

Why Are Youth Vaping and How Prevention Can Respond

The use of electronic vaporizing devices (“vaping”) among youth presents an urgent challenge. This policy brief explains the popularity of vaping, examines the regulatory environment, summarizes the current public health response, and recommends steps to prevent long-term use and consequences.

WHAT IS VAPING?

Vaping is the practice of using a battery-powered device, often known as an electronic cigarette or vaporizing pen, to inhale an aerosol derived from a heated liquid compound. Many liquids can be “vaped”, and liquid cartridges can be bought separately from the vaporizing device. Nicotine (combined with flavorings) is the most commonly vaped substance, but marijuana-derived chemicals (including THC and CBD) are also common.¹ Importantly, all vaporizer cartridges contain at least some other chemicals, and additional compounds may be created when the liquid is exposed to the heating element.²

HIGHLIGHTS

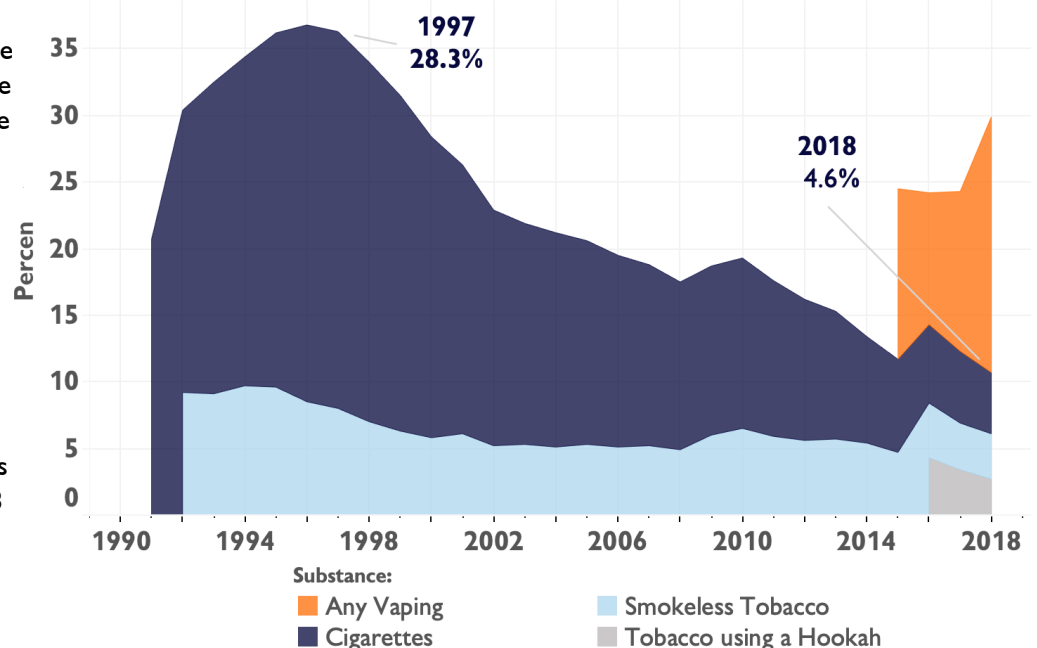
- C 88%** decrease in high school cigarette use from 1997 to 2018
- C 78%** increase in youth vaping rates from 2017 to 2018
- C 26%** of 12th grade students do not believe there is “great risk” associated with regular cigarette smoking
- C 82%** of 12th grade students do not believe there is “great risk” associated with regular vaping
- C FDA** does not currently approve vaping products or enforce product standards
- C Retail inspections** to prevent youth sales do not automatically include vaping products

NICOTINE VAPING IN CONTEXT: SPIKING NICOTINE USE

Reductions in tobacco use over the past several decades are one of the great public health successes in the U.S. As Figure 1 shows, past-30-day cigarette use among high school students declined 83% from 1997 to 2018, with other forms of tobacco use similarly in decline.

But the vaping trend threatens to undo years of success. Past-30-day vaping among high school students nearly doubled from 2017 to 2018 (11.7% to 20.8% in the National Youth Tobacco Survey and 12.0% in the National Health and Medical Examination Survey).

FIGURE 1. TRENDS IN 30-DAY PREVALENCE OF USE AMONG 8TH, 10TH, AND 12TH GRADE STUDENTS³



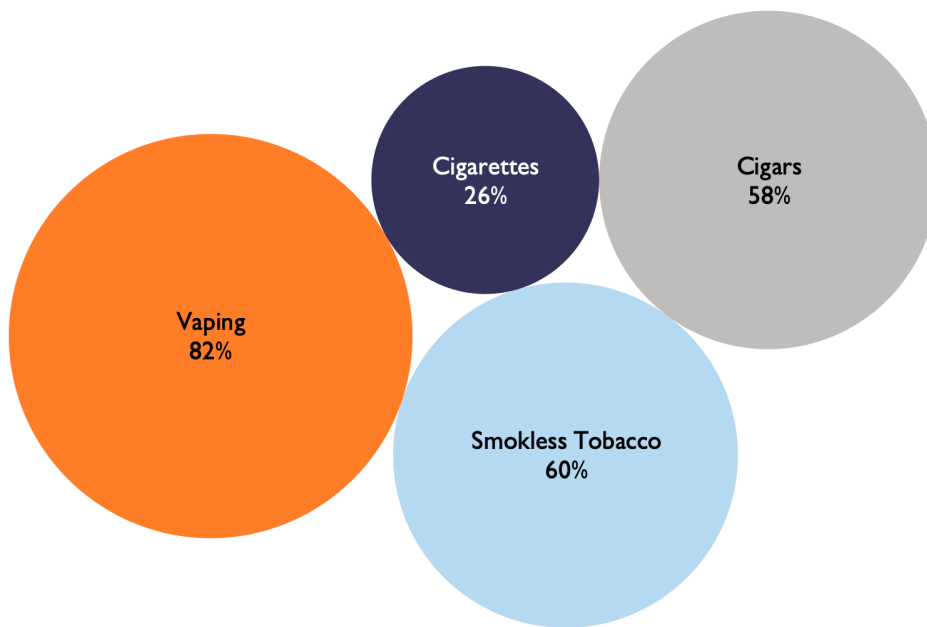
to 19.2% in Monitoring the Future). And research suggests that vaping prevalence is also increasing among adults.⁴ As Figure 2 shows, surveys have found that many youth view vaping as different from smoking or using other tobacco products,⁵ and vaping has surged in popularity even as tobacco prevention measures have remained in place – presenting a challenge for prevention. This requires a public health response.

that Vitamin E acetate was found in all 29 lung fluid samples it examined. Vitamin E acetate is most commonly found as a thickening or diluting agent in some illicit THC vaping products, but it may also be found in legal products.⁸ Much of the danger and confusion stems from the regulatory systems in which vaping operates.

THC vapes are illegal under federal law but may be state-legal under recreational or medical marijuana laws. Federal agencies – including the U.S. Food and Drug Administration (FDA) – play no role in regulating THC vapes. THC vape markets are regulated entirely at the state level, if at all. Though THC vapes may play a large role in the acute danger, this brief will focus primarily on non-marijuana vaping.

FIGURE 2. GAPS IN PERCEPTIONS OF HARM AMONG STUDENTS⁶

Percentage of 12th Grade Students Who Believe Using the Following Tobacco Products Does Not Pose a “Great Risk”



WHAT IS THE ACUTE VAPING DANGER?

As of November 5, 2019, the Centers for Disease Control and Prevention (CDC) confirmed at least 2,051 cases of acute lung injury among individuals with a history of vaping.⁷ Though the precise cause of injury is currently unknown, the CDC identified chemical exposure from vaping as the suspected cause. So far, there have been at least 39 fatalities. The CDC also announced

VAPING REGULATION

Because “vaping” can refer to vaporizing a host of different products, the regulatory environment is complex. There are also considerable black markets for both THC and nicotine vapes. As of August 2014, there were at least 460 vaping brands and 7,770 flavors available online.⁹ And, though black markets affect both THC and non-THC products, the regulatory environments are very different.

The FDA is the federal agency responsible for regulating nicotine-based vapes. But federal regulation is in its infancy. Currently, the FDA does not review or regulate vaping products before they are released to market. In August 2016, the FDA asserted the authority to regulate vaping products as tobacco and immediately prohibited the sale of vaping products to minors.¹⁰ The FDA has also issued warning letters over youth-focused advertising, required businesses to register their points of sale and products sold, and forced manufacturers to provide ingredient listings and other documentation.¹¹

Functionally, vaping devices are subject to no additional regulatory oversight – so the accuracy and completeness of manufacturer-provided information is unverified. For instance, while some leading brands have advertised their small number of ingredients,¹² studies have found ingredients not listed, including toxic metal particles.¹³ Because of the weak regulation, we cannot know whether this is a reporting oversight or product design flaw (e.g., if particles have dissolved from the metal heating coils into the liquid). Manufacturers have until August 2022 to submit premarket product applications¹⁴

and the FDA has not disclosed what it will enforce.

LONG-TERM NICOTINE VAPING RISKS

Acute vaping injuries require an immediate response, but the potential long-term effects are also alarming. There is less research on vaping than on cigarettes or other tobacco products, largely because vaping is still new. Given the significant risks associated with other forms of tobacco use, vaping may be preferable to smoking for adults who already smoke. Notably, some findings suggest that vaping may be more effective than nicotine-replacement therapy at reducing rates of smoking among adults.¹⁵

But there are many risks associated with vaping. Research has established the health effects of nicotine exposure¹⁶ and THC exposure among youth.¹⁷ One new study has even found an association between vaping nicotine and lung cancer in mice.¹⁸ There is also general risk regarding the unknown effects of inhaling aerosolized chemicals yet to be studied.

Manufacturers often point to vape chemicals as safe in other contexts, such as topical ointments or beauty products, but little to no research exists on their safety when inhaled.

CURRENT RESPONSES

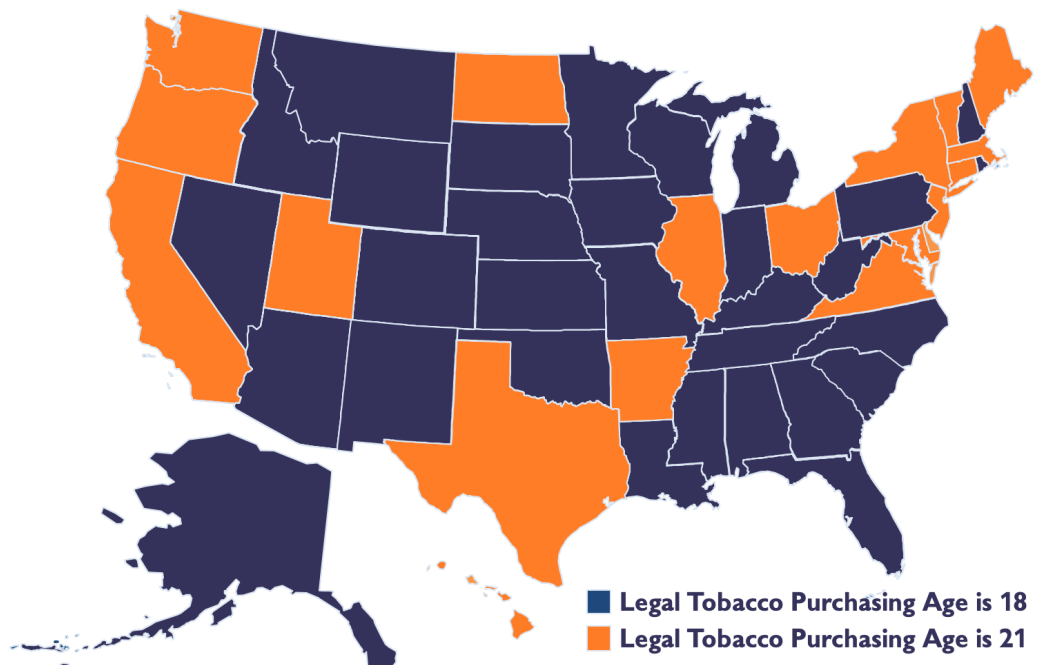
Policymakers should consider responses to two distinct but related challenges: (1) the acute lung injuries and (2) the rising prevalence of vaping and associated long-term risks. In some cases, strategies to address these challenges will align, but in others they will not.

Several jurisdictions have responded with vaping bans – though they vary widely in duration (permanent vs. temporary) and scope (all vapes or only certain types) and possibly in policy objectives as well. San Francisco became the first U.S. jurisdiction to ban all vaping products not approved by the FDA – effectively banning all vapes until the FDA begins regulatory enforcement. Massachusetts enacted a four-month ban of all vaping products, and New York announced a permanent ban on liquid compound flavorings, which are believed to appeal to youth. Other jurisdictions have followed with more temporary bans.¹⁹ Yet many bans have been blocked by state courts as cases brought by vaping stores and industry groups are heard.²⁰ Meanwhile, the CDC and some state health agencies have recommended against vaping marijuana products, due to growing evidence that lung injuries may stem from their use.

Other jurisdictions have taken actions more clearly designed to reduce youth vaping.²¹ Many have included vaping in their tobacco control policies, by defining vaping as a type of “smoking.” Some have also implemented public awareness campaigns, developed fact sheets and infographics, and created toolkits for talking with youth about vaping. Additionally, as Figure 3 shows, 18 states so far have raised their minimum age to purchase tobacco to 21, often including vaping products.

Unfortunately, little research has been conducted to determine the effectiveness of these prevention efforts. Researchers have collected a large body of evidence on the effectiveness of tobacco prevention. But the skyrocketing popularity of vaping occurred even as successful tobacco prevention interventions continued, suggesting that new approaches may be necessary.

FIGURE 3. STATUS OF TOBACCO PURCHASING AGE



Source: [Tobacco21 \(2019\)](#)

RECOMMENDATIONS TO PREVENT YOUTH VAPING

1. Expand Regulatory Oversight of Devices and Liquids

The FDA has not yet implemented a product approval process or published future standards for the vaping industry. The FDA should accelerate this process – before the current target of August 2022 – and implement standards to ensure that vaping products are as safe as possible. While there will always be inherent risk associated with nicotine consumption, the FDA should ensure that flavorings and filler ingredients do not pose a toxic risk. The FDA should also review device construction and assess whether products have been adequately designed to prevent accidents.

2. Address the Gap in Youth Perceptions of Harm

As Figure 2 shows, 82% of 12th grade students say there is not a “great risk” in nicotine vaping, compared with 26% for smoking cigarettes. Studies have also found that e-cigarette users, particularly young adults, have numerous positive expectations associated with vaping and that youth regularly hear positive messages about vaping from family members who vape.²²

The full extent of vaping risks is unknown, and vaping may be less risky than cigarette use, barring the acute lung injuries. However, vaping is considerably riskier than youth perceive it to be – which presents a public health challenge. The nature of this risk gap is not well-studied. It must be a focus for both researchers and preventionists. Researchers should also study the long-term effects of vaping.

3. Expand Youth Sales Enforcement

Although the FDA prohibits the sale of vaping products to youth under age 18, that prohibition is weakly enforced at both brick-and-mortar and online stores. The primary mechanism to prevent brick-and-mortar youth purchases are inspection protocols under the Synar Amendment of tobacco product sales. However, Synar does not define “tobacco products,” instead relying on states to do so. As of FY2018, only 19 states had asked to include vapes under Synar.²³ Other states should also revise their inspection protocols to include vapes, enabling inspectors to verify that retailers are not selling vaping products to youth.

Online enforcement actions have centered on negotiating with payment and shipping companies to block impermissible payments and prevent shipping for tobacco products.²⁴ In addition, in March 2010, the Prevent All Cigarette Trafficking (PACT) Act created additional tax collecting and reporting requirements for online vendors.²⁵ Currently, negotiated limitations and PACT Act requirements do not apply to vaping products – making online vape purchases significantly easier than cigarette purchases (in 2014 there were 460 vaping brands and 7,700 flavors available). Policymakers should expand the scope of successful online enforcement mechanisms to include vaping products.

4. Increase the Minimum Legal Age of Purchase

From a public health perspective, increasing the minimum legal age to purchase harmful products is one of the more effective actions a

government can take. In the past three years, 18 states have raised their minimum legal age to purchase tobacco products from 18 to 21, usually including vaping products. The remaining states and the federal government should approve similar changes. Raising the minimum legal age for alcohol showed associations with decreased use and many other positive outcomes for nearly all ages.²⁶

CRISIS RESPONSE

The acute lung injuries associated with vaping present a major short-term challenge for policymakers. The most common responses – vaping bans and voluntary sales restrictions – are well-intentioned but run the risk of diverting existing users to the black market and/or to cigarettes, each of which raises its own dangers and public health concerns. Bans and restrictions may be the most effective public health activities available, but policymakers must carefully examine the pros and cons. These approaches are not without risk.

Less controversially, all jurisdictions should issue warnings about the association between vaping and acute lung injury and the uncertainty about which specific products are responsible. Health agencies should also stress that the safest course is to avoid vaping – at least for now. Policymakers should encourage continued research on the issue, easing researcher access to resources, and be prepared to act if or when specific sources of danger are identified. Banning specific products that have been proven to cause acute injury should present fewer unintended consequences than more sweeping bans and may also help side-step legal challenges.

NOTES:

¹ Monitoring the Future (2019). Table 7. 2018 Data from In-School Survey of 8th-, 10th-, and 12th-Grade Students. Retrieved November 12, 2019 from <http://www.monitoringthefuture.org/data/18data/18drtbl7.pdf>

² Benham, B. (2017). Johns Hopkins study finds toxic metals in e-cigarette liquids. John Hopkins University School of Public Health. Retrieved November 13, 2019 from <https://hub.jhu.edu/2017/02/17/e-cigarettes-contain-toxic-metals/>

³ Monitoring the Future (2019). Table 7. 2018 Data from In-School Survey of 8th-, 10th-, and 12th-Grade Students. Retrieved November 12, 2019 from <http://www.monitoringthefuture.org/data/18data/18drtbl7.pdf>. Note: Vaping data was not collected until 2015, with the survey question wording changing in 2016. Tobacco with a Hookah data was not collected until 2016.

⁴ Mirboulk, M. et al (2018). Prevalence and Distribution of E-Cigarette Use Among U.S. Adults: Behavioral Risk Factor Surveillance System, 2016. *Annals of Internal Medicine* 169(7), 429-438.

⁵ Monitoring the Future (2019). Tables 9-14. 2018 Data from In-School Survey of 8th-, 10th-, and 12th-Grade Students. Retrieved November 12, 2019 from <http://www.monitoringthefuture.org/data/18data.html#2018data-drugs>

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⁷ CDC (2019). Outbreak of Lung Injury Associated with E-Cigarette Use, or Vaping. Retrieved October 1, 2019 from https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html

⁸ Belluz, J. (2019). Vitamin E acetate is a key culprit in the vaping illness outbreak. *Vox Media*. Retrieved November 13, 2019 from <https://www.vox.com/science-and-health/2019/11/11/20959198/vaping-vitamin-e-acetate>

⁹ Zhu, S-H., et al (2014). Four Hundred and Sixty Brands of E-Cigarettes and Counting: Implications for Product Regulation. *Tobacco Control* 23, Supplement 3:iii3-iii9.

¹⁰ U.S. Food and Drug Administration (2016). Deeming Tobacco Products To Be Subject to the Federal Food, Drug, and Cosmetic Act, as Amended by the Family Smoking Prevention and Tobacco Control Act; Restrictions on the Sale and Distribution of Tobacco Products and Required Warning Statements for Tobacco Products. Retrieved October 1, 2019 from <https://www.federalregister.gov/documents/2016/05/10/2016-10685/deeming-tobacco-products-to-be-subject-to-the-federal-food-drug-and-cosmetic-act-as-amended-by-the>

[2016/05/10/2016-10685/deeming-tobacco-products-to-be-subject-to-the-federal-food-drug-and-cosmetic-act-as-amended-by-the](https://www.federalregister.gov/documents/2016/05/10/2016-10685/deeming-tobacco-products-to-be-subject-to-the-federal-food-drug-and-cosmetic-act-as-amended-by-the)

¹¹ Sharpless, N. (2019). How FDA is Regulating E-Cigarettes. U.S. Food and Drug Administration. Retrieved November 13, 2019 from <https://www.fda.gov/news-events/fda-voices-perspectives-fda-leadership-and-experts/how-fda-regulating-e-cigarettes>

¹² JUUL (n/d). JUULPODS Basics. Retrieved October 4, 2019 from <https://www.juul.com/learn/pods>

¹³ Catherine Ann Hess, Pablo Olmedo, Ana Navas-Acien, Walter Goessler, Joanna E. Cohen, Ana Maria Rule. E-cigarettes as a source of toxic and potentially carcinogenic metals. *Environmental Research*, 2017; 152: 221

¹⁴ U.S. Food and Drug Administration (2019). FDA's Comprehensive Plan for Tobacco and Nicotine Regulation. Retrieved November 13, 2019 from <https://www.fda.gov/tobacco-products/ctp-newsroom/fdas-comprehensive-plan-tobacco-and-nicotine-regulation>

¹⁵ Hajek, P. et al (2019). A Randomized Trial of E-Cigarettes versus Nicotine-Replacement Therapy. *The New England Journal of Medicine* 380(7), 629-637. Available from <https://www.nejm.org/doi/full/10.1056/NEJMoa1808779?query=TOC>

¹⁶ Callahan-Lyon, P. (2014). Electronic cigarettes: Human health effects. *Tobacco Control* 23; ii36-ii40.

¹⁷ Weir, K. (2015). Marijuana and the developing brain. *American Psychological Association Feature* 46(10). Retrieved October 8, 2019 from <https://www.apa.org/monitor/2015/11/marijuana-brain>

¹⁸ Tang, M. (2019). Electronic-cigarette smoke induces lung adenocarcinoma and bladder urothelial hyperplasia in mice. *Proceedings of the National Academy of Sciences of the United States of America* published online before print. Retrieved October 8, 2019 from <https://www.pnas.org/content/pnas/early/2019/10/01/1911321116.full.pdf>

¹⁹ Norcia, A. (2019). A running list of US cities and states where vapes are banned. *VICE*. Retrieved November 13, 2019 from https://www.vice.com/en_us/article/9keg7v/where-are-vapes-banned-rhode-island-michigan-washington-oregon-massachusetts-vape-laws-2019

²⁰ Singh, K. (2019). New York court blocks state ban on flavored e-cigarettes. *Reuters*. Retrieved November 13, 2019 from <https://www.reuters.com/article/us-health-vaping-new-york/new-york-court-blocks-state-ban-on-flavored-e-cigarettes-idUSKBN1WJ0IK>

²¹ Public Health Law Center (2019). U.S. E-CIGARETTE REGULATIONS - 50 STATE

REVIEW (2019). Mitchell Hamline School of Law. Retrieved November 13, 2019 from <https://www.publichealthlawcenter.org/resources/us-e-cigarette-regulations-50-state-review>

²² Alexander, J. et al (2019). Youth who use e-cigarettes regularly: A qualitative study of behavior, attitudes, and familial norms. *Preventive Medicine Reports* 13, 93-97. Retrieved October 4, 2019 from <https://www.sciencedirect.com/science/article/pii/S2211335518302699>

²³ SAMHSA (2019). Multi-Level Prevention Strategies to Address Teen E-Cigarette Use. Retrieved October 4, 2019 from https://www.samhsa.gov/sites/default/files/program_campaigns/nation_prevention_week/samhsa-npw-february-webinar-deck.pdf

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²⁵ National Association of Attorneys General (n/d). Attorneys General Praise PACT Act Being Signed into Law. Retrieved November 19, 2019 from <https://www.naag.org/publications/naagazette/volume-4-number-4/attorneys-general-praise-pact-act-being-signed-into-law.php>

²⁶ Wagenaar, A. & Toomey, T. (2002). Effects of Minimum Drinking Age Laws: Review and Analyses of the Literature from 1960 to 2000. *Journal of Studies on Alcohol. Supplement No.* 14, 206-225



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