



Comparison of beliefs about e-cigarettes' harms and benefits among never users and ever users of e-cigarettes



Andy S.L. Tan^{a,b,*}, Chul-joo Lee^c, Cabral A. Bigman^d

^a Dana-Farber Cancer Institute, Population Sciences Division, Center for Community Based Research, Boston, USA

^b Harvard TH Chan School of Public Health, Department of Social and Behavioral Sciences, Boston, USA

^c Seoul National University, Department of Communication, Seoul, Republic of Korea

^d University of Illinois at Urbana-Champaign, Department of Communication, Urbana, USA

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ABSTRACT

Introduction: E-cigarette use is rapidly increasing, especially among youth and young adults. We need to learn what factors are associated with uptake in e-cigarettes. One important set of predictors is beliefs about e-cigarettes' potential harms and benefits.

Methods: Online survey data were collected in July, 2014 from 527 U.S. adults from a nationally representative online panel (KnowledgePanel) who reported being aware of e-cigarettes. Participants were asked to rate 7 statements related to e-cigarettes harms or benefits (e.g., breathing vapors from other people's e-cigarettes is harmful to my health; vaping or using e-cigarettes can help people quit smoking regular cigarettes completely). Responses were categorized into agree, disagree, or no opinion. We compared the proportions of agreement between respondents who ever used e-cigarettes and those who had never used. Multinomial logistic regression was used to predict agree or no opinion versus disagree (base outcome) for each belief. Relative risk ratios (RRRs) are reported. The analyses were completed in December, 2014 and were weighted to match the general U.S. adult population.

Results: Agreement across the 7 beliefs ranged from 33% (vaping can help people quit smoking) to 56% (e-cigarettes make smoking look more acceptable to youth). Ever use of e-cigarettes was associated with lower relative risk of agreeing with statements about potential harms and higher relative risk of agreeing with statements about benefits (versus disagreeing) compared with never users.

Discussion: These findings provide timely data on beliefs about e-cigarettes between e-cigarette users and non-users to inform potential message topics for health campaign interventions.

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1. Introduction

E-cigarette use is rapidly increasing in the U.S. population, especially among youth and young adults (Amrock et al., 2014; Bunnell et al., 2015; Carroll Chapman and Wu, 2014; Krishnan-Sarin et al., 2014; Pearson et al., 2012; Regan et al., 2013). The long-term impacts of e-cigarette use on health outcomes at the individual and population levels are still unknown. Current evidence suggests that e-cigarette emissions generally contain lower levels of tobacco-specific pollutants compared with cigarette smoke (Goniewicz et al., 2013; Grana et al., 2014). However, certain toxicants known to have harmful health effects are found at elevated levels in e-cigarette emissions compared with cigarette smoke.

These include hemiacetals (formaldehyde-releasing agents), metal, and silicate particles (Jensen et al., 2015; Williams et al., 2013). There is also concern in the public health community that as e-cigarettes gain popularity among youth, this could lead to increased nicotine dependence and other tobacco use (Fairchild et al., 2014; Leventhal et al., 2015; Office of Senator Richard J. Durbin, 2014; Paek et al., 2014; Primack et al., 2015).

We need to learn what the key factors that influence the increasing uptake of e-cigarettes are. Based on health behavioral theories and empirical research regarding factors influencing smoking regular tobacco cigarettes, beliefs about the harms (e.g., health consequences) and benefits (e.g., social benefits) of smoking stand out as important predictors of smoking or cessation behavior and intention (Brennan et al., 2014; Klesges et al., 1988). Extending from this earlier research, we expect that beliefs about the potential advantages and risks associated with e-cigarette use would also be important factors that influence e-cigarette use behavior.

* Corresponding author at: Dana-Farber Cancer Institute, 450 Brookline Avenue, LW 662, Boston, MA 02215, USA.

E-mail address: andy.tan@dfci.harvard.edu (A.S.L. Tan).

Prior surveys have assessed e-cigarette-related beliefs among a variety of study populations in the U.S. and other countries (Adkison et al., 2013). A systematic review categorized beliefs about e-cigarettes and reasons for using e-cigarettes into 11 major themes including beliefs about cost of e-cigarettes, e-cigarettes as a gateway tobacco product, health and safety concerns of e-cigarette use, and e-cigarettes helping people to quit smoking (Pepper and Brewer, 2013). For instance, several population-based surveys in the U.S. have asked participants about their beliefs regarding the relative harms of using e-cigarettes versus smoking regular tobacco cigarettes (Ambrose et al., 2014; Pearson et al., 2012; Pokhrel et al., 2015a; Richardson et al., 2014; Tan and Bigman, 2014), risks of developing health problems from using e-cigarettes (Pepper et al., 2014b), harms of inhaling secondhand e-cigarette emissions (Tan et al., 2015a), whether e-cigarettes help smokers quit (Choi and Forster, 2014), and whether e-cigarettes are less addictive than regular cigarettes (Choi and Forster, 2014). In a longitudinal study among a cohort of Minnesotan young adults, Choi and Forster reported that participants who believed that e-cigarettes can help people to quit smoking and that e-cigarettes are less harmful than cigarettes at baseline were more likely to report experimenting with e-cigarettes at one year's follow-up (Choi and Forster, 2014). These previous studies underscore the importance of eliciting public beliefs about e-cigarettes.

However, many of these prior studies measured a narrow set of e-cigarette-related beliefs. This limitation precludes a comparison of whether certain beliefs about e-cigarettes are more strongly held by the population than others. Another limitation is some of these earlier studies either involved samples that were limited to smokers/former smokers or participants from specific geographic areas instead of a national sample. In addition, due to the rapidly evolving information and regulatory environment surrounding e-cigarettes over the past few years, we need more recent data about public beliefs about e-cigarettes to guide timely interventions and policies.

The purpose of this study is to assess public beliefs about e-cigarettes across a set of seven beliefs about e-cigarettes beyond a narrow set of beliefs that have been reported in earlier surveys (e.g., perceived relative harms versus smoking) in a national sample of US adults. We further compared beliefs about harms and benefits of e-cigarettes between those who had ever used e-cigarettes and non-users. Findings will provide important and timely information about public beliefs about e-cigarettes, identify beliefs that are associated with e-cigarette use, and help to prioritize topics that could be message targets in future public campaign interventions, given that beliefs are key predictors of smoking behavior (Brennan et al., 2014; Klesges et al., 1988).

2. Methods

2.1. Study sample and data collection

The study sample comprised participants who were invited through KnowledgePanel (maintained by GfK), a nationally representative online research panel randomly recruited by probability-based sampling of households using random-digit dial (RDD) and address-based sampling methods (see www.knowledgenetworks.com/knpanel/). In previous validation research, online surveys of probability samples yielded more accurate population estimates than online surveys involving non-probability samples (Chang and Krosnick, 2009; Yeager et al., 2011). Participating households are supplied with hardware and internet service if needed. Participation in the survey was voluntary and consent was implied from completion of the survey. No personally identifiable data was

collected. The institutional review board of the University of Illinois at Urbana-Champaign approved this study.

The data for this analysis were obtained from a longitudinal study that focused on health information exposure among U.S. adults aged 18 years and older. There were three rounds of online surveys among a cohort of adults. In the first two rounds of the survey conducted in January and April, 2014, items related to beliefs about e-cigarette harms and benefits were not included. We added these items in the third round of the study conducted in July 2014. In the first round of the survey (January 2014), 58% ($n = 795$) of invited participants completed the survey. Of these participants, 784 were re-invited for the second survey (April 2014) and 626 completed this survey (completion rate of 80%). For the third round, 748 participants from the first round were re-invited in June, 2014 and 571 completed this third round (completion rate = 76%). Overall, 72% of the first round participants completed the third round. Older adults and those who had higher education were more likely to have completed the third round survey. For the present analysis, participants were excluded if they indicated that they had never heard about e-cigarettes ($n = 44$), resulting in a final analyzed sample of 527 respondents (aged 18–87 years). Those with higher education and former smokers (versus non-smokers) were more likely to have heard about e-cigarettes. These variables were included as covariates in the analyses described below.

2.2. Measures

2.2.1. Outcome variables. Participants were asked if they agreed or disagreed with seven belief items policies with the following question: "How much do you agree or disagree with the following statements?" The seven statements were: (1) breathing vapors from other people's e-cigarettes is harmful to my health, (2) if I vape or use e-cigarettes every day, I will become addicted, (3) e-cigarettes tempt non-smoking youth to start smoking regular cigarettes, (4) e-cigarettes make smoking look more acceptable to youth, (5) if I vape, or use e-cigarettes, it will be less harmful to me than if I smoke regular cigarettes, (6) vaping or using e-cigarettes can help people quit smoking regular cigarettes completely, (7) breathing vapors from other people's e-cigarettes is less harmful to my health than breathing smoke from other people's regular cigarettes. The decision to focus on these seven beliefs was based on prior qualitative research and surveys on salient beliefs associated with e-cigarettes (Choi et al., 2012; Choi and Forster, 2014; Pearson et al., 2012; Pepper and Brewer, 2013; Pokhrel et al., 2015b; Tan et al., 2015a). The first four items about potential harms of e-cigarettes appeared as a block (in random order) followed by the remaining three items about potential benefits as a block on a separate screen (also in random order). Responses options were 'strongly agree', 'agree', 'disagree', 'strongly disagree', or 'no opinion'. We recognized that for some people, e-cigarette use may not be a salient health issue. They may not have formed an opinion one way or the other about harms and benefits. We therefore included the "no opinion" response in order not to have forced choice responses between agree and disagree. These responses were re-categorized into 'agree', 'disagree', or 'no opinion'. Approximately 20–26 cases (3.8–4.9%) were missing on one or more of these items.

2.2.2. Ever used e-cigarettes. Participants were asked about their e-cigarette use with a single item: "Have you ever tried or used electronic cigarettes (e-cigarettes), even just one time?" Responses included: "I have never heard about e-cigarettes/I have never tried them/I have tried them, but not in the past 30 days/I used them at least once in the past 30 days". We excluded 44 respondents who had never heard about e-cigarettes from the analyses. We categorized participants as never users (84.4%) and ever users (comprising

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