Vaping, Perceptions of Vaping, and Plans to Quit Among E-cigarette Users in the United States and the United Kingdom

Nathalia Munck Machado PhD[1,] , **Keith Feldman PhD[2,3,]** , **Ligia Menezes do Amaral PhD[4]**,
Telmo Mota Ronzani, PhD[5], Kimber P. Richter PhD[1]

[1]Department of Population Health, University of Kansas Medical Center, Kansas City, KS 66160, USA
[2]Department of Pediatrics, Division of Health Services and Outcomes Research, Children's Mercy Kansas City, Kansas City, MO 64108, USA
[3]Department of Pediatrics, University of Missouri Kansas City School of Medicine, Kansas City, MO, USA
[4]Medical Clinic Department, Universidade Federal de Juiz de Fora, Juiz de Fora, MG 36036-900, Brazil
[5]Department of Psychology, Universidade Federal de Juiz de Fora, Juiz de Fora, MG 36036-900, Brazil

Corresponding Author: Nathalia Munck Machado, PhD, Department of Population Health, University of Kansas Medical Center, Kansas City, KS 66160, USA.
Telephone: +1 816 328 7381; E-mail: mucknathalia@gmail.com

Abstract

Introduction: Government and health organizations in the United States and the United Kingdom have taken different stances on e-cigarettes policy. To explore the potential effects of these policies, we describe e-cigarette user characteristics, intentions to quit, and perceived attitudes toward vaping.

Methods: We used the online crowdsourcing platform Prolific to conduct a cross-sectional survey of current vapers in both countries. Measures were drawn from international surveys.

Results: The sample included 1044 vapers (524 United Kingdom; 520 United States) with a mean age of 34. Samples differed by gender (United States: 57% male vs 45% in United Kingdom), race (United States: 79% White vs 90% in United Kingdom) and employment (United States: 73% employed vs 79% in United Kingdom). UK respondents were more likely than US respondents to be ever smokers (89% vs 71%, $p < .0001$); be daily vapers (69% vs 53%, $p < .0001$) and to use e-cigarettes to quit smoking (75% vs 65%, $p < .0007$). Most vapers in the United Kingdom and the United States want to stop vaping (62% vs 61%; $p < .9493$), but US respondents plan to quit significantly sooner (odds ratio 0.47, $p < .0004$). Attitudes differed as well. Over half (56%) of UK respondents reported their government-approved e-cigarette use, and 24% felt health care providers had positive views on e-cigarettes versus 29% and 13% from the United States, respectively ($p < .0004$ for both).

Conclusions: Plans for quitting and perceptions regarding e-cigarettes differ markedly between demographically similar groups of vapers in the two countries. Future research should determine whether e-cigarette cessation for adults should be a public health goal, and if so, identify effective ways to stop.

Implications: The contribution of this study is that it describes differences in behaviors and attitudes of vapers recruited through the same research platform and adjusted to account for minor demographic differences across country samples. For clinicians, these findings suggest that most vapers would welcome assistance in quitting. For researchers and policymakers, findings suggest that government policy regarding nicotine devices might influence behaviors and attitudes related to use and also that future research is needed to determine effective ways to quit.

Introduction

E-cigarettes are viewed by many as safer than combustible cigarettes and a way to potentially reduce tobacco-related harm.[1] However, the evidence on short-term risks associated with e-cigarette use is limited, and long-term risks have yet to be evaluated. This lack of evidence regarding the risks of vaping has led to different recommendations, policies, and regulations across countries. Although the UK approach is based on maximizing the potential of e-cigarettes for promoting smoking cessation,[2] the US policy is focused on minimizing the possible harms that e-cigarettes might inflict.[3]

Although most vapers report using e-cigarettes to reduce or stop combustible cigarette consumption,[4] little is known regarding vapers' preferences about when, if ever, they plan to stop vaping and how national policy may affect these plans. We describe and compare the characteristics of e-cigarette users in the two countries and examine the influence of perceived societal attitudes toward e-cigarettes on intentions to stop vaping.

Methods

We used the online crowdsourcing platform *Prolific Academic*[5] to conduct a cross-sectional survey of current e-cigarette users living in the United States and United Kingdom in March of 2020 (see Supplementary Material for more details on the research platform). The study was approved by the KUMC Human Research Protection Program (IRB#STUDY00145254).

Participants

Inclusion criteria included being (1) a current e-cigarette user; (2) between 18 and 90 years old; and (3) a resident of the United States or United Kingdom. Prolific prescreened enrollees and invited those who met the age and residency criteria to participate in the study. We administered a prescreening questionnaire to identify and invite current e-cigarette users to complete the full study survey. Participants were compensated $0.20 for the prescreening questionnaire ($12/hour for the 1-minute survey) and $4.34 for the full questionnaire ($13.02/hour for the 20-minute survey). All participants gave their consent before answering the surveys.

In designing the survey, we included items to eliminate participants who misrepresented their e-cigarette status to complete the survey or who were responding randomly to finish quickly. We asked respondents if they currently used e-cigarettes both in the screening and in the full survey. Those who answered "no" in the full survey were excluded for logical inconsistency. In the full survey, we also included two attention check questions that asked participants to respond with a given number (e.g., slide the ruler to the number "37"). Those who failed to enter the correct number for either check were excluded. In addition, we excluded outliers related to age, as identified by *xplot* in R (age 64–73, $N = 20$).

Measures

The survey included measures drawn from the Population Assessment of Tobacco and Health Study (PATH),[6] the Global Adult Tobacco Survey (GATS),[7] and the Household Economic Survey.[8] Items covered three categories: (1) individual characteristics; (2) measures of perceived social and political environment related to e-cigarettes; and (3) outcome measures. The full questionnaire took 15–20 minutes to complete and is available on request. Details on variables and recoding can be found in Supplementary Table S1.

Sample Size

We conducted a power analysis to determine the sample size needed to detect a 10% difference in intention to quit between the two countries. This difference was based on prior studies comparing patterns in Europe[9] versus the United States.[10] Utilizing a threshold of 90% power and an alpha of 0.05 and including additional participants to account for 5% attrition due to misreporting or incomplete surveys, we arrived at a required sample size of 1026 (513 from each country).

Analysis

We performed three types of analyses to address our research questions. Inferential analysis was conducted to describe and compare variables and countries and examine the influence of perceived social attitudes toward e-cigarettes on intentions to stop vaping. We included variables in regression analyses to adjust for known predictors of quitting, and for minor demographic differences between the two countries, to isolate the impact of government and social influences on intentions to quit. Logistic regression was conducted to determine predictors of intentions to quit vaping, and ordinal logistic regression was performed to compare future plans for quitting. Most survey items required an answer and had no missing data, but some measures included branching logic; hence, sample sizes vary for some items. All analyses were performed using the software R Core Team version 4.0.2.[11]

Participant Characteristics and Univariate Analyses

First, descriptive statistics were used to characterize participant demographics, survey responses, and perceptions of social and political attitudes/environment regarding e-cigarette use by country. For each, statistical comparisons were made between countries using the Wilcoxon signed-rank test for continuous data and Fisher's exact test two-sided for nominal variables.

Adjusted Binary Model of Ever Intending to Quit

Next, to determine factors associated with individuals' intentions to quit vaping, we used a logistic regression model. We used three criteria to identify variables to include in adjusted models. First, we included variables that are known to be associated with smoking cessation and intention to quit. We also included participant characteristics that were significant at $p < .05$ in the univariate analyses. Last, variables in univariate analysis that significantly predicted intentions to quit at the level of $p < .05$ were included. Adjusted odds ratios (OR) and 95% confidence intervals were calculated.

We examined the correlation between variables and excluded overlapping variables that were correlated with key predictors. As the primary objective of this analysis was to characterize the relationship between various measured characteristics and an individual's intention to quit, we took additional steps in the model specification to minimize the potential for multicollinearity (e.g., correlation between independent variables) to ensure accurate inference quantifying the magnitude and direction of the observed associations. Given the potentially complex interactions between multiple factors, we used the generalized variance inflation factor (GVIF). Broadly, multicollinearity concern among the study variables was found below the commonly accepted threshold of 5, with a maximal GVIF of 1.28.

Adjusted Ordinal Model of Future Plans to Quit

We used ordinal logistic regression for cross-country comparison of future plans for quitting vaping. This approach provided advantages over other generalized linear models, which may oversimplify data by assuming equal intervals between response categories. Rather, ordinal regression treats a dependent variable as a series of pairwise, ordered, groupings of consecutive nominal elements (e.g., Lv.1| Lv.2; Lv.2| Lv.3). Similar to binary logistic regression, which models associations of an outcome (1) compared with no-outcome (0), ordinal regression captures the odds of moving up 1 level in the ordering, under the proportional odds assumption across multiple levels. In this case, the dependent variable represented future plans for quitting, ordered as ("In the next 7 days," "In the next 30 days," "In the next 6 months," "In the next year," or "More than one year from now"). For consistency, independent features included the same set of variables used in the binary model of intention to quit.

Adjusted Ordinal Model of Attitudes and Perceptions Regarding E-cigarette Use

We also conducted adjusted analyses for cross-country comparisons of perceived social attitudes regarding e-cigarette use. We used logistic regression models for binary variables and ordinal regression for nonbinary variables. We adjusted for the same variables used in the analyses of ever intending to quit and future plans to quit.

Results

A total of 10 783 completed eligibility prescreening, 1208 met criteria and were invited to complete the full survey; 1044 were retained in the final sample (524 from the United Kingdom; 520 from the United States; see Supplementary Figure S1). Participants' mean age was 34.17 years old (33.11 United States; 35.24 United Kingdom); most were male in the United States (56.73%) and female in the United Kingdom (44.46%), white (79.03% United States; 90.07% United Kingdom), had a bachelor's degree or above (54.02% United States; 56.87% United Kingdom), and were employed (72.88% United States; 79% United Kingdom). UK respondents were more likely than US respondents to be ever (89.31% vs 71.34%; $p < .0001$) and current (59.34% vs 54.60%; $p < .1293$) cigarette smokers; daily vapers (68.9% vs 53.3%, $p < .0001$); and to use e-cigarettes to quit smoking (74.8% vs 65.2%, $p < .0007$). Rates of e-cigarette dependence did not differ significantly between countries (11.66% in the United Kingdom vs 11.46% in the United States; $p < .3219$) nor did motivation to quit e-cigarettes (5.35 in the United States vs 5.33 in the United Kingdom ; $p < .9918$). More US respondents used cannabis in their e-cigarettes (33.26% vs 8.20%; $p < .0001$; Supplementary Table S2).

Most UK (61.6%) and US (61.3%) respondents intended to stop vaping at some time for good; this did not differ by country in unadjusted analysis ($p < .9493$). Unadjusted analysis found that the timing of plans to quit did differ significantly between countries (OR 0.47, $p < .0004$), with more US respondents planning to quit sooner. Over three quarters (78.63%) of UK respondents planned to quit a year or more in the future versus 58.93% of US respondents (Supplementary Figure S2).

Adjusted logistic regression also found no significant difference between countries in terms of intentions to ever quit vaping (Supplementary Table S3). Notably, the model reveals that, adjusting for country, increasing age (OR 1.01; $p < .0104$), being unemployed (OR 2.45; $p < .0002$) and nondaily e-cigarette use (OR 1.29; $p < .0600$) were positively correlated with intention to ever stop vaping. Conversely, adjusting for country, being female (OR 0.76; $p < .0474$), in poor health (OR 0.64; $p < .0216$), having private health insurance (OR 0.72; $p = .0737$), and binge drinking (OR 0.78; $P = .0688$) were all negatively associated with ever intending to quit.

Differences between countries regarding the timing of future plans to quit remained significant in the adjusted ordinal logistic regression (Table 1). UK respondents had higher odds for pushing plans for quitting farther into the future (OR 1.97; $p = .0003$) than US respondents. Regardless of country, daily vapers planned to stop farther into the future than nondaily vapers (OR 0.15; $p = .0004$).

Attitudes differed significantly by country (Figure 1 and Supplementary Table S4). In general, UK respondents perceived that others had more positive attitudes about e-cigarettes compared with US respondents. Over half (56%) of UK respondents reported their government-approved e-cigarette use, and 24% felt their health care providers had positive views on e-cigarettes versus 29% and 13% from the United States, respectively ($p = .0004$ for both). Adjusted analyses confirm that, compared with US respondents, UK respondents perceived their government (OR 0.27; $p < .0001$), their health care providers (OR 0.37; $p < .0001$),

Table 1. Predictors for Future Plans for Quitting ($N = 642$)

Predictors of Future Plans for Quitting ($N = 642$)

Variable	SE	Odds Ratio	P
Future plans for quitting (intercepts)			
Next 7 days—next 30 days	0.496		<.0001
Next 30 days—next 6 months	0.417		<.0001
Next 6 months—in next year	0.402		.0292
In next year–>1 year	0.400		.0475
Country			
United States	Reference		
United Kingdom	0.1891	1.970 (1.359–2.854)	.0003
Sex			
Male	Reference		
Female	0.153	0.778 (0.576–1.050)	.1013
Other	0.736	2.163 (0.511–9.154)	.2950
Race			
White	Reference		
African American or Black	0.421	0.448 (0.196–1.023)	.0569
Asian or Chinese	0.309	1.143 (0.623–2.095)	.6650
Other	0.363	1.316 (0.645–2.683)	.4489
Education			
Bachelor's degree or above	Reference		
Less than bachelor	0.154	1.181 (0.872–1.599)	.2806
Employment			
Employed	Reference		
Unemployed	0.300	0.956 (0.530–1.723)	.8811
Student	0.265	0.785 (0.467–1.319)	.3613
Other	0.335	1.031 (0.534–1.993)	.9255
Health insurance			
Public	Reference		
Private	0.203	1.031 (0.692–1.538)	.8781
No health insurance	0.191	0.798 (0.548–1.163)	.2413
Physical health			
Excellent	Reference		
Good	0.167	0.910 (0.655–1.265)	.5762
Poor	0.207	0.967 (0.644–1.451)	.8736
Anxiety			
Minimum risk	Reference		
Severe risk	0.162	0.863 (0.627–1.187)	.3652
Audit			
Negative	Reference		
Positive	0.146	0.951 (0.714–1.266)	.7318
Cannabis in e-cigarettes[a]			
Yes	Reference		
No	0.196	1.000 (0.680–1.469)	.9986
Days use e-cigarettes			
Some days	Reference		
Every day	0.157	1.736 (1.274–2.364)	.0004

[a]In the past 12 months, have you used marijuana, cannabis, marijuana concentrates, marijuana waxes, THC, or hash oils in an electronic cigarette or Juul?

and others (OR 1.60; *p* = .0038) had more positive views about e-cigarette use (Supplementary Table S5).

Discussion

More than half of respondents in both countries intended to quit vaping. Age, being unemployed, and nondaily use were predictors of ever intending to quit. This is consistent with another study that found that 62.38% of US vapers want to quit.[10] Adjusted analyses found that US respondents planned to quit sooner than UK respondents. This may be due to country differences in policies and events related to e-cigarettes. Examples include UK organizations recommending e-cigarette use as a cessation aid, US federal and local policies related to e-cigarette regulation, and the outbreak of e-cigarette or vaping use-associated lung injury (EVALI) in the United States. Surprisingly, we found that less than one in four UK vapers believe health care providers have positive views of e-cigarettes. This is consistent with research that found UK providers offered more cautious advice regarding e-cigarettes than is encouraged by country guidelines.[12]

Most of our sample was ever or current cigarette smokers, similar to other studies that found a higher prevalence of vaping among smokers and ex-smokers.[13] The sociodemographic characteristics of the US participants in this study were similar to the population of vapers in the country, which has a higher prevalence of use among men, white adults, and those of younger age groups.[14,15] The characteristics of UK sample were also similar to the UK vapers, which have a higher prevalence of use in the 25–34 and 35–44 age groups, depending on the national survey.[16] However, our sample differed from the UK national surveys in terms of sex, showing a higher prevalence of vaping among women rather than men. The high rate of cannabis vaping among US respondents is surprising, given national recommendations to avoid this practice.[17] Future research should address cannabis vaping practices, awareness of the role of cannabis in the EVALI epidemic, and interventions to reduce EVALI risk.

Our survey was limited in that it did not seek representative samples of vapers from the United States and United Kingdom. It did, however, recruit participants from the same research platform that has large numbers of enrollees in both countries. Our country samples differed by some characteristics. This could be because the platform attracts different types of registrants in the two countries. It is also possible that different social environments related to e-cigarettes lead to different populations of vapers. We used adjusted analyses to account for the cross-country demographic differences.

Although e-cigarettes are considered less harmful than combustible cigarettes, they likely carry some health risks. Most vapers in these two advanced economy countries want to quit. For combustible cigarettes, intention to quit smoking is a strong predictor of future quit attempts as well as quit success.[18] In terms of clinical care, our findings suggest that most vapers would welcome assistance in quitting. Studies found that a quarter to half of the vapers who want to quit were interested in using vaping cessation support.[9] Future studies should assess to what extent this intention to stop vaping translates into action. Whether this is desirable depends on the short- and long-term risk profile of e-cigarettes and the likelihood of relapsing to cigarette use following e-cigarette cessation. In the meantime, as most vapers want to quit, future research should focus on understanding why vapers are interested in quitting and developing effective methods for helping them stop. Future research should also employ more definitive designs to explore the impact of government and nongovernmental agency policies on knowledge, attitudes, and behaviors related to vaping.
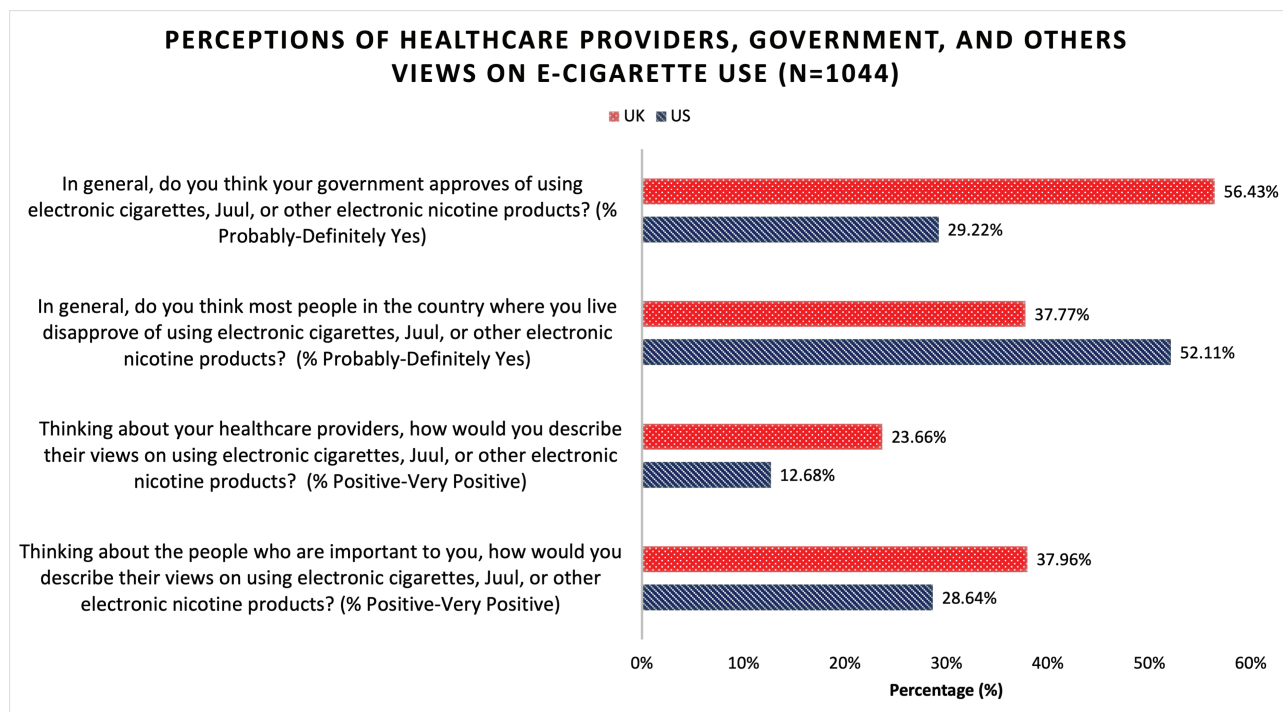
PERCEPTIONS OF HEALTHCARE PROVIDERS, GOVERNMENT, AND OTHERS VIEWS ON E-CIGARETTE USE (N=1044)

UK US

In general, do you think your government approves of using electronic cigarettes, Juul, or other electronic nicotine products? (% Probably-Definitely Yes): UK 56.43%, US 29.22%

In general, do you think most people in the country where you live disapprove of using electronic cigarettes, Juul, or other electronic nicotine products? (% Probably-Definitely Yes): UK 37.77%, US 52.11%

Thinking about your healthcare providers, how would you describe their views on using electronic cigarettes, Juul, or other electronic nicotine products? (% Positive-Very Positive): UK 23.66%, US 12.68%

Thinking about the people who are important to you, how would you describe their views on using electronic cigarettes, Juul, or other electronic nicotine products? (% Positive-Very Positive): UK 37.96%, US 28.64%

Percentage (%)

Figure 1. Perceptions of health care providers, government, and others views on e-cigarette use (*N* = 1044).

Supplementary Material

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

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Ethics Approval

The study was approved by the University of Kansas Medical Center Human Research Protection Program (IRB# STUDY00145254). All participants gave individual consent before taking part in the study.

Author Contributor

All authors contributed to writing the manuscript and approved the final version. KR, NM, KF, LA, and TM planned the study. NM conducted the survey. NM and KF conducted the analysis. KR, NM, KF, LA, and TM wrote the paper. All listed authors meet authorship criteria, and no others meeting the criteria have been omitted.

Declaration of Interests

The authors declare that they have no conflict of interest.

Data Availability

Deidentified data will be made available upon request to the corresponding author on January 1, 2023.

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