

## VIEWPOINT

# Potential Benefits and Risks of High-Nicotine e-Cigarettes

**Robin Koval, MBA**  
Truth Initiative,  
Washington, DC.

**Jeffrey Willett, PhD**  
Schroeder Institute at  
Truth Initiative,  
Washington, DC.

**Jodie Briggs, MA**  
Schroeder Institute at  
Truth Initiative,  
Washington, DC.

**The substantial reduction in smoking** in the United States represents one of the most important public health advances of the last 50 years. Among children and adolescents this progress has been particularly encouraging, with smoking rates declining among 8th-, 10th-, and 12th-grade students from 28.3% in 1997 to 5.4% in 2017.<sup>1</sup> These positive trends suggest that the powerful appeal of tobacco and nicotine has been reduced in younger generations. However, emerging products such as JUUL, Suorin Air, Envi FITT, and MYLE, high-tech e-cigarettes capable of delivering nicotine at levels comparable to cigarettes, have the potential to undo years of progress if a new generation of young people becomes addicted to nicotine. An expert committee of the National Academy of Sciences, Engineering, and Medicine presented e-cigarettes as a safer alternative to cigarettes in a 2018 report, concluding, "There is conclusive evidence that completely substituting e-cigarettes for combustible tobacco cigarettes reduces users' exposure to numerous toxicants and carcinogens present in combustible tobacco cigarettes."<sup>2</sup>

These high-tech e-cigarettes may represent a positive innovation, but also are associated with significant challenges. On one hand, these products may enable adults to switch completely from more harmful

e-cigarette market, even products intended for adults have the potential to attract younger users. The potent nicotine delivery of these products means that along with the potential as a harm reduction tool for adults is the concern of use among young people. While these products can potentially support adults who want to quit smoking, they also require regulatory actions to protect children.

Introduced in 2015, JUUL devices quickly overtook the e-cigarette market and accounted for more than 65% of e-cigarette sales in June 2018, with estimated retail sales of more than \$650 million in the first 6 months of 2018.<sup>4</sup> With such a new product, accurate prevalence measures are difficult to determine, but one study of 1012 adolescents and young adults (aged 15-24 years) found that 25% recognized JUUL devices and 10% had tried them.<sup>5</sup> Although these data are limited, they suggest that many teenagers recognize the product. In addition, the practice of using the device has been described as "JUULing," implying it is no mere e-cigarette but a unique device whose use is worthy of its own branding.

Several features make this product distinct and a unique concern. First, the device is small and narrow and closely resembles a USB flash drive. This e-cigarette can fit in the palm of the hand, making it both easy to hide and easy to disguise as something more benign.

Second, the flavor pods marketed with this e-cigarette are available in flavors that appeal to young users, including fruit medley, cool mint, and mango. Research has demonstrated that flavored tobacco products are often "starter" products, especially among children and adolescents.<sup>6</sup> Even though federal law prohibits the use of flavors (excluding menthol) in combustible cigarettes, there

is no regulation preventing the use of flavors in e-cigarettes, cigars, hookah, or smokeless products.

Third, and perhaps most concerning, is the ability of these e-cigarettes to deliver nicotine. Unlike many other e-cigarettes, JUUL devices use nicotine salts derived from tobacco leaves, enabling delivery of nicotine at levels comparable to cigarettes. The manufacturer claims that examinations of blood nicotine levels after users take a puff from the device reveal nicotine yields similar to those drawn from cigarette puffs.<sup>7</sup> Laboratory studies also suggest the chemical composition of JUUL flavor pods produces an aerosol that is less harsh than other e-cigarette solutions.<sup>8</sup> Although enhanced nicotine delivery might pose some promise for the device's use as a substitute for cigarettes among adult smokers, it could lead to addiction to nicotine in children and adolescents.

Left unsaid is the reality that, in an unregulated or poorly regulated e-cigarette market, even products intended for adults have the potential to attract younger users.

products, such as combustible cigarettes, to a less harmful product. This notion of harm reduction is part of the US Food and Drug Administration's (FDA's) nicotine-focused strategy for reducing the major adverse health effects from cigarette smoking. Through this framework, the FDA contends that reducing nicotine levels in cigarettes, along with the development of innovative, less harmful nicotine-delivery products, will help more smokers either quit or transition entirely to safer products, such as e-cigarettes and cessation medications.

The manufacturer of one of these products, JUUL Laboratories Inc, presents its product as an alternative to cigarettes for adults. The manufacturer claims that the devices are intended only for adults and that their design features and nicotine levels can help smokers switch from combustible cigarettes.<sup>3</sup> Left unsaid is the reality that, in an unregulated or poorly regulated

**Corresponding Author:** Jodie Briggs, MA, Schroeder Institute at Truth Initiative, 900 G St NW, Washington, DC 20001 ([jbriggs@truthinitiative.org](mailto:jbriggs@truthinitiative.org)).

Extensive research has shown the adverse effects of nicotine on developing brains, and nicotine exposure during adolescence is likely to adversely affect cognitive function and development.<sup>9</sup> Creating dependence or addiction to nicotine among young consumers also ensures tobacco companies have customers for generations. In addition, while there may be significant debate about whether e-cigarette use by nonsmokers leads to initiation of cigarette smoking, it is highly likely that individuals who become addicted to nicotine, even if they began with a noncombustible product, may be vulnerable to smoking cigarettes as long as tobacco products are still widely available.

Harm-reduction strategies do have the potential to help adults quit smoking. However, novel high-tech e-cigarettes have the potential to become an addictive nicotine product adopted by children and adolescents. Even though switching completely to an e-cigarette may be a reasonable option for an adult smoker who otherwise cannot or will not quit smoking, there is no role for nicotine among children and adolescents.

Delays in enforcement action by the FDA as well as failure to enforce the full, premarket review process have created a climate

in which products like JUUL devices can be marketed as smoking cessation to adults while ignoring the potential ramifications for adolescents and teenagers.<sup>10</sup> There are regulatory actions the FDA could take to reduce youth e-cigarette use, such as requiring age verification for internet sales, prohibiting branded merchandise, carefully reviewing how flavors are used in products, and examining where and how these products are marketed. Despite recent actions by both the FDA and the product's manufacturers, the reality is that with relatively easy access, clear appeal, and powerful nicotine delivery, use of these types of e-cigarettes has the potential to attract young users.

Stopping e-cigarette use, such as with JUUL devices and other products, among vulnerable age groups will require stronger regulatory actions and sustained efforts by policy makers, medical professionals, public health activists, and the manufacturers who claim they are against the use of their products by children and adolescents, but stand to benefit financially from massive youth appeal. The campaign against smoking has been successful and it is important to ensure that these highly addictive products do not create a generation of young smokers.

#### ARTICLE INFORMATION

**Published Online:** September 20, 2018.  
doi:10.1001/jama.2018.12328

**Conflict of Interest Disclosures:** All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

#### REFERENCES

1. Johnston LD, Miech RA, O'Malley PM, Bachman JG, Schulenberg JE, Patrick ME. *Monitoring the Future National Survey Results on Drug Use: 1975-2017. Overview, key findings on adolescent drug use*. Ann Arbor: Institute for Social Research, The University of Michigan; 2018.
2. National Academies of Sciences, Engineering, and Medicine. *Public Health Consequences of E-Cigarettes*. Washington, DC: National Academies Press; 2018. <https://www.nap.edu/resource/24952/012318ecigaretteConclusionsbyEvidence.pdf>.
3. JUUL Laboratories Inc. Our responsibility. Juul website. <https://www.juul.com/our-responsibility>. Accessed April 27, 2018.
4. Wells Fargo Securities. *Nielsen: Tobacco "All Channel" Data. Equity Research*. San Francisco, CA: Wells Fargo Securities; 2018. <https://1bxcx1bcuig1rfxaq3rd6w9-wpengine.netdna-ssl.com/wp-content/uploads/2018/02/Nielsen-Tobacco-All-Channel-Report-Period-Ending-1.27.18.pdf>.
5. Willett JG, Bennett M, Hair EC, et al. Recognition, use and perceptions of JUUL among youth and young adults [published online April 18, 2018]. *Tob Control*. doi:10.1136/tobaccocontrol-2018-054273
6. Ambrose BK, Day HR, Rostron B, et al. Flavored tobacco product use among US youth aged 12-17 years, 2013-2014. *JAMA*. 2015;314(17):1871-1873. doi:10.1001/jama.2015.13802
7. Cohen G, Mehoudar P, Carbonara C, Wynne C. Acute use of nicotine salt-based ENDS and combusted cigarettes. Paper presented at: Society for Research on Nicotine and Tobacco Annual Meeting; February 24, 2018; Baltimore, MD.
8. Duell AK, Pankow JF, Peyton DH. Free-base nicotine determination in electronic cigarette liquids by <sup>1</sup>H NMR spectroscopy. *Chem Res Toxicol*. 2018;31(6):431-434. doi:10.1021/acs.chemrestox.8b00097
9. US Department of Health and Human Services (USDHHS). *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*. Atlanta, GA: US Centers for Disease Control and Prevention; 2014.
10. McDevitt M. Health groups sue FDA over deeming rule implementation delay. American Academy of Family Physicians website. <https://www.aafp.org/news/health-of-the-public/20180416fdalawsuit.html>. Published April 16, 2018. Accessed June 26, 2018.