

Characteristics of e-cigarette users and their perceptions of the benefits, harms and risks of e-cigarette use: survey results from a convenience sample in Ottawa, Canada

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Abstract

Introduction: Although e-cigarette use (“vaping”) is increasing in Canada, few attempts have been made to describe e-cigarette users (“vapers”). In this context, we conducted a study in Ottawa, Canada, to describe e-cigarette users’ perceptions of the benefits, harms and risks of e-cigarettes. We also collected information on why, how and where they use e-cigarettes as well as information on side effects.

Methods: A 24-item online survey was administered to individuals who purchased e-cigarettes or e-cigarette-related supplies at one of Ottawa’s 17 e-cigarette shops. Descriptive analyses characterized respondents, and logistic regression models were fitted to evaluate the relationship between respondents’ characteristics and their perception of e-cigarette harms.

Results: The mean age of the 242 respondents was 38.1 years (range: 16–70 years); 66% were male. Nearly all had smoked 100 or more cigarettes in their lifetime (97.9%). More than 80% indicated that quitting smoking was a very important reason for starting to use e-cigarettes and 60% indicated that they intend to stop using e-cigarettes at some point. About 40% reported experiencing some side effects within 2 hours of using e-cigarettes. Those who did not report experiencing any of the listed side effects had approximately 3.2 times higher odds of perceiving e-cigarettes as harmless than those who reported having side effects (odds ratio = 3.17; 95% confidence interval: 1.75–5.73).

Conclusion: Our findings suggest that most e-cigarette users are using them to reduce or stop smoking cigarettes and perceive them as harmless. Due to our use of convenience sampling, the reader should be cautious in generalizing our findings to all Canadian e-cigarette users.

Keywords: *electronic cigarettes, smoking cessation, nicotine, cigarette smoking, tobacco products, perception*

Introduction

Electronic cigarettes (“e-cigarettes”) are battery-powered devices that heat a liquid solution into an aerosol mist that users (“vapers”) inhale, allowing them to imitate the act of smoking.¹ The liquid solution (referred to as “e-liquid”) is

typically composed of propylene glycol, glycerin, flavouring and nicotine.^{2,3,4} Unlike cigarettes, e-cigarettes do not produce side-stream smoke,⁵ and exposure studies suggest that they do not contain the same levels of harmful chemicals that cigarettes do.^{2,4,5,6} However, the vapours produced from e-cigarettes may increase

Highlights

- This study describes e-cigarette users’ perceptions of e-cigarettes, and information about users and side effects.
- Nearly all 242 survey respondents (about 98%) had smoked 100 or more cigarettes in their lifetime.
- More than 80% said that quitting smoking altogether or reducing the number of cigarettes they smoked were very important reasons for starting to use e-cigarettes.
- About 40% reported experiencing at least one side effect within 2 hours of using an e-cigarette.
- 60% believed that e-cigarettes are harmless.

concentrations of fine particulate matter in indoor environments to levels that affect health.⁷ The short- and long-term health effects for both the e-cigarette user and the bystander are not well understood, and addressing this research gap remains an important priority.^{1,2,4,5,8}

The popularity and sale of e-cigarettes has increased dramatically since their introduction to North American markets in 2007.^{9,10} There are concerns that never-smokers and youth could be introduced to cigarettes through e-cigarettes and that former smokers could be reintroduced to cigarettes.^{1,11} To date, studies indicate that the majority of vapers are current or former cigarette smokers,^{12–16} that they use e-cigarettes to

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reduce or eliminate cigarette consumption and that they perceive e-cigarettes as less harmful than cigarettes.^{13,16,17} Even though there is evidence that e-cigarettes are effective in reducing or eliminating cigarette consumption, this finding is not consistent.^{18,19}

Although e-cigarette awareness and use are increasing in Canada, there have been few attempts to describe e-cigarette users.^{9,12,20,21} An online survey of 1188 young adults found that 43% were aware of e-cigarettes and 5.7% were current e-cigarette users.¹² This same study also revealed that 80% of current cigarette smokers reported an interest in trying e-cigarettes to help them quit smoking or to use in places where smoking is banned.¹² The 2013 *Canadian Tobacco, Alcohol and Drugs Survey* found that 8.5% of Canadians aged 15 years and older had tried an e-cigarette,²¹ but Canadian data on why, where and how e-cigarettes are being used as well as the perceptions of e-cigarette users are limited.

The increase in use and awareness of e-cigarettes coupled with the lack of Canadian data on e-cigarette users underscores the need to better describe users. (At the time of our survey data on e-cigarette users in Ottawa were not available.) Having local data is important given the role of local jurisdictions in implementing policies on smoking and e-cigarette use.

In this study, we aim to describe the reasons for e-cigarette use, how and where they are used, and the perceptions of the benefits, harms and risks of e-cigarettes in a sample of Ottawa-area e-cigarette users. As vapers' perceptions of the harm caused by e-cigarettes may influence how much they use them and whether they use them around others, this study also evaluates to what extent characteristics of e-cigarette users varied by the perception that e-cigarettes are harmless.

Methods

We used a 24-item online survey (available from the authors on request) to collect information on e-cigarette users: who is

using them; how, why and where they use them; and their perceptions of the benefits, harms and risks of e-cigarette use. Individuals who made a purchase at any one of Ottawa's 17 e-cigarette shops were eligible to participate. Recruiting respondents through Ottawa-area e-cigarette shops was the most feasible way to efficiently reach our target population: Ottawa-area residents who use e-cigarettes.

Respondents were recruited between 8 January and 2 March 2015 in two ways. First, 2364 business-card-like fliers containing a link to the online survey were distributed to those making purchase(s) in Ottawa-area e-cigarette shops. Second, these e-cigarette shops posted the survey link on their company Facebook webpages. Respondents were not required to disclose their coordinates, and IP addresses were not collected. Respondents who chose to provide their email address were entered into a draw for one of four \$25.00 Tim Hortons gift cards.

This study received ethics approval from Carleton University Research Ethics Board.

Measures

The four-part survey was administered using Qualtrics survey software (<http://www.qualtrics.com/research-suite>).²² The sociodemographic section asked respondents their age, sex, marital status, visible minority status, employment status, education attainment and household income.

The lifestyle section asked participants if they had smoked 100 or more cigarettes in their lifetime, years and number of cigarettes smoked (while a smoker), perceived general health, and frequency of alcohol consumption and exercise. The survey did not assess current cigarette smoking status. Many of the sociodemographic and lifestyle questions were adapted from the 2012 Canadian Community Health Survey.²³

The e-cigarette use section asked how respondents first heard about e-cigarettes, when they started using them, how long they use their e-cigarettes in a single "sitting," nicotine and e-liquid use, side effects, and type of e-cigarette used (open

ended), if they hope to stop e-cigarette use at some point, graded reasons for starting to use e-cigarettes, and how often they use their e-cigarettes in particular places.

Perceptions of e-cigarette benefits, harms and risks were measured by having respondents indicate a level of agreement from 1 to 5, where 1 represented strong disagreement and 5 strong agreement, with eight statements such as "E-cigarettes improved my health" (benefit); "E-cigarettes are harmless" (harm); and "It is okay to use e-cigarettes around non-smoking family/friends" (risk).

Variables

Respondents were asked how many cigarettes they smoked per day while a smoker. These responses were categorized into less than or equal to 20, 21 to 40, and 41 or more. Based on a regular-sized cigarette pack containing 20 cigarettes, 41 or more cigarettes represented smoking more than 2 packs per day. Pack-years were calculated by taking the total number of cigarettes smoked per day while a smoker, dividing this number by 20 and then multiplying by years smoked. Respondents who reported smoking 20 or fewer cigarettes per day while a smoker were classified as "light" while those who smoked over 21 cigarettes per day were classified as "heavy." Lifestyle characteristics and variables relating to e-cigarette use are shown for the total sample and stratified by whether the respondent was/is a light or heavy cigarette smoker. To ensure a sufficient number of responses in each category, the variables perceived general health, frequency of alcohol consumption and exercise were each collapsed into three levels.

To measure frequency of e-cigarette use, respondents were asked: "On average how long does a bottle of e-liquid last?" and "What is the size of the bottle (in ml)?" They were assigned a value for average daily e-liquid use by dividing the size of the bottle by the number of days taken to finish it.

Respondents were asked if they had experienced any of 14 listed side effects

within 2 hours of using an e-cigarette; the 14 side effects were based on an international survey of e-cigarette users.¹⁶ Respondents were also asked to indicate whether they “regularly,” “sometimes,” “rarely” or “never” use e-cigarettes in particular places such as restaurants, and whether particular reasons for e-cigarette use applied to them by choosing from among “very,” “somewhat,” “a little,” “not at all important” or “not applicable.”

To investigate whether characteristics varied by e-cigarette harm perceptions, participants’ responses to the statement: “E-cigarettes are harmless” were assessed. Those who agreed or strongly agreed that e-cigarettes are harmless were labelled “harmless” and other responses were labelled “harmful.” To ensure a sufficient number of responses in each category, the variables education attainment, household income, perceived general health, frequency of alcohol consumption and exercise, and e-cigarette use at work or school were reduced to three or fewer levels prior to inclusion in the logistic regression.

Statistical analyses

To describe e-cigarette users, we tabulated frequencies, percentages, medians, means and 95% confidence intervals (CI) using SPSS version 22 software (IBM, Chicago, IL, USA).²⁴ Pearson chi-square tests and their 95% *p* values were calculated to determine any statistically significant differences between light and heavy smokers (while a smoker) in terms of their lifestyle characteristics, reasons for starting to use e-cigarettes, how they use e-cigarettes and where they use them. We fitted logistic regression models to evaluate the relationship between these characteristics and the perception that e-cigarette are harmless, and estimated odds ratios (OR) and their 95% CIs as well as unadjusted ORs and sex- and age-adjusted ORs.

Results

Of the 383 individuals who responded to the invitation to be surveyed, 141 answered “no” to the question asking if they had made a purchase at a local

(Ottawa area) e-cigarette shop and were excluded from the analysis.

Of the 242 respondents, almost twice as many males (*n* = 159) as females (*n* = 83) completed the online survey. The mean age was 38.1 (range: 16–70 years) years. Over half were married/common law (56.9%); the majority were not visible minorities (89.0%); and two-thirds had completed post-secondary education (66.5%) (Table 1).

Almost all survey respondents had smoked 100 or more cigarettes in their lifetime (97.9%) (Table 1). The mean number of years smoking cigarettes was 20.2 (range: 2–50 years); the mean number of cigarettes smoked per day while a smoker was 21 (range: 1–75 cigarettes); and the mean number of pack-years was 23.9 (range: 0.20–122.85 pack-years).

More light smokers than heavy smokers experienced one or more side effects within 2 hours of using an e-cigarette (48.0% vs. 35.0%, *p* = .05) (Table 2). Conversely, more heavy smokers drank alcoholic beverages rarely (a few times a year) or never (44.7% vs. 28.1% for light smokers, *p* = .02). More light smokers first found out about e-cigarettes via the Internet (18.8% vs. 7.8%, *p* = .02), while more heavy smokers first learned about e-cigarettes from an advertisement/other media (15.5% vs. 5.5%, *p* = .02).

The most important reasons for starting to use e-cigarettes were to quit smoking and reduce the number of cigarettes smoked. Respondents most commonly used e-cigarettes in their homes, and 63.8% indicated that they regularly or sometimes use their e-cigarettes at work or school (Table 2).

Almost all the respondents (96.6%) used nicotine in their e-cigarettes (Table 2). More than half did not report any of the listed side effects (58.5%). Side effects included a sore/dry mouth or throat (*n* = 71), a cough (*n* = 33), a headache (*n* = 23), and dizziness (*n* = 17) (data not shown). The less commonly reported side effects included sleeplessness

(*n* = 10), mouth/tongue sores (*n* = 7), fatigue (*n* = 5), heart palpitations (*n* = 4), allergies (*n* = 4), chest pain (*n* = 3), breathing difficulties (*n* = 3), nose bleeding (*n* = 2), gum bleeding (*n* = 2) and stress (*n* = 1) (data not shown).

More than half of those surveyed (59.5%) indicated that they hope to stop using e-cigarettes at some point (Table 2).

The median amount of time spent using an e-cigarette in a single sitting was 5 minutes, and the median daily e-liquid use was 2.15 ml (data not shown). This means that it takes participants on average 14 days to finish a standard 30 ml bottle of e-liquid. Although the types of e-cigarette devices used varied substantially, medium-sized devices, “tank” devices and Joyetech eGo-C devices that use e-liquid cartridges were used most often. Thirty-four respondents reported using a combination of e-cigarette components from different brands.

Three-quarters of respondents strongly agreed that e-cigarettes are an effective way to quit smoking (71.7%) and that e-cigarettes helped improve their health (75.5%); 60.1% agreed or strongly agreed that e-cigarettes are harmless (Table 3; some data not shown). Those who did not report any of the listed side effects had approximately 3 times higher odds of perceiving e-cigarettes as harmless as those who reported one or more side effects (OR = 3.17; 95% CI: 1.75–5.73) (Table 4).

Discussion

Some public health organizations, regulators and researchers have suggested that e-cigarette uptake among never-smokers and current smokers may undermine smoking cessation efforts.^{1,11} They take the view that never-smokers who use e-cigarettes could be exposed to health risks they would not have had and that smokers who use e-cigarettes may not be reducing their risks to the extent they believe they have.

Consistent with other surveys, the majority of respondents had smoked cigarettes.^{12–16} One recent study that recruited 19 414 respondents through a website

TABLE 1
Sociodemographic characteristics and smoking histories of survey respondents, N = 242, 2015, Ottawa, Canada

Sociodemographic characteristic	Number, n	Percentage, %
Sex		
Male	159	65.7
Female	83	34.3
Age, years		
< 25	40	16.5
25–34	71	29.3
35–44	50	20.7
45–54	47	19.4
≥ 55	34	14.1
Marital status ^a		
Single/never married	70	30.2
Separated/divorced/widowed	30	12.9
Married/common law	132	56.9
Visible minority ^b		
Yes	24	11.0
No	195	89.0
Employed ^c		
Yes	195	83.7
No	38	16.3
Education completed ^c		
< High school	3	1.3
High school	75	32.2
College certificate or university degree	141	60.5
Graduate degree	14	6.0
Household income, \$ ^d		
< 20,000	23	11.7
20,000–39,999	29	14.8
40,000–59,999	37	18.9
60,000–79,999	40	20.4
80,000–99,999	34	17.3
≥ 100,000	33	16.8
Smoked ≥ 100 cigarettes in lifetime ^e		
Yes	232	97.9
No	5	2.1
Cigarettes per day (while a smoker) ^f		
≤ 20 (1 pack)	128	54.2
21–40 (2 packs)	92	39.0
≥ 41 (≥ 2 packs)	11	4.7
Never smoker	5	2.1

^a 10 responses missing.

^b 23 responses missing or “prefer not to say.”

^c 9 responses missing.

^d 46 responses missing or “prefer not to say.”

^e 5 responses missing.

^f 6 responses missing.

emphasizing e-cigarette research found that 99.5% were current or former smokers.¹⁶ Our study found that 97.9% of those surveyed were current or former smokers on the basis that they had smoked 100 or more cigarettes in their lifetime. However, our survey did not ascertain whether cigarette use occurred prior to initiating e-cigarette use or if it continued during e-cigarette use.

As e-cigarettes can be made up of several components, the brands, types and ways to modify them can vary substantially.⁴ The availability of the numerous brands and modifications made it difficult to classify the type of e-cigarette devices the respondents used most often. Nevertheless, the device our study respondents reported using most often was the Joyetech eGo-C, the same as Dawkins et al.¹³ found. In addition to the different types of devices and modifications, few regulations govern e-cigarette manufacturing which could result in quality control issues.² The variation observed in our smaller localized sample implies a larger potential variation among e-cigarette devices in general. This variation can make it difficult to draw conclusions about the safety of e-cigarette devices.²⁵

Products that deliver nicotine are regulated under the *Food and Drugs Act* and require Health Canada’s authorization prior to being advertised or sold.²⁶ Even though e-cigarette devices that deliver nicotine have not been approved in Canada, we found that 96.6% of survey respondents used an e-liquid that contained nicotine. While our results come from a convenience sample, larger studies found that 96% and higher proportions of their participants use an e-liquid with nicotine.^{13,16} Recruiting respondents through local e-cigarette shops that, to our knowledge, do not sell disposable e-cigarettes may have influenced our result.

Our survey only captured information on current nicotine use. It is possible that people who vape to reduce or quit smoking also reduce or stop using nicotine in their e-cigarettes over time.

It has been noted that the labelled nicotine content is not always an accurate

TABLE 2
Lifestyle characteristics and e-cigarette use of survey respondents by light^a and heavy^b smoking status (while a smoker),
N = 242^c, 2015, Ottawa, Canada

Characteristic	Total (n = 242)		Light ^a (n = 128)		Heavy ^b (n = 103)		p value
	n/N	%	n/N	%	n/N	%	
Perceived general health							
Fair/poor	30/237	12.7	14/128	10.9	16/103	15.5	.55
Good	98/237	41.4	55/128	43.0	40/103	38.9	
Excellent/very good	109/237	46.0	59/128	46.1	47/103	45.6	
Frequency of alcohol consumption							
≥ 2 times per week	72/237	30.4	45/128	35.2	24/103	23.3	.02
≤ 1 per week	82/237	34.6	47/128	36.7	33/103	32.0	
A few times a year or never	83/237	35.0	36/128	28.1	46/103	44.7	
Frequency of exercise							
< 1 per week	66/237	27.8	35/128	27.4	29/103	28.2	.44
1–3 times per week	109/237	46.0	63/128	49.2	43/103	41.7	
≥ 4 times per week	62/237	26.2	30/128	23.4	31/103	30.1	
First heard about e-cigarettes from ^d							
Family	124/242	51.2	20/128	15.6	19/103	18.5	.02
Friend/co-worker	40/242	16.5	66/128	51.6	54/103	52.4	
Advertisement or media	25/242	10.3	7/128	5.5	16/103	15.5	
Internet/Internet search	35/242	14.5	24/128	18.8	8/103	7.8	
Other ^e	18/242	7.5	11/128	8.6	6/103	5.8	
Year started e-cigarette use							
2014 or 2015	130/237	54.8	68/125	54.4	58/102	56.9	.61
2013	62/237	26.2	35/125	28.0	23/102	22.5	
2012 or earlier	45/237	19.0	22/125	17.6	21/102	20.6	
Nicotine content, mg/ml							
0	8/238	3.4	4/128	3.1	2/102	2.0	.20
1–6	93/238	39.1	56/128	43.8	33/102	32.3	
7–12	66/238	27.7	29/128	22.7	36/102	35.3	
13–18	56/238	23.5	30/128	23.4	26/102	25.5	
19–24	15/238	6.3	9/128	7.0	5/102	4.9	
Side effects							
Yes	100/241	41.5	61/127	48.0	36/103	35.0	.05
No	141/241	58.5	66/127	52.0	67/103	65.0	
Hope to stop e-cigarette use							
Yes	141/237	59.5	78/128	60.9	59/102	57.8	.64
No	96/237	40.5	50/128	39.1	43/102	42.2	
Very important reasons for starting use							
Quit smoking	190/233	81.5	101/124	81.5	82/100	82.0	.92
Reduce number of cigarettes	189/216	86.3	98/111	88.3	85/97	87.6	.88
Reduce family/friends exposure to cigarettes	133/209	63.6	66/110	60.0	62/91	68.1	.23
Save money	123/219	56.2	70/121	57.9	51/95	53.7	.54
Enjoy choice of flavours	86/219	39.3	48/119	40.3	34/90	37.8	.71
Encouragement from spouse/friend	57/182	31.3	33/96	34.4	22/80	27.5	.33
Avoid smoking bans in public places	40/214	18.7	23/117	19.7	16/89	18.0	.76
Regularly or sometimes use e-cigarette							
Inside my home	227/237	95.8	124/127	97.6	97/103	94.2	.18
Outside	221/235	94.0	118/127	92.9	97/102	95.1	.49

Continued on the following page

TABLE 2 (continued)
Lifestyle characteristics and e-cigarette use of survey respondents by light^a and heavy^b smoking status (while a smoker),
N = 242^c, 2015, Ottawa, Canada

Characteristic	Total (n = 242)		Light ^a (n = 128)		Heavy ^b (n = 103)		p value
	n/N	%	n/N	%	n/N	%	
Inside friend's homes	160/235	68.1	84/125	67.2	73/103	70.9	.55
Inside family's homes	150/234	64.1	77/126	61.1	70/101	69.3	.20
Work or school	146/229	63.8	79/124	63.7	65/99	65.7	.76
Bars/pubs/clubs	71/233	30.5	38/126	30.2	31/100	31.0	.89
Restaurants	42/235	17.9	20/126	15.9	20/102	19.6	.46
Public transportation	34/233	14.6	21/126	16.7	12/100	12.0	.32

^a Respondents who reported smoking ≤ 20 cigarettes per day (while a smoker) were considered "light" smokers.

^b Respondents who reported smoking ≥ 21 cigarettes per day (while a smoker) were considered "heavy" smokers.

^c There were 11 missing or non-smokers for the question about number of cigarettes smoked per day (while a smoker).

^d The denominator (N) for each of the variables excludes missing and not applicable responses.

^e The category "Other" includes medical doctor, which had 3 responses each from light and heavy smokers (while a smoker).

reflection of the actual nicotine content of e-fluids.^{2,4} Fieldwork in the e-cigarette retail space could provide important information on the extent to which e-liquid containing nicotine is available for sale.

Compared to a United States study of daily e-cigarette users where 71% vaped at work, 43% in bars or cafés and 15% on public transportation,¹⁴ about 64% of our survey respondents reported regularly or sometimes using their e-cigarettes at work or school and 15% on public transit. The *Making Healthier Choices Act, 2015*, which received Royal Assent on 28 May, 2015, will regulate many aspects of e-cigarette use in Ontario, including where they can be used.²⁷ Our survey showed that e-cigarette use occurs in places where cigarette smoking is currently banned, potentially exposing bystanders to second-hand

e-cigarette vapours. The regulations on use in public spaces defined in the *Electronic Cigarettes Act, 2015* have not yet come into force, but e-cigarette use in public spaces could change with the introduction and enforcement of those regulations. In the absence of those regulations, it is possible that organizations self-regulate e-cigarette use; however, we are unsure to what extent self-regulation is practiced, followed and enforced.

The side effects most commonly reported by those surveyed (e.g. sore/dry mouth or throat and cough) are often reported in the literature.^{14,17,28,29} This finding is not surprising as aerosol propylene glycol and glycerin, the primary ingredients of e-liquid, are associated with mouth and throat irritation. It is possible that these side effects would eventually diminish

(half the participants had been using e-cigarettes for at most 14 months at the time of the survey).^{16,29} Some respondents reported potentially more serious health effects—4 noted heart palpitations and 3 reported chest pain. In a summary of adverse events potentially related to e-cigarettes, Chen²⁸ noted that chest pain and rapid heartbeat have been reported to the Food and Drug Administration.

Several studies reported that users generally do not perceive e-cigarettes as entirely harmless but as less harmful than cigarettes.^{14,16,17} Over half of our sample (60.1%) perceived e-cigarettes as harmless, with female respondents more likely to do so (data not shown). Not surprisingly, those who reported none of the 14 listed side effects were more likely to perceive e-cigarettes as harmless

TABLE 3
Survey participants' perceptions of the benefits, harms and risks of e-cigarettes, n = 233,^a 2015, Ottawa, Canada²⁸

Perception statement	Mean (95% CI) ^b	Strongly agree, n (%)
E-cigarettes helped improve my health	4.58 (4.46–4.69)	176 (75.5)
E-cigarettes are an effective way to quit smoking	4.55 (4.43–4.66)	167 (71.7)
My family/friends are supportive of me using e-cigarettes	4.33 (4.20–4.46)	140 (60.1)
It is okay to use e-cigarettes around non-smoking family/friends ^c	3.74 (3.59–3.88)	70 (30.2)
E-cigarettes are harmless	3.67 (3.53–3.81)	56 (24.0)
It is okay to use e-cigarettes around children	2.86 (2.68–3.03)	38 (16.3)
E-cigarettes should have the same restrictions on them that tobacco cigarettes do	1.65 (1.50–1.81)	17 (7.3)
E-cigarettes are as harmful as tobacco cigarettes	1.19 (1.10–1.28)	4 (1.7)

Abbreviation: CI, confidence interval.

^a n = 233 respondents answered the perceptions questions at the end of the survey.

^b Mean perception on a scale of 1 to 5, where 1 represents strong disagreement and 5 represents strong agreement.

^c 1 response missing for this variable.

TABLE 4
Odds ratios for select characteristics of those survey participants who perceived e-cigarettes as harmless, n = 233, 2015, Ottawa, Canada

Characteristics	Respondents who perceived e-cigarettes as		OR	95% CI	AOR ^b	95% CI
	Harmless ^a n = 140 n (%)	Harmful ^a n = 93 n (%)				
Sex						
Male	85 (60.7)	68 (73.1)	1.00	—	1.00	—
Female	55 (39.3)	25 (26.9)	1.76	1.0–3.11	1.61	0.88–2.95
Age, years						
< 25	28 (70.0)	12 (30.0)	1.00	—	1.00	—
25–34	30 (42.3)	41 (57.7)	0.31	0.14–0.72	0.31	0.14–0.72
35–44	29 (61.7)	18 (38.3)	0.69	0.28–1.69	0.68	0.28–1.68
45–54	30 (69.8)	13 (30.2)	0.99	0.39–2.52	0.99	0.39–2.54
≥ 55	23 (71.9)	9 (28.1)	1.10	0.39–3.05	0.93	0.32–2.65
Marital status^c						
Single/never married	43 (61.4)	27 (38.6)	1.00	—	1.00	—
Separated/divorced/widowed	15 (50.0)	15 (50.0)	0.63	0.27–1.49	0.25	0.08–0.76
Married/common law	81 (61.4)	51 (38.6)	1.00	0.55–1.81	0.85	0.42–1.74
Employed						
Yes	118 (84.3)	77 (82.8)	1.00	—	1.00	—
No	22 (15.7)	16 (17.2)	0.90	0.44–1.82	0.61	0.28–1.31
Education attainment						
Less than post-secondary	45 (32.1)	33 (35.5)	1.00	—	1.00	—
Post-secondary	95 (67.9)	60 (64.5)	1.16	0.67–2.02	1.28	0.71–2.29
Household income, \$^d						
< 40,000	31 (27.0)	21 (25.9)	1.00	—	1.00	—
40,000–79,999	46 (40.0)	31 (38.3)	1.01	0.49–2.06	1.66	0.73–3.79
≥ 80,000	38 (33.0)	29 (35.8)	0.89	0.43–1.85	1.36	0.58–3.21
Perceived general health						
Fair/poor	14 (10.0)	15 (16.1)	1.00	—	1.00	—
Good	55 (39.3)	41 (44.1)	1.44	0.63–3.31	1.59	0.66–3.85
Excellent/very good	71 (50.7)	37 (39.8)	2.06	0.90–4.70	2.11	0.88–5.05
Frequency of alcohol consumption						
≥ 2 times per week	41 (29.3)	28 (30.1)	1.00	—	1.00	—
≤ 1 times per week	47 (33.6)	34 (36.6)	0.94	0.49–1.81	1.03	0.52–2.03
A few times a year or never	52 (37.1)	31 (33.3)	1.15	0.60–2.21	1.08	0.54–2.17
Frequency of exercise (times per week)						
< 1	39 (60.0)	26 (40.0)	1.00	—	1.00	—
1–3	65 (59.6)	44 (40.4)	0.99	0.53–1.84	1.17	0.60–2.25
≥ 4	36 (61.0)	23 (39.0)	1.04	0.51–2.15	1.14	0.53–2.41
Side effects^e						
Yes	94 (67.6)	39 (41.9)	1.00	—	1.00	—
No	45 (32.4)	54 (58.1)	2.89	1.68–4.98	3.17	1.75–5.73
Regular use at work or school^e						
Yes	55 (40.1)	37 (42.0)	1.00	—	1.00	—
No	82 (59.9)	51 (58.0)	0.93	0.54–1.59	0.79	0.44–1.41
Hope to stop e-cigarette use^e						
Yes	70 (51.1)	67 (48.9)	1.00	—	1.00	—
No	70 (73.7)	25 (26.3)	2.68	1.52–4.72	2.82	1.55–5.12

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

^a Respondents who “agreed” or “strongly agreed” that e-cigarettes are harmless were classified as “harmless” and other responses were classified as “harmful.”

^b Age- and sex-adjusted odds ratios.

^c 1 response missing.

^d 37 responses missing or “prefer not to say.”

^e 8 responses missing.

(Table 4). Perceiving e-cigarettes as harmless may play a role in whether individuals use e-cigarettes and the extent to which they use e-cigarettes around others.

Strengths and limitations

This study contributes to the limited literature on e-cigarette user characteristics by providing detailed information on how and where e-cigarettes are used and perceptions of e-cigarette users. This survey provides some insights that, alongside other studies, can inform future research directions and priorities for policy makers. It can also be used to inform future survey work involving e-cigarette users.

Our ability to generalize the characteristics and perceptions of survey respondents is limited due to our relatively small sample size ($n = 242$). It is possible that the characteristics of individuals who purchased e-cigarettes in a shop in Ottawa differ from those who purchase e-cigarettes elsewhere (e.g. gas stations, online, etc.) and from those e-cigarette users residing in different regions. Our use of convenience sampling limits the generalizability of the findings to Canadian e-cigarette users; therefore the findings should be interpreted with caution.

Respondent bias may be present as those who have more positive perceptions of e-cigarettes may have been more motivated to complete a survey emphasizing e-cigarettes than those with less favourable perceptions. As the survey was delivered in the first two months of the year, it may have captured a disproportionate number of those who had resolved to quit smoking in the New Year. In addition, the survey was administered in English, which may mean that those whose dominant language is not English are less well represented, and required an Internet connection to participate (although this was likely not a substantial barrier).

Although the survey collected information on respondents' smoking histories, it did not capture current smoking status, and so we did not assess the dual (concurrent) use of e-cigarettes and cigarettes.

Conclusions

Despite these limitations, this survey provided several insights into the vaping population in the Ottawa area. We found that the majority of respondents within this convenience sample of e-cigarette users had a history of smoking, used e-liquid containing nicotine in their e-cigarettes, and had favourable perceptions of e-cigarettes. Reducing or eliminating cigarette consumption were considered very important reasons to start using e-cigarettes, and more than half of respondents indicated that they hope to stop using e-cigarettes at some point. Additional surveys are needed to characterize the profile of e-cigarette users in other Canadian regions and across sociodemographic and cultural factors. We hope that our findings can help inform future surveys on e-cigarette use and assist policy makers in developing priorities for further exploration.

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