Motives and Perceptions Regarding Electronic Nicotine Delivery Systems (ENDS) Use among Adults with Mental Health Conditions

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Abstract

Background—Smoking rates are disproportionately high among adults with mental health conditions (MHC), and recent research suggests that among former smokers, those with MHC are more likely to use electronic nicotine delivery systems (ENDS). This study investigated reasons for ENDS use and related risk perceptions among individuals with versus without MHC.

Methods—Among adult current ENDS users (*n* = 550), associations between self-reported MHC diagnoses and motives for ENDS use and ENDS risk perceptions were examined, stratified by smoking status.

Results—There were no significant associations between MHC status and ENDS motives or perceptions in the overall sample. However, current smokers with MHC indicated thinking more about how ENDS might improve their health, and former smokers with MHC reported thinking less about how ENDS might harm their health, compared to their counterparts without MHC.

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Former smokers with MHC rated several reasons for ENDS use (e.g., less harmful than regular cigarettes; to quit smoking; appealing flavors) as more important than did those without MHC.

Conclusions—Current and former smokers with MHC may be especially optimistic about health benefits of ENDS. However, they might also be prone to health risks of continued ENDS use or concurrent use with traditional cigarettes. It will be important for public health messaging to provide this population with accurate information about benefits and risks of ENDS.

Keywords

mental health conditions; electronic nicotine delivery devices; e-cigarettes; risk perceptions

1. Introduction

Cigarette smoking rates are disproportionately high among adults with mental health conditions (MHC) [1–5]. Smokers with MHC also tend to have higher levels of tobacco dependence and more difficulty quitting [2,3,6]. Individuals with MHC are at heightened risk for tobacco-related morbidity and mortality [5]. There is an urgent need to identify effective harm reduction and smoking cessation strategies for smokers with MHC, and although more research is needed, electronic nicotine delivery systems (ENDS; e.g., e-cigarettes) could have potential in this regard [7,8]. Two U.S. nationally representative surveys suggest that adults with MHC use ENDS at higher rates than those without MHC [9,10]. In a 2012 survey, among current smokers, those with MHC were more likely to have used e-cigarettes [9]. In 2015, former smokers with MHC were more likely to have used ENDS than those without MHC [10]. However, reasons for using ENDS and risk/benefit perceptions among individuals with MHC, as well as how they might differ from those without MHC, are unclear. An understanding of these factors will be critical to inform public health messaging about ENDS for this priority population.

Recent studies have increased our knowledge of reasons for ENDS use in general adult populations [11–16]. ENDS users commonly report using these products in efforts to quit or reduce smoking, to be considerate of others, or as a way to self-administer nicotine when smoking is not allowed [11–16]. Although there is a relative dearth of ENDS-related research among individuals with MHC, recent studies have begun to examine this topic. Hefner et al. [17] reported that among current smokers with MHC, e-cigarette users reported the ability to use these products in non-smoking areas, saving money, and reducing harm to others as reasons for use. Perceived health benefits and reducing or quitting smoking are common reasons for e-cigarette use among patients with schizophrenia [18]. Recent studies suggest that approximately half of smokers who were patients in community mental health centers were interested in e-cigarettes to help them quit smoking [19], and among smokers with serious mental illness, those using e-cigarettes indicated greater intent to quit smoking [20]. In a nationally representative survey, former smokers with MHC were twice as likely to have switched to ENDS in a past smoking quit attempt than those without MHC [10]. Scant research has directly compared reasons for ENDS use among adults with vs. without MHC; Cummins et al. [9] found that reasons for using ENDS did not differ significantly by MHC status.

Almost 40% of adults misperceive that ENDS are equally or more harmful than regular cigarettes, a percentage that has tripled in the last four years [21]. It will be important to understand whether individuals with MHC are more or less prone to misperceptions about ENDS, compared to those without MHC. Although little research has examined ENDS risk perceptions among people with MHC, a recent study found that only 34% of patients with schizophrenia considered e-cigarettes less harmful than traditional cigarettes [18]. Miller et al. [22] found that although there were no differences in negative expectancies, smokers with severe psychological distress indicated more positive expectancies of ENDS (i.e., for positive social effects and weight control) than those without severe distress. It is possible that smokers with MHC are more optimistic about the potential benefits of ENDS than those without MHC.

Continued research is needed to understand whether individuals with MHC have more or less positive perceptions of ENDS compared to those without MHC, and it will be important to examine this question separately among current, former, and never smokers. For example, it might behoove current smokers with MHC to consider the reduced harm caused by ENDS compared to traditional cigarettes. Conversely, it would be concerning if never smokers with MHC perceive ENDS as "safe," as these devices are not harmless [23,24]. This study sought to elucidate reasons for ENDS use, ENDS risk perceptions, and thoughts about potential health harms and benefits of ENDS among adult ENDS users with vs. without MHC.

2. Methods

2.1. Procedure and Sample

Data were drawn from the 2015 Tobacco Products and Risk Perceptions Survey conducted by the Georgia State University (GSU) Tobacco Center of Regulatory Science. This cross-sectional survey involved a probability sample and representative oversample of cigarette smokers from GfK's KnowledgePanel (a probability-based web panel designed to be representative of non-institutionalized U.S. adults [25]). Data were collected between August-September 2015, and participants were provided with small cash-equivalent compensation. This study was approved by the GSU Institutional Review Board.

A total of 8,135 KnowledgePanel members were invited to participate. Of the 6,091 completers, 38 from the general population sample and 2 from the smoker augment sample were excluded for not answering more than half the survey questions, yielding a sample of 6,051. Following closure of the survey, a study-specific post-stratification weight was computed using an iterative proportional fitting (raking) procedure to adjust for survey non-response and oversampling of smokers. Demographic and geographic distributions from the most recent Current Population Survey were employed as benchmarks for adjustment, and included gender, age, race/ethnicity, education, household income, census region, metropolitan area, and internet access. Participants who indicated current ENDS use ($n = 550$) were included in this study.

2.2. Measures

2.2.1. Demographic characteristics—Gender, age, race/ethnicity, education, and annual household income were obtained from GfK profile surveys.

2.2.2. Mental Health Condition (MHC)—Participants were asked if they had ever been "diagnosed by a doctor or other qualified medical professional" with several medical conditions, including the following MHCs: anxiety disorder, bipolar disorder, depression, mood disorder, schizoaffective disorder, schizophrenia, and other mental conditions. Participants were coded as having MHC if they reported any of the above [9]. Participants also indicated whether they had ever seen a psychiatrist, psychologist, or social worker for counseling or therapy.

2.2.3. Smoking Status—Participants who reported smoking at least 100 cigarettes in their lifetime were asked, "Do you currently smoke cigarettes every day, some days, or not at all?". Those who responded "every day" or "some days" were considered current smokers, and those who responded "not at all" were considered former smokers. Participants who denied having smoked at least 100 cigarettes in their lifetime were considered never smokers.

2.2.4. ENDS Use—Participants were provided a description of ENDS (e.g., e-cigarettes, e-cigars, vape pens, personal vaporizers/mods) and shown pictures of prototypical devices. Then, participants indicated whether they had ever used ENDS. Those who reported having used ENDS were asked, "Do you now use electronic vapor products every day, some days, rarely, or not at all?". Those who responded "every day," "some days," or "rarely" were considered current ENDS users and included in this study [26,27].

2.2.5. Reasons for ENDS Use—Participants rated the importance of several reasons for ENDS use with a 7-point scale ranging from "Not at all important" to "Very important." Reasons were: (a) "I could use them in places where regular cigarette smoking isn't allowed;" (b) "Electronic vapor products are less harmful to me than regular cigarettes;" (c) "Electronic vapor products are less harmful to those around me than regular cigarettes;" (d) "Electronic vapor products could help me quit smoking regular cigarettes;" (e) "Electronic vapor products could help me reduce the number of regular cigarettes I smoke;" (f) "Using an electronic vapor product feels like smoking a regular cigarette;" (g) "Electronic vapor products are more acceptable than regular cigarettes;" (h) "To satisfy my curiosity;" and (i) "They come in flavors I like." Items were based on the Population Assessment of Tobacco and Health (PATH) study [28] and have been linked to patterns of ENDS use [16].

2.2.6. Perceptions of ENDS

2.2.6.1. Risk Perceptions: Participants were asked, "Is using electronic vapor products less harmful, about the same, or more harmful than smoking regular cigarettes?" Options were "less harmful," "about the same level of harm," more harmful," and "I don't know" (adapted from PATH [28]). Because only a small proportion of participants responded "more harmful," the "about the same" and "more harmful" categories were combined [21]. Studies

support the validity of measures comparing perceived harm from ENDS versus cigarettes [21,29,30].

2.2.6.2. Thoughts about Health Risks and Benefits: Participants were asked: 1) "How much do you think about how using electronic vapor products might harm your health" and 2) "How much do you think about how using electronic vapor products might improve your health," ("a lot," "a little," "not at all"). Items were adapted from PATH [28], the National Adult Tobacco Survey [31], and Slovic [32].

2.3. Statistical Analysis

SAS 9.4 was used to obtain weighted point estimates and 95% confidence intervals, stratified by MHC and smoking status. Associations between MHC and variables of interest were examined using Rao-Scott χ^2, weighted independent-samples t tests of mean differences, and weighted ordinal logistic regression. For ordinal logistic regression, the proportional odds assumption was tested and found to be tenable. Analyses were stratified by smoking status.

3. Results

3.1. Participant Characteristics

Demographic variables are shown in Table 1. Compared to ENDS users without MHC, those with MHC were more likely to be female and indicated lower income levels. In this sample of ENDS users, 27.4% (95% CI: 22.1, 32.7) reported having been diagnosed with MHC. The distribution of disorders is shown in Table 2. The most common disorders were depression (19.8%; 95% CI: 14.9, 24.6) and anxiety (15.6%; 95% CI: 11.3, 20.0). The majority (79.8%; 95% CI: 71.3, 88.4) of participants with MHC reported having sought counseling or therapy.

3.2. Reasons for ENDS Use

Table 3 shows mean ratings of reasons for using ENDS, by MHC and smoking status. There were significant associations between MHC status and reasons for ENDS use specifically among former smokers. Compared to former smokers without MHC, former smokers with MHC gave higher importance ratings for the following reasons for ENDS use: using them in places where regular smoking is not allowed (t[78] = 2.48, p = .014); less harmful to self than regular cigarettes (t[78] = 2.86, p = .004); less harmful to others than regular cigarettes (t[78] = 3.26, p = .001); quitting smoking (t[78] = 2.42, p = .016); reducing smoking (t[78] = 3.77, p = .0002); and appealing flavors (t[79] = 3.83, p = .0001). With Bonferroni adjustment for multiple comparisons, the above results with p ≤ .001 would remain significant.

3.3. Perceptions of ENDS

3.3.1 Risk Perceptions—There were no significant associations between MHC and whether participants perceived that ENDS were less, equally, or more harmful than traditional cigarettes (Table 4).

3.3.2. Thoughts about Health Risks and Benefits—There was not an overall association between MHC and thoughts about health harms of ENDS (Table 5). However, among former smokers, participants with MHC indicated thinking less about how ENDS might harm their health, *OR* = 0.23 (95% CI: 0.06, 0.84), *p* = .026. Whereas only 3.7% of former smokers with MHC thought "a lot" about how ENDS might harm their health, one-quarter (24.5%) of former smokers without MHC thought a lot about health consequences of ENDS. Although 53.2% of former smokers with MHC reported thinking "not at all" about how ENDS might harm their health, 22.6% of those without MHC denied thinking about how ENDS might harm their health.

There was also not an overall association between MHC and frequency of thoughts about ENDS health benefits (Table 5). However, among current smokers, those with MHC indicated thinking more about how ENDS might improve their health, *OR* = 1.86 (95% CI: 1.03, 3.35), *p* = .041. Among current smokers, 30.1% of those with MHC (vs. 16.4% of those without MHC) reported thinking "a lot" about how ENDS might improve their health. Whereas 28.4% of current smokers with MHC reported thinking "not at all" about how ENDS might improve their health, 39.3% of those without MHC denied thinking about health benefits of ENDS.

4. Discussion

Recent research has documented relatively high rates of ENDS use among adults with MHC [9,10], a population at heightened risk for tobacco-related disparities [2,3,5,6,33]. This priority population could have much to gain from ENDS as a harm reduction and/or smoking cessation tool [34], but could also be at higher risk for consequences of continued ENDS use, particularly if used in conjunction with traditional cigarettes (i.e., dual use). In order to inform appropriate public health messaging, it will be critical to understand why adults with MHC are using ENDS, how they perceive potential risks and benefits, and whether ENDS use increases the likelihood of complete cessation of combustible tobacco. In this study, there were no associations between MHC status and ENDS motives or perceptions in the overall sample. However, former smokers with MHC rated several reasons for ENDS use (e.g., less harmful than regular cigarettes; to reduce smoking) as more important than those without MHC. Former smokers with MHC reported thinking less about potential harms, and current smokers with MHC indicated thinking more about health benefits of ENDS, compared to their counterparts without MHC. Overall, current and former smokers with MHC may be especially optimistic about health benefits of ENDS. However, they might also be prone to health risks of continued ENDS use, particularly if smokers with MHC continue to use both ENDS and traditional cigarettes.

Small pilot studies suggest that ENDS use is associated with reducing or quitting smoking among current smokers with MHC [7,8], and if confirmed in larger controlled studies, smokers with MHC should be aware of these benefits. In our sample, current smokers with vs. without MHC did not differ in their reasons for using ENDS or their perceptions of ENDS harms. However, current smokers with MHC did indicate thinking more about how ENDS might improve their health. This finding dovetails with Miller et al.'s [22] finding that smokers with psychological distress indicated more positive (but not negative)

expectancies for ENDS use compared to those without severe distress. Given that smokers with MHC often have difficulty quitting [3,6] and may be frustrated with traditional cessation approaches, they might be particularly drawn to novel methods. However, the evidence regarding ENDS as a cessation tool in the general population is not definitive [35–41], and much less research has focused on smokers with MHC. Furthermore, for individuals with MHC who use both traditional cigarettes and ENDS (i.e., dual users), ENDS could potentially delay or discourage smoking cessation [23,42]. Public health messaging might emphasize to smokers with MHC that ENDS could offer a less harmful alternative to smoking but that continued dual use could be counterproductive.

Among adults who successfully quit smoking, those with MHC are more likely to relapse [3]. ENDS could offer former smokers with MHC a safer method of self-administering nicotine, thereby helping them to refrain from smoking (although FDA-approved nicotine replacement therapy would be a preferred mode of nicotine administration). However, ENDS could serve to maintain addiction (a significant concern given that MHC's are frequently comorbid with and involve common neurobiological pathways with addictive disorders [43–46]) or even increase likelihood of returning to smoking [47]. Results suggest that former smokers with MHC place higher importance on several reasons for ENDS use, including harm reduction, smoking cessation, and availability of appealing flavors. These individuals may be effectively using ENDS to avoid traditional cigarettes, but the high interest in flavors could potentially prolong ENDS use. Cummins et al. [9] did not find significant differences in reasons for ENDS use between adults with vs. without MHC. However, results were not presented separately by smoking status. It is possible that former smokers with MHC have greater confidence in the potential for ENDS to prevent smoking relapse.

Interestingly, MHC status was not associated with importance ratings for any of the reasons for ENDS use among current smokers. It is unclear why former smokers but not current smokers with MHC report harm reduction and quitting smoking as especially important reasons for ENDS use. Perhaps among former smokers, those with MHC attribute more of their quitting success to ENDS. This could be reflective of the common finding that individuals with MHC (particularly depression, the most common MHC in our sample) are more likely to attribute positive events to external factors and negative events to internal factors [48,49]. More research is needed to understand how smokers with MHC make attributions regarding quitting success.

Former smokers with MHC indicated thinking less about potential health harms of ENDS than those without MHC. If ENDS help these individuals to remain abstinent from smoking and long-term studies do not reveal significant health risks (at least relative to smoking), this may not be problematic. However, they could be more susceptible to ENDS use for a longer time after quitting smoking. ENDS are not harmless and more research is needed to understand their long-term health effects [23,24,42,50], particularly for disparity populations. It may be important to communicate to former smokers with MHC that while ENDS use is less harmful than smoking, it is not without health risks.

ENDS could have health consequences for never smokers with MHC. Concerns have been raised about ENDS experimentation as a gateway to compulsive nicotine use among non-smokers [47,51]. Individuals with MHC have been targeted by the tobacco industry [52,53], and ENDS may now be marketed toward people with MHC regardless of their smoking status [9]. ENDS marketing has referenced celebrities using e-cigarettes to cope with stress [54] and highlighted social inclusion [55], both of which could appeal to non-smokers with MHC. In discussing ENDS, one celebrity indicated "...it is not bad for you, so it's a fun addiction" [56]. Such appeals could draw individuals with MHC who do not currently smoke but are at heightened risk for addiction. In our study, there were no differences in ENDS motives or risk perceptions among never smokers with vs. without MHC. However, as noted below, statistical power was limited in this subgroup and these results should be interpreted with caution.

Limitations must be noted. This study relied on self-reported MHC, ENDS use and smoking behavior using a cross-sectional design. Longitudinal cohort data are needed for understanding associations between MHC and ENDS perceptions and use over time. Participants indicated whether they had ever been diagnosed with MHC, and those who noted MHC may or may not currently meet diagnostic criteria. Most participants who reported MHC also indicated having received counseling or therapy, which increases our confidence that self-reported conditions represented clinically significant symptoms. However, future research should examine current condition status, symptom severity, and the extent to which participants are using ENDS for symptom management. Analyses considered MHC diagnoses overall rather than by specific disorder, as sample sizes for several disorders were small, especially when stratified by smoking status. Our web-based survey (designed to be representative of the non-institutionalized US adult population) may underrepresent those with serious MHC or severe acute symptoms. Those with more severe MHC are more likely to be institutionalized (psychiatric hospitalization, incarceration [57]) and therefore may be less well-represented. In addition, this study focused only on current ENDS users; future research should elucidate ENDS risk/benefit perceptions among non-users with vs. without MHC.

For some of the stratified analyses, statistical power was inadequate. Power analyses indicated that for t-tests to detect a medium effect size ($d = .50$) with .80 power and two-tailed $\alpha = .05$, 128 participants (64 per group) would be needed. Among the overall sample and current smokers, there was $> .99$ power to detect a medium effect size, increasing our confidence in the lack of differences in reasons for ENDS among current smokers with vs. without MHC. However, power was insufficient among the sub-samples of never smokers and former smokers. In particular, the lack of significant findings among never smokers should be interpreted with caution. Notably, despite limited power to detect differences among former smokers, there was a consistent pattern of results in this subgroup. Because multiple comparisons were conducted, we have greater confidence in differences that remained significant after Bonferroni correction (i.e., former smokers with MHC indicated that less harm to others, smoking reduction, and flavors were more important reasons for ENDS use). Continued research is needed to examine whether results are replicated in larger samples. This study adds to the small but growing literature on ENDS use among the priority population of individuals with MHC.

5. Conclusions

Although there were no associations between MHC status and ENDS motives or perceptions in our overall sample of ENDS users, there were significant differences among subgroups of current and former smokers. Among former smokers, those with MHC placed greater importance on a number of reasons for using ENDS, including ENDS as relatively less harmful products than combustible cigarettes. Current smokers with MHC indicated thinking more about how ENDS might improve their health, compared to those without MHC. Former and current smokers with MHC (vs. those without MHC) may perceive greater potential for ENDS as a less harmful alternative to regular cigarettes and/or as a smoking cessation aid. However, they might also be at greater risk for any health consequences of continued ENDS use or concurrent use with traditional cigarettes. It will be important for public health messaging to provide this population with accurate information about benefits and risks of ENDS.

Acknowledgments

List of Abbreviations

MHC   Mental Health Conditions

ENDS   Electronic Nicotine Delivery Systems

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Highlights

- Adults with and without mental health conditions (MHC) reported perceptions of ENDS

- Current smokers with MHC thought more about how ENDS might improve their health

- Former smokers with MHC thought less about how ENDS might harm their health

- Smokers with MHC may be especially optimistic about health benefits of ENDS

Table 1

Demographics (%, CI) by Mental Health Condition among Current ENDS Users.

Demographic Characteristic	Total n = 550	Mental Health Condition n = 172	No Mental Health Condition n = 378
Mental Health Condition	27.4 (22.1, 32.7)		
Gender**			
Female	50.4 (44.4, 56.5)	65.8 (55.3, 76.3)	44.6 (37.5, 51.7)
Age			
18–29	39.1 (32.9, 45.4)	31.1 (20.1, 42.1)	42.2 (34.8, 49.6)
30–44	29.6 (24.2, 34.9)	35.0 (24.1, 45.8)	27.5 (21.4, 33.6)
45–59	22.0 (17.5, 26.6)	23.0 (13.8, 32.2)	21.7 (16.4, 26.9)
60+	9.3 (6.6, 11.9)	10.9 (4.6, 17.3)	8.6 (5.8, 11.4)
Race/Ethnicity			
White, NH	59.0 (52.8, 65.1)	68.2 (57.2, 79.3)	55.5 (48.2, 62.3)
Black, NH	10.2 (6.1, 14.2)	8.0 (1.1, 15.0)	11.0 (6.1, 15.8)
Other, NH	8.0 (3.9, 12.1)	6.7 (1.1, 12.2)	8.5 (3.2, 13.7)
Hispanic	22.9 (17.6, 28.1)	17.1 (7.9, 26.3)	25.1 (18.7, 31.4)
Education			
< High School	19.6 (13.6, 25.5)	28.5 (15.5, 41.5)	16.2 (9.9, 22.5)
High School	31.8 (26.5, 37.1)	26.4 (17.8, 35.0)	33.9 (27.4, 40.4)
Some College	31.0 (25.6, 36.4)	30.5 (21.0, 40.1)	31.2 (24.7, 37.7)
Bachelor's Degree+	17.6 (13.4, 27.8)	14.6 (8.9, 20.3)	18.7 (13.4, 24.0)
Household Income*			
<$15,000	18.9 (13.9, 23.9)	31.7 (19.8, 43.7)	14.0 (9.3, 18.7)
$15,000–$24,999	6.6 (3.6, 9.7)	4.4 (1.3, 7.5)	7.5 (3.5, 11.5)
$25,000–$39,999	12.4 (8.9, 15.8)	11.0 (5.3, 16.7)	12.9 (8.7, 17.1)
$40,000–$59,999	14.3 (10.6, 18.0)	11.5 (6.0, 17.0)	15.3 (10.7, 20.0)
$60,000–$84,999	20.8 (16.1, 25.6)	15.6 (7.4, 23.8)	22.8 (17.1, 28.5)
$85,000–$99,999	10.3 (5.8, 14.8)	7.3 (2.6, 12.0)	11.5 (5.6, 17.3)
$100,000+	16.7 (12.0, 21.3)	18.5 (9.6, 27.3)	16.0 (10.5, 21.5)
Smoking Status			
Current Smoker	56.9 (50.7, 63.1)	68.2 (57.1, 79.4)	52.6 (45.4, 59.8)
Former Smoker	20.3 (15.1, 25.6)	17.4 (7.6, 27.3)	21.4 (15.2, 27.6)
Never Smoker	22.8 (17.2, 28.3)	14.3 (6.4, 22.3)	26.0 (19.1, 32.8)

NH = non-Hispanic. Weighted percentages are reported, with 95% confidence intervals in parentheses. Asterisks indicate significant associations as determined by Rao-Scott χ^2 tests

*
$p < 0.05$;

**
p 0.01.

Table 2

Distribution of Lifetime Mental Health Conditions (MHC) Among Current ENDS Users, 2015.

Mental Health Condition	n	% of Current ENDS Users with Each MHC
Any Mental Health Condition	172	27.4 (22.1, 32.7)
Bipolar Disorder	36	6.7 (3.3, 10.2)
Schizoaffective Disorder	4	1.0 (0.0, 2.5)
Schizophrenia	2	0.4 (0.0, 1.1)
Anxiety Disorder	103	15.6 (11.3, 20.0)
Depression	126	19.8 (14.9, 24.6)
Mood Disorder	28	4.2 (1.7, 6.6)
Other Mental Health Condition	30	4.1 (2.0, 6.1)
No Mental Health Condition	378	72.6 (67.3, 77.9)

Unweighted frequencies (*n*) and weighted prevalence and confidence intervals are reported.

Table 3

Reasons for ENDS Use (Mean Importance Ratings by MHC and Smoking Status).

	Overall	Never Smokers(*n*=70)	Former Smokers(*n* = 78)	Current Smokers(*n* = 391)
	MHC: *n*=166	MHC: *n*=17	MHC: *n*=18	MHC: *n*=131
	No MHC: *n*=373	No MHC: *n*=53	No MHC: *n*=60	No MHC: *n*=260
I could use them in places where regular cigarette smoking isn't allowed				
Mental Health Condition	3.70	2.12	4.69[*]	3.79
No Mental Health Condition	3.38	3.15	3.14	3.59
Electronic vapor products are less harmful to me than regular cigarettes				
Mental Health Condition	4.16	2.88	5.58[**]	4.17
No Mental Health Condition	3.71	3.36	4.27	3.66
Electronic vapor products are less harmful to those around me than regular cigarettes				
Mental Health Condition	4.20	3.35	5.51[***]	4.18
No Mental Health Condition	3.90	3.75	3.99	3.96
Electronic vapor products could help me quit smoking regular cigarettes				
Mental Health Condition	3.70	1.67	5.46[*]	3.87
No Mental Health Condition	3.47	2.34	4.20	3.73
Electronic vapor products could help me reduce the number of regular cigarettes I smoke				
Mental Health Condition	4.02	1.62	5.65[***]	4.25
No Mental Health Condition	3.52	2.23	3.96	4.01
Using an electronic vapor product feels like smoking a regular cigarette				
Mental Health Condition	3.21	2.16	4.50	3.27
No Mental Health Condition	2.95	2.25	3.19	3.21
Electronic vapor products are more acceptable than regular cigarettes				
Mental Health Condition	3.45	2.57	3.89	3.59
No Mental Health Condition	3.28	2.86	3.41	3.43
To satisfy my curiosity				
Mental Health Condition	3.11	2.81	3.79	3.00
No Mental Health Condition	2.67	2.75	2.40	2.73
They come in flavors I like				
Mental Health Condition	3.90	3.10	5.47[***]	3.71
No Mental Health Condition	3.55	4.03	3.70	3.26

Mean ratings of the importance of each reason for using ENDS are shown (0 = Not at all Important, 6 = Very Important). Asterisks indicate significant differences in importance ratings between former smokers with and without MHC, as determined by weighted t tests.

[*]
$p < 0.05$;

[**]
p 0.01;

***
p .001.

With Bonferroni adjustment, only p .001 is significant.

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Table 4

Perceived Relative Harm of ENDS (%, CI) by Mental Health Condition and Smoking Status.

	Overall MHC: *n*=171 No MHC: *n*=378	Never Smokers(*n* = 70) MHC: *n*=17 No MHC: *n*=53	Former Smokers (*n*= 79) MHC: *n*=18 No MHC: *n*=61	Current Smokers (*n*= 400) MHC: *n*=137 No MHC: *n*=263
Is using electronic vapor products less harmful, about the same, or more harmful than smoking regular cigarettes?				
Less Harmful				
Mental Health Condition	60.5 (49.3, 71.6)	56.7 (29.3, 84.2)	92.9 (82.8, 100.0)	52.8 (39.6, 66.0)
No Mental Health Condition	63.0 (56.1, 69.9)	66.1 (51.4, 80.9)	71.3 (54.1, 88.4)	58.1 (49.5, 66.6)
Equal or More Harmful				
Mental Health Condition	23.1 (13.1, 33.0)	27.4 (3.7, 51.0)	3.3 (0.0, 10.0)	27.4 (14.6, 40.1)
No Mental Health Condition	21.8 (15.7, 27.9)	20.9 (8.2, 33.6)	15.1 (0.0, 30.4)	24.9 (17.4, 32.4)
I Don't Know				
Mental Health Condition	16.5 (8.2, 24.7)	15.9 (0.0, 39.3)	3.7 (0.0, 11.2)	19.8 (9.3, 30.4)
No Mental Health Condition	15.2 (10.2, 20.2)	12.9 (3.1, 22.8)	13.6 (1.5, 25.8)	17.0 (10.6, 23.3)

Weighted percentages are reported, with 95% confidence intervals in parentheses. There were no significant associations between mental health condition (MHC) status and perceptions of harm of ENDS.

Table 5

Thoughts about Harms and Benefits of ENDS (%, CI) by Mental Health Condition and Smoking Status.

	Overall	Never Smokers (n = 70)	Former Smokers[*] (n = 80)	Current Smokers (n= 395)
	MHC: n=170	MHC: n=17	MHC: n=18	MHC: n=136
	No MHC: n=375	No MHC: n=53	No MHC: n=62	No MHC: n=259
How much do you think about how using electronic vapor products might HARM your health?				
A Lot				
Mental Health Condition	14.5 (6.0, 22.9)	5.5 (0.0, 13.5)	3.7 (0.0, 11.2)	19.0 (7.5, 30.5)
No Mental Health Condition	23.4 (16.7, 30.0)	26.2 (11.9, 40.6)	24.5 (8.7, 40.3)	21.4 (13.1, 29.7)
A Little				
Mental Health Condition	54.3 (42.6, 65.9)	52.8 (20.9, 84.6)	43.1 (13.1, 73.0)	57.4 (44.2, 70.6)
No Mental Health Condition	54.3 (47.0, 61.5)	53.5 (37.3, 69.7)	52.9 (36.4, 69.3)	55.2 (46.4, 64.0)
Not at All				
Mental Health Condition	31.3 (19.7, 42.8)	41.8 (9.1, 74.5)	53.2 (22.1, 84.4)	23.6 (12.5, 34.6)
No Mental Health Condition	22.4 (16.6, 28.2)	20.3 (6.1, 34.4)	22.6 (11.1, 34.2)	23.4 (16.3, 30.4)
	Overall	Never Smokers	Former Smokers	Current Smokers[*]
How much do you think about: How using electronic vapor products might IMPROVE your health?				
A Lot				
Mental Health Condition	23.9 (14.4, 33.5)	2.9 (0.0, 8.8)	16.0 (0.0, 33.2)	30.1 (17.7, 42.5)
No Mental Health Condition	16.4 (11.4, 21.3)	14.0 (3.5, 24.5)	19.2 (8.2, 30.2)	16.4 (9.9, 22.8)
A Little				
Mental Health Condition	40.7 (29.6, 51.7)	31.0 (4.2, 57.8)	44.7 (14.2, 75.3)	41.5 (28.5, 54.6)
No Mental Health Condition	39.7 (32.6, 46.8)	31.3 (16.3, 46.2)	39.1 (22.4, 55.8)	44.3 (35.6, 53.0)
Not at All				
Mental Health Condition	35.4 (23.9, 46.9)	66.1 (38.6, 93.5)	39.2 (3.7, 74.8)	28.4 (17.1, 39.7)
No Mental Health Condition	43.9 (36.8, 51.0)	54.7 (38.7, 70.7)	41.7 (25.5, 57.9)	39.3 (30.9, 47.7)

Weighted percentages are reported, with 95% confidence intervals in parentheses. Asterisks indicate significant associations between mental health condition and frequency of thoughts about ENDS harm/benefit by smoking status as determined by ordinal logistic regression.

[*] $p < 0.05$.