$) compared to the other two categories.

Figure 1 presents detail of YouTube e-cigarette health effects content in each video category by “pro”, “anti” and “neutral” messages. Most advertising/marketing videos ($n=14$) and personal/testimonial videos ($n=16$) had “pro” messages whereas educational/medical/news videos ($n=17$) had the most “anti” messages. Only 18 videos were amateur produced, with most of these in the personal/testimonial ($n=12$) category. Males were the most prominent messenger in the videos ($n=37$, 67.3%) and only 12.7% ($n=7$) were females; 9.1% ($n=5$) had both male and female messengers and three (10.9%) videos displayed text and pictures without a messenger.

The topics covered are displayed in Table 2. The three most common negative health effects mentioned across all three coding categories included discussing nicotine, e-cigarettes not being FDA regulated, and known and unknown health consequences related to e-cigarette use. Exposure to vapor was discussed in one-third (33.3%) of educational/medical/news videos compared to only being discussed in one advertising/marketing video and were not discussed in any personal/testimonial videos. Addiction to e-cigarettes was mentioned in one-third (33.3%) of educational/medical/news videos compared to only one (6.7%) advertising/marketing video and one (5.3%) personal/testimonial video, and e-cigarettes as a gateway drug or addictive potential in youth was only mentioned in one (3.3%) educational/medical/news video.

The top three positive health effects discussed were how e-cigarettes can help individuals quit smoking, e-cigarettes are healthier than smoking, and e-cigarettes have no smoke or secondhand smoke exposure across all three categories. Two (10.5%) advertising/marketing videos and one (5.4%) personal/testimonial video discussed that e-cigarettes help individuals sleep better, and one advertising and marketing video (6.7%) and one personal/testimonial video (5.3%) discussed that e-cigarettes help individuals breathe better.

The top promotional claims across categories were mentioning e-cigarette flavors and tastes, brands, and smell. E-cigarette brand mentions were in 66.7% (n=10) of advertising/marketing videos, 31.6% (n=6) of personal/testimonial videos, and 23.3% (n=7) of educational/medical/news videos; “Blu” and “Green Smoke” were common brands discussed.

Discussion

To our knowledge this is the first study to document the quantity, quality, and reach of e-cigarette health effects videos on YouTube. The majority of videos fell under the educational/medical/news category, which had the most professionally produced videos; yet, personal/testimonial videos had the highest average number of views despite having the most amateur produced videos. Evaluation of videos revealed frequent mentions of both positive and negative health effects. A high proportion of videos also included promotional content of e-cigarettes, which is similar to other findings (Bromberg et al., 2012; Carroll et al., 2013; Freeman & Chapman, 2007; Hua et al., 2013; Luo et al., 2014; Richardson & Vallone, 2014). Further, most videos classified in the educational/medical/news category had “anti” e-cigarette messages, while advertising/marketing and personal/testimonial videos had more “pro” e-cigarette messages. Although we were unable to measure any effect of YouTube messages on use of e-cigarettes in our study, there is evidence that marketing these products as safe and socially acceptable influences patterns of use (Berg et al., 2015). Given the 13 million views of the YouTube videos included in this study and the high level of reach these videos have on a daily basis (YouTube, 2015), it is likely that exposure to e-cigarette health effects video content has an important impact on use.

The educational/medical/news category had the greatest mentions of negative health effects. The top three negative health effects described in all video genres were nicotine, known and unknown health consequences, and lacking FDA regulation. Regarding nicotine, research on consumption revealed puff duration of e-cigarettes are longer and require stronger suction compared to conventional cigarettes (Hua et al., 2013). The FDA is concerned about the nicotine content and other impurities as there is too much variability in the amount being inhaled during e-cigarette use to consider them safe (Westenberger, 2009). Thus, difficult questions remain on how the FDA will consider the engineering of more than 250 brands in order to make regulatory decisions on marketing the risks and benefits of e-cigarettes (Benowitz & Goniewicz, 2013). Implementing the FDA's authority for tobacco product regulation in order to reduce addiction and harm are needed (U.S. Department of Health and Human Services, 2014). In addition to the impending regulation of e-cigarettes, health consequences need to be critically examined (Etter, Bullen, Flouris, Laugesen, & Eissenberg, 2011) since YouTube videos may misinform viewers and potential consumers on the short- and long-term effects of use.

While there was not an overwhelming amount of YouTube videos focusing on e-cigarette health effects, the prevalence of positive health effects messages have implications. Themes of several videos focused on e-cigarettes as a mechanism to help individuals quit smoking despite limited evidence available on the effectiveness of this product on cessation. In fact, some experts are concerned about the short- and long-term health effects associated with e-

cigarettes, and suggest characterizing the product's safety profile before testing their efficacy as smoking cessation aids (Etter et al., 2011). However, research has examined the effectiveness of e-cigarettes as a smoking cessation product compared to nicotine replacement therapy, and results have showed low efficacy for quitting smoking (Bullen et al., 2013). Further, e-cigarettes were frequently promoted on YouTube as being healthier than smoking conventional cigarettes and having no smoke exposure, even though the toxicants released in the vapor are currently unknown (Benowitz & Goniewicz, 2013). Given the inconclusive scientific evidence (World Health Organization, 2014), the positive health effects messages in YouTube videos may support misperceptions of risk and encourage initiation or renormalization of e-cigarettes.

Marketing strategies, including promoting that e-cigarettes help people quit smoking and people can use them anywhere, have an impact on core tobacco control efforts (World Health Organization, 2014). The promotional message that was frequently communicated in videos was about flavors and taste. This has implications for youth since public health experts and the FDA have raised concerns that the different flavors, such as chocolate and mint, may appeal to this vulnerable population. It is important to note that no age restrictions were imposed on any YouTube videos included in the study, suggesting users of all ages may access these videos. E-cigarette use among youth is on the rise (CDC, 2015), and viewing promotional content may influence uptake of e-cigarettes by youth and young adults. More research is needed on who is susceptible to these YouTube messages since media may not influence all viewers equally (Tanski, Stoolmiller, Gerrard, & Sargent, 2012), in addition to which messages influence consumer use.

Interestingly, e-cigarettes as a gateway drug leading to nicotine dependence and addiction in youth were rarely discussed as a negative health effect (King, Smith, McNamara, Matthews, & Fridberg, 2014). E-cigarettes may lead to greater rates of nicotine addiction, which may lead to the initiation of cigarette smoking (World Health Organization, 2014). Further, there is growing concern that marketing e-cigarettes may renormalize nicotine dependency and portray smoking as a socially acceptable public practice (Duke et al., 2014). While there are not enough studies to demonstrate the efficacy of e-cigarettes in smoking cessation or harm reduction (Grana, Benowitz, & Glantz, 2014), there is a growing concern that these products will create a new generation of youth to become future tobacco users or entice former smokers back to nicotine dependency (Stanwick, 2015). Thus, renormalizing nicotine dependency may reverse the efforts that have decreased initiation and use of nicotine and tobacco products in youth and former smokers over time.

Limitations

There are several limitations of this study. First, the sampling methodology was designed to imitate user search behavior and to include e-cigarette health effects videos with the highest user views. Thus, the sample may not be fully representative of all e-cigarette health effects YouTube videos. Second, the video sample may not be generalizable to the current top search results for e-cigarette videos due to the constant shifting nature of the Internet. Thus, video results may be different during some periods of time. Third, two researchers coded all of the videos, and the reliability of coding may have been affected. Fourth, we used simple

video statistics and did not analyze the qualitative video comments. Finally, YouTube no longer provides publicly accessible demographic information on the sex, age, and location of where these videos were most frequently watched.

Conclusions

This study is the first surveillance study to assess the depiction of e-cigarette health effects on YouTube. These unregulated battery-operated products were portrayed as having both negative and beneficial health effects despite inconclusive scientific evidence on the safety of use. For this reason, it is critical to monitor health effects messages on e-cigarettes delivered through YouTube videos and develop appropriate messages to inform consumers about the potential risks associated with product use while mitigating false and misleading information presented. Despite the study limitations, this study adds to the developing literature about e-cigarette health effects and provides valuable information for consumers, health care professionals, regulatory authorities, policy makers, and the tobacco community. Future research should continue to investigate the nature of e-cigarette health effects to determine if these products have a positive or negative impact on population health and tobacco control.

Acknowledgements

This work was supported by the National Cancer Institute/National Institutes of Health grant CA184337 (Dr. Mahabee-Gittens).

References

- Ayers JW, Ribisl KM, Brownstein JS. Tracking the rise in popularity of electronic nicotine delivery systems (electronic cigarettes) using search query surveillance. *American Journal of Preventive Medicine*. 2011; 40(4):448–453. doi:10.1016/j.amepre.2010.12.007. [PubMed: 21406279]
- Benowitz NL, Goniewicz ML. The regulatory challenge of electronic cigarettes. *Journal of the American Medical Association*. 2013; 310(7):685–686. doi:10.1001/jama.2013.109501. [PubMed: 23856948]
- Berg CJ, Stratton E, Schauer GL, Lewis M, Wang Y, Windle M, Kegler M. Perceived harm, addictiveness, and social acceptability of tobacco products and marijuana among young adults: Marijuana, hookah, and electronic cigarettes win. *Substance Use & Misuse*. 2015; 50(1):79. [PubMed: 25268294]
- Bromberg JE, Augustson EM, Backinger CL. Portrayal of smokeless tobacco in YouTube videos. *Nicotine & Tobacco Research*. 2012; 14(4):455–462. doi:10.1093/ntr/ntr235. [PubMed: 22080585]
- Bullen C, Howe C, Laugesen M, McRobbie H, Parag V, Williman J, Walker N. Electronic cigarettes for smoking cessation: A randomised controlled trial. *Lancet*. 2013; 382(9905):1629. doi:10.1016/S0140-6736(13)61842-5. [PubMed: 24029165]
- Cahn Z, Siegel M. Electronic cigarettes as a harm reduction strategy for tobacco control: A step forward or a repeat of past mistakes? *Journal of Public Health Policy*. 2011; 32(1):16–31. doi: 10.1057/jphp.2010.41. [PubMed: 21150942]
- Carroll MV, Shensa A, Primack BA. A comparison of cigarette- and hookah-related videos on YouTube. *Tobacco Control*. 2013; 22(5):319–323. doi:10.1136/tobaccocontrol-2011-050253. [PubMed: 22363069]
- Centers for Disease Control and Prevention. About one in five US adult cigarette smokers have tried an electronic cigarette.. Centers for Disease Control and Prevention. 2013. Retrieved from http://www.cdc.gov/media/releases/2013/p0228_electronic_cigarettes.html

- Centers for Disease Control and Prevention. E-cigarette use triples among middle and high school students in just one year.. Centers for Disease Control and Prevention Newsroom. 2015. Retrieved from <http://www.cdc.gov/media/releases/2015/p0416-e-cigarette-use.html>
- Charlesworth A, Glantz SA. Smoking in the movies increases adolescent smoking: A review. *Pediatrics*. 2005; 116(6):1516–1528. doi:10.1542/peds.2005-0141. [PubMed: 16322180]
- Cobb NK, Abrams DB. E-cigarette or drug-delivery device? Regulating novel nicotine products. *The New England Journal of Medicine*. 2011; 365(3):193–195. doi:10.1056/NEJMp1105249. [PubMed: 21774706]
- Duke JC, Lee YO, Kim AE, Watson KA, Arnold KY, Nonnemaker JM, Porter L. Exposure to electronic cigarette television advertisements among youth and young adults. *Pediatrics*. 2014; 134(1):e29. doi:10.1542/peds.2014-0269. [PubMed: 24918224]
- Etter J. Electronic cigarettes: A survey of users. *BMC Public Health*. 2010; 10(1):231. doi: 10.1186/1471-2458-10-231. [PubMed: 20441579]
- Etter J, Bullen C, Flouris AD, Laugesen M, Eissenberg T. Electronic nicotine delivery systems: A research agenda. *Tobacco Control*. 2011; 20(3):243–248. doi:10.1136/tc.2010.042168. [PubMed: 21415064]
- Freeman B, Chapman S. Is “YouTube” telling or selling you something? Tobacco content on the YouTube video-sharing website. *Tobacco Control*. 2007; 16(3):207–210. doi:10.1136/tc.2007.020024. [PubMed: 17565142]
- Google Trends. Electronic cigarettes.. Google. 2015. Retrieved from <https://www.google.com/trends/explore#q=electronic%20cigarettes>
- Grana R, Benowitz N, Glantz SA. E-cigarettes: A scientific review. *Circulation*. 2014; 129(19):1972–1986. doi:10.1161/CIRCULATIONAHA.114.007667. [PubMed: 24821826]
- Herzog, B. E-cigs revolutionizing the tobacco industry.. Wells Fargo Securities - Equity Research. 2013. Retrieved from <http://www.smallcapfinancialwire.com/wp-content/uploads/2013/11/E-Cigs-Revolutionizing-the-Tobacco-Industry-Interactive-Model.pdf>
- Hua M, Yip H, Talbot P. Mining data on usage of electronic nicotine delivery systems (ENDS) from YouTube videos. *Tobacco Control*. 2013; 22(2):103–106. doi:10.1136/tobaccocontrol-2011-050226. [PubMed: 22116832]
- Internet World Stats. Internet users in the world. 2015. Retrieved from <http://www.internetworldstats.com/stats.htm>
- Jansen BJ, Spink A. How are we searching the world wide web? A comparison of nine search engine transaction logs. *Information Processing and Management*. 2006; 42(1):248–263. doi:10.1016/j.ipm.2004.10.007.
- King AC, Smith LJ, McNamara PJ, Matthews AK, Fridberg DJ. Passive exposure to electronic cigarette (e-cigarette) use increases desire for combustible and e-cigarettes in young adult smokers. *Tobacco Control*. 2014 doi:10.1136/tobaccocontrol-2014-051563.
- Luo C, Zheng X, Zeng DD, Leischow S. Portrayal of electronic cigarettes on YouTube. *BMC Public Health*. 2014; 14(1):1028–1028. doi:10.1186/1471-2458-14-1028. [PubMed: 25277872]
- Pew Research Center. Health fact sheet. 2015. Retrieved from <http://www.pewinternet.org/fact-sheets/health-fact-sheet/>
- Pisinger C, Døssing M. A systematic review of health effects of electronic cigarettes. *Preventive Medicine*. 2014; 69:248–260. doi:10.1016/j.ypmed.2014.10.009. [PubMed: 25456810]
- Richardson A, Vallone DM. YouTube: A promotional vehicle for little cigars and cigarillos? *Tobacco Control*. 2014; 23(1):21. [PubMed: 23047887]
- Sargent JD, Beach ML, Adachi-Mejia AM, Gibson JJ, Titus-Ernstoff LT, Carusi CP, Dalton MA. Exposure to movie smoking: Its relation to smoking initiation among US adolescents. *Pediatrics*. 2005; 116(5):1183–1191. doi:10.1542/peds.2005-0714. [PubMed: 16264007]
- Seidenberg AB, Rodgers EJ, Rees VW, Connolly GN. Youth access, creation, and content of smokeless tobacco (“Dip”) videos in social media. *Journal of Adolescent Health*. 2012; 50(4):334–338. doi:10.1016/j.jadohealth.2011.09.003. [PubMed: 22443835]
- Shadur JM, Felton JW, MacPherson L, Lejuez CW. Perceived drinking risk and adolescent alcohol use over time: A dual latent growth curve analysis. *Drug and Alcohol Dependence*. 2015; 146:e96. doi:10.1016/j.drugalcdep.2014.09.629.

- Stanwick R. E-cigarettes: Are we renormalizing public smoking? Reversing five decades of tobacco control and revitalizing nicotine dependency in children and youth in Canada. *Paediatrics & Child Health*. 2015; 20(2):1.
- Steinberg P. YouTube as source of prostate cancer information. *Urology*. 2010; 75(3):619–622. doi: 10.1016/j.urolgy.2008.07.059. [PubMed: 19815255]
- Tanski SE, Stoolmiller M, Gerrard M, Sargent JD. Moderation of the association between media exposure and youth smoking onset: Race/ethnicity, and parent smoking. *Prevention Science*. 2012; 13(1):55–63. doi:10.1007/s11121-011-0244-3. [PubMed: 21901429]
- Technavio. E-cigarette market in the US 2014-2018. Infiniti Research Ltd; 2014. Retrieved from <http://www.technavio.com/report/e-cigarette-market-in-the-us-2014-2018>
- U.S. Department of Health and Human Services. The health consequences of smoking - 50 years of progress: A report of the surgeon general. U.S. Department of Health and Human Services, Office of the Surgeon General; Rockville, MD: 2014.
- U.S. Food and Drug Administration. Electronic cigarettes (e-cigarettes). U.S. Department of Health and Human Services; 2015. Retrieved from <http://www.fda.gov/NewsEvents/PublicHealthFocus/ucm172906.htm>
- Vance K, Howe W, Dellavalle RP. Social internet sites as a source of public health information. *Dermatologic Clinics*. 2009; 27(2):133–136. doi:10.1016/j.det.2008.11.010. [PubMed: 19254656]
- Westenberger, BJ. Evaluation of e-cigarettes. Department of Health and Human Services, Food and Drug Administration, Center for Drug Evaluation and Research, Division of Pharmaceutical Analysis; St. Louis, MO: 2009.
- World Health Organization. Electronic nicotine delivery systems: Report by WHO. World Health Organization Framework Convention on Tobacco Control, FCTC/COP/6/10 Rev.1. 2014
- Yamin CK, Bitton A, Bates DW. E-cigarettes: A rapidly growing internet phenomenon. *Annals of Internal Medicine*. 2010; 153(9):607. [PubMed: 21041581]
- Yan XS, D'Ruiz C. Effects of using electronic cigarettes on nicotine delivery and cardiovascular function in comparison with regular cigarettes. *Regulatory Toxicology and Pharmacology : RTP*. 2015; 71(1):24–34. doi:10.1016/j.yrtph.2014.11.004. [PubMed: 25460033]
- YouTube. YouTube statistics. 2015. Retrieved from <http://www.youtube.com/yt/press/statistics.html>

Figure 1.

Detail of YouTube e-cigarette health effects content. This figure illustrates e-cigarette health effects content in each video category by “pro”, “anti”, or “neutral” classification.

Table 1

Video Statistics associated with YouTube videos that are Categorized as Educational/Medical/News, Advertising/Marketing, or “Personal/Testimonial” E-cigarette Health Effects Videos

	Educational/Medical/News (n = 30)	Advertising/Marketing (n = 15)	Personal/Testimonial (n = 19)
Number of Views			
Total	6,847,255	2,917,335	5,709,404
Average	228,242	208,381	317,189
Range	208-2,918,809	802-1,153,488	802-2,100,600
Number of “Likes”			
Total	44,516	7,874	23,814
Average	1,484	562	969
Range	0-14,523	3-4,422	3-4,422
Number of “Dislikes”			
Total	16,686	1,221	2,387
Average	556	87	126
Range	1-10,613	0-509	0-509
Number of Comments			
Total	26,104	8,479	8,345
Average	870	368	439
Range	1-9,105	0-2,591	7-2,591

Note. One advertising/marketing video did not show total number of views and one advertising/marketing video did not show total number of “likes” and “dislikes”, so the statistics listed refer to the remaining advertising/marketing videos for each category.

Table 2

Health Effects Topics Covered in YouTube E-Cigarette Educational/Medical/News, Advertising/Marketing and Personal/Testimonial Videos

	<u>Educational/Medical/News</u>		<u>Advertising/ Marketing</u>		<u>Personal/ Testimonial</u>	
	<u>n = 30</u>		<u>n = 15</u>		<u>n = 19</u>	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
Negative Health Effects	29	96.7	9	60.0	12	63.2
Nicotine	25	83.3	9	60.0	11	57.9
Known/unknown health consequences	23	76.6	2	13.3	3	15.8
Not FDA regulated	13	43.3	3	20.0	4	21.0
Exposure to vapor	10	33.3	1	6.7	0	0
Addiction to ECs	10	33.3	1	6.7	1	5.3
Not proven to quit	5	16.7	0	0	0	0
Respiratory symptoms	2	6.7	2	13.3	2	10.5
Addiction in youth/gateway drug	1	3.3	0	0	0	0
Positive Health Effects	23	76.7	12	80.0	16	84.2
Quit smoking	11	36.7	9	60.0	13	68.4
Healthier than smoking	9	30.0	10	66.7	13	68.4
No smoke exposure	5	16.7	2	13.3	2	10.5
Sleep better	0	0	1	6.7	2	10.5
Breathe better	0	0	1	6.7	1	5.3
Feel better	0	0	0	0	2	10.5
Promotional Content	14	46.6	13	86.7	10	52.6
Flavors/taste	9	30.0	6	40.0	2	10.5
Brand mention	7	23.3	10	66.7	6	31.6
Smell	2	6.7	2	13.3	3	15.8
Save money	1	3.3	4	26.7	2	10.5
Like real cigarettes	1	3.3	2	13.3	0	0
Environmentally friendly	1	3.3	1	6.7	1	5.3
Use it anywhere	0	0	1	6.7	1	5.3

Note. The numbers refer to the total number of videos within the educational/medical/news, advertising/marketing, and personal/testimonial subgroups.