



JUUL AND OTHER HIGH NICOTINE E-CIGARETTES ARE ADDICTING A NEW GENERATION OF YOUTH

Launched in 2015, JUUL quickly disrupted the e-cigarette marketplace, popularizing e-cigarette devices that are sleek, discreet and have sweet flavors and a powerful nicotine hit. Nicotine is highly addictive, can negatively impact the development of the adolescent brain, and can harm the cardiovascular system.¹ Youth e-cigarette use in the United States has skyrocketed to what the U.S. Surgeon General and the FDA have called “epidemic” levels, with 5.3 million middle and high school students using e-cigarettes.² Former FDA Commissioner Scott Gottlieb has stated, “There’s no question the Juul product drove a lot of the youth use.”³ The Surgeon General has called for “aggressive steps to protect our children from these highly potent products that risk exposing a new generation of young people to nicotine.”⁴

Use of Nicotine Salts Makes it Easier for New Users to Try E-Cigarettes

Just like the tobacco industry has used additives and design changes to make cigarettes more addictive and appealing to new users (particularly youth),⁵ JUUL pioneered a new e-liquid formulation that delivers nicotine more effectively and with less irritation than earlier e-cigarette models. According to the company, the nicotine in JUUL is made from “nicotine salts found in leaf tobacco, rather than free-base nicotine,” in order to “accommodate cigarette-like strength nicotine levels.”⁶ JUUL’s original patent stated that, “certain nicotine salt formulations provide satisfaction in an individual superior to that of free base nicotine, and more comparable to the satisfaction in an individual smoking a traditional cigarette. The satisfaction effect is consistent with an efficient transfer of nicotine to the lungs of an individual and a rapid rise of nicotine absorption in the plasma,” and that, “a user of an e-cigarette comprising the nicotine salt formulation will experience a comparable rate of physical and emotional satisfaction from using a formulation comprising a mixture of nicotine salts prepared with an appropriate acid at least 1.2X to 3X faster than using a formulation comprising a freebase nicotine.”⁷

According to a 2018 Surgeon General advisory on e-cigarette use among youth, nicotine salts allow users to inhale high levels of nicotine more easily and with less irritation than e-cigarettes that use free-base nicotine. As a result, it could be easier for young people to initiate the use of nicotine with these products.⁸ Educating youth about the dangers of JUUL and nicotine use is critical—a study from Truth Initiative found that 63 percent of 15-24 year old JUUL users did not know the product always contains nicotine, even though all pods sold from JUUL do contain nicotine.⁹ On the other hand, many youth are well aware of the powerful nicotine punch that JUUL delivers, seeking out what they call a “head rush.”¹⁰

JUUL’s High Nicotine Content Disrupted the E-Cigarette Marketplace

JUUL Labs claims that the nicotine in a JUULpod is equivalent to that of a pack of 20 cigarettes. Unlike most e-cigarettes, which had previously advertised their nicotine content by volume, JUUL advertised its nicotine content by weight when it entered the market in 2015. The advertised 5% nicotine level by weight would be the equivalent of 5.9% by volume, making JUUL three or more times as powerful as most e-cigarettes on the market prior to 2015, which had a nicotine content of 1-2% by volume.¹¹ One study found that the nicotine emissions from one puff of the JUUL device are equivalent to up to 10 puffs from closed system devices on the market prior to JUUL.¹² The 5% nicotine JUULpods sold in the U.S. exceed nicotine level limits set by many other countries.

JUUL’s competitors, seeking to emulate the company’s success, have since flooded the U.S. market with similar pod-based e-cigarettes, including some that have nicotine levels even higher than 5%, resulting in what some researchers have referred to as a “nicotine arms race.” By September 2018, researchers had identified 14 brands offering “JUUL-compatible” pods and 39 JUUL knock-off devices that offered nicotine levels equal or higher to that of JUUL. Many of these companies offer the devices and pods for cheaper than JUUL and in a wider variety of kid-friendly flavors.¹³ An analysis of e-cigarette sales in Nielsen-

tracked channels* found that products with 5% nicotine or higher increased from 0% of dollar sales in 2013 to 31.8% in 2017, and then doubled to 66.4% in 2018. From 2017 to 2018, the market share for fruit-flavored e-liquids nearly doubled, from 14.6% to 27.7% of dollar sales. In 2018, fruit-flavored e-liquids had a higher mean nicotine concentration (4.7%) than any other flavor category.¹⁴

Beginning February 6, 2020, FDA required the removal of pod-based e-cigarettes in flavors other than tobacco and menthol from the market unless they have received prior authorization. However, disposable e-cigarettes are still available in a wide array of flavors with the same high nicotine salt formulation that made pod-based products popular among kids. A 2019 study identified over 30 brands of disposable e-cigarettes. These products are similar in appearance to Juul, but are pre-charged, cheaper (some for less than \$5), available in a wide variety of flavors, and some have even higher nicotine concentrations.¹⁵



Stig Crisp Apple Disposable E-Cigarettes (6% nicotine); Mango Mojo Disposable E-Cigarette (5% nicotine); Puff Bar Disposable E-Cigarettes (5% nicotine); Blue Slushie Sea Stix Disposable E-Cigarette (5% nicotine)

A pending lawsuit against JUUL from the state of North Carolina asserts that JUUL deceived consumers by understating the nicotine levels of its product and its addiction potential.¹⁶ The lawsuit claims that, “JUUL entered the e-cigarette market with among the highest nicotine potency of any product, a nicotine level so high that, in some countries, it is illegal for consumers of any age. JUUL has deceived consumers about that nicotine strength, has misrepresented the nicotine equivalency of its products to traditional cigarettes, and has understated the risks of addiction that occur with such powerful levels of nicotine.”

Kids are Not Just “Experimenting” with E-Cigarettes

Kids are no longer just experimenting with e-cigarettes, but are using them frequently, leading to an addiction that is difficult to break. Among youth who had used e-cigarettes in the past 30 days in 2019, 34.2% of high schoolers and 18% of middle schoolers were frequent users of e-cigarettes, using e-cigarettes on at least 20 of the preceding 30 days. 21.4% of high school e-cigarette users and 8.8% of middle school e-cigarette users were daily users, a strong indication of addiction. This amounts to 1.6 million middle and high school students who were frequent users of e-cigarettes, including nearly 1 million (970,000) daily users.¹⁷ Data from another national survey, the 2019 Monitoring the Future study, found that one out of nine high school seniors (11.7%) report that they vaped nicotine nearly daily, a strong indication of addiction. This means that nearly half (46%) of high school seniors who vape nicotine vape nearly every day. One-third of 10th graders who vape nicotine vape nearly every day.¹⁸

Adolescents are more likely to experience nicotine dependence at lower levels of exposure than adults and can feel dependent after just minimal exposure and within a relatively short period of time.¹⁹ A review of the evidence on the impacts of nicotine on the developing brain, published in the *American Journal of Preventive Medicine*, concluded that, “evidence is currently sufficient to warrant extreme caution regarding exposure of adolescents to exogenous nicotine.”²⁰ One study estimated that youth could meet the threshold for nicotine addiction by consuming just one quarter of a JUULpod per day.²¹ A small study

* Tracked data includes mass channel and convenience stores; does not include online sales or sales from tobacco and vape shops.

of users of JUUL and other JUUL-like devices (including Bo, Phix and Sourin) ages 13-21 found that their urinary cotinine levels far exceeded that of youth cigarette smokers.²²

News reports across the country have documented troubling stories of teens facing unexpected addiction to JUUL and other e-cigarettes:

“The kids who did it for like a month because it was popular got addicted and couldn’t stop.”

– high school junior, Massachusetts.²³

“I’ve tried to stop, and over the summer I stopped for a few weeks, but honestly, I’m addicted to nicotine. Like if I don’t have it, I think about it all the time.”

– high school senior, Georgia.²⁴

Whenever he put the Juul away, he says, the stress and negative feelings would return. **“I felt kind of trapped,”** he recalls. He would go back to it. **“I couldn’t stop,”** he says.

– high school freshman, North Carolina.²⁵

“I realized that I couldn’t stop...When I started hearing all the facts and everything bad about it, it was already too late. I was already hooked onto it.”

– 8th grader, New York.²⁶

He would come to hate himself for being dependent on the tiny device, which he nicknamed his “11th finger.” Yet any thought of quitting made him crazy-anxious.

– high school student, Massachusetts.²⁷

“It’s impossible to let go once you started using. I’ll tell you — after even an hour and a half or two, I am chomping at the bit to find my Juul.”

– college student who started using as a high school sophomore, Colorado.²⁸

Pediatricians across the country have echoed concerns about nicotine addiction in young patients who are using e-cigarettes:

“Nicotine addiction can take hold in only a few days, especially in the developing adolescent brain that is particularly vulnerable to addiction to nicotine. My teenage patients who use JUUL are not merely engaging in harmless youthful experimentation. Many of them are using JUUL on a daily basis and show significant signs of nicotine addiction.”

-Dr. Jonathan Winickoff, American Academy of Pediatrics²⁹

“With the Juuls, kids are able to get a much higher dose of nicotine — and dose matters. These kids have behaviors that we often see in patients who have opioid or marijuana addiction, but we didn’t typically see with kids who developed addiction to traditional tobacco cigarettes.”

-Dr. Sharon Levy, Director of the Adolescent Substance Use and Addiction Program at Boston Children’s Hospital³⁰

Health Concerns for Youth Exposure to Nicotine

According to the Surgeon General, “E-cigarette use poses a significant – and avoidable – health risk to young people in the United States. Besides increasing the possibility of addiction and long-term harm to brain development and respiratory health, e-cigarette use is associated with the use of other tobacco products that can do even more damage to the body.”³¹ Nicotine is a highly addictive drug that can have lasting damaging effects on adolescent brain development—the brain keeps developing until about age 25. In particular, nicotine use can harm the parts of the adolescent brain responsible for attention,

learning, mood and impulse control.³² The Surgeon General concluded that, “The use of products containing nicotine in any form among youth, including in e-cigarettes, is unsafe.”³³

In general, nicotine has been found to impact the cardiovascular system.³⁴ A 2018 report by the National Academies of Science, Engineering and Medicine (NASEM) found that the nicotine in e-cigarettes can increase heart rate and diastolic blood pressure in users shortly after use, but the long-term evidence was not available to determine an association between e-cigarette use and other cardiovascular outcomes such as heart disease and stroke. However, the NASEM report acknowledged that the nicotine in e-cigarettes could elevate cardiovascular disease risk in users with pre-existing cardiovascular disease.³⁵

Delivered in high doses, nicotine can be lethal. The Surgeon General’s report and the NASEM report both found that contact with e-liquids can cause adverse health effects and ingesting e-liquids can lead to death.³⁶ Exposure to liquid nicotine found in e-cigarettes has resulted in thousands of calls to poison control centers in recent years according to the American Association of Poison Control Centers (AAPCC).³⁷ Reports of nicotine poisoning from e-cigarettes peaked in 2014 and declined for several years, but as of 2018 are on the rise again. The FDA is currently investigating over 100 cases of reported seizures that may be linked to nicotine poisoning from e-cigarette use.³⁸

There is also concern that use of e-cigarettes may function as a gateway to the use of more dangerous, combustible tobacco products. In 2016, the Surgeon General concluded that e-cigarette use is “strongly associated” with the use of other tobacco products among youth and young adults, including conventional cigarettes.³⁹ The NASEM found a causal link between e-cigarette and cigarette smoking initiation, concluding that, “There is substantial evidence that e-cigarette use increases risk of ever using combustible tobacco cigarettes among youth and young adults.”⁴⁰ An analysis of data from the FDA’s nationally representative Population Assessment of Tobacco and Health (PATH) study found that from 2013 to 2016, youth (ages 12-15) e-cigarette use was associated with more than four times the odds of trying cigarettes and nearly three times the odds of current cigarette use. The researchers estimate that this translates to over 43,000 current youth cigarette smokers who might not have become smokers without e-cigarettes.⁴¹ In addition, several studies find that the link between e-cigarette use and smoking initiation was stronger for those who had *lower* risk factors for smoking at baseline.⁴²

Number of calls to poison control centers involving exposures to e-cigarette devices and liquid nicotine.*

2011	269
2012	459
2013	1,540
2014	4,012
2015	3,733
2016	2,899
2017	2,470
2018	3,139
2019*	5,183

* Preliminary data, as poison centers continue to update their reports.

For more information on JUUL, visit:

<https://www.tobaccofreekids.org/what-we-do/industry-watch/e-cigarettes>

Campaign for Tobacco-Free Kids, February 11, 2020 / Laura Bach

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