





E-cigarette Marketing Expenditures in the United States From 2016 to 2021: Targeted Media Outlets Geared Toward People Who Are at Increased Risk for Tobacco Use

Jenny E. Ozga PhD¹, Andrea M. Stroup PhD, MPH, MS¹, Melissa H. Abadi PhD²,
Marshall K. Cheney PhD³, Anuja Majmundar PhD, MBA⁴, Kathleen A. Garrison PhD⁵,
Julia Chen-Sankey PhD, MPP⁶, Steve Shamblen PhD², Christopher Dunlap MS³,
Cassandra A. Stanton PhD¹

¹Behavioral Health and Health Policy, Westat, Rockville, MD, USA

²Pacific Institute for Research and Evaluation, Louisville, KY, USA

³Department of Health and Exercise Science, University of Oklahoma, Norman, OK, USA

⁴American Cancer Society, Atlanta, GA, USA

⁵Department of Psychiatry, Yale University, New Haven, CT, USA

⁶Department of Health Behavior, Society, and Policy, Rutgers Center for Tobacco Studies, New Brunswick, NJ, USA

Corresponding Author: Jenny E. Ozga, PhD, Westat, 1600 Research Blvd., Rockville, MD 20850, USA. Telephone: 240-453-2614; E-mail: JennyOzga@Westat.com

Abstract

Introduction: E-cigarette advertising exposure is linked to e-cigarette initiation and use. Thus, monitoring trends in e-cigarette advertising practices is important to understand e-cigarette use patterns observed over recent years.

Aims and Methods: E-cigarette advertising expenditures (January 2016–July 2021; Numerator Ad Intel) for 154 U.S. market areas were harmonized with U.S. Census sociodemographic data through Nielsen zip code designations by market area. Descriptive statistics and multivariable linear regressions were used to examine trends in e-cigarette advertising expenditures across media outlets and associations between sociodemographic characteristics and e-cigarette advertising over time.

Results: E-cigarette advertising expenditures peaked in 2018/2019, followed by a sharp decline in 2020. Expenditures were concentrated primarily on print (58.9%), TV (20.6%), and radio (14.4%). Major print outlets were Sports Illustrated, Rolling Stone, and Star magazines. Top TV channels were AMC, Investigation Discovery, and TBS. TV advertisements were purchased commonly during popular movies and TV series (eg King of Queens, Everybody Loves Raymond, The Walking Dead). Higher expenditures were associated with U.S. market areas that had (1) a larger percentage of non-rural zip codes (radio), (2) smaller male populations (radio), and (3) larger White or Caucasian, Black or African American, American Indian or Alaska Native, Asian, and Other or Multiracial populations (radio, print, online display, and online video).

Conclusions: E-cigarette companies advertised in print magazines geared toward males and youth and young adults, radio commercials focused in urban areas with smaller male populations, and nationwide TV commercials. Declines in e-cigarette advertising expenditures in 2020 demonstrate the potential impact that federal policies may have on protecting populations who are at higher risk for tobacco use from predatory advertising practices.

Implications: E-cigarette advertising exposure is associated with the initiation and use of e-cigarettes. This study shows how e-cigarette marketing expenditures in the United States may have targeted specific consumers (eg youth and young adults) between 2016 and 2021. The precipitous drop in advertising expenditures across all outlets during early 2020 corresponds with the implementation of the Tobacco 21 federal policy, the federal enforcement policy to remove most unauthorized flavored e-cigarette cartridges from the U.S. market, preparations for FDA's premarket review of e-cigarette products, and the decision by several TV broadcast companies to stop showing e-cigarette ads. The potential impact of federal policies may have far-reaching implications for protecting populations who are at high risk for tobacco use and its health consequences.

Introduction

Current e-cigarette use prevalence among U.S. youth and young adults increased at an alarming rate between 2017 and 2019.^{1–3} In an effort to combat this steep rise in the use of e-cigarettes, the U.S. Food and Drug Administration (FDA) implemented a federal enforcement policy to remove most unauthorized flavored (except tobacco and menthol)

cartridge-based e-cigarettes from the U.S. market beginning in January 2020.⁴ The federal Tobacco 21 policy was also implemented around this time, raising the minimum age to purchase tobacco (including e-cigarette products) from 18 to 21 years.⁵ Although use prevalence declined in 2020 for both youth and young adults,⁶ e-cigarettes continue to be the most commonly used tobacco product among youth.⁷ Of particular concern is that, compared to non-users, youth and

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young adults who use e-cigarettes may be more likely to subsequently initiate the use of tobacco cigarettes, though studies have shown mixed results.^{8–11}

Self-reported e-cigarette advertising exposure is significantly associated with e-cigarette use among youth¹² and young adults.¹³ In fact, national-level survey data from the Population Assessment of Tobacco and Health (PATH) Study show that U.S. youth's e-cigarette advertisement exposure in 2016–2017 was associated with an increased likelihood of ever and current e-cigarette use just one year later.¹⁴ Of course, youth and young adults are not the only populations using e-cigarettes. Adults 25 years and older in the PATH Study who were e-cigarette-naïve in 2013/14 initiated use of e-cigarettes at a higher rate than four other tobacco products (cigarettes, cigars, hookah, and smokeless tobacco) over the next 2 years (2014/15 or 2015/16).¹⁵ In addition, certain racial or ethnic groups (eg non-Hispanic Whites) and males may be more likely to use e-cigarettes than their counterparts regardless of age.¹⁶ Given the important associations between e-cigarette advertising exposure and use for all age groups,^{12–14,17} e-cigarette advertising represents an important potential regulatory target.

Several studies have investigated e-cigarette advertising exposure from the perspective of consumers,¹⁸ yet little is known about how e-cigarette companies allocate advertising expenditures. Industry advertising practices need to be monitored as FDA marketing authorization decisions and marketing stipulations are made. Two studies examining trends in e-cigarette advertising expenditures over time found that spending by popular e-cigarette companies (eg JUUL, Blu, and Vuse) was largely concentrated on print and television (TV) advertisements, and increased substantially toward the end of 2018 and the beginning of 2019.^{19,20} Interestingly, this increase in spending was parallel to the spike in e-cigarette use among U.S. youth and young adults. To date, however, no studies have examined whether e-cigarette companies may target youth and young adults or other populations who are at risk for e-cigarette use. Thus, the purpose of this study was to expand upon prior work^{19,20} by identifying trends in e-cigarette advertising expenditures from January 2016 through July 2021, after major tobacco federal policies took effect, and examining associations between consumer sociodemographic characteristics and e-cigarette advertising expenditures.

Methods

Data Sources and Measures

Numerator Ad Intel e-cigarette advertising expenditure data (<https://www.numerator.com/ad-intel-dashboard>) from January 1, 2016 through July 31, 2021 included $N = 729\,399$ e-cigarette advertisement occurrences allocated to print ($n = 11\,429$; 1.6%), TV ($n = 55\,389$; 7.6%), radio ($n = 612\,020$; 83.9%), online video ($n = 2159$; 0.3%), online display ($n = 45\,113$; 6.2%), and mobile ($n = 3289$; 0.5%) domains within Numerator's network. Online display advertisement (ie static image advertisements on websites, such as website banners) information was collected from 4000 websites accessed via computer. Online video advertisement (ie video advertisements on websites, such as those occurring before, during, and/or after a video stream) information was obtained from a sample of 500 websites accessed via computer. Mobile advertisement data were collected from 2500 websites and 1000 applications (apps) accessed via mobile device, and

included both static image and video advertisements. For each advertisement occurrence, the company or advertiser name, media outlet details, designated market area (DMA) where the advertisement aired, air date, and cost (in U.S. dollars) were provided. Media outlet details included the media channel (ie TV, print, radio, etc.) and source (ie TV channel, TV show, website, newspaper, etc.). Data included 154 of a possible 210 DMAs in the United States, which are geographic regions established by Nielsen and used by marketing agencies to track advertising.²¹ The Numerator Ad Intel data also included a "National" DMA, which refers to advertising occurrences that targeted the entire United States.

U.S. Census data from 2010 (<https://www.census.gov/data.html>) were used to characterize the sociodemographic characteristics of DMAs included in the Numerator Ad Intel dataset. U.S. Census data included the percent of the population in each U.S. zip code classified as being male, under 21 years of age, of Hispanic or Latino ethnicity, and of one or more races (White or Caucasian, Black or African American, American Indian or Alaskan Native, Asian, or Other or Multiracial). The number of housing units per person, a proxy measure for socioeconomic status (SES), was also provided by zip code. Primary Rural-Urban Commuting Area (RUCA) codes from 2010 were used to identify U.S. zip codes as being non-rural/metropolitan or rural (including small and large rural).

Nielsen zip code designations by DMA from 2021 (<https://www.nielsen.com/us/en/contact-us/intl-campaigns/dma-maps/>) were used to harmonize zip codes from U.S. Census data and DMAs from Numerator Ad Intel. The Nielsen designations provided a breakdown of all U.S. zip codes within each DMA. Sociodemographic data were averaged across all zip codes within a particular DMA to evaluate the characteristics of each DMA.

Data Analysis

The present analyses included the entire e-cigarette expenditures dataset obtained from Numerator Ad Intel, which was harmonized with U.S. Census sociodemographic data through Nielsen zip code designations by DMA. E-cigarette advertising expenditure data were adjusted for inflation to 2021 dollars using the U.S. Consumer Price Index.²² Then, expenditures were aggregated by quarters within years to examine overall trends by a media outlet for all DMAs combined. Within each media outlet, descriptive statistics were used to summarize media outlet details. Then, expenditure data were further aggregated by DMAs and separate multivariable linear regressions were used for each media outlet to evaluate associations between the sociodemographic characteristics of DMAs and e-cigarette advertising expenditures across years. Analyses were conducted using R version 4.1.0 (<http://www.r-project.org/>). Statistical significance was defined as $p < .05$.

Results

Figure 1 shows e-cigarette advertising expenditures by media outlet and quarter and year during the data period. For all DMAs combined, total expenditures peaked in late 2018/early 2019, followed by a sharp decline that continued through the end of July 2021. The largest amount of spend was concentrated on print (58.9%), followed by TV (20.6%), radio (14.4%), online display (3.8%), mobile (1.7%), and online video (0.6%) advertisements. However, more advertisement

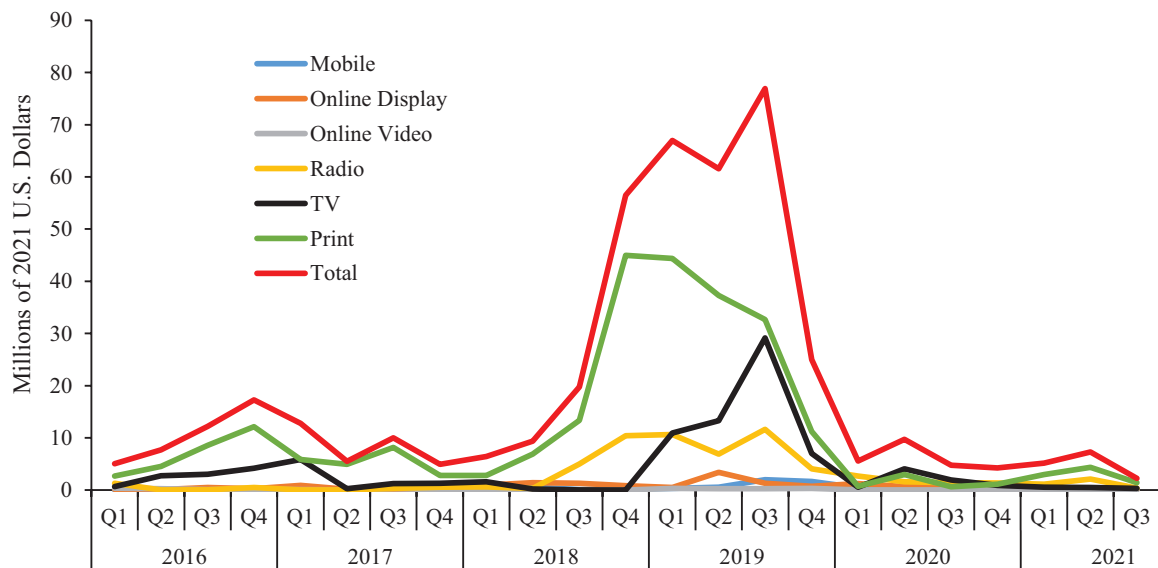


Figure 1. E-cigarette advertising expenditures (in millions of inflation-adjusted 2021 U.S. dollars) across media outlets, January 2016–July 2021.

occurrences were purchased for radio (83.9%), followed by TV (7.6%), online display (6.2%), print (1.6%), mobile (0.5%), and online video (0.3%), indicating that the unit cost for advertisements in different media outlets varied widely.

For print ads, the top four outlets were *Sports Illustrated* (total spend = \$10.60 million (M)), *Rolling Stone* (\$9.51M), and *Star* (\$9.97M) magazines, followed by the *Washington Post* newspaper (\$8.74M). For radio ads, the top four outlets were stations categorized as News, Talk, or Information (\$16.19M), Adult Contemporary music (\$11.19M), Rock music (\$10.37M), and Urban music (\$7.28M). For TV, the top four targeted channels were AMC (\$9.03M), Investigation Discovery (\$6.89M), TBS (\$5.42M), and TNT (\$4.81M). TV e-cigarette advertisements were purchased most commonly during movies and shows such as *King of Queens*, *Everybody Loves Raymond*, and *The Walking Dead*. The unit cost for advertisements differed across TV channels, movies or TV series, and radio stations, such that total expenditures and total advertisement occurrences purchased were not always directly related to one another.

Supplementary Table 1 shows multivariable regression outcomes for associations between sociodemographic characteristics and e-cigarette advertising expenditures for different media outlets across the years. For radio, print, online display, online video, and all media outlets combined, DMAs with higher percentages of White or Caucasian, Black or African American, American Indian or Alaska Native, Asian, and Other or Multiracial populations were associated with higher spending. DMAs with smaller male populations and those with more non-rural or metropolitan zip codes were also associated with higher spending on radio advertisements. No other significant sociodemographic associations were observed for radio, print, online display, online video, or all media outlets combined. In addition, there were no significant associations between sociodemographic characteristics and e-cigarette advertising expenditures for TV or mobile advertisements.

Discussion

The purpose of this study was to evaluate associations between e-cigarette company advertising expenditures and sociodemographic characteristics of U.S. market areas.

E-cigarette advertising expenditures peaked in late 2018/early 2019, followed by a sharp decline that continued through July 2021. This finding is in line with prior work assessing e-cigarette advertising expenditures through 2019,^{19,20} which demonstrated the same pattern and further supports the significant role that e-cigarette advertising played in the substantial uptake of e-cigarettes among youth and young adults during this time period.^{1–3,23} Although many factors, such as the 2020 coronavirus pandemic, may have contributed to the decline in advertising expenditures during 2020, it is possible that the federal Tobacco 21 policy,⁵ the federal enforcement policy to remove most unauthorized flavored cartridge-based e-cigarettes from the U.S. market,⁴ and companies' preparations for FDA's premarket review of e-cigarette products²⁴ served as major players. Importantly, declines in e-cigarette advertising expenditures after the peak in 2018/2019 parallel those seen with use prevalence among youth from a national survey,²⁵ providing further support for the influence of pervasive marketing on e-cigarette use.

Also in line with prior research,¹⁹ e-cigarette advertising expenditures were concentrated primarily on print, TV, and radio outlets. Expenditures were highest for print. Although only <2% of occurrences were for print ads, the cost per advertisement occurrence was higher for print relative to other media types. Across the years, print advertising expenditures were allocated largely to three magazines—*Rolling Stone*, *Sports Illustrated*, and *Star*. As of 2020, approximately 91% of adults read magazines, with individuals <35 years of age being more likely (93%–94%) than older age groups.²⁶ In addition, data from March 2022 indicate that *Rolling Stone* magazine was viewed online by mostly males (63.4%) and people <35 years of age (51%);²⁷ *Sports Illustrated*²⁸ and *Star*²⁹ magazines had similar online audience compositions at that time. These limited data on magazine readership characteristics suggest that males and youth and young adults may have been exposed to print e-cigarette advertisements more than their counterparts. Importantly, males³⁰ and youth and young adults^{31,32} also have relatively higher rates of e-cigarette use, giving further support for the notion that e-cigarette advertising exposure may contribute to e-cigarette use. In addition, multivariable analysis showed that higher print

expenditures were associated with areas having larger racial or ethnic majority *and* minority populations, suggesting that print expenditures during this period of time were targeted toward areas with larger populations in general and not toward a specific racial or ethnic group.

TV advertisements ranked second in advertising expenditures and in the total number of ads purchased. Importantly, in 2019, several major TV broadcast companies, including CBS, Viacom (ie Comedy Central, BET, and MTV), and WarnerMedia (ie TBS, TNT, and TruTV), decided to stop showing e-cigarette ads on their networks.³³ Such networks encompass some of the most commonly targeted TV channels for e-cigarette advertisements identified in the current study (ie TBS, TNT). In addition, TV e-cigarette advertising expenditures took a sharp decline in the third quarter of 2019 among the present data, highlighting how these company-wide changes may have impacted e-cigarette TV advertising expenditures during this timeframe. Although the current study identified the most commonly targeted TV channels and shows for e-cigarette advertising (eg King of Queens, The Walking Dead), we were unable to find reliable data on specific audience demographics due to the general distribution of cable TV shows across the United States. Along these same lines, multivariable analyses did not show any significant associations between TV advertising expenditures and sociodemographic characteristics by DMA; however, most TV expenditures encompassed the “national” market and were not specific to individual DMAs. Thus, it is unclear from the current data whether airing e-cigarette advertisements on these specific channels or during these programs targeted certain sociodemographic groups.

Radio advertising expenditures ranked third for expenditures but first in the number of occurrences across all media types, highlighting how the cost per occurrence for radio ads was relatively lower than those for print or TV. In addition to being relatively cheaper, it is no surprise that radio had the most advertising occurrences due to high frequencies of radio advertisement breaks on most stations and substantial audience reach. In fact, in 2019, an estimated 92% of Americans listened to the radio on a regular basis, which was higher than TV viewership (87%), PC use (54%), smartphone use (81%), and tablet use (46%).³⁴ Also in 2019, 71.2 million adults aged 18–34 years listened to the radio on a monthly basis, although substantially more older adults (≥35+ years of age; 174.5 million) also listened.³⁴ Similar to print advertising, multivariable analyses revealed that higher radio advertising expenditures were associated with DMAs that were more non-rural or metropolitan, which had larger populations of all U.S. Census racial/ethnic groups. Higher radio advertising expenditures also were associated with market areas that had smaller male populations, which is in line with some other work,³⁵ but in contrast to results from a recent systematic review indicating that males are more likely to be exposed to e-cigarette advertisements than females.¹⁸

Limitations

First, more than half of e-cigarette advertising expenditures were aimed at national markets and were not specific to individual DMAs. This resulted in a relatively limited sample of expenditures to use for U.S. Census sociodemographic targeting assessment. Second, the sociodemographic data were obtained from the 2010 U.S. Census. These data are relatively dated, however, they are the most recent national data regarding U.S. sociodemographic characteristics available at the zip-code level, which was necessary for harmonizing

sociodemographic data with e-cigarette advertising expenditure data. Using 2010 U.S. Census data may have resulted in an over- or under-estimation of the sociodemographic characteristics of DMAs. Third, Numerator Ad Intel data includes advertising expenditures only for media outlets with which they have ongoing contracts; these are not comprehensive data on total e-cigarette advertising expenditures nationwide. Moreover, advertising on social media could not be accounted for in this dataset. However, results from the current study are similar to results from prior studies utilizing data from Kantar Media, an alternative media tracking company,^{19,20} indicating high interrater reliability. It's also important to note that higher advertising expenditures did not equate to a larger number of occurrences purchased in the current study. Thus, results and conclusions about e-cigarette advertising trends may differ when using advertisement occurrences as the outcome measure rather than expenditures. Finally, changes in advertising practices in early 2020 may have been related to other factors not accounted for, including the coronavirus pandemic. Continued monitoring of trends over time is critical.

Conclusions

From January 2016 through July 2021, e-cigarette companies focused their advertising expenditures on print magazines geared toward males and youth and young adults, radio commercials focused in urban areas with larger female populations, and TV commercials on nationwide channels. Notably, expenditures for all media types took a sharp decline in 2020. Based on the tobacco federal policies implemented during this time (ie Tobacco 21 and the enforcement policy to remove most unauthorized flavored e-cigarette cartridges), these findings highlight the important role that such policies along with premarket review marketing restrictions may play in protecting populations at higher risk for e-cigarette use by limiting predatory advertising practices. Advertising trends will need to be monitored as premarket review decisions and marketing stipulations are made.

Supplementary Material

A Contributorship Form detailing each author's specific involvement with this content, as well as any supplementary data, are available online at <https://academic.oup.com/ntr>.

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Declaration of Interests

The content of this paper is solely the responsibility of the authors and does not necessarily represent the official views of the coauthors' institutions, the NIH, or the FDA. The authors have no conflicts of interest to declare.

Data Availability

The data underlying this article were provided by Numerator Ad Intel under license. Data will be shared on request to the corresponding author with the permission of Numerator Ad Intel.

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