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# Use of e-cigarettes by individuals with mental health conditions

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## ABSTRACT

**Background** Individuals with mental health conditions (MHC) have disproportionately high tobacco-related morbidity and mortality due to high smoking prevalence rates. As high consumers of cigarettes, smokers with MHC may consider using e-cigarettes as an alternative form of nicotine delivery.

**Objective** Examination of the susceptibility to use e-cigarettes by individuals with MHC.

**Methods** A US population survey with a national probability sample (n=10 041) was used to assess ever use and current use of regular cigarettes, e-cigarettes, and US Food and Drug Administration-approved pharmacotherapy for smoking cessation. Survey respondents provided information about whether they had been diagnosed with an anxiety disorder, depression, or other MHC.

**Results** Individuals with MHC were more likely to have tried e-cigarettes (14.8%) and to be current users of e-cigarettes (3.1%) than those without MHC (6.6% and 1.1%, respectively; p<0.01). Ever smokers with MHC were also more likely to have tried approved pharmacotherapy (52.2% vs 31.1%, p<0.01) and to be currently using these products (9.9% vs 3.5%, p<0.01) than those without MHC. Additionally, current smokers with MHC were more susceptible to future use of e-cigarettes than smokers without MHC (60.5% vs 45.3%, respectively, p<0.01).

**Conclusions** Smokers with MHC are differentially affected by the rise in popularity of e-cigarettes. Clinical interventions and policies for tobacco control on e-cigarettes should take into account the possible outcomes and their implications for this priority population.

## INTRODUCTION

The use of electronic cigarettes (commonly known as e-cigarettes) has increased dramatically in the last few years. As of 2012, an estimated 8.1% of adults in the USA had used e-cigarettes.<sup>1</sup> This estimate is up considerably from the 3.3% and 6.2% found in 2010 and 2011, respectively.<sup>2</sup> Likewise, use of e-cigarettes among high school and middle school students doubled from 2011 to 2012.<sup>3</sup> There has been considerable speculation about what impact these products will have on tobacco control efforts.<sup>1 4 5</sup> Research on e-cigarettes is in the early stages and, as with most tobacco research, has been focused on the general population.<sup>1 2 6</sup> The current study compares individuals with mental health conditions (MHC) to those without, on their use and perceptions of e-cigarettes. We believe this study is important because mental health status is rarely assessed in tobacco research, yet those with MHC

are arguably the group most burdened by the health consequences of tobacco use.<sup>7</sup>

Smoking prevalence for individuals with MHC is estimated to be about 70% higher than for those without (36.1% vs 21.4%).<sup>8 9</sup> Rates of smoking differ by diagnosis, ranging from approximately 38% for those with anxiety disorder, 45% for those with affective disorders, and 64% for those with substance use disorders.<sup>10</sup> Smokers with mental health disorders typically smoke more heavily than smokers without mental illness, and have poorer cessation outcomes.<sup>8 9</sup> Over time, that difficulty with quitting has resulted in higher rates of MHC among the remaining smokers. In fact, estimates suggest that individuals with psychiatric disorders consume between a third to a half of all cigarettes sold in the USA.<sup>8 9 11</sup> Consequently, tobacco-related morbidity and mortality are disproportionately high among individuals with MHC.<sup>12 13</sup>

Historically, faulty assumptions about smokers with MHC have kept researchers from including them in cessation studies, and clinicians from addressing cessation in their treatment plans. In other words, there has been a persistent belief that smokers with MHC are not interested in quitting, not capable of quitting, and that cessation may have a negative impact on their mental illness.<sup>14–16</sup> However, attitudes have been changing. Recent publications in the research and clinical literature have highlighted the need to address tobacco use among individuals with MHC.<sup>14–20</sup> There is greater recognition that such smokers worry about the health effects of their smoking and want to quit.<sup>14</sup> Mental health communities have called for healthcare professionals to address the issue of smoking with their patients.<sup>21 22</sup> Also, many mental health treatment facilities have instituted smoke-free campuses and have begun to offer cessation treatment concurrent with treatment for mental health or substance disorders.<sup>22</sup> It is now recognised that smokers with MHC may require a different treatment approach to quitting than other smokers, one characterised by an extended number of counselling sessions, extended use of pharmacotherapy, or both.<sup>16 23 24</sup> Williams *et al*<sup>7</sup> make a strong case that smokers with mental health and substance abuse conditions should be designated as a tobacco-disparity group, to focus national attention and resources on this priority population.

We believe that in the midst of the lively debate about e-cigarettes it is important to consider whether e-cigarettes have a differential impact on individuals with MHC. E-cigarettes are particularly relevant to smokers with MHC because they have provoked debate about their potential to reduce the



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harm associated with smoking regular cigarettes and their usefulness as a cessation aid.<sup>25–27</sup> Despite a shortage of evidence to support these claims, e-cigarettes are commonly promoted for smoking cessation<sup>28</sup> and often are used for this purpose.<sup>1 29</sup> Of particular concern is that some e-cigarette manufacturers are marketing their products as a means for managing psychiatric symptoms.<sup>30 31</sup> These companies are directly targeting individuals with MHC, whether they are current smokers or not.

This study examines the use of e-cigarettes, regular cigarettes, and approved quitting aids, comparing individuals with MHC to those without. If those with MHC are a priority for tobacco control, then it is necessary to examine whether they are being differentially affected by the rise in popularity of e-cigarettes. Specifically, this study examines consumption rates, and whether the reasons for using e-cigarettes differ by mental health status.

## METHODS

### Data source

A survey was commissioned by the University of California, San Diego and administered in February 2012 by GfK, a market research institute. GfK recruits a probability sample representative of the US population (KnowledgePanel) using an address-based sampling methodology.<sup>32 33</sup> Surveys are performed online, and panel participants are provided with a netbook computer and network access, as needed. The KnowledgePanel methodology results in a probability sample of the US population with representativeness equivalent to most other well-known population surveys.<sup>34–36</sup>

The present study came out of a cross-sectional survey that was designed to gather information on smoking history and cigarette use, perceptions about different tobacco products (including e-cigarettes) and quitting aids, attitudes toward tobacco control efforts, and beliefs about the process of quitting smoking.<sup>1</sup> The response rate for the survey was 66.5% (n=10 041) of which 3111 were current smokers, 3676 were former smokers and 3254 were never smokers. The survey was conducted between 24 February and 8 March 2012.

### Measurement

Upon enrolment, each KnowledgePanel participant is asked to complete a self-reported personal health profile that includes smoking status and a list of ailments and diagnosed medical conditions such as attention deficit disorder, diabetes, heart disease, high blood pressure and cancer. Three MHC are listed, including anxiety disorder, depression, and other ‘mental health condition.’ For the purposes of this study, anyone who reported any of the three mental health items was coded as having a MHC.

Cigarette smoking was assessed using multiple questions with smokers defined as those who had smoked at least 100 cigarettes in their lifetime. Smokers were classified as: current, if they said they smoked ‘every day’ or ‘some days’ (when asked ‘Do you currently smoke cigarettes every day, some days, or not at all?’), recent former if they smoked within the past year, and long-term former if they last smoked over 1 year ago. Never smokers were defined as those who had not smoked 100 cigarettes in their lifetime.

Likewise, the use of e-cigarettes was assessed using multiple questions. Since the product was relatively new, the survey described e-cigarettes as ‘electronic devices that deliver nicotine in a vapour and look like cigarettes, but contain no tobacco.’ Respondents who had ever used e-cigarettes were coded as current users if they had used them in the previous 30 days. Respondents were also asked about their ever use and current use (within the past 30 days) of the following approved quitting

aids: nicotine patches, nicotine gum, nicotine lozenges, nicotine spray/inhaler, Zyban (Wellbutrin, bupropion), and Chantix (varenicline).

Ever users of e-cigarettes were asked why they used e-cigarettes, and indicated yes or no for each of the following options: ‘safer than cigarettes,’ ‘cheaper than cigarettes,’ ‘easy to use when I can’t smoke,’ ‘to try to quit smoking cigarettes,’ or ‘just because.’ These options were presented in randomised order for each respondent to minimise the order effect in response. To assess susceptibility to using e-cigarettes in the future, respondents who had never used e-cigarettes were asked ‘How likely are you to try e-cigarettes in the future?’ Those who responded that they were very likely or somewhat likely to use e-cigarettes were considered to be susceptible, as were those who had tried e-cigarettes but were not currently using them.<sup>1 37</sup>

### Analysis

The 2010 US Current Population Survey was used to calculate weighted percentages.<sup>36</sup> A poststratification adjustment was used to account for non-response, for non-coverage, and undersampling and oversampling resulting from the KnowledgePanel survey-specific sampling design. An adjustment for the oversampling of smokers produced an overall smoking prevalence for the USA of 19.1%, equivalent to a national estimate of 19.3% based on the 2010 National Health Interview Survey.<sup>38</sup> Results were analysed by demographic categories (gender, age, educational level, ethnic background) and by smoking status. Demographic characteristics were examined as potential confounders of mental health status and e-cigarette outcomes. Gender emerged as the only possible confounder, and only for the outcome of ever use of e-cigarettes. A logistic regression with gender, mental health status, and the interaction term confirmed that gender and the interaction were not significantly related to the outcome with mental health status in the model, and that the findings for mental health status were robust. SEs were calculated and 95% CIs were computed based on the sampling distribution of the corresponding summary statistic. CIs for binomial proportions were computed using the method of Agresti and Coull.<sup>39 40</sup> P values were determined using logistic regression, with a Holm’s adjustment to protect against family-wise error from the large number of comparisons.<sup>41</sup> All calculations were done using R 2.12.1.<sup>42</sup>

## RESULTS

**Table 1** shows the demographic breakdown for those who endorsed at least one of the MHC: depression, anxiety disorder, or ‘other mental health condition.’ Those with MHC were more likely to be female (p<0.01). Other differences in ethnicity and age were not significant using a Holm-adjusted p value.

**Table 2** provides the breakdown of mental health condition by smoking status. Overall, the adjusted prevalence of MHC was 17.2%; 13.7% reported being diagnosed with depression, 8.6% with anxiety disorder, and 3.6% with some other mental health condition. Among those with any mental health condition, depression was the most commonly reported (79.4%), followed by anxiety disorder (49.7%); the least common was some other MHC which was reported by 21.0% of those with any MHC. Seventy percent of respondents who reported any MHC reported having a single condition, 30% reported having two, and 10% reported having all three (data not shown). Current smokers and recent former smokers had significantly higher rates of self-reported MHC (27.8% and 26.0%, respectively) than did non-smokers (13.4%) or long-term former smokers

**Table 1** Demographics by mental health condition

Demographic	Total	Mental health condition (n=1905)	No mental health condition (n=8045)
Gender*			
Female	52.0 (50.5 to 53.5)	63.5 (60.1 to 66.7)	49.3 (47.7 to 50.9)
Age			
18–29	20.4 (19.0 to 21.8)	20.1 (17.0 to 23.2)	20.3 (18.7 to 21.9)
30–44	25.9 (24.5 to 27.3)	26.9 (23.6 to 30.2)	25.5 (23.9 to 27.1)
45–59	28.0 (26.8 to 29.2)	31.2 (28.3 to 34.1)	27.3 (25.9 to 28.7)
60+	25.7 (24.6 to 26.8)	21.7 (19.2 to 24.2)	26.9 (25.7 to 28.1)
Education			
High school or less	42.5 (41.0 to 44.0)	46.6 (43.1 to 50.1)	41.7 (40.1 to 43.3)
Ethnicity			
White	67.6 (66.1 to 69.1)	71.8 (68.5 to 75.1)	66.7 (65.1 to 68.3)
Black	11.3 (10.3 to 12.3)	10.3 (1.2 to 20.8)	11.5 (10.3 to 12.7)
Hispanic	13.9 (12.7 to 15.1)	11.6 (8.9 to 14.3)	14.3 (12.9 to 15.7)
Other	6.0 (5.2 to 6.8)	4.5 (2.9 to 6.1)	6.2 (5.2 to 7.2)
Multiracial	1.3 (1.1 to 1.5)	1.7 (0.9 to 2.5)	1.2 (1.0 to 1.4)

\*p Value (with Holm adjustment) <0.01.

(16.4%). Never were marginally different from long-term former smokers ( $p=0.01$ , unadjusted value,  $p=0.025$  with the Holm adjustment).

Table 3 presents data on the ever use and current use of a range of US Food and Drug Administration-approved quitting aids for those who had ever smoked cigarettes comparing across mental health status. Ever smokers with MHC were significantly more likely to have ever used a quitting aid (52.2%) than those without (31.1%,  $p<0.01$ ), as well as to currently be using a quitting aid (9.9% and 3.5%, respectively,  $p<0.01$ ). Each product was significantly more likely to be used by individuals with MHC than by those without, except for the nicotine inhaler/spray where the rates were comparable across mental health status. Use of bupropion was three times as high (for ever use) and six times as high (for current use) among those with MHC compared to those without. Bupropion is an antidepressant (under the name Wellbutrin), but is also prescribed as a cessation aid under the name Zyban. In this study, participants were not asked whether their use of bupropion was for depression, cessation, or both. However, removing bupropion from the analysis of ever use and current use of a quitting aid did not change the conclusions that those with MHC were more likely to have ever used approved cessation aids compared to those without MHC (28.6%, 95% CI 25.1 to 32.1 vs 23.2%, 95% CI 21.6 to 24.8, respectively,  $p<0.01$ ) although the current rates of use by ever smokers were not statistically different by mental health status (5.5%, 95% CI 3.7 to 7.3 vs 3.1%, 95% CI 2.5 to

3.7 for MHC and no MHC, respectively,  $p>0.05$ ). Additionally, smokers with MHC who had used any quitting aid were more likely to have tried multiple quitting aids. Removing bupropion from the analysis (since it is an antidepressant that is also used as a cessation aid), those with MHC had used an average of 1.90 different quitting aids compared to an average of 1.68 for those without MHC ( $p<0.001$ ).

Across smoking status, the rate of ever using e-cigarettes was 8.1% (table 4). Rates were significantly higher for current smokers and recent former smokers (32.2% and 26.8%, respectively) than for long-term former smokers or for non-smokers of conventional cigarettes (2.4% and 1.0%, respectively). Overall, participants with MHC were twice as likely to have tried e-cigarettes (14.8%) as those without (6.6%,  $p<0.01$ ). Over 40% of current smokers with MHC had tried e-cigarettes compared to 28.7% of current smokers without such conditions, a statistically significant difference ( $p<0.01$ ).

Current use of e-cigarettes was much lower than ever use (1.4% vs 8.1%). However, the pattern for current use was similar to the pattern for ever having used e-cigarettes (second row of table 4). Rates were significantly higher for current and recent former smokers (6.3% and 6.1%) than for long-term former smokers or non-smokers (0.2% and 0.04%). Although there was a trend toward more current smokers with MHC being dual users (ie, use conventional cigarettes and e-cigarettes) than those without MHC, the difference was not significant (8.6% vs 5.4%,  $p=0.056$ ).

**Table 2** Mental health condition by smoking status

	Total	Never smokers (n=3254)	Long-term former smokers* (n=3263)	Recent former smokers† (n=413)	Current smokers (n=3111)
Depression	13.7 (12.7 to 14.7)	10.1 (8.7 to 11.5)	13.2 (11.6 to 14.8)	20.6 (15.3 to 25.9)	23.4 (20.9 to 25.9)
Anxiety disorder	8.6 (7.8 to 9.4)	6.4 (5.2 to 7.6)	6.6 (5.4 to 7.8)	18.7 (13.2 to 24.2)	15.5 (13.3 to 17.7)
Other mental health	3.6 (3.1 to 4.1)	2.2 (1.4 to 3.0)	3.0 (2.2 to 3.8)	5.9 (3.2 to 8.6)	7.9 (6.3 to 9.5)
Any mental health condition	17.2 (16.1 to 18.3)	13.4 (11.9 to 14.9) <sup>a</sup>	16.4 (14.8 to 18.1) <sup>a</sup>	26.0 (20.3 to 31.6) <sup>b</sup>	27.8 (25.1 to 30.5) <sup>b</sup>

\*Smokers who quit more than a year ago at the time of survey.

†Smokers who quit within a year or less at the time of survey.

<sup>a,b</sup>Statistics with differing subscripts are statistically different (with Holm adjustment)  $p<0.01$ .

**Table 3** Use of quitting aids by mental health condition among ever smokers

	Total	Mental health condition (n=1477)	No mental health condition (n=5262)
<b>Ever tried</b>			
Nicotine patches	21.7 (20.3 to 23.1)	31.4 (27.9 to 34.9)	18.9 (17.5 to 20.3)
Nicotine gum	25.3 (23.0 to 27.6)	30.7 (27.2 to 34.2)	17.4 (16.0 to 18.8)
Nicotine lozenges	5.7 (4.9 to 6.5)	10.1 (7.6 to 12.6)	4.5 (3.7 to 5.3)
Nicotine spray/inhaler	1.3 (0.9 to 1.7)	2.0 (0.8 to 3.2)	1.1 (0.6 to 1.6)
Zyban or Wellbutrin (bupropion)	11.4 (10.4 to 12.4)	23.7 (20.6 to 26.8)	7.9 (6.9 to 8.9)
Chantix (varenicline)	9.0 (8.1 to 9.9)	12.6 (10.2 to 15.0)	7.9 (6.9 to 8.9)
Ever tried any* (with bupropion)	35.8 (34.2 to 37.4)	52.2 (48.3 to 56.1)	31.1 (29.3 to 32.9)
Ever tried any* (without bupropion)	24.5 (23.0 to 26.0)	28.6 (25.1 to 32.1)	23.2 (21.6 to 24.8)
<b>Current use</b>			
Nicotine patches	1.5 (1.1 to 1.9)	2.0 (1.0 to 3.0)	1.4 (1.0 to 1.8)
Nicotine gum	1.7 (1.3 to 2.1)	2.8 (1.5 to 4.1)	1.4 (1.0 to 1.8)
Nicotine lozenges	1.1 (0.7 to 1.5)	1.7 (0.5 to 2.9)	0.9 (0.5 to 1.3)
Nicotine spray/inhaler	0.3 (0 to 0.6)	0.9 (0 to 2.0)	0.1 (0 to 0.3)
Zyban or Wellbutrin (bupropion)	1.8 (1.4 to 2.2)	5.2 (3.8 to 6.6)	0.8 (0.5 to 1.1)
Chantix (varenicline)	0.7 (0.4 to 2.2)	5.2 (3.8 to 6.6)	0.8 (0.5 to 1.1)
Currently use any* (with bupropion)	4.9 (4.2 to 5.6)	9.9 (7.7 to 12.1)	3.5 (2.9 to 4.1)
Currently use any* (without bupropion)	3.6 (3.0 to 4.2)	5.5 (3.7 to 7.3)	3.1 (2.5 to 3.7)

\*p Value (with Holm adjustment) <0.01.

The most common reason survey participants gave for trying e-cigarettes was 'just because' (68.9%), followed by 'to try and quit smoking cigarettes' (55.2%), 'safer than cigarettes' (51.2%), and 'easy to use when I can't smoke' (46.7%). The least common reason was that they were 'cheaper than cigarettes' (31.3%). Although participants with MHC were more likely to endorse all the reasons than those without, none of the differences reached significance (table 5).

Table 6 shows that the susceptibility to using e-cigarettes in the future was significantly higher among current smokers than among recent former smokers (49.5% vs 24.9%). Recent former smokers were, in turn, more susceptible than long-term former smokers (3.3%) or never smokers (2.6%). Long-term former smokers were not significantly more susceptible than those who have never smoked. The table also indicates that only among current smokers does the difference in susceptibility between those with MHC and those without reach significance. Over 60% of current smokers with MHC are susceptible to using e-cigarettes compared to 45% of smokers without MHC ( $p < 0.01$ ).

## DISCUSSION

This is the first study to demonstrate that individuals with MHC are more likely to try e-cigarettes, to be current users of e-cigarettes, and to be susceptible to future use of e-cigarettes. This study also showed that individuals with MHC were more likely to smoke cigarettes than those without MHC, which is consistent with earlier research in the field.<sup>8 9 11</sup> Smokers with MHC meet all the criteria for classification as a tobacco disparity group, including higher tobacco prevalence, higher levels of nicotine dependence, lower cessation rates, disproportionate health burden from tobacco use, and so on.<sup>7</sup> The finding that smokers with MHC are differentially susceptible to e-cigarette use is an important step in the surveillance and treatment of this priority population.

Although smokers with MHC are more susceptible to e-cigarette use than those without MHC, it should be noted that they appear to use e-cigarettes for the same reasons. Some are experimenting with the product, but many indicate they are using e-cigarettes to quit smoking regular cigarettes or to reduce the harm associated with regular cigarettes. We found that

**Table 4** Ever and current use of e-cigarettes by mental health condition and smoking status

	Total	Never smokers (n=3254)	Long-term former smokers* (n=3263)	Recent former smokers† (n=413)	Current smokers (n=3111)
<b>Ever use of e-cigarettes</b>					
Mental health condition	14.8 (12.4 to 17.2)	0.5 (0 to 1.0)	3.3 (1.1 to 5.6)	31.0 (19.2 to 42.8)	40.3 (34.6 to 46.0)
No mental health condition	6.6 (5.9 to 7.3)	1.1 (0.6 to 1.6)	2.2 (1.6 to 2.9)	25.7 (19.6 to 31.9)	28.7 (25.5 to 31.9)
Total	8.1 (7.4 to 8.8)	1.0 (0.6 to 1.5) <sup>a</sup>	2.4 (1.7 to 3.1) <sup>b</sup>	26.8 (21.4 to 32.2) <sup>c</sup>	32.2 (29.3 to 35.0) <sup>c</sup>
<b>Current use of e-cigarettes</b>					
Mental health condition	3.1 (2.0 to 4.3)	0.2 (0 to 0.5)	0.3 (0 to 0.8)	7.5 (0.5 to 14.4)	8.6 (5.3 to 12.0)
No mental health condition	1.1 (0.8 to 1.4)	0 (0 to 0)	0.1 (0 to 0.3)	5.6 (2.7 to 8.5)	5.4 (3.8 to 6.9)
Total	1.4 (1.1 to 1.7)	0.4 (0 to 0.1) <sup>a</sup>	0.2 (0 to 0.3) <sup>a</sup>	6.1 (3.3 to 8.9) <sup>b</sup>	6.3 (4.8 to 7.7) <sup>b</sup>

\*Smokers who quit more than a year ago at the time of survey.

†Smokers who quit within a year or less at the time of survey.

<sup>a,b,c</sup>Statistics with differing subscripts are statistically different (with Holm adjustment)  $p < 0.01$ .



**Table 5** Reasons for use of e-cigarettes by mental health status\*

	Total	Mental health condition (n=359)	No mental health condition (n=813)
Safer than cigarettes	51.2 (46.3 to 56.1)	54.6 (44.9 to 64.3)	48.5 (42.3 to 54.7)
Cheaper than cigarettes	31.3 (26.8 to 35.8)	36.7 (27.5 to 45.9)	27.9 (22.7 to 33.1)
Easy to use when I can't smoke	46.7 (41.8 to 51.6)	50.4 (40.6 to 60.2)	42.5 (36.6 to 48.4)
To try to quit smoking cigarettes	55.2 (50.4 to 60.0)	59.6 (50.0 to 69.2)	52.9 (46.8 to 59.0)
Just because	68.9 (64.6 to 73.2)	69.6 (61.3 to 77.9)	67.4 (62.0 to 72.8)

\*The order of these options was randomised for individual respondents to minimise the order effect in response.

e-cigarettes appeal most to smokers and, to a lesser degree, recent quitters, and that this is true among individuals with MHC and among those without. Never smokers and former smokers who quit smoking over a year appear to have very low susceptibility to using e-cigarettes, regardless of MHC. At present, e-cigarettes do not appear to be attractive to those who do not smoke, even though e-cigarettes have been marketed as a way to cope with depression and anxiety.

What explains the greater use and susceptibility to using e-cigarettes seen among individuals with MHC? One possible explanation is that e-cigarette use is an extension of the tendency to use approved quitting aids. Although e-cigarettes are not approved as cessation aids (in fact, it is illegal to make the claim that they are effective aids to quitting), many smokers view them as such, regardless of mental health status. In this study, smokers with MHC were more likely to have used approved cessation aids than their non-MHC counterparts; they seem to find the use of cessation aids, such as nicotine replacement therapy and other pharmacotherapies, more acceptable. By extension, they may find e-cigarettes more acceptable as well.

The greater use of approved cessation aids may also reflect an acceptance by individuals with MHC that quitting may be particularly difficult for them. Although research has shown that smokers with mental health disorders benefit from cessation treatment, they typically have poorer cessation outcomes.<sup>9 14 43</sup> The current study found that smokers with MHC were more likely than those without MHC to have used approved aids, and were more likely to have tried two, three, or four of them. Even when bupropion, which is an antidepressant also used as a cessation aid, was removed from the analysis, those with MHC were more likely to have tried two or three of the approved aids. Perhaps, having failed to quit using other strategies, they are looking to try something new and may be open to using e-cigarettes or one of the newer nicotine delivery devices.<sup>44</sup>

This study has some limitations, mostly related to the use of self-report for MHC, e-cigarette use, and reasons for using

e-cigarettes. At the time of enrolment into the KnowledgePanel survey, participants were asked about three MHC as part of their health profile: depression, anxiety disorder, or 'mental health condition.' No guidance was given as to the definition of each except to indicate whether they had ever been diagnosed by a healthcare provider with any of the listed conditions. As a result, there could have been some overendorsement, particularly of depression, since that term is broadly used. The 13.7% rate of depression reported here is slightly lower than the 16% lifetime prevalence of depression reported in the National Comorbidity Survey Replication (NCS-R) study.<sup>45</sup> Overendorsement is unlikely to have affected our findings. The use of e-cigarettes is also self-report, although there is little reason to think that survey participants would not remember having used the products or that they would misrepresent their use of them. Respondents selected their reasons for using e-cigarettes from options provided, which did not include other possibilities, such as a way to self-medicate or cope with psychological issues.

## CONCLUSIONS

Limitations notwithstanding, data from this study clearly indicate that smokers with MHC are more susceptible to the use of e-cigarettes than are smokers without these conditions. They use e-cigarettes for the same reasons as other smokers—as quitting aids, and because they perceive them to be less harmful than smoking. Equally clear is the fact that e-cigarettes appeal to smokers, but not to those who have never smoked or who quit smoking for more than a year. In the near future, regulations, social norms and guidelines on the use of e-cigarettes in treatment settings are likely to change rapidly. We urge ongoing assessment of mental health status in order to be able to determine if new regulations on pricing, access to e-cigarettes, bans related to e-cigarettes, and the like affect individuals with MHC differentially, and whether differences in use and susceptibility serve to increase or decrease health disparities of this priority population.

**Table 6** Susceptibility to using e-cigarettes in the future\*

	Total	Never smokers (n=3254)	Long-term former smokers† (n=3263)	Recent former smokers‡ (n=413)	Current smokers (n=3111)
Mental health condition	21.4 (18.7 to 24.1)	2.8 (0.8 to 4.8)	4.9 (2.4 to 7.4)	29.5 (17.9 to 41.1)	60.5 (54.8 to 66.2)
No mental health condition	10.1 (9.2 to 11.0)	2.6 (1.8 to 3.4)	3.1 (2.3 to 3.9)	23.8 (17.5 to 30.1)	45.3 (41.6 to 49.0)
Over-all	12.0 (11.1 to 12.9)	2.6 (1.8 to 3.4) <sup>a</sup>	3.3 (2.5 to 4.1) <sup>a</sup>	24.9 (19.4 to 30.4) <sup>b</sup>	49.5 (46.4 to 52.6) <sup>c</sup>

\*Sample excludes those who reported current use of e-cigarettes.

†Smokers who quit more than a year ago at the time of survey.

‡Smokers who quit within a year or less at the time of survey.

<sup>a,b,c</sup>Statistics with differing subscripts are statistically different (with Holm adjustment) <0.01.

## What this paper adds

- ▶ This is the first study to demonstrate that individuals with mental health conditions are more likely to try e-cigarettes, to be current users of e-cigarettes, and to be susceptible to future use of e-cigarettes.
- ▶ Individuals with mental health conditions use e-cigarettes for the same reasons that other smokers do—primarily to quit smoking regular cigarettes or to reduce the harm associated with regular cigarettes.
- ▶ Use of e-cigarettes by smokers with mental health conditions may be an extension of their tendency to use approved quitting aids.

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