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“I actually finally feel like the cigarettes aren’t controlling me.” – Interviews with participants smoking very low nicotine content cigarettes during a residential study

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Abstract

Background: The U.S. Food and Drug Administration (FDA) is considering a low-nicotine product standard for cigarettes. The purpose of this qualitative study was to explore participants’ experiences after 72 hours of exclusively smoking very low nicotine content (VLNC) cigarettes.

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Conflict of Interest: Dr. Benowitz has been a consultant to Achieve Life Sciences and Pfizer, companies that market or are developing smoking cessation medications, and has been a paid expert witness in litigation against tobacco companies. Dr. Carpenter has received consulting honoraria from Pfizer and Frutarom.

Methods: We conducted a residential study during which participants who smoked cigarettes (N=16) stayed in a smoking-friendly hotel for 5 days/4 nights. Participants only had access to VLNC cigarettes and were told the cigarettes had 97% less nicotine compared to conventional cigarettes. We conducted individual interviews with participants to assess their initial expectations about VLNC cigarettes, subjective experiences when smoking VLNC cigarettes, opinions regarding a low-nicotine product standard, and predicted use behavior if only VLNC cigarettes were available. Interviews were transcribed verbatim and analyzed using thematic analysis methods.

Results: Several participants expected, prior to trying VLNC cigarettes, to compensate for the reduced nicotine levels by smoking more cigarettes but were surprised when they did not increase their smoking. A subset of participants reported experiencing minor withdrawal symptoms, such as irritability and fatigue. Several participants reported feeling less dependent after exclusively smoking VLNC cigarettes. Most participants said they would smoke VLNC cigarettes if they were the only cigarettes available to purchase. Some also said that smoking VLNC cigarettes could help people taper down or quit smoking.

Conclusions: Health communication strategies are needed to inform people who smoke about what to expect from a low-nicotine product standard for cigarettes in order to maximize the public health impact of the policy and increase support.

Keywords

Smoking; Nicotine; Policy

1.0 Introduction

If the Food and Drug Administration (FDA) were to implement a proposed low-nicotine product standard for cigarettes, an estimated 8 million fewer smoking-attributable deaths are expected to occur in the United States during this century (Apelberg et al., 2018). This policy would require that all commercially-available cigarettes have nicotine levels that are minimally- or non-addictive. In clinical trials, participants assigned to very low nicotine (VLNC) cigarettes experienced reductions in smoking and biomarkers of harm, as well as increases in quit attempts compared to participants assigned to normal nicotine content (NNC) cigarettes (Denlinger-Apte, Kotlyar, et al., 2019; Donny et al., 2015; Hatsukami et al., 2018). Results from these trials provide evidence that a nicotine reduction policy for cigarettes could have positive public health outcomes.

Although previous VLNC cigarette trials have included quantitative assessments of policy-relevant constructs (e.g., subjective smoking effects, withdrawal and craving, policy support) (Denlinger-Apte, Tidey, et al., 2019; Dermody et al., 2018; Smith, Donny, et al., 2019), no studies have directly interviewed participants about their experiences when smoking VLNC cigarettes. Qualitative research methods allow tobacco regulatory scientists to explore the nuances of nicotine addiction, smoking motivations, product perceptions, and policy reactions beyond what can be captured in traditional quantitative assessments. Capturing in their own words participants' experiences when smoking VLNC cigarettes could provide

key insight into how other people who smoke may react if the FDA moves forward with a low-nicotine product standard.

Participants in most VLNC clinical trials are intentionally not informed about the nicotine content in their assigned research cigarettes (i.e., VLNC or NNC cigarettes), which enables researchers to isolate the effects of cigarette nicotine content on changes in behavior and subjective responses while minimizing the impact of product expectancies on these outcomes (Donny et al., 2015; Hatsukami et al., 2018; Smith, Koopmeiners, et al., 2019; Tidey et al., 2019). However, as the FDA moves forward with enacting a low-nicotine product standard, such a mandate will unfold publicly. Thus, anticipating the effects of peoples' expectancies prior to policy implementation may help to avoid unintended consequences. Since few studies have been conducted in an open-label manner, little is known about the impact of VLNC cigarette product expectancies on smoking-related outcomes.

We recently conducted a residential smoking study to examine the impact of exclusively smoking VLNC cigarettes on compensation (Smith et al., 2020). As part of this study, we conducted in-depth interviews with participants to examine the following topics: 1) expectancies about VLNC cigarettes including anticipated smoking behavior, subjective effects, and risk perceptions; 2) experiences of withdrawal symptoms and dependence; 3) reactions to a proposed FDA-mandated low-nicotine product standard for cigarettes; and 4) predicted behavior if only VLNC cigarettes are available to purchase. Although the parent trial involved a crossover design of VLNC and NNC cigarettes (one week of each, with a washout period in between), we restricted the qualitative interviews to the VLNC cigarette week alone.

2.0 Materials and Methods

2.1 Participants

We recruited people who smoke from Charleston, South Carolina, USA and the surrounding community. To be eligible, participants had to smoke at least 5 cigarettes per day for the past year, provide a breath carbon monoxide (CO) level > 8 ppm (or a urinary cotinine level > 2000 ng/ml), and be willing to stay in a hotel during two separate 5-day stays. Exclusion criteria included smoking > 30 cigarettes per day for the past month, interest in quitting smoking in the next two months, unstable medical or psychiatric conditions, pregnancy and lactation, and binge-drinking alcohol or using illicit drugs more than 9 days in the past month. If participants had positive urine toxicology tests (excluding cannabis) at their screening visits, then they were dismissed from the study. The Medical University of South Carolina's Institutional Review Board approved all study procedures and participants provided written informed consent prior to study enrollment.

2.2 Design and Intervention

Eligible participants (N=16) completed a three-week, open-label crossover study for which they resided in a smoking-friendly hotel from Monday afternoon through Friday morning during two stays separated by a 9-day at-home washout period. While at the hotel,

participants were not permitted to socialize with people not affiliated with the study, have outside visitors, or leave the hotel property. Between study procedures, participants could socialize with each other and study staff, watch television or movies, play games, complete remote work or school obligations, read books or magazines, engage in other hobbies (e.g., puzzles or crafts), exercise, or swim at the onsite pool. Additionally, participants were not permitted to use alcohol, cannabis, or other substances while at the hotel. Prior to arrival, participants had to provide negative urine toxicology tests (excluding cannabis) and their personal belongings were checked to ensure they did not have any tobacco, alcohol, cannabis, and other substances with them.

During the first stay (herein referred to as the NNC week), participants exclusively smoked NNC cigarettes (Spectrum cigarettes containing 15.5 mg nicotine/g tobacco). Researchers informed the participants the NNC cigarettes had nicotine levels similar to commercially-available cigarettes. During the second hotel stay (herein referred to as the VLNC week), participants exclusively smoked VLNC cigarettes (Spectrum cigarettes containing 0.4 mg nicotine/g tobacco). Researchers informed the participants that the VLNC cigarettes had 97% less nicotine compared to the NNC cigarettes. During each hotel stay, participants did not have access to their regular cigarettes or other tobacco products, but were given a \$72 account balance to purchase research cigarettes at \$6/pack. Each day, participants recorded their cigarette consumption, completed assessments about their mood and the subjective effects of smoking, provided CO readings, and provided 24-hour urine samples. Study procedures were identical during the two hotel stays with the exception of the qualitative assessment that is the focus of this paper, which was only conducted during the VLNC week. Cigarette adherence during the VLNC week was assessed by daily self-report, returned cigarette butts, and reductions in urinary biomarkers of exposure. Additional study details are reported elsewhere (Smith et al., 2020).

Measures—Authors RDA and TS developed the interview guide based on their prior experiences conducting clinical trials and residential studies of participants smoking VLNC cigarettes (Denlinger et al., 2016; Donny et al., 2015; Smith, Koopmeiners, et al., 2019). They received expert feedback from authors NB and ED to ensure the interview guide assessed policy-relevant constructs including compensation, subjective effects, and policy perceptions (see Supplemental Materials). Author RDA conducted semi-structured interviews with all 16 participants who completed the residential study to elicit feedback about VLNC cigarettes. She conducted the interviews on Thursday to maximize participant exposure to VLNC cigarettes. Thirty-minute time slots were scheduled for each participant and interviews were conducted in a private room. Participants were told the interviews were confidential and that compensation was not contingent upon any comments made during the interview.

Analyses—Interviews were audio recorded and transcribed verbatim. Transcripts were provided to the Wake Forest Comprehensive Cancer Center's Qualitative and Patient Reported Outcomes (Q-PRO) research team for analysis. The Q-PRO research team reviewed all de-identified transcripts, listening to the audio-recording while reading the transcripts to ensure accuracy. Transcripts were imported into ATLAS.ti (version 7.5) to

manage the data (“ATLAS.ti,” 2016). The Q-PRO staff developed a codebook inductively in consultation with author RDA to identify meaningful categories of data based on the study aims. Two Q-PRO staff members independently coded each transcript. They met periodically to resolve discrepancies in coding and revise the codebook as needed. After completing the coding, they abstracted and synthesized the data within each category into themes. Themes were determined by their prevalence and salience in the data, per the principles of thematic analysis (Green & Thorogood, 2018). Saturation was not a goal of this investigation.

3.0 Results

On average, participants were 38.9 years old (range=26–63), smoked 14.8 (range=7–30) cigarettes per day at baseline, and were moderately dependent with Fagerström Test for Cigarette Dependence (FTCD) scores of 5.1 (range=2–10). The sample was 50% female and predominantly identified as non-Hispanic, White (81%). All participants self-reported that they were adherent and had decreases in nicotine metabolites consistent with use of VLNC cigarettes. Themes are illustrated with exemplar quotations from the dataset, in italics. Quotations are identified by the speaker using a participant identification letter from A to P. Information about age and gender of the speaker is excluded because it could be identifiable within participant cohorts.

3.1 Expected vs. Actual Smoking Compensation and Subjective Effects

When told they would be smoking cigarettes with 97% less nicotine, several participants said they anticipated needing to smoke more cigarettes. Participants also voiced initial concerns about how the VLNC cigarettes would taste. They anticipated the VLNC cigarettes would be less satisfying, which would result in increased smoking. However, most participants acknowledged that their smoking expectations did not match reality.

The majority of participants felt they smoked the same amount or less during the VLNC week as compared to the NNC week (see Table S1).

“And so it wasn’t as bad. What my thoughts were and what the reality was was two totally different ideas. You know my thought was they’re going to be nasty. You’re not going to even taste anything. I’m going to smoke like a freight train to try to make up for the nicotine my body is craving and it ended up that it didn’t even come out that way.” (B)

“I was just wondering how they were going to taste... I was wondering, you know, if my want to smoke a cigarette was going to change any as far as how many I would smoke to try to compensate. But I didn’t really want to compensate, once it got down to it because still, I’m smoking a whole cigarette. It didn’t matter that there was less nicotine in it.” (C)

A few participants attempted to compensate for the lower nicotine levels by increasing their smoking early in the VLNC week but reported tapering down over time.

“I probably smoked more the first day or two than I would have the very first week I came here...But now after, I think it was like on day two, I got adjusted to it and I noticed I wasn't smoking as much.” (J)

3.2 Risk Perceptions

When asked to compare the VLNC cigarettes to their regular cigarettes with respect to level of harm, answers varied. Some participants equated changes in a physical response, such as increased coughing, to increased harm. Others perceived the VLNC cigarettes as less harmful due to differences in the subjective experience of smoking VLNC cigarettes relative to smoking other cigarettes. Several participants correctly understood that VLNC cigarettes are less addictive but maintain the same health risks as conventional cigarettes.

Inaccurate risk perceptions

“I don't feel like they were as strong, so that helped me feel like I wasn't putting as much stuff into my body.... I would compare it to more of like a Ultra-Light or something. So, I feel like it was not as harmful as – or not as more damaging to the lungs I'd say. Because I didn't feel as many, I guess you could say chemicals or something.” (J)

“Well, I would say that what I'm smoking now [VLNC] is less harmful...I've also noticed that I haven't experienced as much tightness in my chest as I do when I'm smoking the normal cigarettes.” (L)

“I have more of a cough, I know that. And I supposed they're more harmful.” (O)

Accurate risk perceptions

“...if they're manufactured the same way, then I'm going to guess they're just as harmful. They have less nicotine in them so it makes them less addictive, but that doesn't mean there's any less of the other chemicals that make them harmful.” (D)

3.3 Withdrawal Symptoms and Dependence

Some participants experienced minor nicotine withdrawal symptoms, including irritability, fatigue and increased appetite, when exclusively smoking VLNC cigarettes.

“And I'm definitely more irritated, agitated.” (G)

“I'm not freaking out, I'm not upset, I'm not depressed, I feel fine. I feel kinda tired though, you know, kinda drained.”(I)

“I wouldn't say I've noticed any mood changes or mood swings or nothing like that. And maybe, if anything, I've been more – maybe more hungry.” (J)

Others said they had not experienced any withdrawal symptoms during the VLNC week or did not notice differences in subjective effects when smoking VLNC and NNC cigarettes.

“Mood and behavior, I don't think anything has changed. The cigarette itself or lack thereof, hasn't really changed my emotions or anything like that.” (C)

“Normal. I mean I haven't really noticed any physical or mental changes.” (D)

“I’ve enjoyed them. I haven’t been able to really tell too much of a difference from the last – ...as the last ones.” (L)

Several participants expressed feeling less dependent or more motivated to quit after smoking VLNC cigarettes.

“And so I’ve been able to cut down on smoking. I don’t seem to be as needy on the cigarettes.” (B)

“It makes me want to just go ahead and quit. Put them down.” (F)

“You know, I honestly think I could probably quit, smoking these for a couple weeks.” (I)

“It’s like I don’t really feel like I need to smoke them as often, which is convenient, I guess.” (L)

“I actually finally feel like the cigarettes aren’t controlling me.” (N)

3.4 Reactions to Potential FDA Regulation

Policy Purpose—When asked to provide reasons why they believed the FDA is considering a low-nicotine product standard, participants discussed the contributions of nicotine to smoking-attributable harm. Some participants correctly reasoned that the FDA is interested in limiting the allowable nicotine content in cigarettes because nicotine is the primary addictive constituent in cigarettes. Others, however, had vague or inaccurate comprehension regarding nicotine as a harmful constituent in cigarettes, independent of its addictive properties.

“...nicotine is the stuff that makes us addicted to it, and the tar is the actual bad stuff...” (A)

“It might be a good idea to, I guess, wean people off nicotine. But there’s still thousands of chemicals in it, I don’t see how it makes a difference.” (K)

“Because nicotine is terrible for you...nicotine is the worst part about cigarettes, right? And it’s what gets you addicted to it.” (L)

Some participants further reasoned that reducing nicotine levels would encourage people to quit. They explained that fewer people who smoke equates to better public health and lower healthcare costs. Therefore, such factors would motivate the FDA to implement a low-nicotine product standard.

“Healthcare is costing people money. It’s costing people their lives. It’s really unhealthy. I’m pretty sure that’s why the FDA’s doing that.” (C)

“Oh, make it healthier for people. Make it easier for them to quit. Less nicotine in it means less addiction there is.” (F)

Policy Implementation Approach—Although participants were not questioned about policy implementation approaches (i.e., gradually reducing nicotine content over time), several commented on the topic. They felt that cigarette nicotine reduction, although beneficial, should be implemented gradually over time. Others suggested VLNC cigarettes

should be available while still allowing people who smoke the choice to use conventional cigarettes.

“I think that they should produce a low-level nicotine cigarette available to everybody for people like me and others who would like to quit one day. And then, they should have the regular-level nicotine cigarettes for people who don’t. I feel like it should be a freedom-of-choice type of thing.” (D)

“I just think that they shouldn’t be cut down real low immediately. I think they should like take people on steps - like they do with the patches.” (M)

3.5 Predicted Behavior If Only VLNC Cigarettes Are Available

We asked participants to imagine that only VLNC cigarettes were available to purchase in the US. Most said they would smoke VLNC cigarettes and several predicted they would use VLNC cigarettes to reduce their smoking over time until they eventually quit.

“I would buy them and definitely start consciously tapering down in order to quit. Because they’re not as good, so it’s not as fun [to smoke].” (A)

“I think I would use these to slowly just kind of wean myself off and eventually quit.” (D)

Product Switching—We asked a follow-up question regarding use of other tobacco products if only VLNC cigarettes were available to purchase. Participants discussed both combusted and non-combusted products as potential substitutes.

“I’ve considered switching to like an e-cigarette or something like that.” (L)

“See, my neighbor smoked these ... they’re like little flavored cigars. And I would consider smoking those because those does have a taste... So, I would switch to that.” (M)

Others expressed dislike of alternative products or voiced health and safety concerns about vaping.

“The only reason I would never go with those [e-cigarettes] is I’ve seen bad videos of them blowing up in people’s faces and stuff like that... so I wouldn’t.” (J)

“No, I don’t like chew. And as far as vaping goes, I’ve actually tried it one time and got double pneumonia in both my lungs. So no, I’d rather not inhale water vapors into my lungs.” (N)

Illicit Purchasing of Conventional Cigarettes—A few participants discussed purchasing conventional cigarettes from potentially illicit sources such as farmers, other countries, or the black market if the FDA implemented a low-nicotine product standard.

“I’d be ordering some from Mexico...It’s illegal, but you know there’s tons of black websites out there that you can order stuff off of.” (F)

“...a moonshine cigarette...go straight to the farmer and let me get a couple ounces of unregulated you know non-hybrid tobacco then we’re in the heartland for that. I’d gladly do it.” (P)

4.0 DISCUSSION

The overall aim of the residential study was to examine compensatory smoking when people who smoke only had access to open-label VLNC cigarettes (Smith et al., 2020). Anticipated compensation emerged as a major theme from the interviews. Several participants expected to increase their smoking upon learning the cigarettes had 97% less nicotine. They worried the VLNC cigarettes would taste different and as a result they would need to smoke more to achieve their desired level of cigarette satisfaction. However, most acknowledged that their actual smoking experiences were not as bad as they had initially anticipated. Others did not identify any differences in their smoking between the VLNC and NNC weeks. A few said they definitely increased or decreased their smoking; however, there were no significant differences in the total number of cigarettes smoked per day during the VLNC and NNC weeks (Smith et al., 2020). Our qualitative findings indicate that concerns about compensation and taste may be common among people who smoke if a low-nicotine product standard is implemented. Since the literature indicates that sustained compensation is unlikely to occur when smoking VLNC cigarettes (Berman & Glasser, 2019), publicizing this research prior to policy implementation could help to alleviate potential concerns.

The hotel setting provided an opportunity to examine withdrawal symptoms associated with VLNC cigarette use. By design, participants underwent a nicotine withdrawal period since they did not have access to alternative nicotine products. However, at the time of their interviews, most participants reported feeling generally fine or mildly uncomfortable due to nicotine withdrawal. A few participants even described feeling less dependent on cigarettes after smoking VLNC cigarettes for only three days. Others compared their subjective smoking experiences across the two hotel stays and reported not feeling different or not experiencing withdrawal symptoms during the VLNC week. If the FDA implements a low-nicotine product standard, then corresponding public health messages that preemptively address negative expectancies could help with the transition to VLNC cigarettes. For example, informing people who smoke that they may experience minor withdrawal symptoms, like increased irritability, when initially smoking VLNC cigarettes may motivate some people to use medicinal nicotine or switch to other nicotine products to avoid symptoms.

VLNC cigarette risk perceptions varied substantially across participants. Several participants correctly articulated that VLNC cigarettes are less addictive but not less harmful, which is encouraging. However, a few participants misunderstood nicotine’s contribution to smoking-related harms and subsequently could not identify why the FDA would want to implement a low-nicotine product standard. Further, some participants described smoking VLNC cigarettes as less harsh compared to smoking conventional cigarettes. This subjective experience may have implicitly, but incorrectly, conveyed reduced harm. People may delay cessation or avoid switching to less harmful products if both sensory differences and nicotine misperceptions lead them to believe that VLNC cigarettes are less harmful products

(Byron, Jeong, Abrams, & Brewer, 2018). Similar sensory experiences and risk misperceptions have been reported with cigarettes labeled as ‘light’ or ‘ultra-light’ (Shiffman, Pillitteri, Burton, Rohay, & Gitchell, 2001). Therefore, nuanced public health messaging that conveys the purpose and benefits of a nicotine reduction policy while also explaining VLNC cigarette health risks must be developed and tested prior to policy implementation in order to maximize the public health impact.

Predicted behavioral intentions under a proposed low-nicotine product standard varied across participants. Most said they would smoke VLNC cigarettes if they were the only cigarettes available to purchase; but several felt that doing so would help them taper down or quit smoking. If regulators move forward with a nicotine reduction policy, highlighting the policy’s potential for facilitating smoking cessation may help to increase support among people who smoke. Participants who had previously used vaping devices mentioned they would consider using them as substitutes for VLNC cigarettes. However, a couple of participants perceived vaping devices as being too harmful to be a viable alternative. This is problematic since vaping devices are likely less harmful products relative to combusted tobacco (National Academies of Sciences, 2018). If some people who smoke perceive non-combusted products as equally or more harmful than cigarettes, then additional health communication campaigns may be necessary to accurately explain the continuum of harm for tobacco products. Another participant said they would switch to little cigars, reinforcing the need for a low-nicotine product standard to encompass all combusted products to maximize public health impact. A few participants mentioned illicit strategies for obtaining conventional cigarettes including internet sales from other countries or buying tobacco directly from farmers. Concerns about an emerging NNC cigarette black market are commonly voiced when discussing a low-nicotine product standard (Bates, 2017, March; Kozlowski, 2017). However, approaches used to address current illicit sales could be applied and strengthened for a nicotine reduction policy (Ribisl, Hatsukami, Huang, Williams, & Donny, 2019). Enforcement procedures for internet sales, track and trace procedures for tobacco manufacturing, and ensuring easy access to less harmful nicotine alternatives (e.g., medicinal nicotine or vaping devices) could help to minimize NNC cigarette illicit trade.

A few participants voiced their preference for a gradual nicotine reduction approach, and one participant even compared it to the step-down approach of using nicotine patches. A previous VLNC cigarette trial examined the impact of nicotine reduction pace on smoking-related outcomes and found that an immediate reduction approach resulted in greater reductions in smoking and toxicant exposure compared to a gradual reduction approach (Hatsukami et al., 2018). From a regulatory perspective, an immediate reduction approach would likely be more logistically feasible to implement than gradually reducing the allowable nicotine in cigarettes over time. However, from a consumer’s perspective, a gradual reduction approach may be more conceptually appealing since many are familiar with the step-down approach of medicinal nicotine. Reconciling these two perspectives may be important for public health officials, if the FDA does implement an immediate reduction approach. Health communication campaigns explaining the potential benefits of an immediate reduction approach and differentiating cigarette nicotine reduction from nicotine replacement therapy may be advantageous. Additionally, a few participants suggested that VLNC cigarettes should be commercially-available along with conventional cigarettes so

that people who smoke have a choice to use VLNC cigarettes rather than be forced to use them via a product standard. The FDA recently approved Moonlight[®] cigarettes, so people may soon have the option to buy VLNC cigarettes (Administration, 2019). Future studies should examine the impact of VLNC cigarettes as a marketplace choice versus a product standard on smoking-related outcomes to determine if a low-nicotine product standard is necessary for facilitating smoking behavior change.

There are a few limitations to consider. First, the sample is small and, as with all qualitative studies, the comments from some participants do not reflect the views of all people who smoke. Participants identified predominantly as non-Hispanic, white so these findings may not generalize to those identifying as racial and ethnic minorities. Second, the interviewer and participants spent several days together in the hotel prior to the interview and both were aware of the reduced nicotine levels in the cigarettes. Together, these study demand characteristics may have led to increased social desirability biases. Third, we may not have achieved saturation since our sample was restricted to the 16 participants who completed the main study. Other themes may emerge among larger samples of people smoking VLNC cigarettes; therefore, current and future VLNC cigarette studies should consider adding qualitative interviews to examine other policy-relevant constructs not discussed or expand upon themes that emerged from this study. Further, participants' smoking experiences while in the hotel may not encompass all facets of smoking VLNC cigarettes, so additional information could emerge when conducting interviews with people using VLNC cigarettes in a more natural environment. Finally, the informed consent document provided basic information about VLNC cigarette health risks and FDA regulation of tobacco, which could have contributed to product and policy expectancies.

4.1 Conclusions

Despite the limitations, this study adds to the VLNC cigarette literature by providing context about how people who smoke perceive VLNC cigarettes and pending nicotine regulation. Our results demonstrate the crucial need for public health officials to clearly articulate the sustained risks of smoking VLNC cigarettes as well as potential benefits of a low-nicotine product standard. Additionally, this work further reinforces the need for tobacco regulatory science researchers to consider the importance of VLNC cigarette expectancies on study outcomes. A nicotine reduction policy for cigarettes is likely to improve public health outcomes in the US. Moving forward, researchers and public health officials should focus on the policy transition plan in order to address the public health impact of a low-nicotine product standard for cigarettes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- In-depth interviews were conducted with participants (N=16) enrolled in a residential smoking study of very low nicotine content (VLNC) cigarettes.
- Some participants expected to compensate for the reduced nicotine levels by smoking more cigarettes; however, they were surprised when they did not increase their smoking during the study.
- A subset of participants reported experiencing minor withdrawal symptoms after exclusively smoking VLNC cigarettes.
- Some participants reported feeling less dependent after exclusively smoking VLNC cigarettes while others thought VLNC cigarettes could help people quit smoking.