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Use of Electronic Cigarettes in Smoke-free Environments

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Abstract

Background—Although most U.S. states prohibit cigarette smoking in public places and worksites, fewer jurisdictions regulate indoor use of electronic cigarettes (e-cigarettes). Given the dramatic increase in e-cigarette use and concern about its impact on non-users, there is a need to examine the use of e-cigarettes in smoke-free environments and related attitudes and perceptions.

Methods—Recruited from a nationally representative adult panel (GfK's KnowledgePanel), 952 current users of e-cigarettes completed a cross-sectional online survey in 2014. Multivariate logistic regressions were conducted to examine the factors associated with ever using e-cigarettes in smoke-free environments.

Results—Overall, 59.5% of e-cigarette users had vaped where cigarette smoking was not allowed. Young adults (18–29 years) were most likely to do so, 74.2%. The places of first-time use most often mentioned were service venues (bar, restaurant, lounge, and club), 30.7%, followed by worksites, 23.5%. Daily e-cigarette users were more likely to have vaped in smoke-free environments than non-daily users (OR=2.08, p=.012). Only 2.5% of those who used e-cigarettes in smoke-free environments reported negative reactions from other people. Most e-cigarette users did not think e-cigarettes are harmful to themselves or to by-standers, and thus should not be banned where smoking is; those who had used e-cigarettes where smoking is banned were even more likely to hold these views.

Conclusions—E-cigarette use in smoke-free environments was common, suggesting that most e-cigarette users do not consider smoke-free laws to apply to e-cigarettes. Explicit laws should be considered if jurisdictions want to prohibit e-cigarette use in public places.

Keywords

Electronic nicotine delivery systems; public policy; surveillance and monitoring

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CONTRIBUTION

YS, SC, and SZ conceptualized the study. YS conducted the statistical analyses and wrote the first draft. All authors participated in writing and finalizing the paper.

COMPETING INTERESTS

None.

INTRODUCTION

The prevalence of current e-cigarette use among adults has increased significantly in recent years.[1–4] Although smoke-free laws have been widely adopted in the U.S.,[5] fewer jurisdictions have regulated indoor e-cigarette use. As of April 2016, only 8 states had explicit statewide laws banning e-cigarette use in places where cigarette smoking is prohibited, and many of those had only been passed recently.[6] Support for bans on e-cigarette use in public places is substantially lower than for cigarette bans. Studies estimated that the proportion of adults supporting such bans for e-cigarettes were 30%–45% during 2012–2014, [7–9] much lower than the 70–80% who supported smoke-free laws.[10]

Regulating indoor e-cigarette use remains controversial. Those opposing e-cigarette bans argue that e-cigarette use is a harm reduction strategy and little scientific evidence has been presented about long-term health consequences for users or non-users.[11] On the other hand, pollutants from secondhand e-cigarette exposure may still carry risk for non-users, albeit at rates lower than from cigarettes.[12–17] Use of e-cigarettes in smoke-free places might also make enforcement of smoke-free policies more difficult and adversely affect the social norms against smoking.[7–9,11,18]

Despite ongoing debate and monitoring of public attitudes,[7–9] there is little empirical data about how many e-cigarette users have actually vaped in smoke-free environments and who they are. It is not clear if e-cigarette users think existing smoke-free policies apply to e-cigarettes, thus self-regulating their use in public spaces. The heart of the issue is, to what extent do e-cigarette users view e-cigarettes as similar to cigarettes? This study recruited participants from a nationally representative panel and assessed current e-cigarette users' perceptions and patterns of use to determine correlates of using e-cigarettes in smoke-free environments.

METHODS

Sample

This study was based on a cross-sectional survey commissioned by the University of California, San Diego and administered by GfK.[19] Participants were recruited from GfK's KnowledgePanel, a probability-based web panel that represents 97% of the U.S. adult population. Data were collected between February and March, 2014. A total of 8,607 adults completed the survey; 957 (4.96% after weighted adjustment) reported currently using e-cigarettes every day or some days. The study sample was comprised of current e-cigarettes users with complete information on sociodemographic characteristics and tobacco use status (N=952).

Measures

Respondents who had ever smoked 100 cigarettes and currently smoked every day or some days were defined as current smokers. E-cigarette users were those who were currently using e-cigarettes "everyday" or "some days." E-cigarette users were asked "have you ever used an e-cigarette in places where cigarette smoking is not allowed?". Those who responded affirmatively were asked the specific smoke-free place where they first used an e-cigarette

and “how did people react to you?” with possible responses of mostly positive, mostly negative, and neutral.

Respondents were presented with several statements regarding e-cigarettes: 1) “E-cigarettes are less harmful to health than regular cigarettes,” 2) “Using e-cigarettes is harmful to one’s health,” 3) “Exposure to secondhand e-cigarette vapor is harmful,” and 4) “Using e-cigarettes should be illegal in places where cigarette smoking is illegal.” Responses of strongly agree, somewhat agree, somewhat disagree, and strongly disagree were dichotomized into agree or disagree.

A series of individual variables were created to represent sociodemographic status, including gender, age (18–29, 30–44, 45–59, and 60+ years), race/ethnicity (non-Hispanic White, Non-Hispanic Black, Hispanic, and other), and education (no college degree and college or above).

Statistical Analyses

Prevalence of ever using e-cigarettes in smoke-free environments was summarized by sociodemographic characteristics and e-cigarette and cigarette use status. Group differences in proportion were determined by Pearson chi-squared tests. A multivariate logistic regression was conducted to assess associations between ever using e-cigarettes in smoke-free environments and individual sociodemographic characteristics and e-cigarette and cigarette use status. Sampling weights were computed using the 2010 U.S. Current Population Survey to account for non-response, non-coverage, and oversampling in the survey sampling design. Stata 14 was used to perform all statistical analyses. The human subject protocol of this research was approved by the University of California, San Diego’s Institutional Review Board (IRB# 111664).

RESULTS

Overall, 59.5% of current e-cigarette users had vaped where smoking was not allowed. Table 1 shows the rate of using e-cigarettes in smoke-free environments by demographics and tobacco use status. Young adults, 18–29, were most likely to use e-cigarettes where smoking was not allowed, 74.2%. The multivariate analysis confirmed that, relative to the 18–29 age group, older adults were significantly less likely to have used e-cigarettes in smoke-free environments ($p < .01$). In addition, daily users of e-cigarettes had higher odds of having vaped in smoke-free environments than non-daily users ($OR = 2.08$, $p = .012$). Current smokers tended to be more likely to have used e-cigarettes in smoke-free environments, although the difference was not statistically significant.

Among respondents who had used e-cigarettes in smoke-free environments, the most common places of first use were service venues (bar, restaurant, lounge, or club), 30.7%, followed by worksites, 23.6%. Other public places frequently mentioned included shopping malls (9.1%), movie theaters (7.7%), hospitals (7.5%), and schools (7.2%). Only 2.1% mentioned using them in airplanes. The remaining 12.1% indicated other.

Very few e-cigarette users reported receiving negative reactions from other people (2.5%) when they vaped in a smoke-free environment; 72.3% reported neutral reactions and 25.2% reported positive reactions to their use.

When asked to compare e-cigarettes to cigarettes, an overwhelming majority of e-cigarette users, 89%, believed the former are less harmful. Furthermore, Table 2 shows that 61.6% disagreed that e-cigarettes are harmful. Even a greater percentage, 82.9%, disagreed that secondhand vapor is harmful to bystanders and 73.6% disagreed that e-cigarettes should be banned where smoking is illegal. Table 2 also shows that, compared to those who had not used e-cigarettes in smoke-free areas, respondents who vaped in smoke-free environments were significantly more likely to disagree that e-cigarettes are harmful to themselves or to others or that e-cigarettes should be banned in public places ($p<.05$).

DISCUSSION

This study, to our knowledge, is the first report to provide a population estimate of e-cigarette use in places where smoking is prohibited. The prevalence of such use was high: roughly 60% of all e-cigarette users and nearly 75% for young adults. Those who used e-cigarettes in smoke-free environments were less likely to approve of banning e-cigarettes in smoke-free places or to consider e-cigarette use harmful. These findings indicate that the majority of e-cigarette users perceived their use as acceptable in smoke-free areas; they did not feel constrained in using e-cigarettes by the existing bans against smoking cigarettes in public places.

The reported reaction by others to their use of e-cigarettes in smoke-free environment seems to support their belief in the acceptability of the behavior; few reported negative reactions (2.5%). The majority reported that witnesses did not seem to care about their e-cigarette use and 25% reported positive affirmation of the behavior. It is not clear whether the witnesses were themselves e-cigarette users or smokers, but the survey respondents' reports are consistent with reported low levels of support in the general population for banning the use of e-cigarettes in smoke-free places.[7–9]

Service venues and worksites were the most reported smoke-free places where e-cigarettes were used for the first time. Although this may reflect their greater likelihood of frequenting these places, it is notable that these are also the places where tobacco control advocates had to work hardest to pass laws prohibiting cigarette smoking.[20] Regulations to restrict smoking in places such as airplanes or hospitals tended to receive support from the public more easily. States and local jurisdictions should anticipate challenges to implementation and enforcement of policies when extending smoke-free regulations to include e-cigarettes, particularly in service venues and worksites.

There is concern that cigarette smokers may use e-cigarettes as a means to circumvent smoke-free laws.[8,21] A larger proportion of smokers had used e-cigarettes in smoke-free places than had non-smokers, although the results were not significant. E-cigarettes have been promoted as an alternative to smoking; one that can be used anywhere.[22] The

“freedom” appeals and the absence of an explicit e-cigarette ban may have encouraged smokers to vape in places where smoking is banned.

A key issue is whether e-cigarette users consider e-cigarettes as a product similar to cigarettes. Data presented in Table 2 shows that most of them did not. An overwhelmingly majority of them considered e-cigarettes less harmful than cigarettes. Likewise, most of them did not think e-cigarettes are harmful to users or to by-standers, a trend that was especially true among those who had used e-cigarettes in smoke-free environments. These beliefs might represent a bit of post-decision justification.[23] It is interesting that, although most e-cigarette users thought e-cigarettes were not harmful to others, fewer were against banning e-cigarette use in smoke-free venues (83% vs 74%, respectively). This suggests that these e-cigarette users were cognizant of the fact that physical harm of second-hand vapor is not the only reason to ban vaping in places where smoking is currently not allowed.

This study has several limitations. First, as in any survey on behavior, self-report of e-cigarette use and reactions from other people are subject to bias from recall and social desirability. Second, the post-hoc analysis is limited by the data available. For example, there was no data on whether there were local regulations on e-cigarette use in smoke-free environments or whether respondents were aware of such laws, both of which could affect their e-cigarette use behaviors. However, since almost no states had laws prohibiting e-cigarette use at the time of the interview,[6] measuring awareness of such laws would likely not have significantly altered the study findings. Third, although the sample was nationally representative, it was small, limiting statistical power. Lastly, the report on where respondents first used e-cigarettes in public may be influenced by their likelihood of being in such places and may not represent the places of most frequent use.

Limitations notwithstanding, this study clearly showed that most e-cigarette users do not consider smoke-free laws to apply to e-cigarettes, and this was particularly true with young adults. A general ban on tobacco products may not be sufficient to restrict e-cigarette use in public places. Explicit laws and clear signage should be considered if jurisdictions want to prohibit e-cigarette use in public places.

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WHAT THIS PAPER ADDS

As e-cigarette use increases, a question arises as to whether users consider smoke-free policies applicable to e-cigarettes and thus self-regulate their use in public spaces. This study examined the use of e-cigarettes in smoke-free spaces among a nationally representative sample of U.S. e-cigarette users.

This study adds the following:

- Most e-cigarette users in the U.S. do not consider smoke-free laws applicable to e-cigarettes. This was particularly true of young adults.
- In order to minimize nonuser secondhand exposure to e-cigarette aerosol, laws need to be explicit about restrictions on e-cigarette use.

Table 1

Demographics of Those Who Ever Used E-cigarettes in Smoke-free Environments, 2014

Characteristics	Ever used e-cigarettes in smoke-free environments		
	Unweighted sample size	Weighted percentage (%)	Adjusted OR (95% CI)
Total	952	59.5	
Gender			
Male	331	61.2	1.09 (.69–1.70)
Female	621	58.0	1
Age groups			
18–29	138	74.2	1
30–44	190	53.8	.32 (.15–.70) **
45–59	365	56.8	.33 (.16–.67) **
60+	259	50.1	.23 (.11–.50) **
Race/ethnicity			
Non-Hispanic White	776	62.6	1
Non-Hispanic Black	43	56.1	1.02 (.37–2.77)
Hispanic	71	61.6	.94 (.36–2.42)
Other	62	44.0	.39 (.16–.95) *
Education categories			
No college degree	723	60.0	1
College or above	229	56.3	1.07 (.58–1.96)
E-cigarette use status			
Non-daily users	666	56.1	1
Daily users	286	66.3	2.08 (1.17–3.70) *
Cigarette smoking status			
Never or former smoker	230	55.5	1
Current smoker	722	61.9	1.76 (.99–3.13)

*
p<.05,**
p<.01

Table 2

Beliefs about the Harmfulness of E-cigarette Use

Statement	Overall N=948 % Disagree (95%CI)	Ever used e-cigarettes in smoke-free environments	
		Yes N=569 % Disagree (95%CI)	No N=379 % Disagree (95%CI)
Using e-cigarettes is harmful to one's health	61.6 (56.1–67.2)	69.6 (63.7–75.6)	50.2 (40.9–59.6)
Exposure to secondhand e-cigarette vapor is harmful	82.9 (77.6–88.2)	90.3 (86.0–94.5)	72.4 (62.1–82.7)
Using e-cigarettes should be illegal in places where cigarette smoking is illegal	73.6 (68.0–79.1)	83.7 (78.4–89.0)	59.2 (9.4–69.0)