

Vaping: Clearing the Air

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KEY FINDINGS

- Vaping among teens and young adults has increased significantly in the last few years. Rates of smoking continue to decline for all age groups.
- While less harmful than smoking, vaping still carries risks for nicotine addiction.
- Vaping may be more effective for smoking cessation than other methods, but most smokers who initiate vaping continue to use cigarettes.
- The vaping industry has intentionally marketed to young people who have never smoked, despite claims that vape products were meant only to help smokers quit cigarettes.
- Bans on vaping products are likely to be harmful and ineffective. Regulations should focus on restricting advertising and sales to minors while maintaining the appeal of vaping as a less harmful alternative for people who smoke.



INTRODUCTION

On January 1, 1964, 42% of Americans 18 and older smoked cigarettes. A few days later, U.S. Surgeon General Luther Terry released the landmark publication, “U.S. Smoking and Health—Report of the Advisory Committee to the Surgeon General of the Public Health Service.” Based on consulting more than 7,000 articles, the committee concluded that smoking cigarettes causes lung and laryngeal cancer and chronic bronchitis. Cigarettes had been called “cancer sticks” and “coffin nails” long before that, but this incontrovertible document lent powerful reality to those allusions. Few, if any, government publications have had a greater impact on public health. From that day forward, smoking rates in the United States have plunged to an all-time low: 13.7% of adults in 2018.¹

Despite that impressive decline, tobacco use is still a public health crisis. An estimated 480,000 deaths in the U.S. are

linked to smoking each year—the equivalent of three fully loaded jumbo jets crashing every day of the year—and 16 million live with a smoking-related disease. The Centers for Disease Control and Prevention (CDC) estimates that smoking-related illness in the U.S. costs more than \$300 billion annually.² According to the World Health Organization, more than 8 million people die prematurely each year, about 1.2 million of them from exposure to secondhand smoke. Around 80% of the world’s 1.1 billion smokers live in low- and middle-income countries.³

Coincident with the decline of cigarette smoking in this country—and helping accelerate that decline—has been the remarkable rise, extraordinary popularity, and rampant news coverage of the related practice known as “vaping.” We have inhaled a sizable cloud of information regarding this practice, most of it factual, some of it smoke blown to conceal those facts, and some of it just hot air. We offer here our take, given the current state of our knowledge.

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Vaping devices heat liquid nicotine (or THC), flavors, sweeteners, and chemical solvents such as vegetable glycerin that are necessary to create a steam that users can inhale (Illustration 1). Often called vapes, vape pens, e-cigs, and mods, vaping products allow users to consume nicotine free from the many cancer-causing substances included in traditional combustible cigarettes. They have been hailed by the companies who sell them, and supported by proponents of tobacco harm reduction, as a safer alternative to cigarettes that could help further reduce smoking rates.

In the last several years, however, vaping has become increasingly common among teens, alarming public health officials and galvanizing support for greater regulation and even outright bans of some vaping products. That concern grew to panic during the summer of 2019 when reports of “E-cigarette and Vaping-Associated Lung Illnesses” (EVALI) first surfaced. Across the country, people were visiting emergency rooms with such symptoms as shortness of breath, chest pain, coughing, fatigue, nausea, and vomiting. Many of these patients were young and otherwise healthy. Analyses of the lung tissue of some patients revealed that the damage was similar to burns one would experience if exposed to mustard gas or other toxic chemicals.⁴ As of February 18, 2020, the CDC has documented more than 2,800 cases and 68 deaths related to vaping products.⁵

The CDC is now confident that the presence in some vaping devices of vitamin E acetate, a substance safe to ingest in vitamin E pills but not to inhale, is strongly linked to cases of EVALI.⁶ This chemical compound has a thick consistency similar to THC oil, making it an ideal ingredient to cut or dilute THC products, one method for increasing profits. It is more likely to be found in THC vaping products that are sold on the black market or by unlicensed retailers, and one study found that people who became sick after vaping THC were nine times as likely to have bought it from an “informal source.”⁷

Still, health officials have not ruled out the possibility that other chemicals, as well as some found in nicotine-only devices,

could also cause EVALI, because at least a few people who have gotten sick insist they vaped nicotine only.⁸ Thus, while one implication of the EVALI outbreak is the need to rein in black-market THC vaping products, another is that many unknowns remain about the health consequences of vaping generally. This uncertainty has intensified the persisting fear and panic over e-cigs among media outlets, members of the public, and elected officials.

BENEFITS OF VAPING OVER CIGARETTES

Vaping has some established advantages over conventional smoking, primarily that it reduces or eliminates the tars and smoke that contribute to various cancers. A review by the National Academies of Science, Engineering, and Medicine (NASEM) found lower toxin exposure associated with e-cigs compared to traditional cigarettes.⁹ Smoking contributes to heart disease and can cause and exacerbate long-term hypertension; a study of smokers with hypertension found their blood pressure was lowered when they switched from traditional cigarettes to e-cigs.¹⁰

The quality and contents of vaping devices vary widely, however, and this variability can substantially impact the health effects of using any given product.¹¹ The FDA has found that some products contain “tobacco-specific compounds that have been shown to cause cancer in humans.” Other studies have found formaldehyde, a cancer-causing chemical, in some e-cig cartridges.¹² Further, vaping still involves the inhalation of several chemicals for which the long-term effects of exposure are unknown. A 2019 review of vape effects on respiratory health concluded that, “no long-term vaping toxicological/safety studies have been done in humans; without these data, saying with certainty that e-cigarettes are safer than combustible cigarettes is impossible.”¹³

The star ingredient in vaping devices, nicotine, comes with its own risks. It can increase the chance of blood clotting, disrupt the gastrointestinal system, contribute to hardening of the arteries and heart attacks,¹⁴

and lead to premature wrinkling.¹⁵ Use in adolescence can affect development of the prefrontal cortex, the part of the brain responsible for key functions such as decision-making, social cognition, and personality expression.¹⁶

Nicotine is also highly addictive, comparable to heroin in difficulty of quitting.¹⁷ Some of nicotine's negative side effects cease with discontinuation of use, but its addictiveness makes quitting extremely hard—especially for adolescent users whose still-developing brains are more susceptible to addiction. An estimated 90% of adult smokers started using before the age of 19,¹⁸ making nicotine use among teens—whether through electronic or traditional cigarettes—a critical area of public health.

TRENDS IN VAPING AND CIGARETTE USE

Virtually all large-scale public health surveys show increases in vaping and decreases in smoking, although specific estimates vary. Data from the 2019 National Youth Tobacco Survey (NYTS) estimate that 27.5% of high school students used e-cigs in the previous 30 days, up from 13.4% in 2014 and just 1.5% in 2011. Among middle schoolers, rates of past-month e-cigarette use increased from 0.6% in 2011 to 10.5% in 2019. Thirty-four percent of high schoolers and 18% of middle schoolers who reported using e-cigs in the past 30 days said they used them on 20 days or more per month, an indicator of frequent use that is a more telling marker of problematic use or dependence.¹⁹

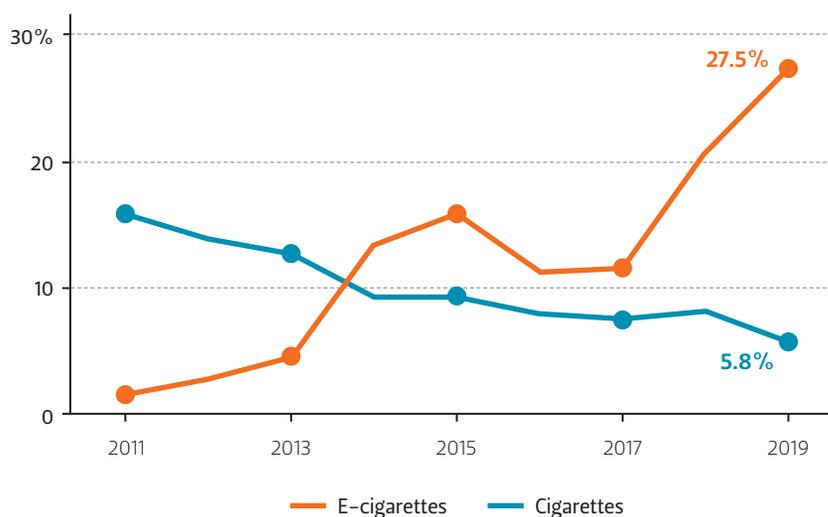
In contrast to the upward trend in vaping, smoking has been steadily declining among middle and high school students for over two decades, and just 5.8% of high school students and 2.3% of middle school students reported past-month cigarette use in 2019.²⁰

Rates of adult vaping remain low and are primarily driven by young adults. Current e-cig use among 18- to 24-year-olds increased from 5.1% in 2014 to 7.8% in 2018.²¹ In contrast, only 4.2% of adults 25 to 44 reported current e-cig use in 2018, and rates are even lower among older Americans.²²

But while young adults are more likely to vape, they are least likely to smoke. Cigarette use among 18 to 24-year-olds fell from 16.7% in 2014 to 7.8% in 2018. Rates among older Americans have also declined but remain much higher; over 16% of 25- to 64-year-olds smoke cigarettes.²³

Of particular concern to public health officials is the frequency of dual use of vaping and tobacco products. Dual use of tobacco products—e.g., smoking and chewing—occurred before the advent of e-cigs, but the rise in vaping has brought greater attention to this behavior. Dual use is concerning because it likely increases individual exposure to nicotine and its associated negative effects.²⁴ Most research on the topic has found dual use to be a common behavior pattern, especially among older smokers.²⁵ According to data from the 2015 National Health Interview Survey, 58.8% of all adult e-cig users also smoked cigarettes.²⁶ The prevalence of dual use makes it critical to understand the extent to which this behavior reflects an increase in smokers who are attempting to quit smoking via e-cigs, an increase in smokers who are supplementing smoking with vaping, or an increase in vapers who have started smoking cigarettes.

FIGURE 1 — PAST-MONTH CIGARETTE AND E-CIG USE AMONG HIGH SCHOOL STUDENTS



SOURCE Reuters, November 5, 2019, <https://reut.rs/326yUwJ>. Data from National Youth Tobacco Survey, U.S. Food and Drug Administration/Centers for Disease Control and Prevention, 2019.

VAPING'S ROLE IN TOBACCO CESSATION VS. NICOTINE INITIATION

The effectiveness of vaping as a cessation tool is a subject of intense debate. Two well-regarded reviews, by the Cochrane Collaboration and NASEM, cautiously conclude that there is some evidence that e-cigs can aid in smoking cessation, but both emphasize the need for more high quality research.²⁷ A 2020 U.S. Surgeon General report on smoking cessation largely concurs. It finds that “the evidence is suggestive but not sufficient to infer” that e-cigs can help some users quit smoking, but also stresses that the health benefits of these products hinge on whether e-cig users stop smoking completely, an outcome that is far from certain.²⁸

A 2019 randomized control trial conducted in the U.K. and not included in any of the aforementioned reviews found e-cigs to be more helpful than other nicotine replacement therapies for abstaining from cigarette use.²⁹ The adults in the study had a median age of 41, wanted to quit, and received at least four weeks of behavioral support, so they differed in significant ways from many American e-cig users, roughly half of whom are under the age of 35.³⁰ As the authors note, these findings “are likely to be valid for dependent smokers who seek help but may not be generalizable to smokers who are less dependent or who try e-cigarettes for reasons other than quitting smoking.”³¹

Observational studies of smokers' habits over a period of time (often one to two years) have found that adults who take up vaping are more likely to eventually abstain from cigarettes compared to smokers who do not use quit aids or use other methods (help from friends and family, nicotine replacement therapies, prescription drugs, etc.). Still, these studies indicate that the vast majority of smokers who initiate e-cig use continue to use cigarettes, even if they want to quit.³² The addictive power of cigarettes appears stronger than the cessation properties of e-cigs.

E-cigs may not be a proven or especially effective smoking cessation tool, but survey data suggest that smokers frequently initiate vaping for this purpose.³³ One study found the most frequently cited reason for initiating e-cig use among smokers was “to reduce my smoking or smoking urges” (63%); another 53% said they initiated “to quit smoking” and 39% said it was “for my health.”³⁴ Quitting or reducing smoking, however, may be a lesser factor for young adults, whose use may be driven more by curiosity and expectation of positive sensory and social experiences.³⁵

This presents a public health conundrum. Independent of scientific evidence on the subject, smokers may perceive e-cigs as more effective cigarette quit aids than other cessation tools, in large part because they promise a more pleasurable experience than, for example, a nicotine patch.³⁶ But the same properties that make vapes appealing to some smokers can also tempt nonsmokers who have no interest in cigarettes to try vaping, thus exposing them to nicotine.

For the population at the center of public concern over vaping—teenagers—some studies suggest that e-cig use may increase the likelihood of eventually smoking. One recent study, for example, estimated that 15.3% of current cigarette use among 12- to 15-year-olds may be attributed to prior e-cig use.³⁷ The NASEM report found “substantial evidence that e-cigarette use increases risk of ever using combustible tobacco cigarettes among youth and young adults.”³⁸ But that report also acknowledged that the relationship between e-cig and cigarette use could instead be explained by the common liability hypothesis; that is, that a common set of risk factors makes some individuals susceptible to trying both e-cigs and traditional cigarettes. Consistent with that explanation, a study of cigarette and e-cig use patterns among 13- to 14-year-olds over a two-year period found that compared with adolescents who did not initiate nicotine use, the predictors of initiating use of e-cigarettes, cigarettes, or both were similar, with higher levels of impulsivity and having friends or family members who smoked being the most salient factors.³⁹

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Among adults of all ages, never-smokers accounted for just 15% of e-cig users in the 2016 Behavioral Risk Factor Surveillance System (BRFS) survey, compared to 30.4% who were former smokers and 54.6% who were current smokers.⁴⁰ Among young adults, however, vaping is more and increasingly common for never-smokers.⁴¹ Analysis from the 2016 BRFS survey found that among 18- to 24-year-old current e-cig users, 44.3% had never smoked traditional cigarettes.⁴² Still, 38.9% said they were former smokers, suggesting a significant portion of young adults used e-cigs as a smoking alternative. Nearly 17% said they currently smoked cigarettes, which could reflect smoking quit attempts but not necessarily.⁴³

To complicate matters further, whether vaping functions as a cigarette quit aid or as an entrée to nicotine addiction depends on a host of individual characteristics such as age, race, education, income, sexuality, gender identity, and mental and physical health. Several studies have found black smokers to be less likely to quit smoking and less likely to use e-cigs compared to white smokers.⁴⁴ Individuals with higher education and higher income may be more likely to quit smoking and to use e-cigs as an aid for doing so.⁴⁵ Those who identify as LGBT are more likely to smoke, vape, and be dual users.⁴⁶ Dual use may also be more common among people with a history of depression or other psychiatric illness.⁴⁷

Understanding these variations in use patterns is critical to developing effective policy responses to both cigarette and vape use.

THE ROLE OF BIG TOBACCO AND JUUL

While age, class, companions, context, and other factors clearly influence both smoking and vaping, the independent variable whose importance cannot be overstated is the role of companies whose success depends on addicting people to nicotine. In April 1994, 30 years after the landmark Surgeon General Report, the top executives of the seven largest American tobacco companies faced six hours of questioning

about the dangers of smoking before a House Subcommittee. Faced with abundant research, they admitted that smoking might cause cancer and heart disease, but when asked individually if they believed cigarettes were addictive, each answered no.⁴⁸ They were lying. In 1998, the four largest of the companies (Philip Morris Inc., R. J. Reynolds, Brown & Williamson, and Lorillard) agreed to a settlement that involved \$206 billion in penalties, spread over at least 25 years, as partial compensation for the addiction, illness, medical costs, and deaths their highly addictive products caused.⁴⁹

Current producers and sellers of vaping products acknowledge that nicotine is addictive but stress that vaping nicotine is far safer than smoking tobacco. Dr. Albert Rizzo, president of the American Lung Association, told *The New York Times*, “To say that something is safer than a product like cigarettes that kills seven million people in the world each year because of tobacco-related disease, and half a million people in this country, is not saying a lot.”⁵⁰ It is possible that early developers of vaping may have wanted to help smokers lessen their chances of getting lung cancer and reduce the reek of their breath, clothes, and car, but when they say their main goal is to end dependence on nicotine and insist they do not want non-smokers, especially kids, to take up vaping, we are skeptical.

The story of the ties between the tobacco and vaping industries has several variations, but most of the relevant elements appear in the symbiotic relationship between the two juggernauts, Philip Morris and JUUL.

Philip Morris USA, since 2003 a subsidiary of Altria Group, owns more than a dozen cigarette brands, including the world’s best-selling Marlboro. Although cigarettes sales have continued to decline in the U.S., Philip Morris claims to sell over 740 billion cigarettes annually and tells investors of its “robust plans to grow [its] cigarette business” and “develop untapped markets” in “low- and middle-income nations across the globe.”⁵¹ In service of that mission, Philip Morris has repeatedly targeted young people in its ad campaigns and worked relentlessly to challenge tobacco control laws in the U.S.

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and overseas.⁵² The company claims that its long-term goal is a smoke-free world,⁵³ but does not expect that will come to pass so soon that investors should be concerned. In an October 2017 interview with *The Wall Street Journal*, André Calantzopoulos, the CEO of Philip Morris International said, “I don’t think it’s 40 years we’re talking about here. It’s much longer.” Despite this optimism, the Marlboro men could not help but take notice of the challenge posed by the new young guns in the vaping industry, particularly its runaway leader, JUUL.

JUUL

On November 24, 2019, a front-page feature story in *The New York Times* traced the beginning of vaping’s crown jewel to the early 2000s, when Adam Bowen and James Monsees, design students at Stanford University and smokers themselves, started thinking about how to devise a “less harmful and more socially acceptable” way to deliver nicotine. E-cigarettes had been in existence for a year or so, but the two friends considered them clunky and the liquid nicotine most used was so harsh that it had to be limited to a weak 1%–2% to avoid irritating the throats of average users, a dose that failed to satisfy the experienced smoker’s craving.⁵⁴

Over almost a decade of obtaining financing and experimenting with vaporizers, the business partners achieved considerable success with the production of the Ploom, a slick “heat not burn” battery-powered device that vaporizes tobacco without combustion, and the highly regarded Pax device for vaping loose-leaf tobacco and cannabis flowers. But their dreamed-of breakthrough came in 2015 when their company, by then called Pax Labs, introduced the first JUUL, a thin, sleek device comprising a heating element and cartridges filled with nicotine liquid and topped with a built-in mouthpiece that snapped into place to give it the look of an extended flash drive.

More important than looking cool was what it vaporized. By mixing benzoic acid with a nicotine base extracted from tobacco to form nicotine salts,⁵⁵ the scientists at Pax had produced an e-cig liquid that greatly softened the nicotine’s harshness and allowed them to kick its level up to 5%, several times stronger than found in other e-cigarettes of the time. The company’s market director was impressed. “When I first tried the JUUL prototype,” he recalled, “the nicotine hit was immediate, within seconds ... This was the first vaping product that actually had a shot at switching an existing smoker.”⁵⁶ Unspoken was that it also had the best chance of addicting non-smokers, many of them adolescents and young adults.

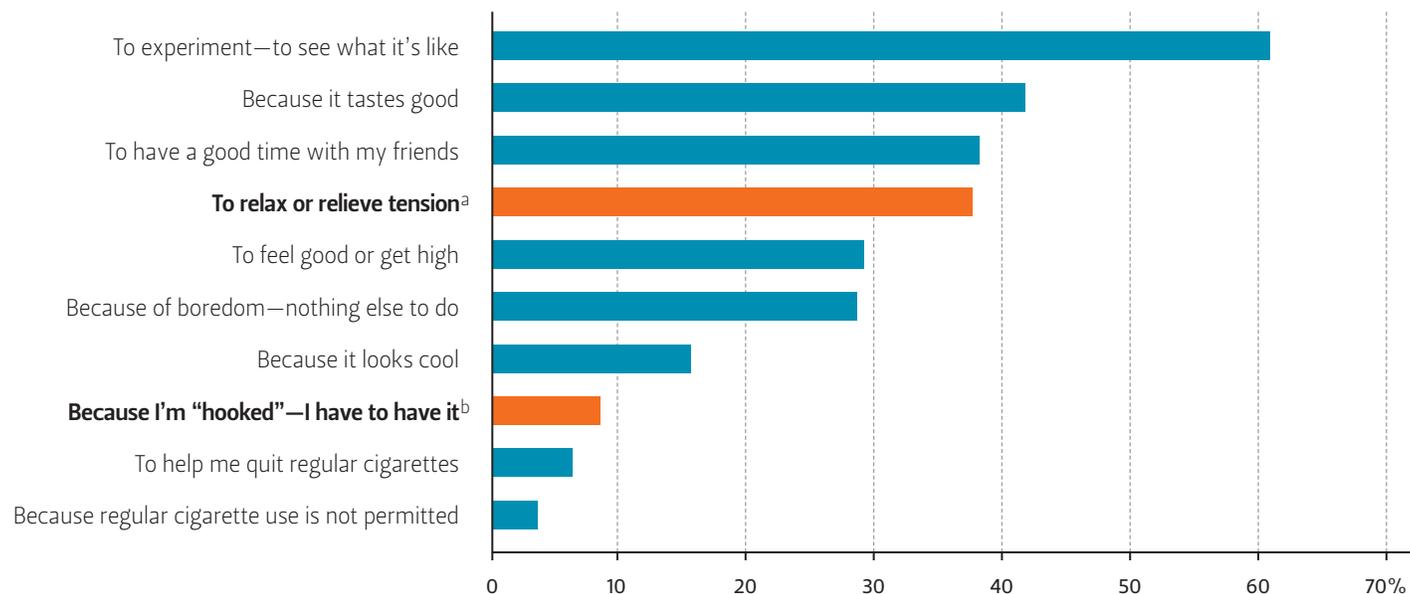
IMAGE 1 — JUUL DEVICE, PACKAGING, AND CARTRIDGES



SOURCE JUUL Labs

NOTE This is a JUUL starter kit, which includes the device, four nicotine pods, and a USB charger.

FIGURE 2 — TEENS REPORT REASONS FOR VAPING



SOURCE *Tobacco, Nicotine, and Vaping*, National Institute on Drug Abuse, Monitoring the Future Survey, January 2020, <https://bit.ly/2SW5mhm>.

NOTE (a) Increased by more than 1/3 since 2018; (b) More than doubled since 2018

JUUL's official stance from the outset has been that its primary aim is "to give adult smokers a safer alternative to cigarettes." At a congressional hearing in July 2019, co-founder Monsees insisted, "We never wanted any non-nicotine user and certainly nobody underage to ever use JUUL products."⁵⁷

The company's behavior did not match those assertions. Beginning with a launch party in New York City on June 1, 2015, complete with electronic billboards in Times Square, a six-month publicity campaign dubbed "Vaporized" featured glitzy events in San Francisco, Las Vegas, and other major cities, where young people were given free samples of JUUL devices and pods. YouTube videos, ads in *Vice* magazine and on Facebook, Instagram, Snapchat, Twitter, and other social media platforms featured attractive young models, often in provocative poses, partying, vaping with JUULs, and urging, "Share JUUL" and "Try this!"⁵⁸ According to the *Times*, the marketing company that created the campaign claimed it had "created ridiculous enthusiasm" for JUUL.⁵⁹ The ads touted the

various flavors: mint, creme brûlée, cool cucumber, mango, and tobacco.

JUUL was a latecomer to the use of flavors in e-cigs. According to an article in *The BMJ* (formerly *The British Medical Journal*), by January 2014 the internet already offered 466 brands, each with its own website and selling some kind of e-cig hardware with a distinct name or logo, and 7,764 unique flavors.⁶⁰ By comparison, JUUL's small batch of flavors was a model of restraint.

At the end of 2015, JUUL had garnered only a small slice of the e-cig market, far smaller than such brands as BLU, LOGIC, and Vuse, all owned by U.S., Japanese, and British tobacco companies trying to offset the decline in smoking. But it already had a firm foothold and was on a rapid ascent. After selling 2.2 million devices in 2016, it zoomed upward by 641% in 2017 with 16.2 million devices sold, nearly one in three e-cig sales nationally.

Tweets about JUUL also rose sharply over this span, trading information on how to buy and use the device, gushing about how cool JUULs are, even suggesting "a petition to make our school mascot a JUUL."⁶¹

73.4%

By July 2019, JUUL had inhaled 73.4% of the e-cig market, justifying its nickname as the iPhone of e-cigarettes.

An analysis of all public active profiles following JUUL's official Twitter account in April 2018, later published in *JAMA Pediatrics*, revealed that approximately 45% of these JUUL fans were age 13 to 17; 81% were 13 to 20, despite the account's stating that one must be 21 or older to follow it.⁶² Over 3.6 million middle and high school students used e-cigarettes in 2018, up by 1.5 million over 2017.⁶³ Soon, major media began to report on JUUL and other e-cigs, often using such terms as the vaping "fad," "craze," or "epidemic."

JUUL's advertising in the early years did not mention that its pods contained nicotine, and in a 2018 study 63% of users ages 15 to 24 said they had not been aware of that fact.⁶⁴ One 18-year-old woman who began JUULing at 15 recalled, "It was everywhere. Everyone had one ... and it looked like they were having fun." Still unable to quit in late 2019, she insisted, "If I knew it had nicotine at all, I wouldn't have done it. Now I'm so reliant on something I had no intention of doing. I knew what cigarettes do. This JUUL was new and nobody knew what the JUUL did."⁶⁵

When the FDA belatedly required JUUL to acknowledge that it was peddling nicotine, the warning at first appeared in small letters, but later became more prominent.

As public awareness of the extent of vaping grew, resistance mounted. In June 2018, San Francisco, where JUUL has its headquarters, banned flavored e-cigs like JUUL. Three months later, the FDA issued letters to five major e-cig manufacturers and more than 1,300 vape retailers, demanding that they put forward specific plans to reduce the sale of vaping products to minors in both brick-and-mortar stores and online retailers. An accompanying news release singled out non-tobacco flavors as "one of the principal drivers of the youth appeal of these products." If the producers and sellers of e-cigs did not take measure to halt illegal sales and kid-friendly marketing, the FDA warned, they could face stiff money penalties and lose the right to make and sell their devices and flavored e-liquids.⁶⁶ The five companies were Vuse, Blu, JUUL, MarkTen XL, and Logic. Only JUUL was not owned by or closely affiliated with a tobacco company. That was about to change.

Despite the increasingly hostile regulatory environment, in December 2018 the Altria Group, the corporation that owns Philip Morris, paid \$12.8 billion cash for a 35% stake in JUUL Labs, which it valued at \$38 billion, higher than the Ford Motor Company.⁶⁷ That deal gave JUUL access to Altria's distribution channels worldwide and offered Altria an opportunity to recover some of the income its cigarette business had lost to vapes.

Altria's optimism regarding JUUL's potential was not misplaced. By July 2019, JUUL had inhaled 73.4% of the e-cig market, justifying its nickname as the iPhone of e-cigarettes. But its ride was getting rougher. The aforementioned outbreak of EVALI, the severe lung illness, had given the FDA and other opponents of vaping a powerful boost. In June 2019, the Democratic-led House Oversight Subcommittee on Economic and Consumer Policy asked JUUL for internal records pertaining to advertising practices, the long-term health impacts of using JUUL products, and the company's deal with Altria.⁶⁸

Feeling the heat, JUUL Labs CEO Kevin Burns apologized to parents whose children had been addicted. "First of all," he said in a CNBC investigative report about e-cig addiction, "I'd tell them that I'm sorry that their child's using the product. It's not intended for them. I hope there was nothing that we did that made it appealing to them." A few weeks later on CBS' "This Morning," Burns acknowledged that the long-term effects of vaping are not known and warned non-smokers, "Don't vape. Don't use JUUL." But he also denied that JUUL products had played any role in the EVALI outbreaks.⁶⁹

On September 9, 2019, the FDA issued a letter declaring JUUL in violation of federal regulations for having a JUUL representative tell students at a presentation that JUUL "was much safer than cigarettes" and that a student "should mention JUUL to his [nicotine-addicted] friend ... because that's a safer alternative than smoking cigarettes, and it would be better for the kid to use," and that the "FDA was about to come out and say it [JUUL] was 99% safer than cigarettes ... and that ... would happen very soon."⁷⁰

That letter was only part of JUUL's mounting problems. Between August and the end of December 2019, a crop of school districts and states sued JUUL or announced investigations into its marketing practices or health claims. More than 200 cities prohibited the sale of flavored tobacco products, including flavored e-cigs. Governors in several states used their emergency executive power or directed their state health departments to issue at least a temporary ban on in-store and online sales of such products.

These developments had an impact. When Altria acquired its large share of JUUL in 2018, the deal gave it the right to make an offer for full control in four years. It did not wait that long to exercise its leverage. On September 25, 2019, JUUL announced that Kevin Burns had stepped down as CEO and would be replaced by K.C. Crosthwaite, who had previously served as Altria's chief growth officer. Noting Crosthwaite's "two decades experience working with regulators and stakeholders, advancing alternative products to combustible cigarettes," the company said he "and the entire JUUL Labs leadership team will continue a broad review of the company's practices and policies to ensure alignment with its aim of responsible leadership within the industry." Crosthwaite acknowledged that the future of alternative nicotine products such as JUUL "is at risk due to unacceptable levels of youth usage and eroding public confidence in our industry." As a show of good faith, JUUL would immediately "suspend all broadcast, print, and digital advertising in the U.S.," which resulted in the sudden and notable disappearance of full-page JUUL ads in major newspapers such as the Houston Chronicle. It would also refrain from lobbying the FDA regarding its drafting of guidance regarding e-cigarettes and was committed "to fully support and comply with the final policy when effective."⁷¹

In the meantime, JUUL is spending millions lobbying politicians in Europe, South America, Africa, the Middle East, Indonesia, India, Vietnam, and the Philippines in an attempt to preempt or roll back regulations that might hamper its marketing. Predictably, these governments fear that JUUL's e-cigs

will pose a health risk to the youth of their countries, as the U.S. government has contended. The responses are also predictable. Speaking at a hearing in the Philippines senate in September 2019, Kenneth Bishop, president of JUUL Labs Asia-Pacific, said, "We have done some things that we are not proud of in the past but we have taken aggressive and industry leading actions to mitigate any risks of exposing our products to youth or appealing to youth."⁷²

The arrangement between Altria/Philip Morris and JUUL is far from unique. In fact, six of the largest tobacco companies in the world—Altria/Philip Morris International, British American Tobacco, Imperial Tobacco, Japan Tobacco International, Huabao International Holdings, and Standard Diversified Inc.—own or market 37 vaping products.⁷³

THE WAY(S) FORWARD

Unsurprisingly, the wide attention the vaping epidemic has drawn over the last four years, greatly heightened by the EVALI outbreaks, has generated calls to outlaw vaping, to raise the legal age of use to 21, and to ban all or most flavors. Some of these calls are getting a response. As 2019 neared its end, President Donald Trump signed legislation to raise the legal age of using tobacco to 21, as at least 19 states and 530 localities had already done. Separately, several cities have enacted bans against some vape products and flavors and on January 2, 2020, the federal government announced a ban on sales of most flavored vape cartridges, with notable exceptions for single-use vape pens and tank vaping systems.⁷⁴ These actions do not include total bans on vaping, at least not yet.

WHY BANS ARE A BAD IDEA

Prohibition is Harmful and Ineffective

Full or partial prohibition of vaping products, even when implemented, is unlikely to significantly reduce use and is quite likely to have unintended and undesirable consequences. The decades-long war on drugs is a living example of the economic

and human costs of prohibition. As with the flourishing illicit drug trade, vape bans will expand the black market for these products, a market that already exists. In cities across the U.S., large-scale illicit vape operations have been discovered, like one in Wisconsin where law enforcement officials found two brothers in possession of at least 98,000 empty vape cartridges.⁷⁵ Shipments of thousands of illicit and counterfeit vape products regularly enter the country from China, where an estimated 95% of all legal vape pods are produced.⁷⁶ So far, it seems that most of the illicit vape industry involves THC products, and the identification of vitamin E acetate as a main culprit in EVALI suggests this illegal supply chain has played a large role in the health risks associated with vaping. Bans on already in-demand e-cig products will drive their supply underground. Purchasing vapes and vape cartridges from unregulated sources will increase the health risks for consumers.

Furthermore, banning a product implies that the ban will be enforced. While it is reasonable to crack down on businesses selling vapes to minors, punishment for illicit vape use will disproportionately affect marginalized groups, exacerbating the inequalities created by the drug war. The recent, well-intentioned bans on vape (and tobacco) use for anyone under 21, if heavily enforced against young users, are likely to cause more harm overall than the use itself. In Texas, for example, schools are increasingly suspending, expelling, and filing criminal charges against students caught with vapes.⁷⁷ School disciplinary action already tends to disproportionately affect poor and minority students; there is little reason to think that enforcement of vape restrictions would be different.

Vaping Bans Will Negatively Affect Smokers Trying to Quit

Another problem with banning vapes or vape flavors is that doing so will reduce access for smokers who use them as quit aids. Jacob Sullum, a senior editor at *Reason* magazine, tells the story of Mark Slis, a 55-year-old man who managed to stop smoking cigarettes with the help of vaping after more

than 30 years of trying to kick the habit by using various nicotine replacement products such as Nicorette and Chantix and even hypnosis, all to no avail. But after a chance 20-minute visit to a vape shop in 2014, he later recalled, “I walked out a nonsmoker.” A true convert, he bought the store and claims to have helped an estimated 1,000 other smokers make the switch to vaping.

Testifying in September 2019 before a Michigan legislative committee considering whether Gov. Gretchen Whitmer’s ban on flavors should be allowed to stand, Slis challenged the view that only kids are attracted to flavored products. “All my customers have three things in common,” he said. “They are adults; they are desperate to quit smoking after years, if not decades, of failing; and they all use flavors ... Ninety-nine percent of my customers use flavors. The flavors are absolutely necessary, and they are the key to quitting smoking.”⁷⁸ Without flavors more appealing than tobacco, Slis and other opponents of flavor bans contend, smokers will have less inclination to switch to e-cigs.

Research supports such anecdotes. A recent study examining e-cig flavor preferences among adults found that fruit, dessert, candy, and chocolate flavors are increasingly popular for users who switched from traditional cigarettes to e-cigs. The study authors found that “tobacco and menthol flavors, the two most popular flavors for initiating e-cigarette use prior to 2013, now rank as the 5th and 6th most popular currently used e-cigarette flavors, respectively,” and cautioned that “restricting access to non-tobacco e-cigarette flavors may discourage smokers from attempting to switch to e-cigarettes.”⁷⁹

Even the American Cancer Society, resolutely opposed to smoking, acknowledges the validity of these claims when considered from a harm-reduction perspective. Cliff Douglas, the society’s vice-president for tobacco control, said, “If the result of stopping vaping is that people smoke Marlboros again, then that’s a disaster. They’re not equivalent.”⁸⁰

Continued access to attractive cigarette alternatives is also important for advancing equity in public health. Low-

income Americans have not benefitted from the steep declines in smoking seen in the U.S. population overall. Nearly 27% of adults who make less than \$20,000 per year smoke, compared to 14.5% of those who make over that amount.⁸¹ Smoking is more common among blacks, Native Americans, veterans, people living in rural areas, people who identify as LGBTQ, people with substance use disorders, and people with mental illness. Higher rates of smoking among these populations contribute to higher rates of disease and mortality and lower life expectancy, compounding already existing health inequalities. In the battle to reduce smoking among the most at-risk groups, vaping is likely to be more friend than foe.

TOBACCO HARM REDUCTION: REGULATIONS TO CONSIDER

Ideal e-cig control policies would make vaping attractive to smokers and unattractive to anyone who does not already smoke cigarettes. Public health officials are struggling to determine how best to strike that balance.

With respect to teen use, it is important to recognize that vaping is consistent with teens' desire to experiment with mind-altering substances and, like drinking, smoking, having sex, and other experimental activities considered risky for adolescents, is a behavior that can be discouraged but not eliminated. With that in mind, regulations should focus on product manufacturers and sellers. Advertising should be limited as it is for tobacco products. Companies that intentionally market to youth should be fined heavily. Laws prohibiting sales of tobacco and vaping products to anyone under 21 should be enforced against businesses regularly and consistently, including loss of license. Teens, however, should not face any level of criminal penalties for use, as these consequences would outweigh the risks of vaping.

Regulations must be considered within the context of other tobacco pricing policies. In a 2018 article published in the *Annual*

Review of Public Health, a group of tobacco and public health researchers, including two affiliated with the anti-tobacco organization Truth Initiative, argue for a harm minimization approach to tobacco and nicotine use that involves "regulating and managing products according to their relative harms." Nicotine control policies should focus on "making combusted tobacco more expensive and less appealing while making [e-cigs] more appealing, less harmful, and less costly."⁸² The authors propose several policies that could serve this goal, including placing lower taxes on less harmful products (nicotine replacement therapies, e-cigs) and higher taxes on more harmful products (cigarettes), reducing the amount of nicotine allowed in cigarettes to lower their appeal, and banning flavors and menthol in cigarettes but not in e-cigs. As recently as July 2017, the FDA announced plans to require lower nicotine levels in cigarettes, but abandoned this goal after heavy pressure from the industry.⁸³

PUBLIC HEALTH EDUCATION AND AWARENESS

It will likely take years to reverse the tobacco industry's enormously successful efforts to make vaping appeal to young people. Like the effective anti-smoking campaigns launched decades ago, vaping prevention and reduction efforts will need to frame vaping as undesirable and uncool. One strategy may be to focus on the inconveniences and anxieties that accompany nicotine addiction.⁸⁴ There are a variety of resources geared toward tobacco education and prevention for youth, including the FDA's "The Real Cost Campaign" and "CATCH My Breath," an evidence-based, free vape prevention program designed for school settings. The Truth Initiative has a text-based program to help teens quit vaping, developed with the help of feedback from adolescents who vape(d), called "DITCH JUUL."⁸⁵

Anti-nicotine efforts should target vulnerable groups; young people who initiate both vaping and smoking have similar risk factors and some groups of people are

Companies that intentionally market to youth should be fined heavily. Teens, however, should not face any level of criminal penalties for use, as these consequences would outweigh the risks of vaping.

more likely to engage in both behaviors, suggesting that public health campaigns need to be geared toward people who are most likely to use and become addicted. Health care providers must also take a proactive role in reducing nicotine use; the Surgeon General report found that “four of every nine adult cigarette smokers who saw a health professional during the past year did not receive advice to quit.”⁸⁶

Educational efforts must also provide accurate information about the risks of vaping and the relative risks of this behavior as compared to smoking. A recent survey published in JAMA showed an increase in U.S. adults who wrongly perceive e-cigs to be just as harmful as cigarettes or more harmful.⁸⁷ While vaping nicotine certainly carries risks, these risks are not equivalent to the nearly guaranteed perils of traditional cigarettes. Individuals who erroneously believe that vaping is just as harmful as smoking may be more likely to use both products,⁸⁸ suggesting that accurate information about vaping’s relative risks is critical to helping consumers make less harmful choices.

CONCLUSION

We are neither advocates nor apologists for vaping, except as a harm reduction tool. Smoking tobacco is unquestionably harmful, first- and second-hand, but no one seriously thinks smokers should be arrested or denied access to tobacco. Over the past half-century, American society has taken measures that have been quite successful in reducing the rate of smoking and the level of offense to non-smokers. We view the aggressive efforts by tobacco companies to peddle their deadly drug, here and throughout much of the world, as reprehensible. We view with substantial skepticism the claims by JUUL and their counterparts that they seek only to offer a safer way to enjoy nicotine and never, ever want anyone under 21 to use their products. But we also accept the evidence

that vaping nicotine is less harmful than smoking and can help some smokers reduce or completely cease their use of combustible tobacco. For the present, we watch with interest the natural experiments being conducted at the local, state and federal level. In the meantime, we urge nonsmokers and adolescents to pay attention to JUUL’s admonition to them: “Don’t vape.”

ENDNOTES

Citations for this report are available at <http://bit.ly/37XAanb>.

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