# Vaping nicotine: High risks for adolescents

## Over 2 million adolescents report vaping

In the U.S., 1 out 7 tenth graders (14%) used vape devices in the past 30 days, [1,2] compared to 1 out of 12 tenth graders in Washington State.[3]

Vaping carries known harms and is prohibited for individuals under 21 years of age.

**Prevention efforts early in life can help deter initiation of all nicotine** product use and reduce likelihood of nicotine addiction.

Vaping is the use of an electronic device, or vape, to heat an e-liquid containing nicotine and inhale the resulting aerosol (nicotine and other chemicals). Words for vapes on the market, include e-cigarettes, e-hookahs, tanks, mods, and pod-mods.[4,5]

The **amount of nicotine in one vape** can be up to **30 times as high as a pack of regular cigarettes** (Figure 1). These high nicotine concentrations are worrisome, as nicotine is a highly addictive substance, and research has shown many adolescents do not know or believe that vapes contain nicotine.[6,7]

## What we know

### Vaping carries physical health risks for adolescents

**Early and heavy nicotine use disrupts brain development during a critical period of maturation**. This can affect key brain functions, which can carry risks for nicotine addiction and later susceptibility to addiction to other substances.[8] Short-term health effects of vaping include elevated heart rate, decreased lung immune function, headache, and nausea.[6,9,10]

- **Vapes contain known toxic chemicals** such as formaldehyde and heavy metals (e.g., lead).[11]
- **The impact of these chemicals from long term vape use is unknown at this time.**

### Vape advertising is designed to appeal to adolescents

- **Advertising is heavily tailored to adolescent populations**, with increasing visibility on social media.[12] Viewing ads has been linked to lower adolescent risk perception[13] as well as increased susceptibility, initiation, and use of vapes.[14, 15, 16]
- **Perceptions of vaping as a "safe" behavior among adolescents**[17,18] has the potential to undermine decades of public health success in reducing youth nicotine use.
- The **vape market is constantly and rapidly evolving** with new products, flavors, and technology. Flavor is often cited as a top reason adolescents try vaping for the first time.[19]
- In 2023, 9 out of 10 adolescents who vape used flavored vapes.[1]

### Emotional stress and peer influence: key motivators for adolescent vaping

- Among adolescents who vape, **almost half (43%)**[20] **report that feeling anxious, stressed,** [21, 22, 23]**or depressed is** the reason they currently vape,[17, 22] and these feelings may predict continued and increased vaping.[23]
- Adolescents with disabilities,[24] or who identify as sexual or gender minorities, or hold multiple marginalized identities[25, 26] report higher rates of vaping.

- Of those who report any vaping, the majority (58%) report that their **first time vaping was in a social situation,**[17, 20] and key vaping motivators were to fit in or to impress peers.[17, 27]
- Of Washington adolescents who vape, over two thirds report getting vapes from friends, family, or an acquaintance.[3]

## Adolescents who vape use other substances

Adolescents who vape are three times more likely to start smoking combustible cigarettes.[6,12,28] Research suggests that many of these adolescents would NOT have used cigarettes otherwise.[29] In Washington State, an estimated 104,000 adolescents alive today will die prematurely due to smoking cigarettes. [30]

- Similarly, adolescents who vape are four times more likely to try cannabis[31] and almost four times more likely to start using alcohol than those who do not vape.[32]
- **Many adolescents who vape also use with other substances** (i.e., poly substance use),[3,33,34] which is associated with worse overall health outcomes.[35]
- **Over half** of adolescents who vape have **made at least one attempt to quit**.[36, 37, 38] This suggest adolescents are eager to quit, but that it is not easy to stay vape-free or have the adequate resources to do so.

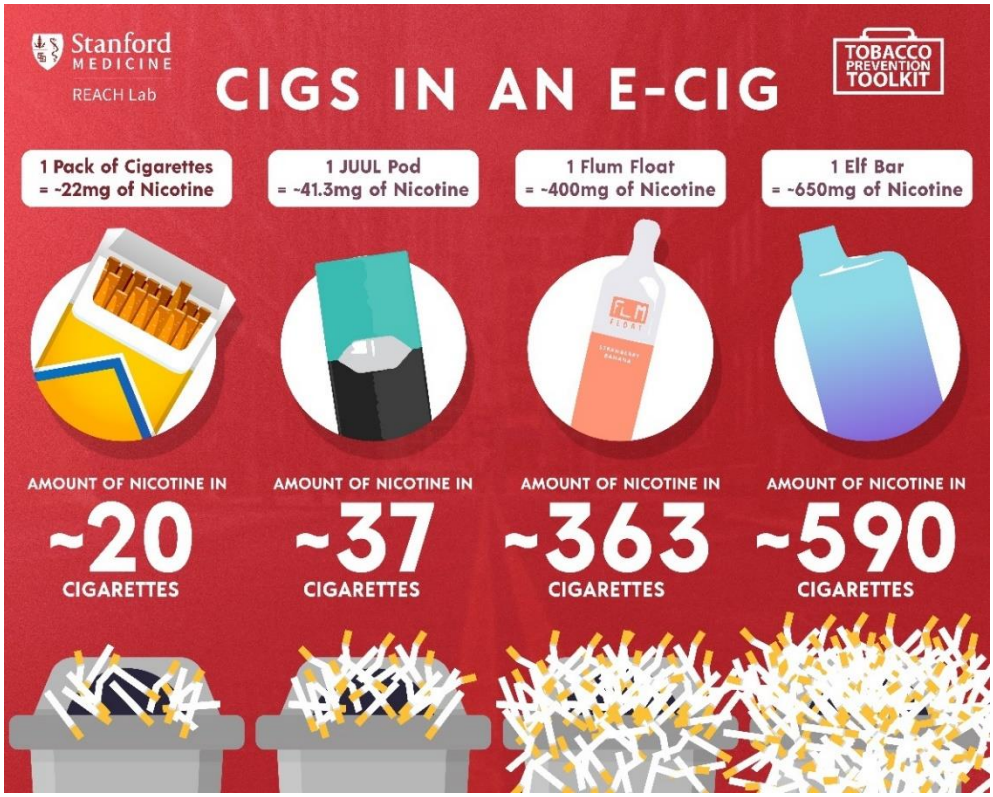


**Figure 1**: Illustration of the number of cigarettes necessary to equal amount of nicotine in vapes

## Prevention programs work

Programs to prevent adolescent substance use address early risk and protective factors, such as engaging in positive activities and interacting with peers who do not use substances. These programs have been shown to prevent adolescent vaping, and promote a healthier, nicotine-free generation.

- **Early prevention is cost effective for communities and promotes adolescent health overall.** Addressing the same key risk and protective factors associated with vaping is also effective at reducing other problem behaviors, such as other substance use, delinquency, and teen pregnancy. [39,40,41,42]
- Prevention messages from primary care providers (e.g., physicians and therapists) is an untapped resource for prevention. This can enhance school, community and family prevention efforts.[43,44]
- Greater collaboration across adolescent support structures is critical to reduce adolescent substance use.[43]

## What more can be done

### Intervene before vaping begins

- Expand and maintain existing tobacco and general substance use prevention programs in Washington State, to reduce adolescent substance initiation and use, including the use of vapes.
- Invest in early consistent prevention messaging from multiple adolescent support structures– e.g., schools, parents, and healthcare providers.
- Invest in expanding the role of primary care providers to deliver screening and referral to prevention for adolescents.[44]

### Strengthen the evidence base by funding robust research

Given the continued and rapid evolution of vapes, increased and ongoing research funding is needed.

- **Increase funding for innovative research** aimed at developing effective and acceptable vaping prevention and cessation programs for adolescents.
- **Fund the adaptation and evaluation of existing effective tobacco prevention programs** (e.g. LifeSkills Training)[45] to understand their impact on vapes.
- **Fund program evaluations of existing vape-specific cessation programs**, to provide harm reduction and cessation strategies for adolescents who have already begun vaping. Expand research on the pharmacotherapy and nicotine replacement therapy for youth under 18.

## Vaping prevention/cessation resources

Bridging Prevention and Harm Reduction Strategies for Adolescent and Young Adult Substance Use
**theathenaforum.org/sites/default/files/public/documents/prsc_brief_harm_reduction_and_prevention_published_5.10.24.pdf**

CDC Protecting Youth from the Harms of Vaping
**cdc.gov/tobacco/e-cigarettes/protecting-youth.html**

Stanford Tobacco Prevention Toolkit
**med.stanford.edu/tobaccopreventiontoolkit/you-and-me-together-vape-free-curriculum.html**

Live Vape Free: Text-to-quit vaping service for 13-26 year olds; **livevapefree.com**

Washington Tobacco Quit Line
1-800-Quit-Now; Text READY to 200-400;
2Morrow Health Cessation App for Vaping
**doh.wa.gov/quit**

Truth Initiative: Text-to-quite vaping service for 13-24 year olds; Text DITCHVAPE to 88709

American Academy of Pediatrics: Tobacco Cessation App **aap.org/en/patient-care/tobacco-control-and-prevention/tobacco-cessation-progressive-web-application/**

## Washington Public Awareness Campaigns

Choose You **chooseyouwa.org**

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## Figure citation

Figure 1 Data Source: Resources & Infographics | Halpern-Felsher REACH Lab | Stanford Medicine.

Accessed June 29, 2024. **med.stanford.edu/halpern-felsher-reach-lab/resources.html**

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## References

1. Miech RA, Johnston LD, Patrick ME,, O'Malley PM. *Monitoring the Future National Survey Results on Drug Use, 1975–2023: Overview and Detailed Results for Secondary School Students (PDF). Monitoring the Future Monograph Series*.; 2024.
2. Birdsey J, Cornelius M, Jamal A, et al. Tobacco Product Use Among U.S. Middle and High School Students — National Youth Tobacco Survey, 2023. *MMWR Morb Mortal Wkly Rep*. 2023;72(44):1173-1182. doi:10.15585/MMWR.MM7244A1
3. *Washington State Healthy Youth Survey Commercial Tobacco Product Use Fact Sheet*. Accessed July 6, 2024. **https://www.askhys.net/SurveyResults/FactSheets**
4. E-Cigarette Use Among Youth | Smoking and Tobacco Use | CDC. Accessed June 28, 2024. **https://www.cdc.gov/tobacco/e-cigarettes/youth.html**
5. Vaping Devices (Electronic Cigarettes) DrugFacts | National Institute on Drug Abuse (NIDA). Accessed June 29, 2024. **https://nida.nih.gov/publications/drugfacts/vaping-devices-electronic-cigarettes**
6. Fadus MC, Smith TT, Squeglia LM. The rise of e-cigarettes, pod mod devices, and JUUL among youth: Factors influencing use, health implications, and downstream effects. *Drug Alcohol Depend*. 2019;201:85-93. doi:10.1016/J.DRUGALCDEP.2019.04.011
7. Willett JG, Bennett M, Hair EC, et al. Recognition, use and perceptions of JUUL among youth and young adults. Tob Control. 2019;28(1):115-116. doi:10.1136/TOBACCOCONTROL-2018-054273
8. Castro EM, Lotfipour S, Leslie FM. Nicotine on the developing brain. Pharmacol Res. 2023;190. doi:10.1016/J.PHRS.2023.106716
9. Mukerjee R, Hirschtick JL, Arciniega LZ, et al. ENDS, Cigarettes, and Respiratory Illness: Longitudinal Associations Among U.S. Youth. *Am J Prev Med*. 2024;66(5):789-796. doi:10.1016/j.amepre.2023.12.005
10. High School - Lesson 2 - Healthy Body, Healthy You-th | Tobacco Prevention Toolkit

| Stanford Medicine. Accessed July 30, 2024. https://med.stanford.edu/tobaccopreventiontoolkit/you-and-me-together-vape-free-curriculum/hs-lesson-2-healthy-body-healthy-youth.html
11. Public Health Consequences of E-Cigarettes. *Public Health Consequences of E-Cigarettes*. Published online 2018. doi:10.17226/24952
12. Smith MJ, Hilton S. Youth's exposure to and engagement with e-cigarette marketing on social media: a UK focus group study. *BMJ Open*. 2023;13(8):71270. doi:10.1136/BMJOPEN-2022-071270
13. Zheng X, Li W, Wong SW, Lin HC. Social media and E-cigarette use among US youth: Longitudinal evidence on the role of online advertisement exposure and risk perception. *Addictive behaviors*. 2021;119. doi:10.1016/J.ADDBEH.2021.106916
14. Padon AA, Lochbuehler K, Maloney EK, Cappella JN. A Randomized Trial of the Effect of Youth Appealing E-Cigarette Advertising on Susceptibility to Use E-Cigarettes Among Youth. *Nicotine Tob Res*. 2018;20(8):954-961. doi:10.1093/NTR/NTX155
15. Fielding-Singh P, Epperson AE, Prochaska JJ. Tobacco Product Promotions Remain Ubiquitous and Are Associated with Use and Susceptibility to Use Among Adolescents. *Nicotine Tob Res*. 2021;23(2):397-401. doi:10.1093/NTR/NTAA136
16. Pettigrew S, Santos JA, Pinho-Gomes AC, Li Y, Jones A. Exposure to e-cigarette advertising and young people's use of e-cigarettes: A four-country study. *Tob Induc Dis*. 2023;21(October). doi:10.18332/TID/172414
17. Crane LA, Asdigian NL, Fitzgerald MD. Looking Cool, Doing Tricks, Managing Stress, and Nicotine Addiction: Youth Perspectives on Nicotine Vaping and Implications for Prevention. https://doi.org/101177/08901171231189560. 2023;37(7):964-974. doi:10.1177/08901171231189560
18. Golan R, Muthigi A, Ghomeshi A, et al. Misconceptions of Vaping Among Young Adults. *Cureus*. 2023;15(4). doi:10.7759/CUREUS.38202
19. Wang TW, Gentzke AS, Creamer MLR, et al. Tobacco Product Use and Associated Factors Among Middle and High School Students - United States, 2019. *MMWR Surveill Summ*. 2019;68(12). doi:10.15585/MMWR.SS6812A1
20. Gentzke AS, Wang TW, Cornelius M, et al. Tobacco Product Use and Associated Factors Among Middle and High School Students — National Youth Tobacco Survey, United States, 2021. *MMWR Surveillance Summaries*. 2022;71(5):1-29. doi:10.15585/MMWR.SS7105A1
21. Donaldson CD, Stupplebeen DA, Fecho CL, Ta T, Zhang X, Williams RJ. Nicotine vaping for relaxation and coping: Race/ethnicity differences and social connectedness mechanisms. *Addictive behaviors*. 2022;132. doi:10.1016/J.ADDBEH.2022.107365
22. Jha V, Kraguljac A. Assessing the Social Influences, Self-Esteem, and Stress of HighSchool Students Who Vape. *Yale J Biol Med*. 2021;94(1):95. Accessed July 6, 2024. /pmc/articles/PMC7995953/
23. Mantey DS, Clendennen SI, Sumbe A, Wilkinson A V., Harrell MB. Perceived stress and E-cigarette use during emerging adulthood: A longitudinal examination of initiation, progression, and continuation. *Prev Med (Baltim)*. 2022;160:107080. doi:10.1016/J.YPMED.2022.107080
24. Senders A, Horner-Johnson W. Disparities in E-Cigarette and Tobacco Use Among Adolescents With Disabilities. Prev Chronic Dis. 2020;17:E135. doi:10.5888/PCD17.200161
25. Azagba S, Latham K, Shan L. Cigarette smoking, e-cigarette use, and sexual identity among high school students in the USA. *Eur J Pediatr*. 2019;178(9):1343-1351. doi:10.1007/S00431-019-03420-W
26. Lee J, Tan ASL. Intersectionality of Sexual Orientation With Race and Ethnicity and

Associations With E-Cigarette Use Status Among U.S. Youth. *Am J Prev Med*. 2022;63(5):669-680. doi:10.1016/J.AMEPRE.2022.06.013
27. Kong G, Bold KW, Cavallo DA, Davis DR, Jackson A, Krishnan-Sarin S. Informing the development of adolescent e-cigarette cessation interventions: A qualitative study. *Addictive Behaviors*. 2021;114:106720. doi:10.1016/J.ADDBEH.2020.106720
28. Soneji S, Barrington-Trimis JL, Wills TA, et al. Association Between Initial Use of e-Cigarettes and Subsequent Cigarette Smoking Among Adolescents and Young Adults: A Systematic Review and Meta-analysis. *JAMA Pediatr*. 2017;171(8):788-797. doi:10.1001/JAMAPEDIATRICS.2017.1488
29. Epstein M, Bailey JA, Kosterman R, et al. E-cigarette use is associated with subsequent cigarette use among young adult non-smokers, over and above a range of antecedent risk factors: a propensity score analysis. *Addiction (Abingdon, England)*. 2021;116(5):1224-1232. doi:10.1111/ADD.15317
30. Tobacco and Vapor Products Data and Reports | Washington State Department of Health. Accessed July 12, 2024. **https://doh.wa.gov/data-statistical-reports/health-behaviors/tobacco**
31. Audrain-Mcgovern J, Stone MD, Barrington-Trimis J, Unger JB, Leventhal AM. Adolescent e-cigarette, hookah, and conventional cigarette use and subsequent marijuana use. *Pediatrics*. 2018;142(3). doi:10.1542/PEDS.2017-3616/81650
32. Lozano A, Liu F, Lee TK, et al. Bidirectional associations between e-cigarette use and alcohol use across adolescence. *Drug Alcohol Depend*. 2021;220:108496. doi:10.1016/J.DRUGALCDEP.2020.108496
33. Gilbert PA, Kava CM, Afifi R. High-School Students Rarely Use E-Cigarettes Alone: A Sociodemographic Analysis of Polysubstance Use Among Adolescents in the United States. *Nicotine Tob Res*. 2021;23(3):505-510. doi:10.1093/NTR/NTAA037
34. Wang TW, Gentzke AS, Neff LJ, et al. Characteristics of e-Cigarette Use Behaviors Among US Youth, 2020. *JAMA Netw Open*. 2021;4(6):E2111336. doi:10.1001/JAMANETWORKOPEN.2021.11336
35. Osman A, Kowitt SD, Ranney LM, Heck C, Goldstein AO. Risk factors for multiple tobacco product use among high school youth. *Addictive Behaviors*. 2019;99:106068. doi:10.1016/J.ADDBEH.2019.106068
36. Garey L, Scott-Sheldon LAJ, Olofsson H, Nelson KM, Japuntich SJ. Electronic Cigarette Cessation among Adolescents and Young Adults. *Subst Use Misuse*. 2021;56(12):1900-1903. doi:10.1080/10826084.2021.1958850
37. Dai HD, Hanh P, Guenzel N, Morgan M, Kerns E, Winickoff JP. Adoption of Vaping Cessation Methods by US Adolescent E-Cigarette Users. *Pediatrics*. 2023;152(5). doi:10.1542/PEDS.2023-062948
38. Pbert L, Dubé CE, Nagawa CS, Simone DP, Wijesundara JG, Sadasivam RS. Vaping cessation support recommendations from adolescents who vape: a qualitative study. *BMC Public Health*. 2024;24(1). doi:10.1186/S12889-024-19036-1
39. Burrow-Sánchez JJ, Ratcliff BR. Adolescent Risk and Protective Factors for the Use of Electronic Cigarettes. https://doi.org/101177/2632077020980734. 2021;2(1):100-134. doi:10.1177/2632077020980734
40. Flay BR. School-based smoking prevention programs with the promise of long-term effects. *Tob Induc Dis*. 2009;5(1):6. doi:10.1186/1617-9625-5-6
41. Duncan LR, Pearson ES, Maddison R. Smoking prevention in children and adolescents: A systematic review of individualized interventions. *Patient Educ Couns*. 2018;101(3):375-388. doi:10.1016/J.PEC.2017.09.011

42. Bailey JA. Addressing Common Risk and Protective Factors Can Prevent a Wide Range of Adolescent Risk Behaviors. *Journal of Adolescent Health*. 2009;45(2):107-108. doi:10.1016/j.jadohealth.2009.05.007
43. Volkow N. Innovative projects answer NIDA's challenge to implement substance use prevention in primary care | National Institute on Drug Abuse (NIDA). Nora's Blog. Published August 22, 2023. Accessed July 12, 2024. **https://nida.nih.gov/about-nida/noras-blog/2023/08/innovative-projects-answer-nidas-challenge-to-implement-substance-use-prevention-in-primary-care**
44. Ridenour TA, Murray DW, Hinde J, et al. Addressing Barriers to Primary Care Screening and Referral to Prevention for Youth Risky Health Behaviors: Evidence Regarding Potential Cost-Savings and Provider Concerns. *Prevention Science*. 2022;23(2):212. doi:10.1007/S11121-021-01321-9
45. Steeger CM, Combs KM, Buckley PR, et al. Substance use prevention during adolescence: Study protocol for a large-scale cluster randomized trial of Botvin High School LifeSkills Training. *Contemp Clin Trials*. 2023;125:107049. doi:10.1016/J.CCT.2022.107049