



Original Investigation

From the Deeming Rule to JUUL—US News Coverage of Electronic Cigarettes, 2015–2018

Olivia A. Wackowski PhD, MPH¹, Jennah M. Sontag PhD², Binu Singh MPH^{1,○}, Jessica King PhD³, M. Jane Lewis DrPH, MPH¹, Michael B. Steinberg MD⁴, Cristine D. Delnevo PhD, MPH¹

¹Rutgers Center for Tobacco Studies, New Brunswick, NJ; ²Department of Pediatrics, Robert Wood Johnson Medical School, Rutgers University, New Brunswick, NJ; ³College of Health, University of Utah, Salt Lake City, UT; ⁴Department of Medicine, Robert Wood Johnson Medical School, Rutgers University, New Brunswick, NJ

Corresponding Author: Olivia A. Wackowski, PhD, MPH, Rutgers Center for Tobacco Studies, 303 George Street, New Brunswick, NJ 08901, USA. Telephone: 848-932-8057; E-mail: wackowol@sph.rutgers.edu

Abstract

Introduction: News media may influence public perceptions and attitudes about electronic cigarettes (e-cigarettes), which may influence product use and attitudes about their regulation. The purpose of this study is to describe trends in US news coverage of e-cigarettes during a period of evolving regulation, science, and trends in the use of e-cigarettes.

Methods: We conducted a content analysis of e-cigarette topics and themes covered in US news articles from 2015 to 2018. Online news databases (Access World News, Factiva) were used to obtain US news articles from the top 34 circulating newspapers, four national wire services, and five leading online news sources.

Results: The number of articles increased by 75.4% between 2015 and 2018 ($n = 1609$). Most articles focused on policy/regulation (43.5%) as a main topic, followed by health effects (22.3%) and prevalence/trends (17.9%). Discussion about flavor bans quadrupled (6.1% to 24.6%) and discussion of youth e-cigarette use was most prevalent (58.4%) in 2018, coinciding with an increase in coverage about JUUL. JUUL was mentioned in 50.8% of 2018 articles. Across years, articles more frequently mentioned e-cigarette risks (70%) than potential benefits (37.3%).

Conclusions: E-cigarettes continue to be a newsworthy topic, with coverage both reflecting numerous changes and events over time, and providing repeated opportunities for informing the public and policymakers about these novel products. Future research should continue to track how discourse changes over time and assess its potential influence on e-cigarette perceptions and policy changes.

Implications: E-cigarette news coverage in the United States increased between 2015 and 2018 and predominantly focused on policy and regulation. Notable spikes in volume were associated with some but not all major e-cigarette events, including the FDA's deeming rule, Surgeon General's report, and release of the National Youth Tobacco Survey data in 2018. Coverage of the 2018 National Academy of Medicine, Engineering, and Sciences report on the Public Health Consequences of E-cigarettes received minimal news coverage. The high volume in 2018 was driven in large part by coverage of the e-cigarette brand JUUL; over half of news articles in 2018 referenced JUUL specifically.

Introduction

Electronic cigarette (or e-cigarette) use among adults and adolescents has increased in the United States in recent years.¹⁻⁴ E-cigarettes can contain nicotine and be addictive and may expose users to various levels of chemicals and heavy metals.³ However, compared to combusted tobacco, e-cigarettes contain lower levels of toxins,^{3,5} and studies demonstrate that some smokers have been able to transition from cigarettes to e-cigarettes.⁶⁻⁹ Proponents claim that e-cigarettes are a cleaner form of nicotine delivery than combusted tobacco that can help smokers quit cigarettes and be used for harm reduction. However, others argue that the appeal of e-cigarettes to youth may facilitate dual use with cigarettes, and may lead to cigarette smoking.

Knowledge and perceptions of e-cigarettes may influence people's use of e-cigarettes and attitudes about their regulation. While exposure to e-cigarette advertisements and social interactions may influence knowledge and perceptions, the news media may also play a significant role in informing and shaping the public's and policy-makers' thinking about e-cigarettes, particularly as a relatively new product compared to other tobacco products. Indeed, agenda-setting theory asserts that the salience and importance of a particular topic are influenced by media coverage of that topic.¹⁰ Recent experimental studies have also documented how exposure to tobacco news stories (including e-cigarette news) with varying valence can impact the public's perceptions about and intentions to use these products.¹¹⁻¹³ This is important given that e-cigarette news coverage has been cited as a likely contributor to changes in public perceptions of e-cigarettes over time, with increases in the proportion of adults who believe e-cigarettes are as harmful as cigarettes over the last several years.^{14,15}

Some population surveys have documented that e-cigarette news media is reaching the public,¹⁶⁻¹⁸ with over 60% of smokers reporting exposure to e-cigarette information in the news in 2014¹⁷ and over 20% of older adult smokers having heard about JUUL, a newly popular e-cigarette brand, in the news in early 2018.¹⁸ However, little is known about the specific e-cigarette information the public receives through the news media. Given that e-cigarettes' availability, promotion, use, regulations, and research has been continually evolving since their introduction, it is important to monitor their characterization in the news media. This is underscored by the occurrence of several potentially newsworthy events and trends in the last several years in the United States providing relevant opportunities to communicate with the public about e-cigarettes, including the passing of the 2016 Deeming Rule (which gave the FDA regulatory authority over e-cigarettes), the rise of JUUL between 2017 and 2018 as a dominant brand leader, and the January 2018 release of a FDA commissioned report on the public health consequences of e-cigarettes by the National Academies of Sciences, Engineering, and Medicine. This report was intended to provide a comprehensive review and summary of the state of research about e-cigarettes and health.³

However, few studies have examined the content of US e-cigarette news in some way, and only two have looked at this over time.^{19,20} Yates et al. found that the majority of US news coverage from 2007 to mid-2014 referred to the potential risks of e-cigarettes versus potential benefits and focused on the need for e-cigarette regulation.¹⁹ Our previous analysis of US articles in 2015, the year before the Deeming Rule was passed, found that policy and regulation was the dominant main topic of articles and that articles that discussed the need for FDA regulation more frequently referred to frames and concerns about youth appeal and use.²¹ More recently, an analysis of

global e-cigarette news (from 2013 to first half of 2018), found an increase in news coverage over time, that news about the potential harms of e-cigarettes was the most frequent topic in US coverage, and that a minority of articles had a positive e-cigarette sentiment.²⁰ However, because of this study's broader focus on global news coverage and news volume, detailed analysis of the content and specific themes/messages in US news articles was limited. To our knowledge, no study has described news coverage surrounding specific US e-cigarette events, nor of the more recent emergence of JUUL, the most popular e-cigarette brand among youth that has been implicated in an overall spike in youth e-cigarette use.^{2,4} Given the potential influence of JUUL-related news coverage on subsequent policy proposals to more strictly limit youth access to e-cigarettes and their marketing, an examination of themes presented in such articles is relevant.

This manuscript adds to the nascent research on e-cigarette communication. Specifically, we conducted a content analysis of US news articles about e-cigarettes from 2015 to 2018, which examines news content before, during and after passing of the 2016 Deeming Rule. Additionally, our time period covers the January 2018 release of the NASEM report on e-cigarettes as well as the emergence and rapid growth of the e-cigarette brand, JUUL.

Methods

Data Sample

The online news databases, *Access World News* and *Factiva*, were used to obtain the articles included in the analysis. Inclusion criteria included articles published between 2015–2018 in the top 34 circulating newspapers in the United States, four national wire services (ie, Associated Press, CNN Wire, Reuters, UPI News Track), and five leading online news sources (ie, ABC News, CBS News, CNN News, Huffington Post, NBC News), as identified by the Pew Research Center and Alliance for Audited Media's Media Intelligence Center.^{22,23} In addition, only news, feature, advice, and opinion articles containing at least one of 21 e-cigarette-related search terms (singular and plural forms of "electronic cigarette," "e-cigarette," "ecigarette," "e-cig," "ecig," "vaping," "vape," "vaporizer," "e-liquid," "e-juice," "electronic nicotine delivery device") or one of three JUUL-related search terms, ("JUUL," "JUULS," "JUULING") in the headline were included. Articles inaccessible through the databases were purchased through the publications' archive services. Articles in the sample were limited to unique articles. Duplicate articles (eg, multiple copies of a unique wire story published in newspapers) were excluded. However, articles that may have included sections from wire stories but also additional unique content were coded as unique articles.

Coding and Analysis

A coding sheet and guide were developed based on previous experience with tobacco news content analyses,^{24,25} review of previous e-cigarette news studies,^{19,26} and an iterative review and pilot coding of a random sample of 50 articles. Coding was completed manually by trained coders. Articles were coded for their overall main topic (ie, e-cigarette prevalence/trends, health effects, policy/regulation, industry activities/retail, cessation, or other), defined as the topic/issue mainly driving the story, typically discussed in the headline and leading paragraphs. Articles were also coded for the presence of statements related to e-cigarette themes or characteristics, including those related to product use, policy, and potential

Table 1. Changes in the Prevalence of E-cigarette Themes and Topics from Year to Year, 2015–2018

Variables	No. (%)					Percentage point change from 2015–2018	Percentage change in volume
	Overall (N = 1609)	2015 (n = 329)	2016 (n = 457)	2017 (n = 246)	2018 (n = 577)		
Types of articles							
News	87.8	264 (80.2)	414 (91.0)	219 (89.0)	515 (89.3)	9.1	95.1
Opinion	11.7	61(18.5)	43 (9.0)	25 (10.0)	60 (10.4)	-8.1	-1.6
Other	0.5	4 (1.2)	0 (0)	2 (1.0)	2 (<1.0)	-1.2	-50.0
Main topic/theme							
E-cig policy/regulation	43.5	146 (44.4)	206 (45.1)	111 (45.1)	237 (41.1)	-3.3	62.3
Health effects	22.3	69 (21.0)	122 (26.7)	51 (20.7)	117 (20.3)	-0.7	69.6
Prevalence/trends	17.9	69 (21.0)	63 (13.8)	40 (16.3)	116 (20.1)	-0.9	68.1
Industry activities	9.8	25 (7.6)	30 (6.6)	22 (8.9)	81 (14.0)	6.4	224.0
Cessation	4.0	17 (5.2)	21 (4.6)	13 (5.3)	14 (2.4)	-2.8	17.7
Other	2.4	3 (1.0)	15 (3.3)	9 (3.7)	12 (2.2)	1.2	300.0
Topics/themes mentioned							
Youth use	43.2	149 (45.3)	135 (29.5)	74 (30.1)	337 (58.4)	13.1	126.2
FDA regulation	32.8	124 (37.7)	174 (38.1)	47 (19.1)	183 (31.7)	-6	47.6
Age-of-sale restrictions	31.0	121 (36.8)	148 (32.4)	33 (13.4)	196 (34.0)	-2.8	62.0
Smoke-free air laws/bans on e-cig use	20.3	95 (28.9)	97 (21.2)	72 (29.3)	62 (10.7)	-18.2	-34.7
JUUL	18.8	0 (0)	1 (<1.0)	8 (3.3)	293 (50.8)	50.8	-
Marketing/advertising restrictions	14.9	41 (12.5)	66 (14.4)	11 (4.5)	122 (21.1)	8.6	197.6
Big Tobacco's involvement in e-cig industry	13.7	37 (11.2)	71 (15.5)	27 (11.0)	85 (14.7)	3.5	129.7
E-cig flavor bans	12.6	20 (6.1)	26 (5.7)	15 (1.5)	142 (24.6)	18.5	610.0
Adult/general use	10.4	38 (11.6)	49 (10.7)	28 (11.4)	52 (9.0)	-2.6	36.8
E-cig taxation	8.4	43 (13.1)	45 (9.8)	21 (8.5)	26 (4.5)	-8.6	-39.5
E-cig warning labels	6.4	27 (8.2)	60 (13.1)	7 (2.8)	9 (1.6)	-6.6	-66.7
Health-related benefits							
Less risky/harmful than cigarettes	28.5	114 (34.7)	115 (25.2)	75 (30.5)	137 (23.7)	-11	20.2
Effective smoking cessation tool	23.8	82 (24.9)	106 (23.2)	52 (21.1)	143 (24.8)	-0.1	74.4
No secondhand smoke	1.2	7 (2.1)	5 (1.1)	-	7 (1.2)	-0.9	0.0
Health-related risks							
Nicotine is addictive/harmful	27.9	86 (26.1)	104 (22.8)	49 (19.9)	210 (36.4)	10.3	144.2
Gateway to tobacco	25.2	111 (33.7)	119 (26.0)	46 (18.7)	129 (22.4)	-11.3	16.2
Flavors appeal to youth	22.0	73 (22.2)	77 (16.8)	30 (12.2)	174 (30.2)	8	138.4
Harmful toxins, chemicals, effects	19.1	87 (26.4)	82 (17.9)	47 (19.1)	92 (15.9)	-10.5	5.8
Health effects unknown	13.8	61 (18.5)	69 (15.1)	26 (10.6)	66 (11.4)	-7.1	8.2
Explosions	12.6	25 (7.6)	101 (22.1)	35 (14.2)	42 (7.3)	-0.3	68.0
Does not work for cessation	5.5	17 (5.2)	26 (5.7)	12 (4.9)	34 (5.9)	0.7	100.0
Renormalizing smoking	3.4	28 (8.5)	14 (3.1)	10 (4.1)	3 (0.5)	-8	-89.3
Prevents quitting/promotes dual use	3.3	10 (3.0)	21 (4.6)	10 (4.1)	12 (2.1)	-0.9	20.0
Quality concerns/unknown ingredients	3.2	8 (2.4)	33 (7.2)	5 (2.0)	5 (0.9)	-1.5	-37.5

risks and benefits (Table 1). Opinion articles (ie, editorials, letters to the editor) were additionally coded for their e-cigarette related slant (ie, the authors' e-cigarette position/opinion) as pro/positive towards e-cigarettes, anti/negative, or neutral towards e-cigarettes (eg, articles that discussed both advantages and disadvantages without a clear leaning towards either side). Finally, given the release of the US NASEM report during the study time period on January 23, 2018, a small sub-analysis was conducted on unique articles in our sample that were published within the first week of the report's release ($n = 8$). Two coders identified which of the

47 NASEM conclusions were reported in these articles (Cohen's $k = 0.66$).

Articles from the overall dataset were coded manually between January 2016 and March 2019 by five unique trained coders, including one consistent lead coder over the time period. To assess intercoder reliability, 10% of all articles were randomly sampled for each year and coded by two coders, resulting in an average Kappa value of 0.87. Disagreements were resolved through review and discussion of the article. Descriptive statistics were used to identify the frequency of topics and messages for each year.

Results

A total of 1609 unique articles were identified, with a 75.4% increase in volume between 2015 and 2018. On average, 20 to 50 unique articles were published each month, from January 2015 to December 2018, with an overall peak of 111 articles published in May 2016, which coincided with the FDA’s Deeming Rule to regulate all tobacco products, including e-cigarettes (Figure 1). Overall, e-cigarette news volume varied such that high volume was associated with major events. While Public Health England released a report (August 2015) stating that e-cigarettes are significantly less harmful than smoking and can help smokers quit, the peak in September 2015 was driven by greater coverage of a study on youth’s use of e-cigarettes to vape marijuana. In 2016, a second peak after the Deeming Rule coincided with release of the US Surgeon General’s report on e-cigarette use among youth and young adults (December 2016). Multiple peaks are noted in 2018 and were associated with reporting on a surge in youth e-cigarette use, followed by FDA statements and actions to address this issue (Figure 1). Interestingly, news coverage was comparatively lower when the FDA announced its comprehensive plan for regulation of tobacco and nicotine—the addictive chemical in e-cigarettes—in July 2017, and when the NASEM report on the public health consequences of e-cigarettes was released in January 2018.

Article Focus and Main Topic

Most articles had a national focus (53.9%), while 41% focused on local issues specific to a city or state, and 4.7% had an international

focus. The majority (88%) were news or feature stories. Among the 189 (12%) opinion articles, 57.7% had a negative/anti e-cigarette slant, while 28.6% had a positive/pro e-cigarette slant and 13.8% were neutral. A minority of opinion articles (9/189) were written by industry representative or advocates (all of which had a positive slant). In terms of main topic, the majority of news stories across the years were about policy/regulation (43.5%), followed by health effects (22.3%) and prevalence/trends (17.9%) (Table 1). The percentage of articles focused on industry activities nearly doubled between 2015 and 2018, an increase driven by JUUL coverage in 2018; of the 81 articles that mentioned industry activities in 2018, 79% mentioned JUUL. In 2018, topics of articles coded as “other” included those related to crime (eg, vape shop burglaries), sightings of celebrities vaping, and an ethics review for a congressman involved in the vaping industry. Additional description of coverage of specific topics and themes is presented next.

References to E-cigarette Prevalence and JUUL

About 43% of all articles addressed the prevalence of youth e-cigarette use. The percent of articles that discussed youth use dropped from 45% in 2015 to 30% by 2017, the year after the Deeming Rule was published, but in 2018 the topic of youth e-cigarette use jumped to nearly 60%, coinciding with an increase in coverage about JUUL (Table 1). In 2018 specifically, 50.8% of articles referenced the use of JUUL—the most popular e-cigarette brand among youth, compared to 3.3% in 2017. In addition, more

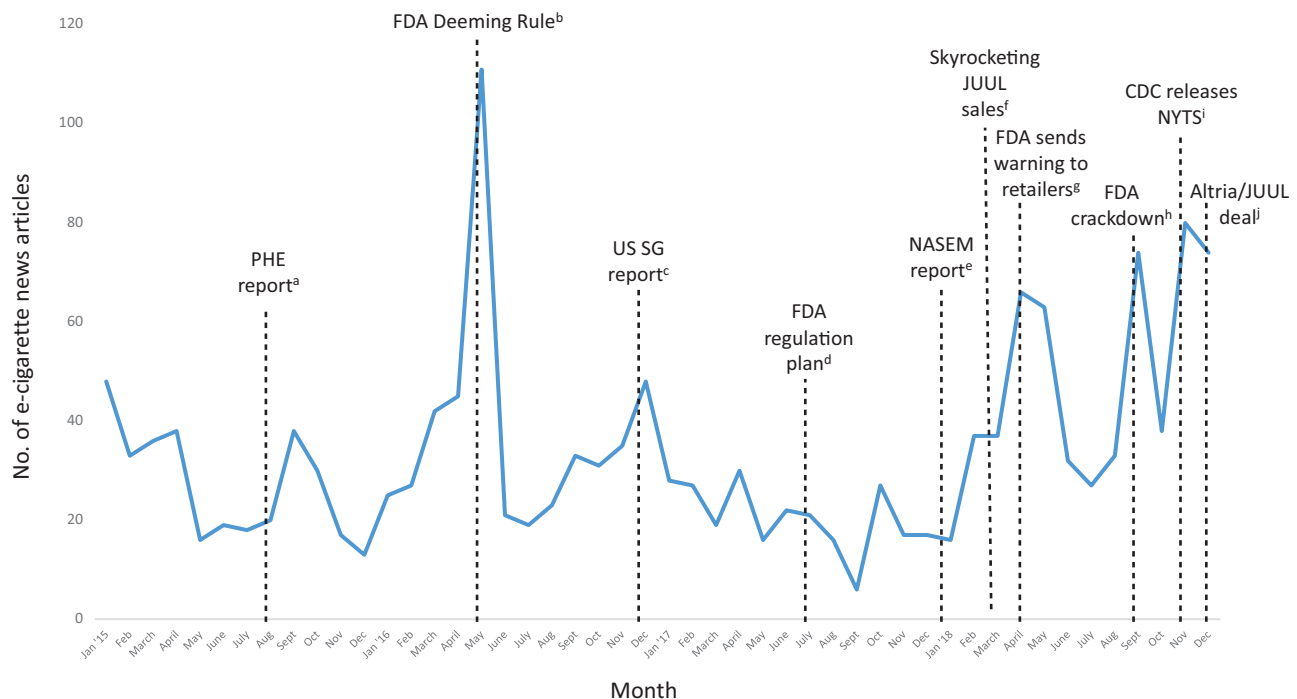


Figure 1. No. of e-cigarette news articles by month, 2015–2018. ^aPublic Health England published report stating that e-cigarettes are significantly less harmful than smoking and have the potential to help smokers quit. ^bFDA publishes final Deeming Rule to regulate all tobacco products. ^cUS Surgeon General releases report, “E-cigarette Use Among Youth and Young Adults.” ^dFDA announces plan for tobacco/nicotine regulation. ^eNASEM report on the public health consequences of e-cigarettes. ^fNumerous news stories reporting on JUUL use among youth, use of e-cigarettes in school and youth epidemic. ^gFDA requests marketing/research information related to youth initiation and use from JUUL Labs; FDA sends warning letters to retailers who illegally sold JUUL to underage youth. ^hFDA crackdown announcement, takes action against more than 1300 retailers, five major manufacturers for roles in perpetuating youth e-cigarette access. ⁱNYTS findings released (showing 78% increase in youth use); FDA announcement to address youth e-cigarette use epidemic, plans to limit sales of flavored e-cigarettes. ^jMonitoring the Future results released, show a spike in youth e-cigarette use; Surgeon General calls youth use an epidemic following data on spike of e-cigarette use (NYTS, MTF); Altria announces buying 12.8 billion stake in JUUL Labs.

Table 2. Prevalence of E-cigarette Themes and Topics in 2018 Articles ($n = 577$), Stratified by Mentioning of JUUL

Variables	No. (%)	
	2018 Articles mentioning JUUL ($n = 293$)	2018 Articles not mentioning JUUL ($n = 284$)
Types of articles		
News	260 (88.7)	255 (89.8)
Opinion	32 (10.9)	28 (9.9)
Other	1 (<1.0)	1 (<1.0)
Main topic/theme		
E-cig policy/regulation	124 (42.3)	113 (39.8)
Health effects	23 (7.8)	94 (33.1)
Prevalence/trends	74 (25.3)	42 (14.8)
Industry activities	64 (21.8)	17 (6.0)
Cessation	6 (2.0)	8 (2.8)
Other	2 (1.0)	10 (3.5)
Topics/themes mentioned		
Youth use	221 (75.4)	116 (40.8)
Adults/general use	35 (11.9)	17 (6.0)
FDA regulation	133 (45.4)	50 (17.6)
Age-of-sale restrictions	146 (49.8)	50 (17.6)
Smoke-free air laws/ bans on e-cig use	11 (3.8)	51 (18.0)
E-cig taxation	10 (3.4)	16 (5.6)
Marketing/advertising restrictions	91 (31.1)	31 (10.9)
E-cig warning labels	5 (2.0)	4 (1.4)
E-cig flavor bans	105 (35.8)	37 (13.0)
Big Tobacco's involvement in e-cig industry	59 (20.1)	26 (9.2)
Health-related benefits		
Less risky/harmful than cigarettes	94 (32.1)	43 (15.1)
Effective smoking cessation tool	99 (33.8)	44 (15.5)
No secondhand smoke	5 (1.7)	2 (1.0)
Health-related risks		
Nicotine is addictive/ harmful	143 (48.8)	67 (23.6)
Harmful toxins, chemicals, effects	37 (12.6)	55 (19.4)
Health effects unknown	40 (13.7)	26 (9.2)
Does not work for cessation	17 (6.0)	17 (6.0)
Prevents quitting/ promotes dual use	1 (<1.0)	11 (3.9)
Gateway to tobacco	80 (27.3)	49 (17.3)
Flavors appeal to youth	128 (43.7)	46 (16.2)
Quality concerns/ unknown ingredients	0 (0)	5 (1.8)
Renormalizing smoking	2 (1.0)	1 (<1.0)
Explosions	2 (1.0)	40 (14.1)

than 75% of articles mentioning JUUL in 2018 also mentioned youth e-cigarette use (Table 2). Articles about adult e-cigarette use remained the same at about 11% from year to year.

Policy and Regulation Topics

Overall, 32.8% of the articles discussed FDA regulation. This was most prominent in 2016, the year the Deeming Rule was

published (Table 1). Other policy strategies most frequently mentioned across years were age-of-sale restrictions (31.0%) and smoke-free air laws/bans on use (20.3%). However, while discussion of smoke free-air laws/e-cigarette bans decreased over time, the percentage of articles discussing e-cigarette flavor bans quadrupled between 2015 and 2018 (from 6.1% to 24.6%). The percentage of articles discussing marketing and advertising restrictions nearly doubled between 2015 and 2018 (Table 1). In 2018, reference to FDA regulation and e-cigarette age-of-sale restrictions, marketing restrictions, and flavor bans were each two to three times more frequent in articles that mentioned JUUL versus articles that did not mention JUUL (Table 2).

Potential Risks and Benefits

Stated risks and benefits of e-cigarette use were also analyzed (Table 1). Overall, 70% of articles mentioned at least one potential risk, while 37.3% mentioned at least one potential benefit. In terms of risks, about a quarter of all articles mentioned at least one youth-related risk/concern, including that e-cigarettes encourage youth use or act as a gateway to tobacco (25.2%), and that flavors appeal to youth (22.0%). In 2018, these concerns were more frequently mentioned in articles that discussed JUUL (Table 2). Articles also referenced nicotine as being addictive/harmful (27.9%) and the risk of exposure to toxins/carcinogens (19.1%). In 2018, the percentage of articles referring to nicotine as being addictive was about twice as high in articles that mentioned JUUL versus those that did not (Table 2).

Over 10% of the articles mentioned that e-cigarette health effects are unknown (13.8%) and discussed e-cigarettes explosions (12.6%). Discussion of e-cigarette explosions peaked in 2016 (22.1%, 101 unique articles), the same year the FAA banned e-cigarettes from commercial airline flights. Less than 10% of articles mentioned quality concerns/unknown ingredients found in e-cigarettes and that e-cigarette use renormalizes smoking, promotes dual use, or does not work for smoking cessation. Reference to all potential risks decreased by 2018, except for articles mentioning flavors appealing to youth and the risk of nicotine addiction.

In terms of potential benefits, over a quarter of all articles (28.5%) mentioned that e-cigarettes are or may be less risky or harmful than cigarettes (Table 1). Reference to this decreased by 11 percentage points between 2015 and 2018. Between 21% and 25% of articles in each year mentioned that e-cigarettes are or maybe an effective smoking cessation tool. Only about 1% of the articles mentioned that e-cigarettes produce no secondhand smoke.

Coverage of the NASEM Report

We identified eight unique stories that covered the NASEM report within the first week of the report's release. Of 47 NASEM conclusions, 28 (59.6%) were reported in at least one article and 12 (25.5%) in over half of articles. Conclusions most frequently reported were 16-1 (substantial evidence that e-cigarettes may lead to youth cigarette use; 8/8 articles, 100%), 18-1 (conclusive evidence that switching from cigarettes to e-cigarettes reduces exposure to numerous toxicants; 8/8 articles, 100%), and 17-1 (limited evidence that e-cigarettes may be effective for cessation; 7/8 articles, 87.5%).

The Report categorized conclusions by subject area: constituents ($n = 9$), health effects ($n = 26$), initiation and cessation ($n = 7$), and harm reduction ($n = 5$). Most (88.9%) conclusions about constituents were reported in one or more articles. Fewer of the conclusions about health effects (57.7%), initiation and cessation (57.1%), and harm reduction (20.0%) were reported in at least one article.

The Report also identified 47 conclusions across five evidence levels: conclusive ($n = 8$), substantial ($n = 10$), moderate ($n = 8$), limited ($n = 12$), insufficient ($n = 4$), or no available evidence ($n = 5$). Most of the conclusive, substantial, and no available evidence conclusions were reported in at least one article (100%, 70.0%, and 80% of articles, respectively), while fewer of the moderate (65.0%), limited (33.3%), and insufficient (25.0%) conclusions were reported in at least one article. [Supplementary Table 1](#) contains the full list of conclusions and the number of news articles they were reported in.

Discussion

This study illustrates that e-cigarettes continue to be a newsworthy topic. Consistent with Ayers et al.,²⁰ we identified that between 2015 and 2018, the volume of e-cigarette news coverage increased overall, with 1609 unique news articles identified in total over this 4-year period. By comparison, a content analysis of smokeless tobacco articles over a 5-year period (between 2006 and 2010) identified about half of this quantity—877 unique articles.²⁴ This likely speaks to the novelty of this product as well as controversies over how it should be regulated given concerns about youth use versus use by current smokers.

We also observed that notable spikes in volume were associated with certain major e-cigarette events such as the FDA's publication of the Deeming Rule to regulate all tobacco products as well as various FDA press releases pertaining to youth vaping in 2018. One of the most noteworthy changes in coverage pertained to youth e-cigarette use. The volume of articles reporting youth use more than quadrupled from 2017 to 2018. Throughout 2018, overall e-cigarette news coverage increased over time, as articles focused on the growing popularity of JUUL e-cigarettes among youth, Big Tobacco's investment in JUUL, the concern for youth nicotine addiction, and in November the FDA's proposal to prevent youth access to flavored tobacco products. The volume of articles that discussed potential bans on flavored e-cigarettes increased by 610% from 2015 to 2018. Consistent with agenda-setting theory,¹⁰ it is possible that media coverage on youth's use of e-cigarettes and JUUL in schools may have contributed to the FDA's responses relevant to current policy considerations, as media attention was given to this issue between February and early April 2018 leading up to the FDA's first 2018 announcement (on April 24) related to tackling Juul and youth use, in which the FDA stated it had begun sting operations targeting illegal sales of e-cigarettes to minors and issued 40 warning letters to retailers.²⁷ Indeed many news articles leading up to this announcement included strong headlines such as "JUULing is the new teen vaping fad taking over school bathrooms" (Milwaukee Journal-Sentinel, March 12, 2018),²⁸ "I can't stop": Schools struggle with vaping explosion" (New York Times, April 2, 2018),²⁹ "Schools and parents fight a Juul e-cigarette epidemic" (Wall Street Journal, April 4, 2018)³⁰; and "Vaping now an epidemic among US high schoolers" (CNN, April 6, 2018).³¹

We also found that compared to the release of the youth-focused Surgeon General's report on e-cigarettes, the 2018 NASEM report received relatively lower coverage (8 vs. 22 unique articles within the first week of report's release). Most articles about the NASEM report presented a balanced view, stating e-cigarettes could help or harm depending on whether they help Americans quit smoking or encourage young people to try e-cigarettes. However, while the NASEM committee reviewed over 800 research studies to form 47 conclusions, news articles reported on roughly half of those conclusions,

focusing on a few prominent themes. Many of the conclusions were not discussed, and thus, the information not likely presented to the public. While all of the articles referenced the Report, none of them indicated the total number of conclusions or provided information about how or where to access the full report. In addition, some conclusions were somewhat misrepresented within articles. Conclusion 18-1 stated there is conclusive evidence that *completely* substituting e-cigarettes for combustible tobacco cigarettes reduces users' exposure to numerous toxicants and carcinogens present in combustible tobacco cigarettes. Although some articles mentioned switching, few mentioned "completely" switching, which is paramount. Additionally, one-third of articles mentioned there is conclusive evidence that e-cigarettes can explode and cause burns and injuries (conclusion 14-1), yet none of the articles mentioned this is a rare occurrence. Such a context would provide better information to the public. Overall, the lack of more widespread coverage of this report may have been a missed opportunity by the news media to provide the public with factual-based information needed to make informed decisions surrounding e-cigarette use.

The overall emphasis in coverage about the potential risks of e-cigarettes versus the potential benefits is consistent with past research analyzing US news content²⁰ but differs from analysis of coverage in the United Kingdom.²⁶ Emphasis on the risks may be helpful in informing audiences and in shaping policy responses to regulate these products, but may interfere with consideration among current smokers and those who treat smokers about the harm-reduction benefits of switching from traditional cigarettes to e-cigarettes.

Our analysis was limited to unique articles in a sample of US publications, which may not reflect total volume nor state-specific perspectives and policy coverage across all states. However, the use of numerous e-cigarette search terms and leading publications, online news, and wire sources increase study generalizability. In addition, e-cigarettes are a new and dynamic product category for which scientific information, use patterns, policy proposals, and regulations continue to rapidly change and evolve, and thus the prevalence and types of topics covered in e-cigarette news may continue to change from that recorded in this study. For example, this study's time period did not include coverage of the 2019 outbreak of e-cigarette and vaping associated lung injuries (EVALI), a new acute health effect communicated to the public through the news media. As such, future research should continue to track and analyze e-cigarette news coverage and discourse over time and assess its potential influence on e-cigarette perceptions. Future research should also investigate youth versus adult exposure to e-cigarette news coverage and how the topics and themes and their prevalence differs among media sources commonly used by youth and adults.

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>.

Funding

This work was supported by a grant (R01CA190444) from the National Cancer Institute (NCI). Contributions by OAW were also supported in part by R37CA222002 from NCI. The content is solely the responsibility of the authors and does not necessarily represent the official views of the funding organizations.

Declaration of Interests

None declared.

References

1. Delnevo CD, Giovenco DP, Steinberg MB, et al. Patterns of electronic cigarette use among adults in the United States. *Nicotine Tob Res.* 2016;18(5):715–719.
2. Cullen KA, Ambrose BK, Gentzke AS, Apelberg BJ, Jamal A, King BA. Notes from the field: Use of electronic cigarettes and any tobacco product among middle and high school students—United States, 2011–2018. *Morb Mortal Wkly Rep.* 2018;67(45):1276.
3. National Academies of Sciences, Engineering, and Medicine. *Public Health Consequences of E-cigarettes.* Washington, DC: National Academies Press; 2018.
4. Cullen KA, Gentzke AS, Sawdey MD, et al. E-Cigarette use among youth in the United States, 2019. *JAMA.* 2019;322(21):2095–2103.
5. Goniewicz ML, Gawron M, Smith DM, Peng M, Jacob P III, Benowitz NL. Exposure to nicotine and selected toxicants in cigarette smokers who switched to electronic cigarettes: a longitudinal within-subjects observational study. *Nicotine Tob Res.* 2017;19(2):160–167.
6. Schoenborn CA, Gindi RM. Electronic cigarette use among adults: United States, 2014. *NCHS Data Brief.* 2015;217:1–8.
7. Kalkhoran S, Chang Y, Rigotti NA. Electronic cigarette use and cigarette abstinence over two years among us smokers in the population assessment of tobacco and health study. *Nicotine Tob Res.* 2019.
8. Hajek P, Phillips-Waller A, Przulj D, et al. A randomized trial of e-cigarettes versus nicotine-replacement therapy. *N Engl J Med.* 2019;380(7):629–637.
9. Giovenco DP, Delnevo CD. Prevalence of population smoking cessation by electronic cigarette use status in a national sample of recent smokers. *Addict Behav.* 2018;76:129–134.
10. McCombs ME, Shaw DL. The agenda-setting function of mass media. *Public Opin Q.* 1972;36(2):176–187.
11. Tan AS, Bigman CA, Sanders-Jackson A. Sociodemographic correlates of self-reported exposure to e-cigarette communications and its association with public support for smoke-free and vape-free policies: results from a national survey of US adults. *Tob Control.* 2015;24(6):574–581.
12. Wackowski OA, Manderski MTB, Lewis MJ, Delnevo CD. The Impact of smokeless tobacco risk information on smokers' risk perceptions and use intentions: a news media experiment. *Health Commun.* 2019;34(3):325–332.
13. Duong HT, Liu J. Vaping in the news: the influence of news exposure on perceived e-cigarette use norms. *Am J Health Educ.* 2019;50(1):25–39.
14. Huang J, Feng B, Weaver SR, Pechacek TF, Slovic P, Eriksen MP. Changing perceptions of harm of e-cigarette vs cigarette use among adults in 2 us national surveys from 2012 to 2017. *JAMA Netw Open.* 2019;2(3):e191047.
15. Majeed BA, Weaver SR, Gregory KR, et al. Changing perceptions of harm of e-cigarettes among U.S. adults, 2012–2015. *Am J Prev Med.* 2017;52(3):331–338.
16. Wackowski OA, Sontag JM, Hammond D. Youth and young adult exposure to and perceptions of news media coverage about e-cigarettes in the United States, Canada and England. *Prev Med.* 2019;121:7–10.
17. Wackowski OA, Bover Manderski MT, Delnevo CD. Smokers' sources of e-cigarette awareness and risk information. *Prev Med Rep.* 2015;2:906–910.
18. Moran MB, Chen-Sankey JC, Tan AS, Soneji S, Lee SJ, Choi K. Sources of Awareness of JUUL E-cigarettes in 2 Surveys of Adults in the United States. *Am J Health Behav.* 2019;43(2):279–286.
19. Yates K, Friedman K, Slater MD, Berman M, Paskett ED, Ferketich AK. A Content analysis of electronic cigarette portrayal in newspapers. *Tob Regul Sci.* 2015;1(1):94–102.
20. Ayers JW, Dredze M, Leas EC, Caputi TL, Allem JP, Cohen JE. Next generation media monitoring: global coverage of electronic nicotine delivery systems (electronic cigarettes) on Bing, Google and Twitter, 2013–2018. *PLoS One.* 2018;13(11):e0205822.
21. Wackowski OA, Giovenco DP, Singh B, Lewis MJ, Steinberg MB, Delnevo CD. Content analysis of us news stories about e-cigarettes in 2015. *Nicotine Tob Res.* 2018;20(8):1015–1019.
22. Mitchell A, Roesnstiel T. *State of the News Media 2015.* Pew Research Center, Journalism & Media: Washington, DC; 2015.
23. Media Intelligence Center. <https://abcas3.auditedmedia.com/MICenter>. Accessed January 8, 2018.
24. Wackowski OA, Lewis MJ, Delnevo CD, Ling PM. A content analysis of smokeless tobacco coverage in U.S. newspapers and news wires. *Nicotine Tob Res.* 2013;15(7):1289–1296.
25. Wackowski OA, Lewis MJ, Hrywna M. Banning smoking in New Jersey casinos—a content analysis of the debate in print media. *Subst Use Misuse.* 2011;46(7):882–888.
26. Rooke C, Amos A. News media representations of electronic cigarettes: An analysis of newspaper coverage in the UK and Scotland. *Tob Control.* 2014;23(6):507–512.
27. Gottlieb S, Food US, Admin D. Statement from FDA Commissioner Scott Gottlieb, MD, on new enforcement actions and a Youth Tobacco Prevention Plan to stop youth use of, and access to, JUUL and other e-cigarettes (Apr. 24, 2018). 2018. <https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm605432.htm>. Accessed June 13, 2019.
28. Hatcher C. JUULing is the new teen vaping fad taking over school bathrooms. *Milwaukee Journal Sentinel.* March 12, 2018.
29. Zernike K. 'I Can't Stop': Schools struggle with vaping explosion. *The New York Times.* April 2, 2018.
30. Chaker AM. Schools and parents fight a Juul e-cigarette epidemic. *The Wall Street Journal.* April 4, 2018.
31. Selig R, Cannaviccio D, Hawks C. Vaping now an epidemic among US high schoolers. *CNN Wire Service.* April 6, 2018.