

Georgia State University

ScholarWorks @ Georgia State University

Communication Faculty Publications

Department of Communication

12-17-2018

Vaping in the News: The Influence of News Exposure on Perceived e-Cigarette Use Norms

Hue Trong Duong

Georgia State University, hduong13@gsu.edu

Jiaying Liu

University of Georgia, jiaying.liu@uga.edu

Follow this and additional works at: https://scholarworks.gsu.edu/communication_facpub



Part of the [Communication Commons](#)

Recommended Citation

Hue Trong Duong & Jiaying Liu (2019) Vaping in the News: The Influence of News Exposure on Perceived e-Cigarette Use Norms, *American Journal of Health Education*, 50:1, 25-39, DOI: <https://doi.org/10.1080/19325037.2018.1548315>

This Article is brought to you for free and open access by the Department of Communication at ScholarWorks @ Georgia State University. It has been accepted for inclusion in Communication Faculty Publications by an authorized administrator of ScholarWorks @ Georgia State University. For more information, please contact scholarworks@gsu.edu.

Vaping in The News:

The Influence of News Exposure on Perceived E-cigarette Use Norms

Hue Trong Duong & Jiaying Liu

Department of Communication Studies

University of Georgia

Athens, Georgia 30602, USA

E-mail: hue.duong25@uga.edu

INFLUENCE OF NEWS EXPOSURE ON E-CIGARETTE USE NORMS

Abstract

Background: Research has documented the impact of descriptive norms on tobacco use, but few studies have investigated how media exposure shapes e-cigarette use norms.

Purpose: To examine how exposure to e-cigarette related news articles shapes individuals' descriptive norm perceptions about real-world e-cigarette use.

Method: The study implemented an experiment with 2 normative direction (high- vs. low-prevalence) x 2 exposure dosage (single- vs. double-dose) between-subject factorial design ($N = 298$). Analysis of variance and thematic analysis were conducted.

Results: Normative direction and exposure dosage of prevalence information contained in the news articles interacted to influence perceived descriptive norms. Increasing the dosage of prevalence information enhanced descriptive norm perceptions in low-prevalence conditions only. Participants relied on institutional signals and behavioral cues to infer descriptive norms when prevalence information was absent in the news.

Discussion. The study investigates the underlying mechanism of how news articles may influence normative perceptions.

Translation to Health Educational Practice. Given that news media may inadvertently form social norms that are conducive to e-cigarette use behavior, Health Educators should pay attention to descriptive norms emanated from news media environment. They should also consider norm debiasing strategies and the integration of dosage of low-prevalence information into social norm messages.

Keywords: news exposure, descriptive norms, e-cigarette, vaping

Vaping in The News:

The Influence of News Exposure on Perceived E-cigarette Use Norms

Background

Electronic cigarettes (e-cigarettes) are battery-powered devices that produce an aerosol by heating a liquid that usually contains nicotine and other chemicals. The behavior of e-cigarette use is referred to as vaping because e-cigarette users (or “vapers”) inhale and exhale aerosol or vapor instead of cigarette smoke. E-cigarettes are now the most commonly used tobacco product by youth in the U.S.¹ Aggressive marketing strategies by tobacco companies on the Internet and social media promote e-cigarette as a “harmless” and “cool” product replacement for conventional cigarettes, which is appealing to the younger population.²⁻⁴ Because of the inconclusive scientific evidence related to the impact of e-cigarette use on health risks,⁵ e-cigarette use has been a heated debate among the scientific community and policy makers about how to regulate this new product.⁶ The controversy has triggered much interest of media attention in recent years.⁷ The sheer number of media news focusing on the e-cigarette debate may inadvertently have a significant effect on media users through “social exposure” - a concept that describes the various ways in which people come in contact with a particular behavior that shapes their norm perception.⁸ Despite the assumption that mass media play a role in producing normative perception, research has so far mostly examined how interpersonal influences affect norm perception. Social norm researchers commented that other significant sources for the development of norms, including mass media environment, have not sufficiently researched, which undermines the understanding of the link between individuals’ environment and the formation of social norms about a health behavior.⁸

The present research investigates how exposure to news articles about e-cigarette use

controversy may shape individuals' perceived prevalence of the vaping behavior, namely, the perceived descriptive norms.⁹ In particular, we examine this question among a sample of college students, who are increasingly finding themselves attracted to e-cigarette use.¹⁰ Scholars have called for considering college students as a distinct priority population due to their developmental context, needs, and community.^{11,12} According to the theory of normative social behavior (TNSB), perceived descriptive norms influence behavior.¹³ Accumulating studies have empirically documented the powerful impact of descriptive norms across behavioral domains and cultural contexts.¹⁴⁻¹⁷ Many social norms campaigns in the U.S. aim to promote positive behavior changes through readjusting individuals' biased descriptive norms related to the target behavior.¹⁸ Public health campaign messages utilizing normative appeals often craft messages by incorporating normative information that indicates either a low prevalence of an undesired behavior, or the high prevalence of a desired behavior to encourage behavior changes through conformity to perceived norms in the society.¹⁹

News articles often contain behavior prevalence statements with the goal of informing the public. In addition, because news is the product of a social institution, it may carry potential heuristic cues to normative perceptions.²⁰ However, compared to the sophisticatedly crafted behavior change campaign messages with a clear intent to persuade, normative information in a news article is only part of its news content. While effects of normative messages have been studied extensively in the context of persuasive communication,^{21,22} no study has examined how normative statements embedded in news articles, which are considered as people's routine information sources, may influence individuals' normative perceptions. When examining the underlying mechanisms of normative formation, scholars focused heavily on influence of movies and television rather than that of news.⁸ Moreover, there is also a lack of knowledge on the cues

or sources people rely on to infer descriptive norms in general population in the absence of explicit prevalence information in news content. To address this gap, the present study aims to examine: a) whether news articles containing behavior prevalence information would affect readers' overall descriptive norm perceptions, and b) how perceived descriptive norms can be inferred from news articles that do not explicitly contain prevalence information. Because the link between perceived descriptive norms and behavioral intention has been consistently established in the literature, we focus this present study on normative perception formation to contribute to norm-building theory. Despite the extant research on social norms theory, the sources of norm formation are insufficiently studied.⁸

Theory of Normative Social Behavior

Social norms are broadly defined as social codes to guide a course of action that would be perceived as most beneficial, or what ought to be done, and typical for individuals, or the prevalence of the behavior.⁹ Theorists addressed these two types of norms as injunctive and descriptive norms. Injunctive and descriptive norms share similarities in that they are informational in nature and that they exist at both social and individual levels. At the individual level, social norms are perceived by individuals based on various social and behavioral cues. The conceptual distinction between the two types of norms is that injunctive norms involve social sanction while descriptive norms do not.¹³

The theory of normative social behavior theorizes the association between descriptive norms and behaviors with a focus on factors that influence this association.²³ Cognitive mechanisms, such as outcome expectations, group identity, impression-management, self-efficacy, psychological involvement and injunctive norms, have been studied as moderators in the TNSB research. Researchers found the interaction effects between these variables with

descriptive norms to influence various health behaviors.^{16,17,24,25} When controlling for these moderators, researchers found the main effects of descriptive norms remain substantial for food consumption, drinking alcohol, and recycling.¹⁶ When the two types of norms are in conflict, researchers found that descriptive norms can outweigh injunctive norms to assert more influence on some risk behaviors.²⁶ Perceived descriptive norms were also found to positively correlate with the use of e-cigarettes among college student population.¹² Clearly, the link between descriptive norms and behavior has been well established, which contributed to resolving the mixed results of social marketing campaigns that utilize the social norms approach on American campuses.²⁷

Critiques of the TNSB research have been surrounding the methodological approach that is overly dependent on cross-sectional survey and the lack of attention to norm building process.^{16,17,28} Simultaneously, researchers have suggested to extend the theory by examining constructs accounting for how or where descriptive norms develop and change.²⁸ This extension adds depth to understanding normative influence, particularly regarding the relationship between communication variables and norm formation.⁸ The body of research on the social norms approach has indicated that descriptive norms are perceived upon the reception of information from interpersonal communication and mass media which convey unhealthy behaviors, such as drinking, smoking and substance use.²⁹ However, the sources of social norms particularly those related to the mediated environment are insufficiently documented.⁸ In this study, therefore, we focused our investigation on the norm formation process, rather than on the well-documented link between norms and behavior.

The E-cigarette Debate and Media Coverage

E-cigarette use is currently one of the most divided topics among the public health

community.⁵ Proponents of e-cigarettes extol the product as an alternative technology with “harm reduction” in comparison to cigarettes.⁷ Specifically, promoters of e-cigarettes posit that e-cigarettes help smoking cessation and are less harmful. These arguments are broadly advertised in e-cigarette marketing.³⁰ Opponents, however, are skeptical of the long-term health consequences of vaping, and are concerned that e-cigarettes may encourage smoking initiation by increasing non-smokers’ chance of getting addicted to nicotine, particularly among young adults.³¹ Recent research found that vaping e-cigarettes may be positively associated with smoking,^{32,33} and the depiction of vaping in commercials increases the temptation for smoking.³⁴ Exposure to vicarious vaping behavior was found to be associated with potential renormalization of smoking among ever and potential smokers,¹⁰ which in turns leads to smoking-related chronic diseases. Moreover, recent research suggested that vaping may directly disable key immune cell in the lung and boost inflammation.³⁵

The debate about e-cigarettes, therefore, has spurred journalistic coverage at both the national and global level. Inconsistent legal framework regarding e-cigarette use in different states in the U.S., as well as among different countries, contributes to the salience of e-cigarette debate in the news.^{36,37} Content analysis in the U.K. and Scotland newspapers indicated a significant annual rise in news reporting about e-cigarettes.^{7,38} The findings revealed the divisive nature of the topic, largely due to inconsistent scientific evidence. Research in South Korea also showed a similar trend in e-cigarette news coverage.⁶ In the U.S., researchers found that the majority of news articles about e-cigarettes were published in recent years, with 85% of the articles reporting e-cigarettes as neither favorable nor unfavorable.³⁹

The inundation of e-cigarette related news in media has been found to predict news consumers’ attitude and behavior. For example, a recent study showed that information seeking

in the media environment leads to higher likelihood of e-cigarette experimentation among youth.⁴⁰ The results were attributed to the prevailing pro-e-cigarette information in the media environment and the discussion about comparative health risks between smoking and vaping. However, limited research has examined the influence of e-cigarette use prevalence information, which is frequently reported or depicted in news articles, on readers' beliefs and perceptions. In addition, given the growing evidence of the overestimation of tobacco-product related descriptive norms, and the association between perceived descriptive norms and e-cigarette use behavior,^{3,12,41} it is important to examine how the perceived descriptive norms surrounding e-cigarette use were formed through media consumption. Considering that younger populations are at a development stage where they are particularly sensitive to normative cues in mass media,⁴² and that college-aged population has the most dramatic increase in risky behaviors and substance use,^{11,43} the present study aims to examine how college students' descriptive norm perceptions are formed as a result of exposure to news articles reporting e-cigarette issues.

Purpose

The purpose of this study is to examine whether and how exposure to e-cigarette related news articles shapes individuals' descriptive norm perceptions about real-world e-cigarette use. In the section that follows, we discuss specific hypotheses and research questions.

Influence of Media Exposure on Prevalence Perceptions

The effect of normative messages in persuasion context on normative perceptions have been well documented,^{21,22,44} but it is insufficiently examined in news media. Social norm campaign messages often convey behavioral prevalence information with explicit summary statements, such as "the majority of college students do not drink when partying."^{19,45} However, it is not yet known whether similar summary information embedded in news articles would

produce a similar effect. Presumably, readers may process such normative information quite differently compared to an intentionally persuasive message in health campaigns. News articles, particularly those reporting scientifically-contested health topics, are basically not produced for the purpose of persuasion but to instead inform readers. Journalists tend to report scientifically-contested issues in an impartial manner and focus more on surrounding debates, as reviewed above, than making the prevalence information salient to users. Moreover, the information processing theory suggests that media users may pay attention to only some selected subsets of information that are available in media content.^{46,47} Because normative information included in the news is not saliently depicted as it is in social norm campaigns, it has to compete with various other types of information content conveyed by the news. For example, e-cigarette news stories have focused substantially on the progress of scientific findings and reactions of relevant organizations. Journalists also pay attention to legislature framework, tobacco companies' responses, and health-related issues. Each separate issue conveyed in one single news article content, therefore, is subjected to users' selective attention. It follows that there is a likelihood that normative information is not retained and processed when people read news articles. It may then fail to influence users' normative perceptions. Even if people can recall prevalence information, their interpretations of social norms may be confounded by personal experience, surrounding environment, and pre-existing beliefs. Therefore, testing the effect of normative information embedded in news articles on readers' perceptions will contribute to norm building theory in the context of routine mass media exposure.

H1: E-cigarette news articles containing prevalence information of e-cigarette use will affect readers' perceived descriptive norms, such that those who read e-cigarette news articles that contain high-prevalence information on average will have significantly higher descriptive

norm perceptions about e-cigarette use than those who read news articles that contain low-prevalence information.

To understand the absolute changes from the baseline produced by prevalence information, the following hypotheses are put forth,

H2a: Those who read e-cigarette news articles that contain high-prevalence information on average have significantly *higher* descriptive norm perceptions about e-cigarette use than those who read news articles that do not contain any explicit prevalence information;

H2b: Those who read e-cigarette news articles that contain low-prevalence information on average will have significantly *lower* descriptive norm perceptions about e-cigarette use than those who read news articles that do not contain any explicit prevalence information.

The Exposure Dosage of Normative Information

The focus theory of normative conduct emphasizes the importance of norm salience in affecting behavior.⁹ Considering the possibility that normative information embedded in the news articles may be obscured by the richness of the news content, the present study also examines whether increasing the salience of normative information during information reception and processing influences perceived descriptive norms. Zillmann suggests that frequently-activated cognitive schemata on social perceptions under conditions related to some levels of ambiguity (in this case, perceived descriptive norms) may influence social judgments of an issue.⁴⁸ The literature in mass communication has indicated that news stories can affect the salience, or enactment, of a cognitive schemata depending on how much news users have been exposed to an issue.⁴⁹ In addition, health communication researchers have demonstrated that increasing exposure to consistent media messages influence the formation of perceptions and attitudes through learning and memorizing.⁵⁰ Health campaigns that use mass media messages

are advised to not only ensure audience reach but also sufficient frequency of exposure to influence target audience.^{51,52} Therefore, increasing the exposure dosage of normative information in the news articles is likely to enhance normative perceptions.

H3: News articles that include double doses of normative information produce greater influence on descriptive norm perceptions compared to their single-dose counterparts.

In addition, we are also interested in understanding how normative directions and exposure dosage may interact to influence descriptive norm perceptions:

RQ1: Are there any interaction effects between normative directions (i.e., high- vs. low-prevalence) and exposure dosage (i.e., single vs. double dosage) in affecting descriptive norm perceptions about e-cigarette use?

The Moderating Role of Behavior Status

Research has found that future tobacco-related product use intention is associated with past smoking and vaping experience.^{34,53} Adolescents with experience in cigarette smoking and e-cigarette vaping were found to be more likely to use e-cigarette than those with no experience.^{2,54,55} The influence of behavior status on perceived descriptive norms as a result of news exposure has not been examined in the literature. However, research has concluded that people's learning from news content is influenced by their engagement in making mental connection between new information they receive from a media stimulus and information of past experience that was already stored in their minds.⁴⁵ Advertising research has found that adolescents who experimented with cigarettes were more likely to attend to advertised tobacco products.⁵⁶ Thus, those who had experience of smoking and/or vaping may have an attention bias on e-cigarette use normative information. In addition, previous smoking and vaping trials likely provide individuals with experiential knowledge about peer e-cigarette use prevalence through

their interpersonal networks. Such experiential knowledge enables news users to engage in issue-relevant thinking,⁵⁷ which is likely to increase related behavioral information accessibility and recall. Thus, the current research attempts to determine whether ever vaping and smoking experience may moderate the news-induced descriptive norm perception formation.

H4: Ever vaping and smoking experience moderate the association between news exposure and perceived descriptive norms about e-cigarette use, such that, the descriptive norm perceptions produced by news content will be more pronounced a) among individuals with ever vaping experience than those with no vaping experience, and b) among those with ever smoking experience than those with no smoking experience.

Implicit Normative Cues Conveyed by News

Social norm theorists suggested that people are motivated to gain information about what others are doing to help with decision-making.²⁰ People can also sense descriptive norms through various informational cues.¹³ Fiske and Taylor raised that human beings, in general, are cognitive misers, and they may use mental shortcuts to make generalization on what is typical in their surroundings.⁵⁸ Tankard and Paluck explained that this motivation derives from the desire to be accurate about events, facts, and social appropriateness.²⁰ Therefore, people may act as naïve scientists as they try to make sense of social phenomena.⁵⁹

Although news articles were found to shape public normative perceptions by providing explicit information of others' behavior choices,⁶⁰ implicit behavioral cues and institutional cues depicted in mass media may also influence normative perceptions.²⁰ Behavioral cues refer to behaviors (or lack thereof) performed by social others in surrounding environment, or through media's portrayals.^{8,61} Institutional cues come from institutions such as government, schools, and the mass media.²⁰ Institutions' acts and innovations can communicate norms, as they may be

perceived to represent or serve the interest of a group. For example, after the issuance of a cigarette ban on campus, students may infer fewer people smoking on campus. The mass media may be perceived as a carrier of descriptive norms due to people's beliefs in media reporting what the public is interested in, or what the public opinion is.²⁰ Hence, mass media may inadvertently send normative signals through merely reporting on certain arguments.⁶² However, there is a surprising paucity of health communication research to investigate what cues or traces people identify as normative cues in news articles that do not contain explicit prevalence information. The dearth of research on this topic presents both challenges to understanding how social norms can be formed through routine media consumption, and opportunities to change behaviors via mass media. To explore this phenomenon, we designed an open-ended question in our survey instrument, which allows participants to qualitatively express their thoughts related to how they formed normative perceptions on e-cigarette use in the absence of prevalence information in the news.

RQ2: Through what sources or indicators do people infer descriptive norms from e-cigarette related news articles that do not contain any explicit prevalence information?

Method

Participants

A total of 298 college students were recruited through a research subject pool at a large public university in the U.S. The participants received class credit for their participation. There were relatively more males (49.0%) than females (39.3%) in the sample, with 11.7% not reporting gender. The average age was 19.23 years old ($SD = 1.39$). The majority described themselves as Caucasian (69.2%), with the remainder identifying as African-American (6.2%),

Asian (11.7%), Hispanic (7.6%), and others (5.3%). About half of the participants reported to have smoked (54%) or vaped (49.3%), even one or two puffs.

Procedure and Design

This study employed a 2 normative direction (high- vs. low-prevalence) x 2 exposure dosage (single- vs. double-dose) between-subject factorial design, with a fifth group serving as the control condition. In the four treatment conditions, we varied the direction and amount of e-cigarette related normative information (i.e., single-dose high-prevalence vs. double-dose high-prevalence vs. single-dose low-prevalence vs. double-dose low-prevalence) contained in the stimuli. In the control condition, no normative information was presented in the stimuli.

Participants were invited to an online *Qualtrics* survey. They first were provided with information about the study and asked to indicate to the informed consent if they chose to participate. They then were randomly assigned to the experimental conditions, where they were presented with randomly selected one out of 10 news articles about e-cigarettes (see details below) within each condition. Afterward, participants completed a set of questions measuring perceived e-cigarette use descriptive norms, prior smoking and vaping behaviors, and demographic variables. Immediately following the descriptive norm perception question, participants were also asked to provide explanations for their ratings on this question with an open-ended question. The entire study took approximately 15 minutes to complete. Participants were debriefed upon completion, thanked for their participation and dismissed.

Stimulus Materials

To address the potential case-category confounding issue, we created more than one news articles ($N = 10$) to be used in the study.⁶³ In this way, even for participants in the same treatment conditions, the news article that was shown to them would be randomly chosen from the pool of

the ten articles. Thus, the results would be less likely to be confounded by some unexpected characteristics associated with a single news article stimulus. All ten news articles were created by modifying real news articles from online websites of top news outlets, such as *Wall Street Journal*, *Huffington Post*, *New York Times*, *The Guardian*, *The Age* and *Reuters*. The news articles' topics were related to the debates surrounding the benefits and risks associated with e-cigarette use, including smoking cessation aid, general health safety, long-term effect (both health and social impacts), vaping in the workplace, vaping in public places, secondhand vaping, vaping etiquette, public opinion about e-cigarettes, and e-cigarette flavors.

All ten news articles were created to be of equivalent length with a neutral photo of an e-cigarette appended to its side (randomly chosen from a pool of similar photos), to maximally resemble the formatting and convention of online news websites thus enhance the materials' ecological validity. All photos were controlled for normative, behavioral, and gender cues by showing only the image of a gender-neutral hand holding an e-cigarette. The valence of the news articles was held balanced. That is, they were designed to contain equal presence (quantity and description length) of positive and negative e-cigarette related topics. The news headlines were also created neutral and balanced so that they would not establish frames of reference that may convey normative or preference implications.⁶⁴ Specifically, the headlines were either crafted in the format of questions (e.g. *Are e-cigarettes a public health hazard or the key to quitting smoking?*), or stated in a neutral tone (e.g. *E-cigarettes: Where we stand now.*) Participants were told that they would read a news story, with no reference to the news agencies. The original ten articles did not contain any normative information.

To manipulate normative direction and exposure dosage, we collected true statements of normative information about e-cigarette use to be incorporated into the ten news articles from the

CDC website and news articles published by the same news outlets that we used to collect our stimulus materials. A pool of 10 normative statements (five containing low-prevalence information, and five high-prevalence information) was obtained. Some examples of low-prevalence statements include “*Only 10 percent of U.S. adults vape, according to a recent online poll,*” or “*As it is a pretty new product on the market, it is relatively new to users and only a few have tried e-cigarettes.*” Examples of high-prevalence statements are “*In recent years, e-cigarette use by youth and young adults has increased,*” and “*E-cigarettes are now the most commonly used tobacco product among youth in the United States.*” We next randomly chose and assigned these statements based on the design of each treatment condition. Specifically, in each of the 10 articles for the high-prevalence and single-dose condition, one high-prevalence statement was randomly selected out of the pool of five to be included as the last sentence of the first paragraph. In the high-prevalence and double-dose condition, two of these statements were randomly selected from the pool and added to the end of the first and last paragraphs respectively for each of the 10 articles. The same manipulation using low-prevalence statements was conducted for the low-prevalence conditions. In the control condition, the 10 original articles which contained no explicit normative information were used (see Appendix 1 for a set of news stimuli associated with the same original news article used in different conditions).

Measures

Descriptive norm perceptions about e-cigarette use. Descriptive norm perceptions were assessed by asking participants to rate the prevalence of e-cigarette use in the real world with a 7-point Likert scale, ranging from 1 (*very low*) to 7 (*very high*).

Ever smoking experience. Ever smoking experience was assessed with the question “*Have you ever smoked, even one or two puffs?*” The responses were recorded on a dichotomous

scale with 0 (*No*) and 1 (*Yes*).

Ever vaping experience. Ever vaping experience was assessed by one question, “*Have you ever used an e-cigarette, even one or two puffs?*” The responses were recorded on a dichotomous scale with 0 (*No*) and 1 (*Yes*).

Demographic. Age; Sex (*Male/Female*); Race/ethnicity (*African-American, Asian, Caucasian, Hispanic, Other*).

Sources of normative inference. In the control condition, we asked an open-ended question immediately following the descriptive norm perception question to ask the participants to indicate the sources or indicators based on which they formed their descriptive norm perceptions: “Which part of the article makes you think the prevalence of e-cigarette use is (*insert their answer to the descriptive norm perception question*)? You can either explain in your own words, or quote the relevant content from the article.”

Data Analysis

SPSS 24 was used for statistical analysis. Data were initially screened and examined for normality and outliers. No age difference, $F(4, 291) = .630, P = .64$, or gender difference, $\chi^2(4) = 1.963, P = .85$, was observed across conditions. Since our focal manipulation was the absence, presence, and dose of prevalence information statements, which were considered intrinsic message features, manipulation checks were not necessary.^{65,66} Descriptive norm perceptions of e-cigarette use were outcomes induced by the message stimuli.

To examine the main (H1 and H3) and interaction effects (RQ1) of the two factors (i.e., normative direction and exposure dosage), we first conducted a two-way ANOVA within the treatment conditions. Then two planned contrasts (high-prevalence vs. control and low-prevalence vs. control) were performed followed by a one-way ANOVA with a three-condition

independent variable (high-prevalence conditions, low-prevalence conditions and control) and e-cigarette descriptive norm perceptions as the dependent variable. To test H4, we conducted moderator analyses within the treatment conditions to examine whether ever smoking or vaping experience would influence the effects of our experimental manipulation (high-prevalence vs. low-prevalence) on perceived e-cigarette descriptive norms.

To answer RQ2, we focused on the control condition ($n = 55$). We analyzed the open-ended responses using systematic categorization and coding.⁶⁷ Using the coding scheme, each of the authors reviewed the responses iteratively to identify categories of responses by the forcefulness, recurrence, and repetition of the data.⁶⁸ We then discussed the themes to refine and reorganize the responses according to the identified patterns within categories.⁶⁷ Finally, we reread the responses to verify the compatibility between the themes and the actual expressions in the data.

Results

Hypothesis Testing

A two-way full-factorial ANOVA within the treatment conditions was first conducted, with normative direction and exposure dosage as fixed factors and perceived descriptive norms of e-cigarette use as the dependent variable. The overall model was significant, $F(3, 220) = 674.72, P < .001, \eta_p^2 = .93$. Normative direction was found to significantly influence perceived descriptive norms of e-cigarette use, $F(1, 220) = 174.60, P < .001, \eta_p^2 = .44$, such that participants in the high-prevalence conditions ($M = 5.58; SD = 1.09$) reported significantly higher e-cigarette use prevalence perceptions than those in the low-prevalence conditions ($M = 3.27; SD = 1.53; P < .001$). H1 was supported. Although the main effect of exposure dosage (H3) was not found to be significant in the omnibus test, $F(1, 220) = 1.06, P = .30, \eta_p^2 =$

.01, a significant interaction (Figure 1) between the normative direction and exposure dosage was observed, $F(1, 220) = 8.76, P < .01, \eta_p^2 = .038$ (RQ1). Simple effects analysis indicated that in low-prevalence conditions, double dosage significantly lowered descriptive norm perceptions compared to that produced by a single dose of low-prevalence information ($P < .05$), but double doses of high-prevalence information did not significantly increase descriptive norm perceptions compared to that in the single-dose high-prevalence condition ($P = .66$).

[Figure 1 about here]

H2 predicted that those who read e-cigarette related news articles containing prevalence information would produce significantly higher (H2a) or lower (H2b) descriptive norm perceptions about e-cigarette use, compared to the baseline (i.e., descriptive norm perceptions of those who read news articles that did not contain any explicit normative information). The one-way ANOVA test results showed a significant omnibus effect, $F(2, 277) = 93.76, P < .001, \eta_p^2 = .40$. Planned contrasts suggested that participants in the high-prevalence conditions ($M = 5.58; SD = 1.09$) reported significantly higher e-cigarette use prevalence perceptions than those in the control conditions ($M = 5.07; SD = 1.17; P < .05$), while participants in the low-prevalence conditions ($M = 3.27; SD = 1.53$) reported significantly lower prevalence perceptions than those in the control condition ($P < .001$). Thus, H2 was supported. See Table 1 for means and standard deviations of the descriptive norm perceptions in all conditions.

[Table 1 about here]

Hypothesis 4 predicted the moderating effects of ever vaping and smoking experience on the relation between news exposure and perceived descriptive norms about e-cigarette use. Moderator analyses results indicated that neither ever vaping experience, $F(1, 204) = 1.09, P = .40, \eta_p^2 = .003$, nor ever smoking experience, $F(1, 205) = 1.04, P = .31, \eta_p^2 = .005$, was found to

be a significant moderator. On average, the e-cigarette never-users ($M = 4.39$, $SD = .13$) formed similar descriptive norm perceptions compared to the ever-users ($M = 4.41$, $SD = .12$). Similarly, never-smokers ($M = 4.30$, $SD = .14$) reported similar levels of perceived descriptive norms compared to that of the ever-smokers ($M = 4.46$, $SD = .11$). Thus, H4 was not supported.

Qualitative Data Analysis

RQ2 asked how participants in the control condition formed descriptive norm perceptions for e-cigarette use based on what they read in the news articles, which did not contain explicit normative information and had a balanced or neutral tone towards e-cigarettes. The qualitative analysis results converged on two salient themes: institutional signals and misattributed behavioral cues. Each theme identified was endorsed by a minimum of 32% occurrences in participants' responses.

Institutional Signals. According to Tankard and Paluck, institutions such as universities, governments, and the mass media can influence normative perceptions by their credibility and perceived legitimacy to represent groups' interests.²⁰ Interestingly, our analysis of participants' responses observed that institutional signals emerged in different forms. We found that participants tended to attribute a behavior being reported in the news as having high salience, thus high prevalence, in the public. Based on the fact that professional journalists and the media agencies decided to report an e-cigarette related news, they inferred use of e-cigarettes must be a salient and important social issue. Participants also responded that although e-cigarette use was neither explicitly supported nor objected, the news article insinuated a negative connotation which led them to estimate high prevalence of e-cigarette use. While the news valence was by design held balanced through an equal presentation of positive and negative e-cigarette related topics, some frequently used language appearing in an e-cigarette news report (e.g., smoke,

cigarettes, chemicals, etc.), may have brought up negative impressions about e-cigarettes through unwittingly creating a misconception about the resemblance between smoking and vaping. For example, one participant stated, “The article is describing a new form of ‘smoking’ and fears of e-cigarettes are used as a stalking horse by tobacco companies, who want to promote the habit.”

Another institutional signal that influenced participants’ normative perceptions was the mention of e-cigarette related research in the news. Participants explained that if institutions were already investing resources to understand the health consequences of e-cigarette use, then there must be a wide use of the product in the population. Mentions about research evidence coming from different countries were used by participants to infer that e-cigarette use is a global issue. One participant wrote, “The prevalence of e-cigarette use must be somewhat high if officials, such as Carlos Corvalan, from Environmental Health Australia is concerned about it. Based on this article, I would assume that Environmental Health Australia is a large government entity.” Moreover, participants also used institutional actions, such as when an institution introduced a new e-cigarette related regulation or policy, to infer perceived descriptive norms. For example, after reading the news article that discussed vaping in the workplace, one participant stated, “The fact that there is a need for organizations to start forming policies on the usage of e-cigarettes demonstrates that the prevalence of e-cigarettes is high.”

Misattributed Behavioral Cues. We found that participants paid attention to language that characterized the state of the e-cigarette debates to infer the prevalence of e-cigarette use. Three participants stated that because the news articles stated that e-cigarette use was going through a hot debate, they concluded that vaping must be trendy and attractive to others. Some participants explained that they estimated a high number of people using e-cigarettes because the news article mentioned the “diverse range of flavors,” and “most of the flavors are safe

chemicals often added to foods.” This means that normative information about the rich features of e-cigarettes, such as their diverse flavors, were used to make inferences about e-cigarette use prevalence. Words that were used to describe the range of e-cigarette flavors, such as “diverse,” “variety,” and “different” were picked up by the participants and misattributed to be the evidence for the popularity of the behavior. Moreover, one participant also suggested that because the news reported e-cigarettes to be an “alternative to smoking,” vaping should be just as popular as smoking. Another participant suggested, “This phenomenon has had a relatively high level of interaction and involvement with society, if it has a commonly used nickname and its users are also referred to by this name.”

The analysis of the open-ended responses also revealed that participants used firsthand knowledge of e-cigarette to form their perceived descriptive norms. For example, participants said that they had seen others using e-cigarettes on a college campus, at a workplace, or in a neighborhood. They also used their prior observations of others’ smoking behavior to infer e-cigarette use norms. One participant commented, “So many people smoke cigarettes and with a product in the same market, I assume many people use e-cigarettes as well.”

Discussion

This research investigated the influence of exposure to normative information embedded in news articles on individuals’ descriptive norm perceptions about e-cigarette use among college-aged young adults. Results from the experiment supported our hypothesis that normative information contained in the news articles can effectively influence participants’ perceptions of the e-cigarette use prevalence, in both normative directions. Findings also indicated that dosage of normative information played a significant role in influencing perceived descriptive norms in the low-prevalence conditions, but not in the high-prevalence conditions, such that double doses

of normative information in the low-prevalence condition significantly reduced perceived descriptive norms compared to that in the single-dose condition. This effect, however, was not found in the high-prevalence conditions. The data also indicated that the influence of news article exposure on perceived descriptive norms was not dependent on whether or not individuals had ever vaped or smoked. The results of the qualitative analysis showed that individuals utilized institutional and misattributed behavioral cues to infer e-cigarette use prevalence in the absence of explicit normative information.

The study sheds light on the process of descriptive norm perception formation through exposure to news articles. Despite scholars' postulation of the mass media influence on social norm formation, it has been unclear whether prevalence information contained in news articles indeed affects descriptive perceptions and how such influence operates.¹³ If the news does have an effect on social norm formation, it is also unclear whether the directions of norms (low- and high- prevalence information) conveyed in the news would carry the same weight in influencing social norm formation. Mass communication theories about how exposure to mass media affect normative perception, such as the cultivation theory, suggest a norm formation mechanism in which descriptive norms are gradually formed overtime.⁶⁹ This experiment, however, showed that the effect of news media can be a one-off and direct stimuli-response reaction, in which normative perceptions of e-cigarette use were successfully formed and reported.

The results of the experiment showed that the normative directions (low- and high-prevalence information) conveyed by the news articles can effectively influence individuals' descriptive norm perceptions. The exposure dosage factor (single and double doses), however, was found to only enhance social norm formation in low-prevalence conditions. Particularly, individuals who were exposed to news articles with two doses of low-prevalence information

perceived significantly fewer people using e-cigarettes, compared to those who read news articles containing only one dose. This finding suggests that low-prevalence information mentioned in the news articles may carry greater weights than information about high prevalence in influencing people's descriptive norm perceptions. Such "negation bias" echoed with previous studies that examined descriptive norm perception formation process through exposure to online user-generated comments.⁶⁰ Research has found that negation of implementing a behavior received more attention from individuals during their evaluation formation and information recalled.^{70,71} The likely existence of negation bias suggests that health educators may benefit from increasing the dosage of low-prevalence information in the messages to maximize effects of social norm appeals on normative perceptions and behavior change.

Our study provided insights into how individuals may form their descriptive norm perceptions from news consumption, in the absence of explicitly communicated prevalence information. Indeed, the qualitative analysis findings revealed that individuals capitalized on institutional and behavioral cues from mass media contents to interpret what was normative in society. This finding provided further empirical evidence to the theorization of the sources of social norms perception formation.^{8,20} People take information delivered by mass media agencies and actions performed by professional organizations as indicators of social norms. Specifically, when news stories report on a health-related behavior, readers assume that the behavior must be significant and prevalent. In addition, institutional actions, such as allocating resources for research and regulation, were perceived as signals of prominence as well. This suggests that the current media coverage of the debates on scientific evidence of e-cigarette use and how to regulate it are likely to have an impact on media users' prevalence estimation about vaping.

We observed a spillover effect related to the semantic knowledge that influenced

individuals' heuristic judgments of descriptive norms. We found that participants tended to transfer the product attributes to behavioral attributes for descriptive norm formation, particularly when descriptions of products attributes were positively perceived. That is, the description of e-cigarettes as having a diverse range of flavors and designs initiated a positive impression of the product, meaning that the product is attractive and popular to consumers. This description, which was commonly used in e-cigarette news articles, appeared to have an effect on news readers' subsequent estimations of e-cigarette use norms. This is consistent with previous research on spreading activation effects, in which associative relatedness of information influenced cognitive elaboration and recall.^{72,73} Research in health communication has also found a health halo effect in product labeling, such that the product titled with positive information heightened cognitive accessibility and judgment of the overall healthfulness perceptions.⁷⁴ Thus, we suspected a mediation mechanism taking place whereby product attributes indirectly influenced social norm perceptions, via behavioral attributes. Given this finding, it would be informative for future studies to further examine this potential mediation pathway.

The results of the test for hypothesis 4, which predicted the moderating effect of ever smoking and vaping experience on the association between news exposure and descriptive norm formation, was corroborated by the findings from the qualitative analysis. Specifically, the quantitative analysis indicated that hypothesis 4 was not supported, while the qualitative findings showed that participants who have ever vaped or smoked did not rely on their own behavior to generate normative perceptions. We found that they relied on their observations of others' vaping and utilized this memory to estimate descriptive norms. The combined findings presented here points to the role of mass media and reference others, rather than own prior experience, to inform one's judgment about the prevalence of a behavior. Research has indicated that people made less

use of their own experience to infer normative cues when media cues were present.⁷⁵ This finding further consolidated the significant influence of mass media on individuals' normative perceptions of e-cigarette use.^{34,39}

This research has limitations. The study measured the outcome variables immediately after their exposure to the stimuli materials, which may not be informative about the long-term effects of media news stories on social norm perceptions. The use of single items to measure the dependent variable may be subject to reliability issues. It would be a fruitful future direction to include multiple items for the measured dependent variables and assess the long-term effect of news exposure on descriptive norm perception. In addition, our attempt to qualitatively analyze news readers' interpretations of social norm sources was limited in scale and depth. However, to the best of our knowledge, our efforts are among pioneering endeavors that aim to decompose this phenomenon with concrete understandings above and beyond the quantitative results. In this sense, the results do provide some ideas for future studies where more systematic qualitative investigation of the subject matter will be conducted.

Translation to Health Education Practice

This study found evidence for the role of media news on influencing individuals' normative perceptions about a scientifically-contested health behavior, for which descriptive norms are often more influential than for well-established behaviors.^{76,77} The study results, when translated into the real world, reveal that people can successfully form their descriptive norms for e-cigarette use based on the explicit prevalence information as well as other implicit informational cues included in the news. The TNSB has indicated that descriptive norms lead to more consumption of tobacco products. Although the health effects of e-cigarette use are still scientifically divisive, research has shown that e-cigarette use can be a gateway to smoking

renormalization. The Centers for Disease Control and Prevention also warns that e-cigarettes are not safe for youth, young adults, and adults, who do not currently use e-cigarettes.¹

Social norm campaigns have focused more on crafting ads with persuasive intent or interpersonal communication than the influence of individuals' daily news consumptions, which is also an influential source of normative perception. News media, which presumably have much greater societal influence and exist in people's day-to-day life, may have unintentionally increased normative perceptions of risk behaviors through highlighting implicit and explicit high-prevalence information. Given the pervasiveness of media content reporting e-cigarette debates and the fact that perceived descriptive norms often guide individuals' behavior decisions, anti-tobacco Health Educators should consider paying close attention to normative cues related to e-cigarette use delivered through people's routine media encounters. Although it is impractical to try to change journalists' reporting practice anytime soon, being considerate of the mechanism of normative perception formation through news exposure may help Health Educators identify important risk factors hindering their social change efforts. Health Educators should carry out formative research to examine normative perceptions of e-cigarette use. In case e-cigarette use norms are inflated, norm debiasing strategies should be adopted to readjust college students' normative misperceptions of e-cigarette use with actual norms.⁷⁸ Such an approach helps prevent inflated descriptive norm perceptions, triggered by exposure to normative media content. When it comes to social norm message design, this research also suggests that social norm interventions should consider increasing the dosage of low-prevalence information to maximize the effect of normative appeals. Further research to replicate and expand these findings will generate more insights into understanding the process of normative perception formation and how to optimally leverage its potent power to influence desirable behavior change.

Table 1.

Means and standard deviations for perceived descriptive norms of e-cigarette use

Experimental Conditions	n	Mean	SD
Low-prevalence/single dose	59	3.61	1.52
Low-prevalence/double dose	56	2.91	1.47
High-prevalence/single dose	54	5.41	.90
High-prevalence/double dose	55	5.75	1.24
No prevalence information (control)	56	5.07	1.17

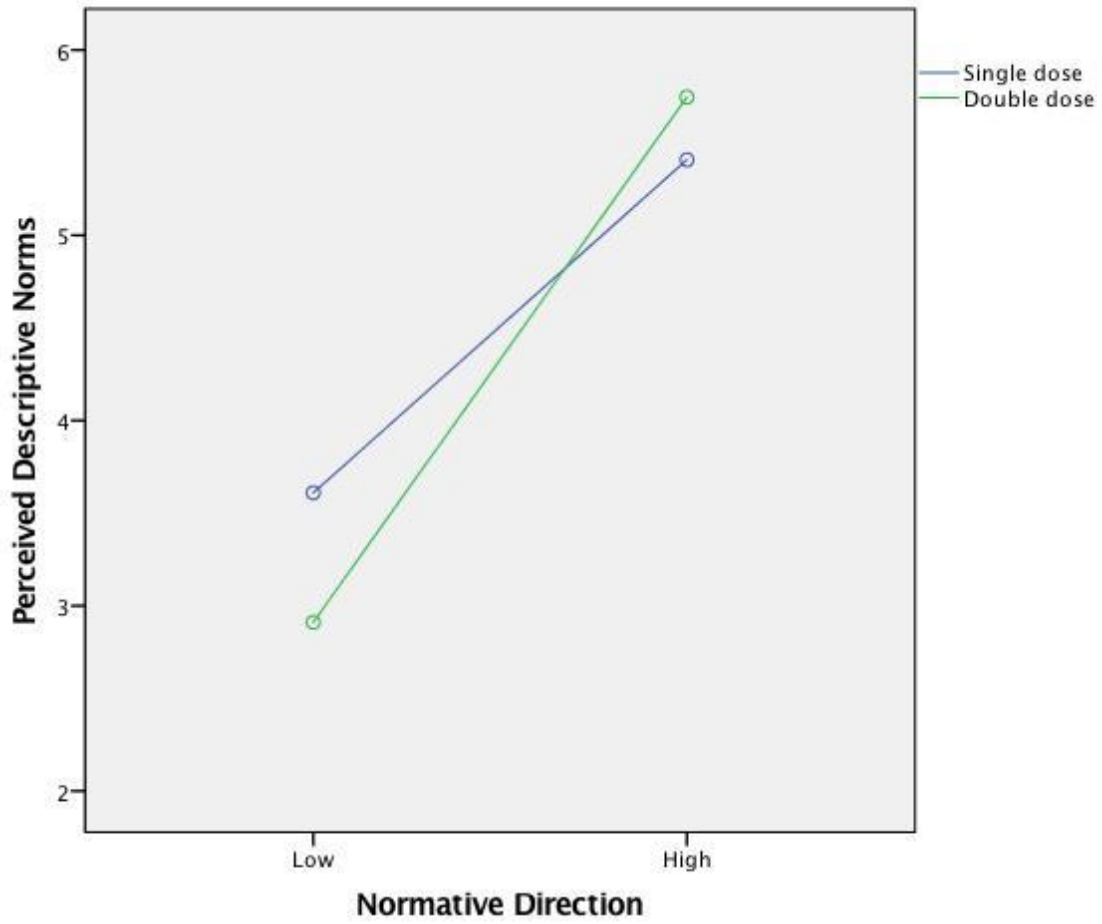


Figure 1. Interaction between normative direction and exposure dosage on perceived descriptive norms of e-cigarette use.

References

1. Centers for Disease Control and Prevention. Smoking and tobacco use: Electronic cigarettes. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/index.htm. Updated August 30, 2018. Accessed October 5, 2018. [17 SEP]
2. Farrelly MC, Duke JC, Crankshaw EC, et al. A randomized trial of the effect of e-cigarette TV advertisements on intentions to use e-cigarettes. *Am J Prev Med*. 2015;49(5):686-693.
3. Kong G, Morean ME, Cavallo DA, Camenga DR, Krishnan-Sarin S. Reasons for electronic cigarette experimentation and discontinuation among adolescents and young adults. *Nicotine Tob Res*. 2015;17(7):847-854.
4. Paek H-J, Kim S, Hove T, Huh JY. Reduced harm or another gateway to smoking? Source, message, and information characteristics of e-cigarette videos on YouTube. *J Health Commun*. 2014;19(5):545-560.
5. Fairchild AL, Bayer R. Smoke and fire over e-cigarettes. *Science*. 2015;347(6220):375-376.
6. Kim S-H, Thrasher JF, Kang M-H, Cho YJ, Kim JK. News media presentations of electronic cigarettes: a content analysis of news coverage in South Korea. *Journal Mass Commun Q*. 2017;94(2):443-464.
7. Rooke C, Amos A. News media representations of electronic cigarettes: an analysis of newspaper coverage in the UK and Scotland: Table 1. *Tob Control*. 2014;23(6):507-512.
8. Mead EL, Rimal RN, Ferrence R, Cohen JE. Understanding the sources of normative influence on behavior: the example of tobacco. *Soc Sci Med*. 2014;115:139-143.
9. Cialdini RB, Reno RR, Kallgren CA. A focus theory of normative conduct: recycling the concept of norms to reduce littering in public places. *J Pers Soc Psychol*. 1990;58(6):1015-1026.
10. Greenhill R, Dawkins L, Notley C, Finn MD, Turner JJD. Adolescent awareness and use of electronic cigarettes: a review of emerging trends and findings. *J Adolesc Health*. 2016;59(6):612-619.
11. Lederer AM, Oswald SB. The value of college health promotion: a critical population and setting for improving the public's health. *Am J Health Educ*. 2017;48(4):215-218.
12. Noland M, Ickes MJ, Rayens MK, Butler K, Wiggins AT, Hahn EJ. Social influences on use of cigarettes, e-cigarettes, and hookah by college students. *J Am Coll Health*. 2016;64(4):319-328.
13. Lapinski MK, Rimal RN. An explication of social norms. *Commun Theory*. 2005;15(2):127-147.
14. Duong HT, Parker L. Going with the flow: young motorcyclists' misperceived norms and motorcycle speeding behaviour. *J Soc Mark*. 2018;8(3): 314-332.
15. François A, Lindstrom Johnson S, Waasdorp TE, Parker EM, Bradshaw CP. Associations between adolescents' perceptions of alcohol norms and alcohol behaviors: incorporating within-school variability. *Am J Health Educ*. 2017;48(2):80-89.
16. Lapinski MK, Zhuang J, Koh H, Shi J. Descriptive norms and involvement in health and environmental behaviors. *Commun Res*. 2017;44(3):367-387.
17. Rimal RN. Modeling the relationship between descriptive norms and behaviors: a test and extension of the theory of normative social behavior (TNSB). *Health Commun*. 2008;23(2):103-116.
18. Haines MP, Perkins HW, Rice RM, Barker G. *A Guide to Marketing Social Norms for Health Promotion in Schools and Communities*. National Social Norms Resource Center; East Lansing MI; 2005.

19. Burchell K, Rettie R, Patel K. Marketing social norms: social marketing and the ‘social norm approach’. *J Consum Behav*. 2013;12(1):1-9.
20. Tankard ME, Paluck EL. Norm perception as a vehicle for social change. *Soc Issues Policy Rev*. 2016;10(1):181-211.
21. Carcioppolo N, Orrego Dunleavy V, Yang Q. How do perceived descriptive norms influence indoor tanning intentions? An application of the theory of normative social behavior. *Health Commun*. 2017;32(2):230-239.
22. Greene K, Campo S, Banerjee SC. Comparing normative, anecdotal, and statistical risk evidence to discourage tanning bed use. *Commun Q*. 2010;58(2):111-132.
23. Rimal RN, Real K. How behaviors are influenced by perceived norms: a test of the theory of normative social behavior. *Commun Res*. 2005;32(3):389–414.
24. Jang SA, Rimal RN, Cho N. Normative influences and alcohol consumption: the role of drinking refusal self-efficacy. *Health Commun*. 2013;28(5):443-451.
25. Mollen S, Rimal RN, Lapinski MK. What is normative in *Health Communication* research on norms? A review and recommendations for future scholarship. *Health Commun*. 2010;25(6-7):544-547.
26. Hue DT, Brennan L, Parker L, Florian M. But I AM normal: safe? Driving in Vietnam. *J Soc Mark*. 2015;5(2):105-124.
27. Mabry A, Mackert M. Advancing use of norms for social marketing: extending the theory of normative social behavior. *Int Rev Public Nonprofit Mark*. 2014;11(2):129-143.
28. Geber S, Baumann E, Klimmt C. Where do norms come from? Peer communication as a factor in normative social influences on risk behavior. *Commun Res*. 2017:1-23. doi: 10.1177/0093650217718656
29. Perkins HW. *The Social Norms Approach To Preventing School and College Age Substance Abuse: A Handbook For Educators, Counselors, and Clinicians*. San Francisco, CA: Jossey-Bass; 2003.
30. Krugman DM. Understanding the impact that marketing, advertising, and promotion have on adolescent e-cigarette behavior. *J Adolesc Health*. 2016;59(6):609-611.
31. O’Loughlin JL. E-cigarettes-Promise or peril? *Can J Public Health Rev Can Sante Publique*. 2014;105(2):94-96.
32. Goniewicz ML, Gawron M, Nadolska J, Balwicki L, Sobczak A. Rise in electronic cigarette use among adolescents in Poland. *J Adolesc Health*. 2014;55(5):713-715.
33. Owotomo O, Maslowsky J, Loukas A. Perceptions of the harm and addictiveness of conventional cigarette smoking among adolescent e-cigarette users. *J Adolesc Health*. 2018;62(1):87-93.
34. Maloney EK, Cappella JN. Does vaping in e-cigarette advertisements affect tobacco smoking urge, intentions, and perceptions in daily, intermittent, and former smokers? *Health Commun*. 2016;31(1):129-138.
35. Scott A, Lugg ST, Aldridge K, et al. Pro-inflammatory effects of e-cigarette vapour condensate on human alveolar macrophages. *Thorax*. 2018;0:1-9.
36. Grana R, Benowitz N, Glantz SA. E-cigarettes: A scientific review. *Circulation*. 2014;129(19):1972-1986.
37. Yong H-H, Borland R, Balmford J, et al. Trends in e-cigarette awareness, trial, and use under the different regulatory environments of Australia and the United Kingdom. *Nicotine Tob Res*. 2015;17(10):1203-1211.

38. Patterson C, Hilton S, Weishaar H. Who thinks what about e-cigarette regulation? A content analysis of UK newspapers. *Addiction*. 2016;111(7):1267-1274.
39. 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.
40. Yang, Q., Liu, J., Lochbuehler, K., & Hornik, R. (2017). Does seeking e-cigarette information lead to vaping? Evidence from a national longitudinal survey of youth and young adults. *Health Commun*. 2017; 1-8. doi: 10.1080/10410236.2017.1407229
41. Peters RJ, Meshack A, Lin M-T, Hill M, Abughosh S. The social norms and beliefs of teenage male electronic cigarette use. *J Ethn Subst Abuse*. 2013;12(4):300-307.
42. Beaudoin CE. The mass media and adolescent socialization: a prospective study in the context of unhealthy food advertising. *Journal Mass Commun Q*. 2014;91(3):544-561.
43. Camenga DR, Delmerico J, Kong G, et al. Trends in use of electronic nicotine delivery systems by adolescents. *Addict Behav*. 2014;39(1):338-340.
44. Perkins HW, Berkowitz AD. Perceiving the community norms of alcohol use among students: some research implications for campus alcohol education programming. *Int J Addict*. 1986;21(9-10):961-976.
45. Vinci DM, Philen RC, Walch SE, et al. Social norms tactics to promote a campus alcohol coalition. *Am J Health Educ*. 2010;41(1):29-37.
46. Eveland WP. News information processing as mediator of the relationship between motivations and political knowledge. *Journal Mass Commun Q*. 2002;79(1):26-40.
47. Eveland WP. The cognitive mediation model of learning from the news: evidence from nonelection, off-year election, and presidential election contexts. *Commun Res*. 2001;28(5):571-601.
48. Zillmann D. Exemplification theory: judging the whole by some of its parts. *Media Psychol*. 1999;1(1):69-94.
49. Kim SH, Scheufele DA, Shanahan J. Think about it this way: attribute agenda-setting function of the press and the public's evaluation of a local issue. *Journal Mass Commun Q*. 2002;79(1):7-25.
50. Hornik RC. Exposure: theory and evidence about all the ways it matters. *Soc Mark Q*. 2002;8(3):31-37.
51. Noar SM. A 10-year retrospective of research in health mass media campaigns: where do we go from here? *J Health Commun*. 2006;11(1):21-42.
52. Sly DF, Trapido E, Ray S. Evidence of the dose effects of an antitobacco counteradvertising campaign. *Prev Med*. 2002;35(5):511-518.
53. Amrock SM, Zakhar J, Zhou S, Weitzman M. Perception of e-cigarette harm and its correlation with use among U.S. adolescents. *Nicotine Tob Res*. 2015;17(3):330-336.
54. Cho JH, Shin E, Moon S-S. Electronic-cigarette smoking experience among adolescents. *J Adolesc Health*. 2011;49(5):542-546.
55. Dai H, Hao J. Exposure to advertisements and susceptibility to electronic cigarette use among youth. *J Adolesc Health*. 2016;59(6):620-626.
56. Klitzner M, Gruenewald PJ, Bamberger E. Cigarette advertising and adolescent experimentation with smoking. *Br J Addict*. 1991;86(3):287-298.
57. O'Keefe DJ. *Persuasion: Theory and Research*. 3rd ed. Thousand Oaks, CA: Sage; 2015.
58. Fiske ST, Taylor SE. *Social Cognition: From Brains to Culture*. Thousand Oaks, CA: Sage; 2013.

59. Eveland WP, Nathanson AI, Detenber BH, McLeod DM. Rethinking the social distance corollary: perceived likelihood of exposure and the third-person perception. *Commun Res.* 1999;26(3):275-302.
60. 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.
61. Liu, J., & Shi, R.. How do online comments affect perceived descriptive norms of e-cigarette use? The role of quasi-statistical sense, valence perceptions, and exposure dosage. *J Comput Mediat Commun.* In press.
62. Zerback T, Koch T, Krämer B. Thinking of others: effects of implicit and explicit media cues on climate of opinion perceptions. *Journal Mass Commun Q.* 2015;92(2):421–443.
63. Jackson S. *Message Effects Research: Principles of Design and Analysis.* New York, NY: Guilford Press; 1992.
64. Tannenbaum PH. The effect of headlines on the interpretation of news stories. *Journal Bull.* 1953;30(2):189-197.
65. O’Keefe DJ. Message properties, mediating states, and manipulation checks: claims, evidence, and data analysis in experimental persuasive message effects research. *Commun Theory.* 2003;13(3):251-274.
66. Tao C-C, Bucy EP. Conceptualizing media stimuli in experimental research: psychological versus attribute-based definitions. *Hum Commun Res.* 2007;33(4):397-426.
67. Lindlof TR, Taylor BC. *Qualitative Communication Research Methods.* Thousand Oaks, CA: Sage; 2001.
68. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol.* 2006;3(2):77-101.
69. Gerbner G, Gross, L, Morgan M, Signorielli N. Growing up with television: the cultivation perspective. In: Bryant J, Zillmann D, eds. *Media Effects: Advances in Theory and Research.* Hillsdale, NJ: Erlbaum; 1994:17-41.
70. Fiske ST. Attention and weight in person perception: the impact of negative and extreme behavior. *J Pers Soc Psychol.* 1980;38(6):889-906.
71. Pratto F, John OP. Automatic vigilance: the attention-grabbing power of negative social information. *J Pers Soc Psychol.* 1991;61(3):380-391.
72. Anderson JR. A spreading activation theory of memory. *J Verbal Learn Verbal Behav.* 1983;22(3):261–295.
73. Schuldt JP, Muller D, Schwarz N. The “fair trade” effect: health halos from social ethics claims. *Soc Psychol Personal Sci.* 2012;3(5):581-589.
74. Fernan C, Schuldt JP, Niederdeppe J. Health halo effects from product titles and nutrient content claims in the context of “protein” bars. *Health Commun.* August 2017:1-9.
75. Shamir J, Shamir M. *The Anatomy of Public Opinion.* Ann Arbor, MI: University of Michigan Press; 2000.
76. Kim HK, Kim S, Niederdeppe J. Scientific uncertainty as a moderator of the relationship between descriptive norm and intentions to engage in cancer risk–reducing behaviors. *J Health Commun.* 2015;20(4):387-395.
77. Rimal RN, Lapinski MK. A re-explication of social norms, ten years later. *Commun Theory.* 2015;25(4):393-409.
78. Blanton H, Köblitz A, McCaul KD. Misperceptions about norm misperceptions: descriptive, injunctive, and affective ‘social norming’ efforts to change health behaviors. *Soc Personal Psychol Compass.* 2008;2(3):1379-1399.

Appendix 1
Example News Stimuli Used in Different Conditions

Are E-Cigarettes a Public Health Hazard or the Key to Quitting Smoking?



E-cigarettes are metal tubes that heat liquids typically laced with nicotine and deliver vapor when inhaled. The liquids come in thousands of flavors, from cotton candy to pizza. E-cigarettes work by heating a pure liquid called e-juice – composed of flavorings, propylene glycol, glycerin and often nicotine – until it vaporizes.



Do e-cigarettes help smokers kick their bad habits? “The short answer, is no”, says Dr. Stanton Glantz, a professor of medicine at the University of California, San Francisco, who analyzed a number of studies that examined the effects of e-cigarettes in quitting smoking. He found that they can actually lower a person’s chance of successfully quitting cigarettes. Not everyone has come to the same conclusion, though. Muhannad Malas, a researcher at the University of Toronto, says that his own analysis of previous studies comparing e-cigs with other smoking cessation aids found that they have been helpful for smokers in quitting or reducing cigarette smoking.

“E-cigarettes are a hot topic,” Hedman of Umeå University in Sweden says. “Some argue that e-cigarettes are a solution to the tobacco epidemic,” as a safer substitute or crutch for quitting. “Others feel they can’t stand behind the product until we know it’s indeed a safe alternative”, she says. The current scientific evidence is generally unsatisfying and we need more evidence to say who’s right.

(A). Example news stimuli with no prevalence information

Note: This news stimulus does not contain prevalence information. It was among one of the 10 original news articles used in the control condition.

Are E-Cigarettes a Public Health Hazard or the Key to Quitting Smoking?



E-cigarettes are metal tubes that heat liquids typically laced with nicotine and deliver vapor when inhaled. The liquids come in thousands of flavors, from cotton candy to pizza. E-cigarettes work by heating a pure liquid called e-juice – composed of flavorings, propylene glycol, glycerin and often nicotine – until it vaporizes. Only 10 percent of U.S. adults vape, according to a recent online poll.



Do e-cigarettes help smokers kick their bad habits? “The short answer, is no”, says Dr. Stanton Glantz, a professor of medicine at the University of California, San Francisco, who analyzed a number of studies that examined the effects of e-cigarettes in quitting smoking. He found that they can actually lower a person’s chance of successfully quitting cigarettes. Not everyone has come to the same conclusion, though. Muhannad Malas, a researcher at the University of Toronto, says that his own analysis of previous studies comparing e-cigs with other smoking cessation aids found that they have been helpful for smokers in quitting or reducing cigarette smoking.

“E-cigarettes are a hot topic,” Hedman of Umeå University in Sweden says. “Some argue that e-cigarettes are a solution to the tobacco epidemic,” as a safer substitute or crutch for quitting. “Others feel they can’t stand behind the product until we know it’s indeed a safe alternative”, she says. The current scientific evidence is generally unsatisfying and we need more evidence to say who’s right. As it is a pretty new product in some markets, it is relatively new to users and only a few have tried e-cigarettes.

(B). Example news stimuli with double doses of low-prevalence information

Note: This news stimulus contains two doses of low-prevalence information. It was among one of the 10 low-prevalence news articles used in the double-dose low-prevalence condition. In the single-dose low-prevalence condition, while other things in the news kept equal, only one dose of low-prevalence information was present.

Are E-Cigarettes a Public Health Hazard or the Key to Quitting Smoking?



E-cigarettes are metal tubes that heat liquids typically laced with nicotine and deliver vapor when inhaled. The liquids come in thousands of flavors, from cotton candy to pizza. E-cigarettes work by heating a pure liquid called e-juice – composed of flavorings, propylene glycol, glycerin and often nicotine – until it vaporizes. E-cigarette use has increased considerably in recent years, growing an astounding 900% among high school students from 2011 to 2015.



Do e-cigarettes help smokers kick their bad habits? “The short answer, is no”, says Dr. Stanton Glantz, a professor of medicine at the University of California, San Francisco, who analyzed a number of studies that examined the effects of e-cigarettes in quitting smoking. He found that they can actually lower a person’s chance of successfully quitting cigarettes. Not everyone has come to the same conclusion, though. Muhannad Malas, a researcher at the University of Toronto, says that his own analysis of previous studies comparing e-cigs with other smoking cessation aids found that they have been helpful for smokers in quitting or reducing cigarette smoking.

“E-cigarettes are a hot topic,” Hedman of Umeå University in Sweden says. “Some argue that e-cigarettes are a solution to the tobacco epidemic,” as a safer substitute or crutch for quitting. “Others feel they can’t stand behind the product until we know it’s indeed a safe alternative”, she says. The current scientific evidence is generally unsatisfying and we need more evidence to say who’s right. E-cigarettes are used in many bars and public places, where people can take advantage of this device to entice youngsters to take part in.

(C). Example news stimuli with double doses of high-prevalence information

Note: This news stimulus contains two doses of high-prevalence information. It was among one of the 10 high-prevalence news articles used in the double-dose high-prevalence condition. In the single-dose high-prevalence condition, while other things in the news kept equal, only one dose of high-prevalence information was present.