

# How Do Perceptions of ENDS Differ between Different Types of Users?

**Elizabeth A. Hood**

Boston College

elizabeth.hood.2@bc.edu

**Stine Grodal**

Northeastern University

**Hasmeena Kathuria, Erika Teresa Minetti, Craig S. Ross, Jessica L. Fetterman**

Boston University

## ABSTRACT

**Objective:** Electronic nicotine delivery systems (ENDS) continue to be utilized by two primary groups: smoked tobacco users seeking to transition to ENDS and younger individuals starting ENDS without significant previous nicotine use. However, established research lacks an examination of the differences in perceptions of ENDS by both these groups in the same study. This study explores the differing perceptions of ENDS by two user groups: smoked tobacco users and ENDS users.

**Methods:** Individuals who primarily used smoked tobacco products (n=35) and individuals who primarily used ENDS (n=48) were interviewed about their perceptions of ENDS and nicotine. Interviews were recorded, transcribed and analysed qualitatively to gain an understanding of users' perceptions of ENDS.

**Results:** Smoked tobacco users and ENDS users differed in their perceptions of ENDS and nicotine. We identified three important distinctions between the groups: monitoring use of ENDS, perceptions of nicotine in ENDS, perceptions of addiction to nicotine. These different perceptions influenced behaviours and patterns surrounding the use of ENDS.

**Conclusions:** Smoked tobacco users and ENDS users develop different perceptions of ENDS based on nicotine which facilitates different views and use of ENDS products.

**Keywords:** electronic nicotine delivery products, e-cigarettes, cigarettes, smoked tobacco users, ENDS users

**Tob Regul Sci.**™ 2022; 8(1): 286-297

**DOI:** doi.org/10.18001/TRS.8.1.28

## INTRODUCTION

Electronic cigarettes were introduced in the U.S. in 2007 [1]. In recent years, various stakeholders such as news outlets, health professionals, and electronic nicotine delivery systems (ENDS) manufacturers have debated the drivers of increasing use of ENDS. Significant controversy surrounds ENDS among health professionals who developed starkly different opinions leading to a divide between supporters and opponents of ENDS. Supporters argue that individuals can reduce their smoked tobacco consumption through switching to ENDS [2]. On the other hand, opponents argue that ENDS can foster additional tobacco use among young individuals [3] and question the viability of quitting smoked tobacco products through the use of ENDS [4]. These different users lie at the

center of the debate around ENDS, yet there is little understanding of how these different consumers view ENDS. We consider two main user groups: those who primarily use smoked tobacco products and those that use ENDS.

Individuals who already use smoked tobacco products may seek to transition to ENDS as an alternative to using smoked cigarettes [5]. While ENDS provide similar behavioral practices as cigarettes [6] such as inhaling the nicotine through a stick-shaped device held between the fingers, some individuals fail to transition completely to ENDS [7], becoming dual users or continue to smoke combustible cigarettes. Despite the similarities between ENDS and cigarettes, some users find ENDS less satisfying than tobacco cigarettes [8].

However, tobacco users are not the only population using ENDS. Some individuals who have never been addicted to tobacco products use ENDS. Previous studies have explored potential reasons young people take up ENDS such as curiosity, social influence, and perceptions of ENDS as cool [9]. In fact, ENDS use among young individuals has vastly increased [10,11] with ENDS being the most frequently utilized tobacco products among young individuals in recent years [12]. Additionally, youth users of ENDS tend to put a high emphasis on the importance of flavors and even use a product more frequently when it is their preferred flavour [13]. Contrary to smoked tobacco users, youth who use ENDS find the experience of ENDS satisfying as they adopt the products.

Previous research has established an initial understanding of how tobacco users and ENDS users perceive ENDS, yet the established literature lacks an examination of ENDS and tobacco users in the same study. Thus, we have a limited understanding of how these groups compare in their process of evaluating ENDS. We sought to examine the differences in perceptions of ENDS between smoked tobacco users and ENDS users by comparing these groups in an inductive qualitative study.

## **METHODS**

### **Recruiting and Sample**

We recruited participants from Craigslist and a student job posting at a university in Boston. We recruited individuals from May 2019 to June 2021 and classified participants based on two use patterns. One sample (n=35) were dual tobacco users categorized as either using two or more tobacco products or at least one tobacco product and ENDS. Out of this sample 6 had never used ENDS. We call this group “smoked tobacco users”. Our second sample (n=48) were ENDS users categorized as individuals who used ENDS products consistently for at least 3 months. These individuals used ENDS as their primary nicotine delivery system. We call this group “ENDS users”. Overall, our participants were comprised primarily of individuals currently residing in Boston and ranged in age from 18 to 64 years old. Our interviewees included 46 females and 37 males as demonstrated in Table 1. All participants were provided with \$50 compensation for completing our semi-structured interview along with a follow-up study.

**Table 1: Demographics**

	<b>Combustible tobacco users (n=35)*</b>	<b>E-cigarette users (n=48)*</b>	<b>Total (n=84)*</b>
<b>Age</b>			
18-24 years	6 (18%)	35 (75%)	41 (50%)
25-44 years	11 (32%)	11 (23%)	22 (27%)
45-64 years	17 (50%)	1 (2%)	18 (22%)
65 years and older	0 (0%)	0 (0%)	1 (1%)
<b>Education</b>			
High school/Less than high school	14 (43%)	4 (9%)	18 (22%)
Some college/ Associate degree	11 (33%)	33 (70%)	44 (54%)
Bachelor's degree	7 (21%)	9 (19%)	17 (21%)
Master's degree	1 (3%)	1 (2%)	2 (3%)
<b>Gender</b>			
Female	18 (51%)	28 (60%)	46 (55%)
Male	17 (49%)	19 (40%)	37 (45%)
<b>Race/Ethnicity</b>			
African American	15 (44%)	3 (7%)	18 (22%)
Asian	3 (9%)	19 (41%)	22 (27%)
Caucasian	13 (38%)	14 (30%)	28 (35%)
Hispanic	3 (9%)	9 (20%)	12 (15%)
Other	0 (0%)	1 (2%)	1 (1%)

\* Please note: Not all participants were willing to disclose specific demographic information therefore not every section will add up to the total number of participants for that category.

## Data Collection

We conducted semi-structured interviews to better understand how individuals made sense of ENDS and the use of nicotine. We covered similar topics for each interview (i.e. use practices, understandings of nicotine, and motivations for using ENDS) but probed different questions for each interviewee dependent upon what the user identified as important factors in evaluating the products. Our interviews typically lasted between 30 and 60 minutes. Except for one, all of the interviews were recorded and transcribed verbatim. We ceased data collection when we reached saturation in the data and were no longer identifying and learning new insights from additional interviews. Throughout this paper, we changed the names of our informants in order to maintain the informants' privacy.

## Data Analysis

We utilized the transcribed interviews to code our data. We coded our data initially through open-coding. We grouped these codes according to different relevant categories. Additionally, we compared responses between primarily tobacco and ENDS users to understand how each group conceptualizes tobacco compared to vaping products. Throughout the process, we met frequently to discuss emerging themes and adjusted our coding to incorporate emerging themes.

## RESULTS

We identified three key dimensions on which smoked tobacco users and ENDS users differed: 1) monitoring use of ENDS, 2) perceptions of nicotine in ENDS, 3) perceptions of addiction to nicotine.

### Monitoring Use of ENDS

Smoked tobacco users attempted to compare their use of ENDS to combustible cigarettes. This comparison was unclear and therefore made it difficult for these users to monitor their use of nicotine in ENDS. Further, since using ENDS could be more convenient and/or have fewer perceived side effects, they found it easier to use ENDS more frequently and thus increase nicotine use unintentionally. On the other hand, ENDS users did not compare their use of ENDS to cigarettes and therefore were able to monitor their use easily through counting the number of days it took to consume a pod of liquid. Thus, smoked tobacco users faced challenges in monitoring their use of ENDS whereas ENDS users did not.

### *Smoked Tobacco Users' Monitoring of ENDS Use*

Smoked tobacco users faced difficulty in comparing the amount of product used in ENDS to cigarettes. This was largely due to the fact that there were fewer endpoints of product use compared to cigarettes. Thus, the smoked tobacco users found using ENDS to lead to ambiguous amounts of use of the product. One smoked tobacco user explains,

*It's definitely harder [to keep track of use] when using a Juul [compared to cigarettes], I think. Because it's just like all conglomerated in that one pod.*

*Versus I guess having it split up into like 20 cigarettes. (Roy)*

The challenge of ambiguous use patterns was further heightened by the lack of signals to stop using the device. For instance, with cigarettes, when an individual finishes smoking a cigarette or the pack of cigarettes, this serves as a signal that the product has been used and therefore may encourage the individual to stop using the product for some time. Whereas with ENDS, the conglomeration of much nicotine in one pod or juice refill prevents the distinct moments where there is a signal that the use of a product has been completed. One smoked tobacco user explained,

*So that's why cigarettes could be like have advantage to a Juul because like you have 20 cigarettes, these are the pack. And since I'm a little bit lazy, I don't want to go to the shop like second time. Even though the shop is going to be on my way or it's going to be around the corner. If the pack is over, it's over. I'm not going to go to the shop to buy another one. So just kind of an incentive for me like let's say to lower my nicotine smoking. (Ralph)*

In addition to discrete products of cigarettes signaling completion, side effects of cigarettes also signal a time to stop smoking for the day. However, with ENDS, the users lacked these signals. Therefore, individuals are able to continue using ENDS more frequently without the physical effects signaling a time to stop using the products. Additionally, ENDS may be perceived as more convenient subsequently leading to increased nicotine use. One smoked tobacco user explained,

*Because with cigs, I was limited to smoking, like, at most, three or four a day. Because then after a while I'd just feel like, after the fourth cig of the day, I'd be like I feel nasty. But with the Juul there's not that feeling. Like my friend even had a problem where he'd like reach over during the night and hit his Juul. If he was awake. And then he'd put it back. And I think, just because you're able to do that, whereas with a cig you have to go outside the building, like that makes you way more able to consume more nicotine than cigs. (Sam)*

With ENDS, the smoked tobacco users faced a challenge in keeping track of the amount of product used because they sought to compare using ENDS to smoking cigarettes. However, for individuals who primarily used ENDS, they did not seek this comparison and therefore expressed fewer challenges keeping track of the amount of ENDS products and nicotine they used.

### **ENDS Users Monitoring of ENDS Use**

In contrast to the smoked tobacco users, ENDS users primarily calculated their use of ENDS according to the number of pods they used in a day or several days. These individuals were able to keep track of their use patterns over time and how the use fluctuated. One ENDS user explained,

*During my heaviest usage, I would finish one pod in two days. Or sometimes like four pods a week, I think that was it, four pods a week. And then but like that was, to me, that was like a bad schedule because I quickly became very tolerant to nicotine. And I needed more and more. And I started getting pretty grumpy. So when I decided to quit, there was a time where I didn't at all. Now I'd say a pod lasts me about nine to 10 days. Yeah, and like I stop it every two pods stuff for four days completely clean, just to make sure I can still quit. (Frank)*

Counting the number of days to consume a pod of juice allowed the individual to manage their use patterns. For instance, after quitting using ENDS for some time, they were able to re-engage in using the product while ensuring that they were using less of the product than previously. Another individual explained how they would account for the pods used over time without knowing precisely how much is in each pod,

*So I used to go through a pack of four pods, four Juul pods. I don't know how many of them is in like the little pods itself, but I would probably go through one pod a week. So one pack would usually last me like a month. And then, the disposables for me these days, I would say probably a week. One per every week. (Abby)*

While some ENDS users focused specifically on the use in terms of pods, others brought in additional metrics of use. For instance, one user accounted for nicotine in addition to pods saying, "I think it's about one pod a week that I go through. And I know it's like 5% nicotine" (Angela). In addition to considering nicotine, other users broke down

the amount of e-liquid used per week from pods to number of puffs per week, all the while still accounting for the amount of nicotine consumed:

*I'd probably say like 400 puffs a week. So however many, how much amount that is. It's usually 5% devices, so.... Each disposable is like 200-300 puffs. So the amount of puffs you would buy, you just multiply that by the puff, or the amount of devices, you multiply that by the amount of puffs. So I do kind of keep track. Because I've been trying to just like lower the amount I'm taking. (Kevin)*

In monitoring use of ENDS and nicotine content, ENDS users and smoked tobacco users differed in their monitoring strategies. Smoked tobacco users found it difficult to monitor their ENDS use because they were attempting to apply the practices that they utilized in monitoring their cigarette smoking to ENDS use; yet these practices were not readily transferable. In contrast, ENDS users developed monitoring practices that were tailored to ENDS and they therefore found it easier to monitor their ENDS use.

### **Perception of Satisfaction from Nicotine in ENDS**

In addition to differences in monitoring use, smoked tobacco users and ENDS users differed greatly in their perception of satisfaction of nicotine within ENDS. Smoked tobacco users noted that ENDS did not satisfy their nicotine cravings and thus were unsatisfying. On the other hand, ENDS users found the nicotine in ENDS satisfying and as the major driver for frequent ENDS use. Additionally, as ENDS users paid more attention to the nicotine, they were more knowledgeable about the percent of nicotine in the ENDS they used.

### **Smoked Tobacco Users' Perceptions of Nicotine in ENDS**

When smoked tobacco users considered the nicotine in ENDS, they tended to compare the experience to cigarettes. This led to evaluations of ENDS as less satisfying than cigarettes. In fact, many smoked tobacco users suggested that there was no nicotine in ENDS while others noted that there was nicotine but it wasn't the same as cigarettes. Of note here is that these smoked tobacco users were using ENDS such as Juul and Blu which were not available with nicotine free liquid. Thus, it is not that the devices did not have nicotine, but rather that the individuals did not experience satisfaction from the nicotine in ENDS. One smoked tobacco user explained:

*Well, I never smoked my e-cigarette, I didn't smoke it that long, because it didn't satisfy the nicotine...It didn't have the nicotine. It was just air (Bob)*

Another smoked tobacco user echoed this feeling: "Because you're sitting there constantly, you know, pulling on it just trying to get that fix of the nicotine. And you're not actually getting nicotine. You're getting a flavor" (Rachel). In addition to noting a lack of nicotine, other smoked tobacco users expressed uncertainty about whether there was any nicotine in their products. When asked if they knew how much nicotine was in their device, one informant answered, "There's no nicotine, is it? It's, I don't know. I'm not sure. I don't know" (Kyle). Thus, the smoked tobacco users expressed both uncertainty and skepticism surrounding nicotine in ENDS.

In addition to the uncertainty about the nicotine content in ENDS, some smoked tobacco users explained that the products felt different and lacked the "real" nicotine. A smoked tobacco user explained the difference between regular cigarettes and ENDS: "That

little nicotine it [e-cigarette] give you ain't nothing like the real cigarette" (Sarah). This individual went on to explain, "Because you tasted that fruity stuff? It ain't real. Just give me plain old nicotine, baby" (Sarah). Thus, the smoked tobacco users viewed ENDS as either lacking nicotine or composed of a not "real" nicotine. These views differed widely from the ENDS users.

### ***ENDS Users' Perceptions of Nicotine in ENDS***

In contrast to the smoked tobacco users, the ENDS users were highly aware of the nicotine in ENDS. The ENDS users experienced the effects of the nicotine in what they called a "nicotine buzz" which they found to be highly satisfying and one of the main reasons they opted to continue to use ENDS. Since the nicotine content was important to these users, they privileged the nicotine content in selecting the products to use:

*I'd say like I know that some people do like their own Juul pods, for example, and they put in way more nicotine. So they'll put in like 7%, which is like insane. And those like can make people way more sick. So I think the normal 5%, which Juul usually is—they either have 5% or 2%, (Allie)*

Many of the ENDS users expressed strong knowledge of the variety of nicotine amounts in the product and used this knowledge to select ENDS. One ENDS user explained, "I'd think most people don't really care about the brand. Whatever's cheaper, and as long as it has like 5% nicotine, they don't really care" (Kevin). In addition to seeking the nicotine buzz with higher amounts of nicotine, other ENDS users seek out lower levels of nicotine. An ENDS user explained, "Yeah, because I'm a D1 athlete, so I mean, I always like get the 3% nicotine pods. Because like that, like really affects me" (Amy).

Comparing smoked tobacco users and ENDS users, we found that they differed in terms of their perceptions of the satisfaction from the nicotine of ENDS. Many smoked tobacco users doubted that ENDS contained nicotine and felt that it did not satisfy their nicotine cravings. In contrast, ENDS users found the nicotine in ENDS satisfying and sought out ENDS specifically for their nicotine rush.

### **Perceptions of Addiction**

Smoked tobacco users and ENDS users also differed widely in their recognition of addiction to nicotine. Smoked tobacco users accepted and recognized their addiction. They highlighted the difficulty in quitting nicotine and their disdain for addiction. On the other hand, the ENDS users were hesitant to admit addiction to nicotine. Rather than acceptance, they sought to convince themselves and others that they were not addicted to nicotine. Ultimately, ENDS users and smoked tobacco users developed different perceptions of their addiction to nicotine.

### ***Smoked Tobacco Users' Perceptions of Addiction***

Smoked tobacco users accepted the fact that they were addicted to cigarettes. While in the beginning, smoked tobacco users might have started smoking to fit in, this was no longer the case as the smoked tobacco users were smoking primarily due to addiction. One user explained:

*Cigarettes, they're a very ugly thing now...Because you don't smoke it like you're cool. You smoke it like it's an addiction. So it's not—it doesn't look cool. But*

*everybody's doing it. So everybody can't be cool... It started off looking cool. Yeah, the girls used to like you with a cigarette, but now they don't like you with cigarettes. (Bob)*

On top of recognizing their addiction to nicotine and cigarettes, smoked tobacco users noted that they wanted to quit but it was hard since they had been using cigarettes for an extended time: "And it's really back to what I was saying about the addiction. It's just like, 'F\*\*\* I really wish I wasn't doing this, but like it's just been so long, you know?'" (Jordan). On top of frustration of the addiction, individuals expressed the struggle they faced in beating their addiction, "I'm addicted to cigarettes. But I'm trying to get off, but I just, I like menthols. But I have one or two cigarettes in my bag they're not menthol. Which I hate. But I'll smoke it anyways" (Jerry). In recognizing their addiction, the smoked tobacco users wanted to get off of cigarettes and nicotine but found it incredibly challenging. One cigarette user explained the need to quit smoking in detail.

*A nicotine fiend is, oh, crazy. You will go and start counting your pennies. Always see the commercial with the lady that said how she quit because she'd find herself going out in a blizzard to buy a pack of cigarettes. I'd see that commercial, I'd be like, "Yup. That's me. Help me quit." .... it's costing me a lot to smoke. And I only get a check once a month. I get disability. I have to really stop smoking. I don't know what I'm going to do. .... Because it's that addiction of the nicotine. (Kayla)*

Thus, the smoked tobacco users outlined their addiction to smoking cigarettes and the difficulties they have quitting. They seek to stop but face immense challenges in getting away from their nicotine addiction.

### ***ENDS Users' Perceptions of Addiction***

In contrast to smoked tobacco users, ENDS users tended to downplay their addiction to nicotine. While some admitted being addicted to ENDS, others denied addiction or even the possibility that they might get addicted in the future. There was an overall notion that addiction itself is worse than using ENDS. This stigma drove their desire to deny their potential addiction to ENDS. One ENDS user explained,

*I think like if people will say like, "Oh, you're addicted to Juul." And they're like, "No, I could stop at any time." So I think people struggle more with acknowledging that they're addicted. I think people don't mind saying that they're a Juul smoker. Like yeah, I mean you have the Juul with you, so it's obvious that you smoke a Juul. It's more like when people label them as addicted to it, addicted to nicotine, so then they're like uncomfortable. Like, "No. No, I'm not." And then they try to quit. And then they struggle. So then clearly they were. (Allie)*

As this individual highlighted, ENDS users were quite concerned about being labelled addicted to nicotine. These individuals generally viewed ENDS as an enjoyable and a social experience, but when ENDS use crossed over and became an addiction, ENDS users began to view ENDS highly negatively. Another ENDS user explained:

*When I first started, I was like one of those people who is like I'm strong enough to, I'm never gonna get addicted. And then now I know like, that's just bullshit. Um yeah, that's pretty much it...Like, if you don't do it every day, sometimes it actually does help with anxiety, or maybe the placebo or whatever.*



*But like, yeah, whatever it is, it actually works. But if you really get addicted to that, it's just really stupid. (Frank)*

This individual went on to explain that if they were advising someone who wanted to begin using ENDS, they should follow a plan to ensure they do not become addicted, “don't think that you're strong enough to not be addicted. Like definitely watch out for that. Like, make a plan to make sure you don't get addicted” (Frank). Thus, ENDS users fostered strategies to avoid becoming addicted while still being able to use the products. In advising a new user, one ENDS user suggested:

*Start with something that's like a disposable one, I guess like a puff bar or like one of those. Because a Juul was like, guaranteed for you to get addicted pretty much because you're just gonna have it on you 24/7. Or I would tell them to stick to doing it in like social places, not just them by themselves. (Melissa)*

This strategy to stick with disposables was a common strategy for ENDS users to avoid addiction. Yet, this strategy is not always successful,

*Because in college itself, it's like, so readily available and stuff. You see it so frequently. As people always like, Oh, I don't want to be addicted. I don't want my own device. Let me get a disposable and then they end up buying a bunch of disposables. (Jack)*

This same user went on to say, “I never want to admit it. But I realized I'm addicted” (Jack). Thus, the notion of addiction was contested for these ENDS users. While some admitted their addiction, most attempted to convince themselves and others into believing that they are not addicted to nicotine.

In comparing smoked tobacco users and ENDS users we found that they had different views of addiction. While all of them were likely addicted to nicotine, smoked tobacco users admitted their addiction while ENDS users tried to find ways to explain away and minimize their addiction.

## DISCUSSION

We extend the qualitative literature on understanding the perceptions of ENDS users and smoked tobacco users. We identified three major distinctions between the understandings of those who are primarily smoked tobacco users and those who are primarily ENDS users: monitoring use of ENDS, perceptions of satisfaction of nicotine in ENDS, and perceptions of addiction to nicotine.

First, ENDS users and smoked tobacco users differed in their experiences monitoring the amount of ENDS they used. Smoked tobacco users had already developed practices and metrics for monitoring their smoking habits. However, when they tried to transfer these practices to ENDS they found it challenging and confusing to keep track of their consumption. Second, smoked tobacco users and ENDS users differed in their perceptions of nicotine in ENDS with smoked tobacco users uncertain whether ENDS contain nicotine and ENDS users prioritizing nicotine. Third, smoked tobacco users and ENDS users varied in their perceptions of addiction to nicotine. Smoked tobacco users admitted their addiction to nicotine and struggled to overcome the addiction. In contrast, ENDS users failed to recognize the potential to become addicted to nicotine, developed strategies to avoid addiction, and sought to deny their addiction.

Our study expands existing research to take into account the perspective of smoked tobacco users and ENDS users in the same study. These users developed distinct evaluations of ENDS with smoked tobacco users findings ENDS unsatisfying while ENDS users found the products highly satisfying. The core surrounding the evaluations centered around nicotine with smoked tobacco users comparing the products cigarettes and disliking the differences in products whereas ENDS users did not make the comparison to cigarettes. Therefore, we contribute to the growing research on evaluations of ENDS through exploring the distinctions and similarities of evaluation between smoked tobacco users and ENDS users.

Our study was limited by our sampling procedure. Specifically, because we recruited individuals who used more than one tobacco product, these individuals tended (though not all) to be above 40 years of age. In contrast, the ENDS users were primarily individuals between the ages of 18 and 25. This study sample is similar to national use patterns where ENDS users are young adults and youth. However, to better assess the differences in these groups, it would be helpful to examine individuals who are over 25 and are primarily ENDS users. While we did not find differences between the ENDS users who were older than this age range, there could still be a valuable perspective to consider in future research.

Additionally, future research should examine the perspectives of individuals who successfully transitioned from smoking cigarettes to using ENDS and those who successfully utilized ENDS as a cessation tool. While we did take into account some individuals who successfully made the transition from cigarettes to ENDS, most of the smoked tobacco users in our sample found ENDS to be unsatisfying. However, it would be helpful to understand the perspective of individuals who found ENDS to be a good replacement to tobacco products.

## **IMPLICATIONS FOR TOBACCO REGULATION**

Understanding how different groups view ENDS is important for policymakers setting new regulations on ENDS. This is a timely issue as the U.S. grapples with how to regulate ENDS to reduce youth adoption of the products while allowing smoked tobacco users ENDS as an alternative for cigarettes. While recent regulations have highlighted the importance of flavors, our findings suggest that the nicotine content is the salient factor for individuals looking to adopt ENDS. Users make sense of ENDS based on ability to monitor nicotine use, amount of nicotine in products, and perceptions of addition to nicotine. Therefore, our findings suggest that regulatory bodies pay special attention to the nicotine content of products as they seek to create new regulations surrounding ENDS.

### **Human Subjects Approval Statement:**

This study has IRB approval from Boston University. IRB number: H-38351.

### **Conflicts of Interest Disclosure Statement:**

One author reported serving as a Section Editor for the Tobacco Dependence Treatment section for UpToDate. No other authors have conflicts of interest.

## Acknowledgments:

Research reported in this publication was supported, in part, by the National Heart, Lung, And Blood Institute of the National Institutes of Health under Award Number U54HL120163 and K01 HL143142 (JLF). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

This work was partially supported by the Evans Center for Interdisciplinary Biomedical Research ARC on Tobacco Regulatory Science at Boston University (<http://www.bumc.bu.edu/evanscenteribr/>). The funders had no role in the conduct of this research.

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