

## ORIGINAL INVESTIGATION

# E-Cigarettes: Prevalence and Attitudes in Great Britain

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## ABSTRACT

**Introduction:** Electronic cigarettes (e-cigarettes) are a means of recreational nicotine use that can potentially eliminate the need to smoke tobacco. Little is known about the prevalence of use or smokers' attitudes toward e-cigarettes. This study describes use of and attitudes toward e-cigarettes in Britain.

**Methods:** Respondents from three surveys were recruited from a panel of adults in Britain. Preliminary online and face-to-face qualitative research informed the development of a smokers' survey (486 smokers who had used e-cigarettes and 894 smokers who had not). Representative samples of adults in Britain were then constructed from the panel for population surveys in 2010 (12,597 adults, including 2,297 smokers) and 2012 (12,432 adults, including 2,093 smokers), generating estimates of the prevalence of e-cigarette use and trial in Great Britain.

**Results:** Awareness, trial, and current use increased between 2010 and 2012; for example, current use more than doubled from 2.7% of smokers in 2010 to 6.7% in 2012. The proportion of ever-users currently using e-cigarettes was around one-third in both years. In 2012, 1.1% of ex-smokers reported current e-cigarette use, and a further 2.7% reported past use. Approximately 0.5% of never-smokers reported having tried e-cigarettes.

**Conclusions:** While we found evidence supporting the view that e-cigarette use may be a bridge to quitting, we found very little evidence of e-cigarette use among adults who had never smoked. British smokers would benefit from information about the effective use, risks, and benefits of e-cigarettes, as this might enable the use of e-cigarettes to improve public health.

## INTRODUCTION

E-cigarettes, also known as ENDS (electronic nicotine delivery systems), are a means of inhaling nicotine vapor, potentially eliminating the need to use smoked tobacco. The Chinese company Ruyan is credited with first introducing e-cigarettes to the market in 2004. Typically, e-cigarettes consist of a plastic or metal tube, a glowing light-emitting diode tip, and the emission of vapor and commonly resemble cigarettes in size and appearance, although models that do not resemble cigarettes also exist. Users puff on the device as they might a cigarette, inhaling a vaporous solution of nicotine in propylene glycol or glycerine. The combination of nicotine delivery, the hand-to-mouth movement, and the cigarette-like appearance are intended to make e-cigarettes a competitor with smoked tobacco in the market for recreational nicotine.

Smoking causes an estimated 100,000 deaths in the United Kingdom (Peto, Lopez, Boreham, & Thun, 2007), and so e-cigarettes are of considerable interest to public health. E-cigarettes are also of great interest to smokers and may offer a new option for those who are unable or unwilling to quit, permitting the total or partial replacement of smoked tobacco without making

any commitment to reduce or abstain from recreational nicotine use. For these smokers, e-cigarettes could greatly reduce morbidity and mortality associated with smoked tobacco use. However, many commentators have urged caution and health concerns were recently summarized by Cobb and Abrams (2011) who have questioned quality standards in manufacture, adequacy and consistency in nicotine delivery, the long-term effect of propylene glycol inhalation, the risk to children of accidentally swallowing refill cartridges, and the risk of e-cigarettes as a "bridge product" for use in places where smoking is prohibited or as starter products attractive to young people.

Borland (2011) has suggested that some opposition to e-cigarette use is pragmatic and among others it is routed in opposition to any recreational use of nicotine. Wager, Siegel, and Borelli (2012) have argued that the harms have been overstated and that e-cigarettes offer "more profit than peril." They contend that the risk of ingestion by children is no greater than many other household products, that concern about toxicity is not born out by the evidence, and that e-cigarette use is associated with increased motivation to quit. Caponnetto, Campagna, Papale, Russo, and Polosa (2012) have argued that e-cigarettes do not raise serious health concerns and "retailers

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all over the world have already sold millions of electronic cigarettes, yet there is no evidence that these products have endangered anyone, and no indication that electronic cigarettes are any more of an immediate threat to public health.”

Borland (2011) describes self-organizing advocacy groups of e-cigarette users calling themselves “vapers” (because they inhale vapor not smoke). Much of our understanding of e-cigarette users attitudes and behaviors arise from these groups of enthusiasts who exchange experience and advice online. These groups have been used to recruit samples for several studies (Etter, 2010, Etter & Bullen, 2011, Goniewicz, 2010). Independent evidence on prevalence of use is limited. The U.K. e-cigarette user group, the Electronic Cigarette Consumer Association, estimate 250,000–300,000 e-cigarette users in the United Kingdom and are reported to have estimated that users will exceed 1,000,000 by the end of 2012 (*The Guardian*, 2012). In the United States, very few people who had never smoked cigarettes had ever used e-cigarettes and the majority believed that e-cigarettes were less harmful than smoked cigarettes (Pearson et al., 2011). So far, only one peer-reviewed study reported population data on e-cigarette use at more than one timepoint (Regan, Promoff, Dube, & Arrazola, 2013). This study of U.S. adults reported that awareness of e-cigarettes doubled between 2009 and 2010 and ever use more than quadrupled to 2.7%. Few studies have been conducted to examine prevalence of use in subpopulations. However, studying Polish high school students, Goniewicz and Zielinska-Danch (2012) found that 23.5% had ever used e-cigarettes and 8.2% had used e-cigarettes in the previous 30 days.

This study reports findings from qualitative and quantitative research of smokers in Britain conducted in 2010 and British population surveys conducted in 2010 and 2012 listed in Table 1. We have estimated the prevalence of e-cigarette use and assessed attitudes, beliefs, trial, and current usage of e-cigarettes among smokers and ex-smokers.

**METHODS**

All respondents were recruited from a panel of adults in Britain developed by the polling company YouGov. In 2010, the panel consisted of more than 185,000 adults, rising to 360,000 in 2012. YouGov panel members opt in to participate in online surveys, are recruited from a variety of sources, including standard advertising and partnerships with other Web sites, and receive a modest financial incentive for survey participation. Respondents’ sociodemographic information is recorded at the time of recruitment. To construct nationally representative survey samples,

YouGov employ a targeted quota sampling methodology using proprietary software. YouGov’s system invites panel members to participate in surveys via E-mail by matching their demographics to the demographics required by currently active surveys. While a panel member may be invited to a survey by the system to meet survey demographic requirements, it does not mean they will definitely be sent to that particular survey—participants receive an invite to the system as a whole, not any individual survey. For example, if a particular survey has since closed, they will be taken to another survey that requires someone of their demographics. It is not possible for the same participant to complete the same survey multiple times, nor is it possible for respondents to screen themselves into a survey where they have a strong preexisting interest in the subject matter. The resulting data are weighted to be representative of British adults (18 years and older) based on age, gender, social class, newspaper readership, and political party affiliation, weighting being derived from population census data and other sources (YouGov Web site).

For the qualitative research and smokers’ survey, a series of screening questions were used. The first identified smokers (“Which of the following best applies to you? I have never smoked; I used to smoke but I have given up now; I smoke but I don’t smoke every day; I smoke every day”). The second identified smokers who used e-cigarettes (“Which of the following best describes you? I currently smoke e-cigarettes; I have tried e-cigarettes in the past 12 months but do not currently smoke them; I have tried e-cigarettes longer than 12 months ago but do not currently smoke them; I have never tried e-cigarettes”).

**Qualitative Research**

Smokers were selected and invited to participate in qualitative research, and a topic guide was designed by the authors in conjunction with YouGov to inform the development of a subsequent survey on e-cigarettes (the smokers’ survey). Discussion items included knowledge of e-cigarettes, safety issues, and perceived advantages and disadvantages of e-cigarettes. Two face-to-face focus groups were used for smokers who had not tried e-cigarettes (n = 5 and 6, respectively). The relatively small number of e-cigarette users and their diverse geographic locations made recruiting face-to-face focus groups unfeasible. Online qualitative research has been found to offer new opportunities to collect data in hard to reach populations (Tates et al. 2009). Such data collection has been characterized as either synchronous (where participants respond to the moderator and to each other instantly) and asynchronous (where participants have longer to consider their responses and are not constrained to addressing questions in

**Table 1. Summary of Qualitative and Quantitative Research Included in Study**

Date	Type of research	Sample description and sample size
February 2010	Quantitative online survey (“2010 population survey”)	All adults (n = 12,597) Smokers (n = 2,297)
March 2010	Qualitative research Face-to-face focus group Synchronous Internet discussions Asynchronous Internet forum	Smokers Non-e-cigarette users, n = 11 e-cigarette users, n = 14 n = 12
April 2010	Quantitative online survey (“Smokers’ survey”)	Smokers (n = 1,380)
February 2012	Quantitative online survey (“2012 population survey”)	All adults (n = 12,432) Smokers (n = 2,093)

the order they appear on the topic guide) (Clarke, 2000). Two synchronous online discussions ( $n = 7$  and  $n = 7$ ) and one asynchronous Internet forum ( $n = 12$ ) were used for smokers who were currently using or had tried e-cigarettes in the last 12 months. The findings, which are not reported here, informed the design of an online survey of smokers.

### 2010 Population Survey

In February 2010, a population sample was constructed by randomly sampling the YouGov panel to fill quotas on age, gender, region, social grade, and newspaper readership. A total of 12,597 adults in Great Britain (including 2,297 smokers) were surveyed online. The survey covered a range of tobacco-related issues, and smokers were routed to questions to assess awareness and use of e-cigarettes. The population surveys were intended to assess levels of e-cigarette awareness as well as use and so, in this case e-cigarette use was determined by the following question, "Which of the following statements BEST applies to you? I have never heard of e-cigarettes and have never tried them; I have heard of e-cigarettes but have never tried them; I have tried e-cigarettes but do not use them (any more); I have tried e-cigarettes and still use them; Don't know."

### Smokers' Survey

In April 2010, YouGov panel members who had been identified at screening as smokers were invited to participate in an online survey referred to here as the smokers' survey. Participants in the February 2010 survey were excluded. One thousand three hundred and eighty adult smokers (486 smokers who had used e-cigarettes and 894 smokers who had not tried e-cigarettes) were interviewed. This survey explored attitudes and behaviors relating to e-cigarette use. All smokers were asked (a) whether they would be interested in finding out more about "a way to satisfy your desire to smoke in situations where you should not smoke (which was not harmful to your health or the health of others)," (b) to compare the perceived safety of e-cigarettes with conventional tobacco and nicotine replacement therapy (NRT) ("Compared with conventional tobacco products (e.g., cigarettes, cigars, roll-ups, etc.), which of the following statements best describes how safe you consider e-cigarettes?"; and "Compared with NRT (e.g., gums, patches, inhalers, etc.), which of the following statements best describes how safe you consider e-cigarettes?") and (c) to select benefits and disadvantages of e-cigarettes from a list generated from the qualitative interviews ("Now thinking back to e-cigarettes, which, if any, of the following would you consider to be among the advantages of this type of product? (Please tick all that apply)" and "Which, if any, of the following would you consider to be among the disadvantages of this type of product? (Please tick all that apply)."

### 2012 Population Survey

Finally, in February 2012, a second population sample was constructed by randomly sampling the YouGov panel to fill quotas on age, gender, region, social grade, and newspaper readership and surveyed online. The survey addressed a range of tobacco issues including awareness and use of e-cigarettes this time among the whole population sample, that is both smokers and nonsmokers (12,432 adults including 2,093 smokers). Responses were both sampled and weighted to be representative of all adults in Great Britain. Table 2 shows the demographic

characteristics and smoking status of the weighted and unweighted sample for the 2010 and 2012 population surveys.

### Analysis

Descriptive statistics on e-cigarette prevalence by survey respondent smoking status in the 2010 and 2012 large population surveys were calculated and confidence intervals (CIs) derived using procedures appropriate for weighted survey data. Independence of e-cigarette use by smoking status and survey year combinations were tested with a chi-square test adjusted for survey design using the Rao–Scott correction. Demographic variables known to predict smoking status (age, gender, and social grade) were explored to determine if they were associated with ever or current e-cigarette use in logistic regression models adjusting for smoking. Potential demographic predictors of e-cigarette use were entered simultaneously into multivariate models. As there were very few never smoking e-cigarette users, the latter analysis was restricted to ex-smokers, occasional

**Table 2.** Weighted and Unweighted Demographic Characteristics and Smoking Status of an Online Panel Sample of Adults in Great Britain Age 18 or Older, 2010 and 2012 Population Surveys

	2010 Weighted percentage (unweighted percentage)	2012 Weighted percentage (unweighted percentage)
Sex		
Male	48.0 (48.6)	48.0 (49.1)
Female	52.0 (51.4)	52.0 (50.9)
Age		
18–24	12.0 (6.1)	12.0 (9.6)
25–34	17.8 (16.8)	16.3 (12.3)
35–44	17.1 (16.5)	17.8 (15.0)
45–54	18.1 (17.3)	18.9 (17.9)
55+	35.0 (43.2)	35.0 (45.2)
Social grade		
A	9.9 (15.9)	8.2 (11.4)
B	16.0 (24.3)	17.7 (22.9)
C1	29.1 (27.3)	29.1 (30.0)
C2	20.7 (15.2)	20.7 (14.6)
D	16.2 (7.6)	16.2 (9.0)
E	8.1 (9.7)	8.1 (12.0)
Country of residence		
England	86.4 (81.6)	86.4 (80.4)
Wales	5.0 (8.9)	5.0 (11.1)
Scotland	8.6 (9.6)	8.6 (8.5)
Smoking status		
Never-smoker	45.2 (45.0)	48.0 (47.2)
Ex-smoker	34.2 (36.8)	33.2 (36.0)
Nondaily smoker	4.6 (4.0)	4.5 (4.0)
Daily smoker	15.9 (14.2)	14.3 (12.8)
Base respondents ( <i>n</i> )	12,597	12,432

*Note.* "Social grade" refers to a system of classification commonly used in Great Britain based on the occupation of the chief wage earner of the household. A = high managerial, administrative or professional; B = intermediate managerial, administrative or professional; C1 = skilled nonmanual workers; C2 = skilled manual workers; D = semi- and unskilled manual workers; E = pensioners, casual or lowest grade workers, or unemployed.

smokers, and daily smokers. Analysis was conducted using R v2.15.1 (The R Foundation for Statistical Computing) with the survey package v3.28-2 (Lumley 2012).

## RESULTS

### Population Surveys: Awareness and Prevalence

Table 3 shows e-cigarette awareness and use by smoking status (never-smoking, ex-smoking, occasional, and daily smoking) for the 2010 and 2012 surveys.

Awareness of e-cigarettes among smokers increased markedly over the period with the proportion of smokers reporting that they had not heard of e-cigarettes falling from 38.2% (95% CI 36.0–40.6) in 2010 to 21.1% (95% CI 18.9–23.2) in 2012 ( $P < .001$ ).

E-cigarette trial and use were found predominantly among current smokers (daily and nondaily). In 2012, around one-third (6.7% [95% CI 5.3–8.0]) of smokers of the 21.6% (95% CI 19.4–23.8) of smokers who had ever used e-cigarettes were current users at the time of the survey; 3.7% (95% CI 3.0–4.5) of ex-smokers reported ever use of e-cigarettes with 1.1% (95% CI 0.6–1.5) current users; around 0.5% of never-smokers reported having ever tried e-cigarettes, and 0.1% reporting current use.

The proportion of smokers who reported having tried e-cigarettes but who no longer use them more than doubled from 5.5% (95% CI 4.4–6.6) in 2010 to 15.0% (95% CI 13.1–16.8) in 2012 ( $P < .001$ ). In 2010, as with 2012, around one-third of ever e-cigarette users were current e-cigarette users at the time of the study, 32.7% in 2010 and 30.9% in 2012 ( $P = .699$ ).

The proportion of smokers reporting current e-cigarette use has more than doubled from 2.7% (95% CI 2.0–3.4) in 2010 to 6.7% (95% CI 5.3–8.0) in 2012 ( $P < .001$ ).

Applying official estimates of the adult population in Great Britain (Office for National Statistics, 2011) to our 2012 survey data, we estimate that at the time of the 2012 survey there were around 800,000 current e-cigarette users, of whom 600,000 current smokers and 170,000 were ex-smokers.

Outcomes of the multivariate models investigating demographic association with e-cigarette use are shown in Table 4. No association with e-cigarette ever use was observed for gender or social grade. Being in the oldest age group (55 years and older), compared with the youngest (18–34), reduced the odds of e-cigarette ever use ( $OR$  0.58, 95% CI 0.43–0.78,  $P < .001$ ), with suggestion of a reduction also present in the 35–54 age group ( $OR$  0.76, 95% CI 0.57–1.03,  $P = .080$ ). None of the demographic variables entered demonstrated strong association with current e-cigarette use, though due to the imprecision of estimates we cannot exclude the possibility of moderate associations that this analysis failed to detect.

Restricting the analysis only to current smokers found that daily smokers were as likely as occasional smokers to be current e-cigarette users ( $OR$  1.14, 95% CI 0.64–2.01,  $P = .654$ ); however, daily smokers were more likely to report ever use than occasional smokers ( $OR$  1.47, 95% CI 1.04–2.07,  $P = .026$ ).

### Smokers' Survey: Attitudes and Beliefs

Figures 1 and 2 show findings from the Smokers' Survey carried out in 2010 concerning perceived advantages and disadvantages of e-cigarettes. The most commonly perceived benefit was that they might satisfy the desire to smoke (60%) followed

by “might help cut down on cigarettes” (55%) and “they might help me give up smoking entirely (51%).” The main perceived disadvantage was expense (53%) followed by “might not satisfy my desire to smoke” (39%) and “might be mistaken for cigarettes” (35%).

A small majority (57%) of e-cigarette users bought their first e-cigarette online and 14% had been given it as a gift. The most commonly given reason for trying e-cigarettes was “as a substitute for smoking where smoking is not allowed” (43%). This was especially common among smokers of 20 or more cigarettes per day (49%) compared with smokers of 10–19 cigarettes (43%) and 9 or less cigarettes (31%) ( $P = .008$ ). The second most common was as an aid to quit smoking (35%) followed by a way to cut down without quitting (31%). Heavier smokers—more than 20 cigarettes per day—were more likely to be interested in electronic nicotine delivery, believing they might “relieve cravings where smoking is prohibited” (62% compared with 49% in smokers of 10–19 cigarettes per day and 38% in smokers of 9 or less cigarettes per day) ( $P < .001$ ), “satisfy the desire to smoke” (64% compared with 62% in smokers of 10–19 cigarettes and 52% in smokers of 9 or less) ( $P = .001$ ) and “help to cut down on cigarettes” (64% compared with 56% in smokers of 10–19 cigarettes per day and 45% in smokers of 9 or less) ( $P < .001$ ).

Seventy-one percent of smokers considered e-cigarettes to be safer than conventional cigarettes (44% much safer, 27% somewhat safer, 1% somewhat less safe, and 1% much less safe) and 28% considered them to be safer than NRT (11% much safer, 17% somewhat safer, 35% about as safe, 5% less safe, and 1% much less safe). A sizeable minority said they did not know which was safer (22% in the case of conventional tobacco and 32% in the case of NRT). Most smokers perceived e-cigarettes to be more satisfying than NRT (34% a great deal more satisfying, 29% somewhat more satisfying, 11% about as satisfying, 5% somewhat more satisfying, and 3% a great deal less satisfying).

## DISCUSSION

### Key Findings

We found a rapid increase in e-cigarette awareness and use during our study period. Awareness of e-cigarettes among smokers increased markedly over the period with the proportion of smokers reporting that they had not heard of e-cigarettes falling from 38.2% in 2010 to 21.1% in 2012 ( $P < .001$ ). The proportion of smokers who reported having tried e-cigarettes but no longer using them also increased markedly from 5.5% in 2010 to 15.0% in 2012 ( $P < .001$ ). Similarly, the proportion of smokers in Great Britain reporting current e-cigarette use more than doubled from 2.7% in 2010 to 6.7% in 2012 ( $P < .001$ ), giving an estimated 600,000 British smokers using e-cigarettes in 2012. In 2012, we found current use of e-cigarettes to be confined almost entirely to current or ex-smokers.

### Limitations and Strengths of the Study

There are several limitations to our data. The survey samples were constructed from an online panel, raising questions over whether these samples can be said to be representative of British adults without Internet access and whether, because participants “opt in” to the panel, they may differ in other potentially relevant ways from the wider population that have not opted in. The latter problem is not exclusive to Internet-based survey



**Table 3. Percentage of E-Cigarette Awareness and Use by Smoking Status in Adults in Great Britain, 2010 and 2012**

	2010					2012				
	Never-smoker	Ex-smoker	Occasional smoker (n = 510)	Daily smoker (n = 1,787)	Never-smoker (n = 5,866)	Ex-smoker (n = 4,473)	Occasional smoker (n = 499)	Daily smoker (n = 1,594)		
Never heard of e-cigarettes and have never tried, % (95% CI)	–	–	40.5% (35.4, 45.7)	37.6% (35.0, 40.2)	58.9% (57.3, 60.5)	49.7% (47.8, 51.5)	26.7% (22.0, 31.5)	19.3% (16.9, 21.7)		
Have heard of e-cigarettes but have never tried them, % (95% CI)	–	–	48.4% (43.2, 53.6)	52.7% (50.0, 55.4)	37.5% (35.9, 39.0)	43.6% (41.8, 45.4)	53.5% (48.0, 59.0)	55.4% (52.4, 58.5)		
Have tried e-cigarettes but do not use them anymore, % (95% CI)	–	–	5.0% (2.4, 7.5)	5.7% (4.5, 6.9)	0.4% (0.2, 0.6)	2.7% (2.1, 3.3)	10.9% (7.4, 14.4)	16.2% (14.0, 18.5)		
Have tried e-cigarettes and still use them, % (95% CI)	–	–	2.5% (0.9, 4.1)	2.7% (1.9, 3.5)	0.1% (0.1, 0.2)	1.1% (0.6, 1.5)	6.1% (3.1, 9.0)	6.9% (5.3, 8.4)		
Don't know, % (95% CI)	–	–	3.6% (1.3, 5.9)	1.3% (0.6, 2.0)	3.1% (2.5, 3.7)	3.0% (2.4, 3.6)	2.8% (1.1, 4.5)	2.1% (1.1, 3.2)		

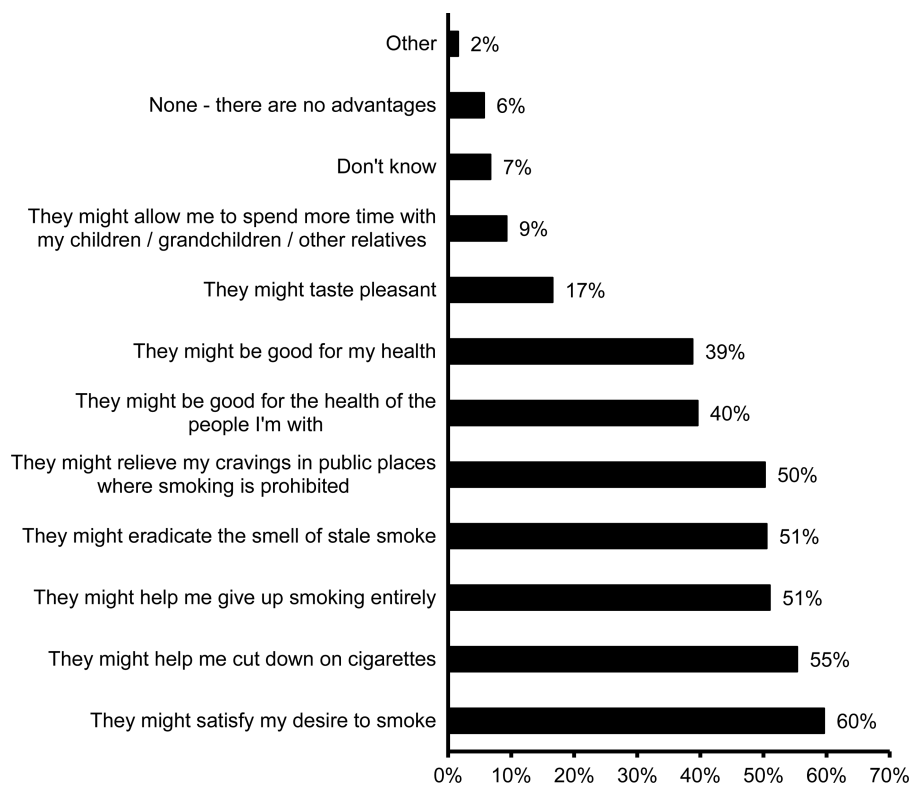
*Note.* CI = confidence interval. Percentages may not add exactly to 100% due to rounding. Percentages have been weighted to be representative of all adults in Great Britain (ages 18+). No data on e-cigarette awareness and use was available for never- and ex-smokers in 2010 as the question was not asked to nonsmokers in this survey.

## E-cigarettes: Prevalence and attitudes in Great Britain

**Table 4.** Adjusted Associations Between Demographic Variables and Ever-Use or Current E-Cigarette Use Among Ex-smokers, Occasional smokers, and Daily Smokers in 2012

	E-cigarette ever-use		E-cigarette current use	
	Odds ratio (95% CI)	<i>p</i> value	Odds ratio (95% CI)	<i>p</i> value
Smoking status				
Ex-smoker	Reference		Reference	
Occasional smoker	4.32 (2.89, 6.48)	<i>p</i> < .001	6.04 (2.92, 12.49)	<i>p</i> < .001
Daily smoker	7.33 (5.66, 9.48)	<i>p</i> < .001	6.68 (4.15, 10.77)	<i>p</i> < .001
Age group (years)				
18–34	Reference		Reference	
35–54	0.76 (0.57, 1.03)	<i>p</i> = .080	1.23 (0.70, 2.15)	<i>p</i> = .472
55+	0.58 (0.43, 0.78)	<i>p</i> < .001	0.91 (0.52, 1.58)	<i>p</i> = .726
Social grade				
A, B, C1	Reference		Reference	
C2, D, E	0.85 (0.68, 1.07)	<i>p</i> = .177	0.99 (0.67, 1.47)	<i>p</i> = .961
Gender				
Male	Reference		Reference	
Female	0.99 (0.79, 1.24)	<i>p</i> = .958	1.21 (0.81, 1.79)	<i>p</i> = .350

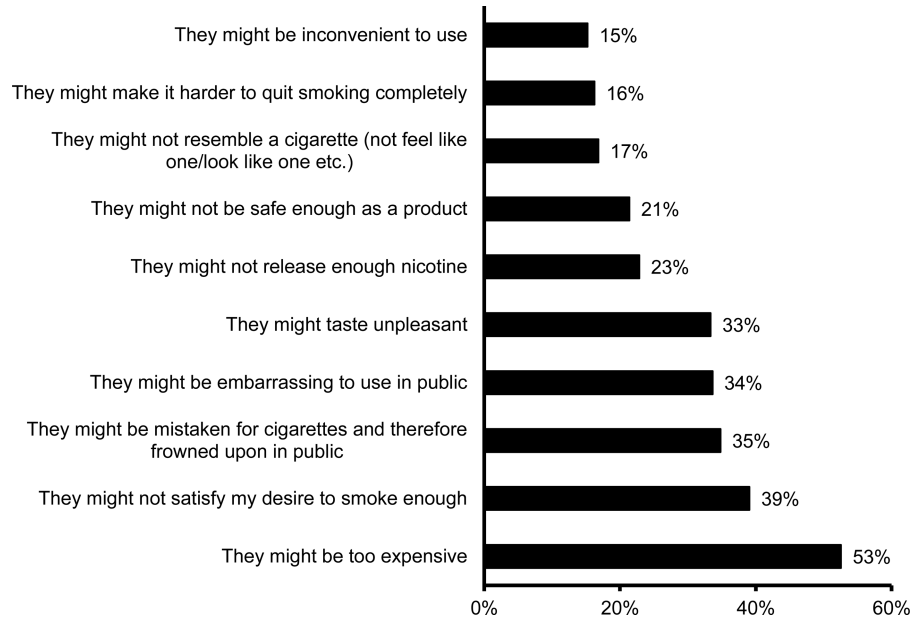
*Note.* CI = confidence interval. All variables entered simultaneously into a multivariate model. Total unweighted base *n* used for analysis was 6,566.



**Figure 1.** Perceived advantages of e-cigarettes.

research—most competing methodologies (e.g., random digit telephone dialling) also require participants to opt in or consent to completing the survey. For the former issue, it has previously been shown in other fields of social research (Sanders, Clarke, Stewart, & Whiteley, 2007) that YouGov's methodological approach has similar use in estimating population parameters as traditional probability-based sampling methods.

An inherent feature of the online panel methodology used to generate these samples is a modest degree of participant overlap between any two or more subsamples of sufficient size (around 10–15%). Where this might introduce bias, overlapping participants were excluded from subsequent samples or were screened to determine if their responses on key questions (e-cigarette awareness and use) differed significantly from nonoverlapping



**Figure 2.** Perceived disadvantages of e-cigarettes.

participants. In a small number of cases (the participants in the synchronous and asynchronous qualitative research), recording procedures were not in place to track their involvement in other study components; however, as these were a small number of cases ( $n = 26$ ), their possible participation in other samples is unlikely to significantly alter the estimates presented here.

In the 2010 population survey, only current smokers were asked about e-cigarette use. Consequently, we are unable to report trends in use among ex-smokers in 2010. Our population survey data do not include the reasons why e-cigarette users chose to use or try e-cigarettes, nor, because of their cross-sectional nature, whether ex-cigarette smokers used e-cigarettes to help them stop smoking or took up e-cigarettes after they had stopped smoking, or whether ex-smokers started using e-cigarettes while still smoking conventional cigarettes. Our smokers' survey was conducted in 2010 at time when e-cigarette awareness among smokers was less widespread and use was therefore confined to relatively early adopters. Attitudes and expectations among today's e-cigarette users may therefore be different from those we found in 2010 as familiarity with and experience of e-cigarettes has increased. Our measure of ever use is also subject to recall bias and may include anything from experimenting once with a friend's e-cigarette to prolonged use. Finally, we did not define "current" use of e-cigarettes, leaving this to users' determination.

The principle strength of our population survey is the potential to provide policy makers up-to-date information with data from a large representative sample of British adults. Electronic cigarette use is a rapidly growing phenomenon, with potential to greatly influence smoking and quitting behavior in the United Kingdom. Our survey documents the early years of the emergence of this product in the U.K. market and provides a user perspective independent of user advocacy groups, manufacturers, and retailers. Although the U.K.'s Health and Social Care Information Centre has announced its intention to include questions on e-cigarette use within the Health Survey for England from 2013, data will only be available for independent analysis from 2015 (Ref HSCIC Web site).

### E-Cigarettes: Behaviors Beliefs and Attitudes

E-cigarette use in Britain has increased sharply in just 2 years, albeit from a low base. The proportion of smokers who have used them has doubled and the proportion of those who say they have never heard of them has fallen by half. In comparison, awareness among nonsmokers is much lower and use among those who have never smoked is negligible. These data are, therefore, suggestive of a gateway out of smoking with around 1% of current e-cigarette users being ex-smokers, equating to around 170,000 adults in Great Britain. In support of this, in their survey of 3,587 visitors to Web sites and online discussion forums dedicated to e-cigarettes, [Etter and Bullen \(2011\)](#) found that "e-cigarettes were used largely by former smokers as an aid to quit smoking, to avoid relapse and to deal with withdrawal symptoms, much as people use nicotine replacement therapy." Our smokers' survey suggests that cessation was one among several reasons for using e-cigarettes. Half (51%) of smokers considered a potential benefit of e-cigarettes to be that they might assist in giving up smoking entirely.

Around one in three of those who report having tried e-cigarettes were still using them at the time of the survey (both in 2010 and in 2012). It would appear, therefore, that only a minority of people who try e-cigarettes find them sufficiently satisfying to continue use. However, not all e-cigarettes are the same and studies ([Vansickel et al., 2010](#)) have found very different levels of nicotine delivery between brands. Similarly, users respond differently to e-cigarettes: studies examining the effect of e-cigarettes on cigarette smoking withdrawal observe substantial benefits to some but not all users. Whereas quitters in an NHS stop-smoking service will receive support and education on the use of NRT, e-cigarette users are largely untutored and better education may result in greater satisfaction and substitution for cigarettes. This study did not find evidence of associations between e-cigarette use and social grade or gender.

Data from the smokers' survey suggest that smokers believe e-cigarettes represent a much smaller threat to their health than smoking and this appears to be justified by a literature, which has so far failed to identify any widespread health threats either to

e-cigarettes users or to those around them. However, there is considerable uncertainty about the risks and a misplaced perception among many smokers that e-cigarettes are less risky than NRT.

It may be that the 60% of smokers who believe e-cigarettes could reduce their desire to smoke and the 55% of smokers who believe that e-cigarette use can help them cut down are justified. Conversely, 50% of smokers believe e-cigarettes could ease their cravings where smoking is banned and this might mean some quit attempts are deferred. These are not questions answered by this study. What is clear is that an increasing number of smokers are trying e-cigarettes to reduce or eliminate their use of smoked tobacco. They do so without access to a growing body of evidence on the potential benefits and risks relative to smoking and to therapeutic nicotine replacement. Such guidance as is available to most smokers comes from friends, the enthusiasts' Web sites and the manufacturers of the products.

### CONCLUSIONS

Use of e-cigarettes in Britain has grown but, with only 6.7% of smokers reporting current use, they remain something of a niche product. Although awareness has increased, the proportion of smokers who were aware of e-cigarettes but had not tried them remains at just more than 50%.

The use of e-cigarette is largely confined to smokers and ex-smokers. Around 170,000 people may have replaced smoking with e-cigarette use. While we found evidence supporting the view that e-cigarette use may be a bridge to quitting, we found negligible evidence of e-cigarette use among those who had never smoked.

The failure to support and educate smokers on the effective use, risks, and benefits of e-cigarettes may represent a lost opportunity for public health.

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### DECLARATION OF INTERESTS

None declared.

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