



Supplement Article

Misperceptions of Nicotine and Nicotine Reduction: The Importance of Public Education to Maximize the Benefits of a Nicotine Reduction Standard

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The public health impact of FDA's recently proposed nicotine reduction standard may be impacted by the extent to which tobacco users and non-users understand the harms of nicotine in relation to specific products (eg, e-cigarettes, nicotine replacement therapy [NRT], reduced nicotine content cigarettes), and how this influences decisions made by users regarding cessation, product switching, or continued use. FDA's 2018 Advance Notice of Proposed Rulemaking (ANPRM) addresses these questions related to perceptions of very low nicotine content (VLNC) cigarettes directly in asking: "IV.B.4. If FDA were to finalize a nicotine tobacco product standard, what is the potential that adults and adolescents would perceive these VLNC cigarettes as 'safe'—and how could youth and adult risk perceptions of these cigarettes impact initiation, use, and cessation habits of combusted tobacco products?" Below, we review current evidence as it pertains to this question and we recommend key elements of public education efforts to correct misperceptions of nicotine in order to maximize the potential benefits of a nicotine reduction standard.

Public Misperceptions of the Health Risks of Nicotine

Recent population-level data highlight that 49%–80% of US adults incorrectly believe that nicotine is responsible for most of the cancer caused by smoking.^{1,2} Data from a 2016 national sample of US young adults showed that 55% of 18- to 40-year-olds believe that nicotine causes cancer, and more than 60% believe that nicotine is responsible for a relatively or very large part of the health risks of smoking and the cancer caused by smoking.³ Additionally, between 23% and 43% of young adults responded "don't know" to items on

nicotine perceptions and more than 50% of respondents, including past 30-day tobacco users, perceived nicotine gum and patch to be as harmful or more harmful than cigarettes to overall health and specifically, to causing cancer or heart attack.³ These studies are consistent with research over the past 20 years that have repeatedly shown that many smokers in the United States and abroad have little knowledge of NRT and equate the harms of NRT use with the harms of cigarette smoking.^{4,5} There are strong correlations between nicotine beliefs and the perceived harms of nicotine and tobacco products.⁶ Given these common misperceptions about nicotine, a low nicotine product standard has potential to further confuse consumers about tobacco product risks in the absence of public education efforts.

Misperceptions About the Harm of Reduced Nicotine Content Cigarettes

Nearly half (47%) of adult smokers believe that continued smoking of VLNC cigarettes is less likely to cause cancer than smoking their current cigarettes.⁷ This misperception is more common among smokers who are age 55+ (57%) and Black (57%). While most smokers say that they would be equally or more likely to quit smoking if a VLNC regulation is passed, 24% said they would be less likely to quit. This reduced interest in quitting was associated with the VLNC misperception ($p < .01$). This suggests that some smokers view VLNC cigarettes as less harmful and therefore may feel there is less need for them to quit. Clinical trials have also found that cigarettes described as having very low nicotine are perceived as less harmful.⁸ In a large multi-site trial on the subjective and behavioral effects of reduced nicotine content cigarettes, participants

who perceived that they were smoking the lowest nicotine content cigarette reported the lowest health risk of their product, overall and for specific smoking-related diseases, compared to participants who perceived that they were smoking higher nicotine content cigarettes.⁹ While the risks are understated, the benefits of a VLNC standard are also not obvious to the public, as a recent study demonstrated that a large proportion of daily smokers who had never used reduced nicotine content cigarettes did not believe that these cigarettes were less addictive (57%) or better able to help them quit smoking (63%) compared to regular cigarettes.¹⁰

Perceptions and Behavior With Reduced Nicotine Content Cigarettes

Two studies have examined associations between reduced nicotine cigarette risk perceptions and smoking behaviors.^{9,11} Product perceptions were not directly associated with smoking behaviors in either study, although Mercincavage and colleagues found that greater false beliefs about reduced nicotine cigarettes were correlated with higher daily cigarette consumption among smokers who provided more favorable subjective ratings of the cigarettes.¹¹ Thus, there is limited data available to address how perceived health risks may influence initiation or long-term use of VLNC cigarettes or cessation. A number of other studies, however, support the premise that this relationship exists. Cross-sectional studies in youth¹² and young adults^{13,14} show that believing that specific tobacco products (eg, e-cigarettes, hookah) are less harmful than a cigarette is correlated with the use of those products. Having low harm perceptions of cigarettes themselves is correlated with current cigarette use in youth¹⁵ and in adults; cross-sectional studies support that lower harm perceptions about NRT are correlated with NRT use.⁵ Recent studies in population samples of young adults and adults demonstrate that lower relative harm perceptions of tobacco products predict subsequent tobacco use behavior.^{14,16-18} Together, these studies highlight the need for public education on nicotine and VLNC cigarettes to correct misperceptions and maximize the intended benefit of the nicotine reduction standard.

Impact of Marketing Messages on Beliefs About Reduced Nicotine Content Cigarettes

Tobacco product marketing has long been a source of smokers' misperceptions about product risks. Recent studies suggest the potential for low nicotine content descriptors and advertising to reduce perceived health risks of VLNC cigarettes.^{8,11} Regarding potential descriptors, Denlinger-Apte and colleagues demonstrated that merely describing a cigarette as containing "very low" nicotine content (vs. an identical cigarette described as having "average" nicotine content) may bias smokers to perceive lower risks of addiction, health issues, and various cancers.⁸ Studies examining smokers' risk perceptions following exposure to unaltered and altered Quest brand reduced nicotine cigarette advertisements suggest that advertising has the potential to promote false beliefs that the cigarettes are healthier or less harmful than other cigarettes.^{11,19}

While these studies provide informative data on how different forms of marketing may potentially influence perceived health risks of using VLNC cigarettes, it should be noted that all have examined acute exposure to the advertising or descriptors. Thus the impact of repeated exposure to product messaging (eg, health claims on the package of a smokers' preferred brand; advertisements at

the point-of-sale) on product perceptions and use is not yet known. Further, these studies have examined these effects among adult daily smokers; there is a need to determine how nonsmokers and non-daily smokers would respond to ads.

Importance of Public Education on Nicotine

Results from a recent pilot study of a brief nicotine messaging intervention—similar to the messages likely to be seen on warning labels or in media campaigns—suggest that communication campaigns have the potential to correct misperceptions of nicotine, NRT, e-cigarettes, and RNC cigarettes.²⁰ To maximize the public health benefit of FDA's nicotine reduction policy, educational messaging should correct misperceptions about nicotine and VLNC cigarettes, provide information on the continuum of risks of tobacco products, and include messages to prevent non-users from initiating tobacco product use. Public education prior to and during the implementation of nicotine reduction policy should also provide substantial support for and resources for cessation.

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Declaration of Interests

None declared.

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