

Keep Gimmicks of Toy E-Cigarettes Away and Juveniles on Track Towards the Tobacco Endgame



Nobel Chenggong Zong, PhD

Yuhan Zhang, MSc

Hua Cai, MD, PhD

Los Angeles, CA

KEY WORDS: adolescent; nicotine; teenager; tobacco endgame; toy e-cigarettes; vaping

Recently, Europe has reported great progress in tobacco endgame initiatives.¹ Despite a consistent decline in US retail purchases of traditional cigarettes, the US Centers for Disease Control and Prevention reported that US e-cigarette sales increased by 46.6% between 2020 and 2022.² A growing trend in sales has also been observed across the Atlantic.³ This mounting evidence indicates that, in addition to being steadfast on existing strategies of tobacco control, we need to keep a close eye out for the emerging new challenges with e-cigarettes.

The crux of the tobacco endgame falls on the generation currently studying in schools. Compared with adults, students have unique social-behavioral dynamics. In 2023, in the United States, approximately one in 100 middle school students and two in 100 high school students reported using cigarettes, whereas one in 22 and one in 10 reported using e-cigarettes, respectively.⁴ These findings suggest a stronger enticement of e-cigarettes for teenagers and illustrate how many juveniles first encounter nicotine in the form of vaping. Surprisingly, the percentage of girls

who vape is more than 50% higher than the percentage of boys who vape,⁴ perhaps because of the luring nature of the colorful and fruity appeals of the e-cigarette packaging and tasting. A reported 14.1% of high school students in 2022 were current e-cigarette users, in stark contrast to 4.5% among adults (including 11% of young adults aged 18 to 24 years).^{5,6} A 2023 report of the United Kingdom's Millennium Cohort Study showed that 32.9% of adolescents aged 14 to 17 years were current users of nicotine products; among the early adopters of e-cigarettes, 58.9% experimented with cigarettes afterwards.⁷ A systematic review and meta-analysis from the Health Research Board and Health Intelligence of Ireland showed that adolescents' exposure to e-cigarettes significantly increased the chance of them smoking later in life.⁸ Hence, not surprisingly, the US Food and Drug Administration has declared adolescent use of e-cigarettes one of the biggest public health challenges.^{9,10} The American Heart Association has also warned that e-cigarette usage threatens to derail the Tobacco Endgame.¹¹

Worse, novelty vaping gadgets shaped after toys or everyday items have started to claim popularity in schools (Fig 1).¹² Students are being targeted by this new form of e-cigarettes, "toy e-cigarettes." As a business precedent, fast food chains have proved the effectiveness of toy items in promoting their popularity in kid's meal varieties among adolescents and children. Although not explicitly declared, the primary clientele of these new vapes is unequivocal. Aggressive marketing of toy e-cigarettes is a major issue that requires attention. Fueled by influences of social media posts, toy e-cigarettes are contagious among those in Generation Z and Generation Alpha. Without a swift and comprehensive intervention strategy, these seemingly playful gadgets, which are reinforced with fun flavors and addictive nicotine, might simply be too hard for the unsuspecting teenagers to resist.

Besides nicotine, vaping-derived decomposition products of solvents and flavoring additives are known to cause pathological consequences (Fig 1).¹³ Vaping generates aerosols of toxic carbonyls (eg, acrolein, propylene oxide) and heavy metals. Some flavor compounds are known carcinogens. Chronic exposure

AFFILIATIONS: From the Department of Anesthesiology/Molecular Medicine, Department of Medicine/Cardiology, David Geffen School of Medicine, University of California Los Angeles.

CORRESPONDENCE TO: Hua Cai, MD, PhD; email: hcai@mednet.ucla.edu

Copyright © 2024 American College of Chest Physicians. Published by Elsevier Inc. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

DOI: <https://doi.org/10.1016/j.chest.2024.06.3810>

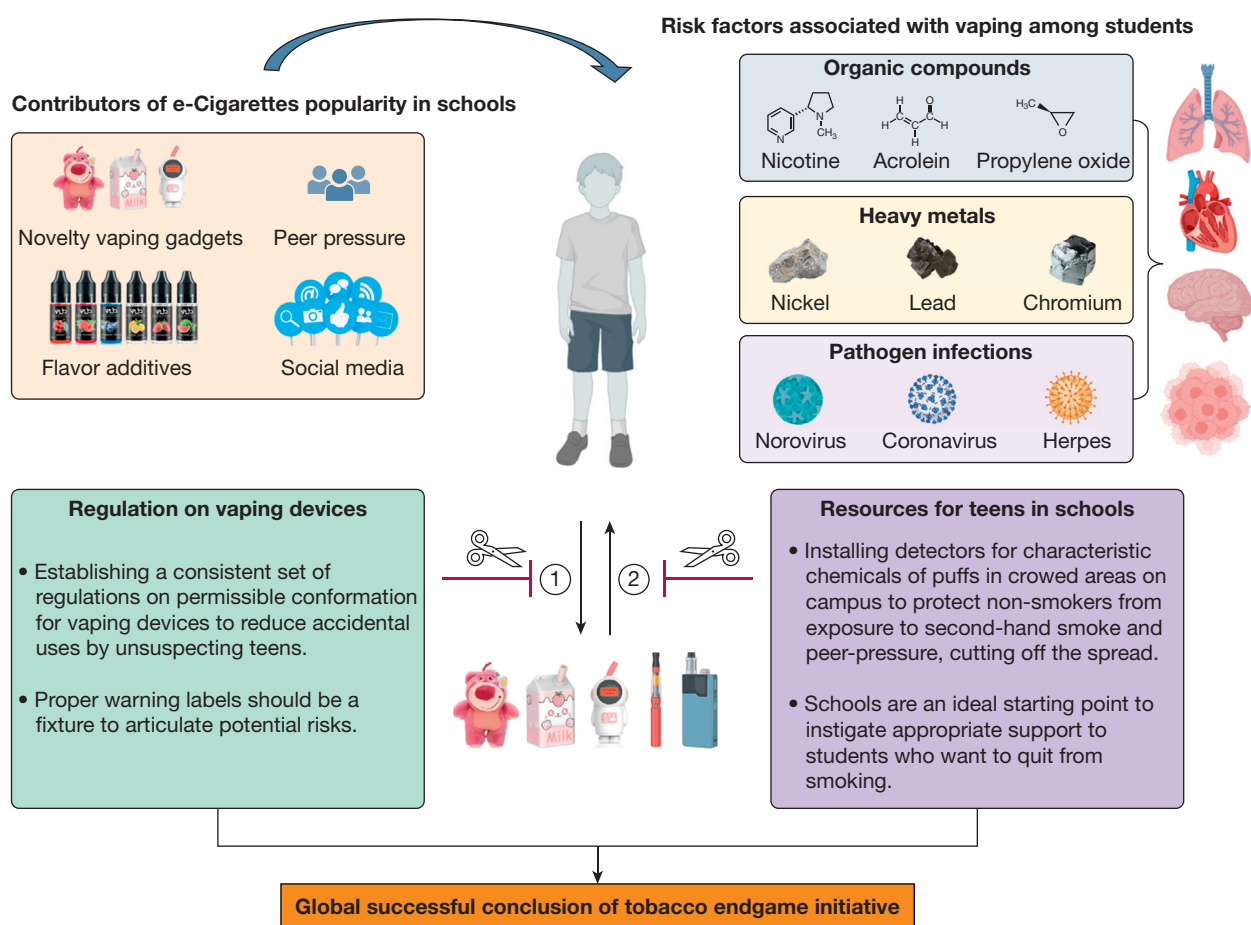


Figure 1 – A growing popularity of vaping among teenagers has been stoked by social media advertisements, peer pressure, enhanced flavor additive infusion, and now toy-shaped novelty gadgets (toy e-cigarettes). Vaping exposes teenagers to a variety of toxic substances as shown here, making them prone to the development of cardiovascular, respiratory, and neurologic disorders and oncogenesis. Regulatory efforts that will mandate allowable product conformance, proper labeling, restricted distribution, and school-based actions to ensure surveillance, prevention, and intervention supports can work together to have major impacts on tapering off vaping popularity among teenagers to safeguard tobacco endgame goals.

to this mixture has been reported to affect brain development, lung capacity, which could lead to pulmonary diseases (eg, COPD), cardiovascular diseases, neurodegenerative disorders (eg, Alzheimers), and cancer. Redox imbalance is a hallmark for these injuries.¹³ Teenagers at a young age are particularly vulnerable.

Moreover, vaping in school adds an additional set of unique challenges. Most students are not equipped with the knowledge to fully comprehend the risks associated with vaping. On a crowded campus, exposure to second-hand smoke seems to be impossible to avoid. Peer pressure among schoolmates could be insurmountable. Additionally, vape-sharing among pupils opens doors for pathogens (eg, herpes, norovirus, coronavirus) to spread. The playfulness of the gadgets tempts the teenagers to “push the

envelope,” which leads to dependence and overconsumption.

Government agencies have taken actions. Several manufacturers and retailers of toy e-cigarettes received warning letters from the US Food and Drug Administration. However, the low entry barrier enabled by global e-commerce and social media marketing makes it onerous to keep pace with new manufacturers and their new gimmicks. An ongoing act of “whack-a-mole” stretches the limited resources of the authorities, especially when the rules of laws and regulations territorially differ across different countries and regions. Time is not on our side to achieve the proclaimed goal of less than 5% population using tobacco by 2040.^{1,11} An international collaborative/coalition has called for streamlining legislative and enforcement expenditures, wisely dispatching resources for maximal effects.

From a global perspective, a consistent set of regulations on permissible conformance for vaping devices is at the top of the agenda by an international collaborative. Aesthetic features should not conceal the primary function of e-cigarettes; warning labels and age limits should be clearly printed on the packaging and the devices. Accidental use or uneducated exposure by the teenagers could thus be reduced. Tobacco 21 initiative in the United States played a seminal role in educating and coordinating antismoking/antivaping efforts.¹⁴ Texas is leading the United States in this regard; House Bill 4758 outlaws e-cigarette promotional displays. Furthermore, existing regulations and practice can be used more strategically in the context of protecting the youth. As battery-powered electronic devices, vaping products are often assigned serial numbers by their vendors. Thus, a targeted recall would be feasible if defective/hazardous batches of batteries or devices are identified. An upgrade would require that all manufacturers, wholesalers, and retailers keep a log of these serial numbers along distribution. Accordingly, when e-cigarettes fall in the hands of teenagers, loopholes in the supply chain can be readily identified and closed.

In most local communities, detectors for characteristic chemicals of puffs could be installed strategically in crowded areas (eg, toilets, locker rooms) on school campuses, which could protect and warn nonsmokers about exposure to second-hand smoke and could alleviate peer-pressure, which could stop the spread. Schools are also ideally positioned to educate pupils about the dangers elicited by the habit of vaping. For students struggling to quit, schools are staffed with nurses and counselors to promptly instigate support, as appropriate. Policies of smoke-free campus should be augmented, especially in territories not yet implemented. The levels of e-cigarette-specific and cigarette-specific chemicals in the sewage could serve as yardsticks to estimate the consumption rate by the student body as a whole. Over time, the effectiveness of policies can be evaluated and refined.

Protecting young people is vital. Macroscopic regulative exercises and microscopic support to individuals are two sides of a winning ticket. All stakeholders should join forces for a robust stance.

Funding/Support

This work was supported by the National Heart, Lung, and Blood Institute grants HL077440 (H. C.), HL088975 (H. C.), HL142951 (H. C.), HL154754 (H. C. and A. M.), HL162407 (H. C. and J. G.), HL142951-03S1 (H. C.), and HL154754-03S1 (H. C.).

Financial/Nonfinancial Disclosures

None declared.

Acknowledgments

Role of sponsors: The sponsor had no role in the design of the study, the collection and analysis of the data, or the preparation of the manuscript.

References

1. The Lancet Respiratory Medicine. A tobacco-free generation: the end goal of the endgame. *Lancet Respir Med*. 2024 Mar;12(3):181. Erratum in: *Lancet Respir Med*. 2024 Apr;12(4):e20.
2. Ali FRM, Seidenberg AB, Crane E, Seaman E, Tynan MA, Marynak K. E-cigarette unit sales by product and flavor type, and top-selling brands, United States, 2020–2022. *MMWR Morb Mortal Wkly Rep*. 2023;72(25):672–677.
3. Statista. E-Cigarettes - Europe. Statista website. Accessed January 25, 2024. <https://www.statista.com/outlook/cmo/tobacco-products/e-cigarettes/europe#revenue>
4. Birdsey J, Cornelius M, Jamal A, et al. Tobacco product use among US middle and high school students: National Youth Tobacco Survey, 2023. *MMWR Morb Mortal Wkly Rep*. 2023;72(44):1173–1182.
5. CDC Newsroom. More than 2.5 million youth reported e-cigarette use in 2022: Flavored products, disposable devices, and a wide variety of brands threaten the health of our nation's youth. CDC website. Accessed January 25, 2024. <https://www.cdc.gov/media/releases/2022/p1007-e-cigarette-use.html>
6. CDC National Center for Health Statistics. Current electronic cigarette use among adults aged 18 and over: United States, 2021. CDC website. Accessed January 25, 2024. <https://www.cdc.gov/nchs/products/databriefs/db475.htm#:~:text=Interview%20Survey%2C%202021.-,Summary,among%20adults%20aged%2025%E2%80%939344>
7. Vrinten C, Parnham JC, Rado MK, et al. Patterns of cigarette and e-cigarette use among UK adolescents: a latent class analysis of the Millennium Cohort Study. *Eur J Public Health*. 2023;33(5):857–863.
8. O'Brien D, Long J, Quigley J, et al. Association between electronic cigarette use and tobacco cigarette smoking initiation in adolescents: a systematic review and meta-analysis. *BMC Public Health*. 2021;21(1):954.
9. US Food & Drug Administration. Statement from FDA Commissioner Scott Gottlieb, M.D., on new data demonstrating rising youth use of tobacco products and the agency's ongoing actions to confront the epidemic of youth e-cigarette use. US Food & Drug Administration website. February 11, 2019. Accessed January 25, 2024. <https://www.fda.gov/news-events/press-announcements/statement-fda-commissioner-scott-gottlieb-md-new-data-demonstrating-rising-youth-use-tobacco>
10. US Food & Drug Administration. Youth e-cigarette use remains serious public health concern amid COVID-19 pandemic: Almost 85 percent of the more than 2 million u.s. middle and high school students who used e-cigarettes used flavored e-cigarettes in 2021. US Food & Drug Administration website. September 30, 2021. Accessed January 25, 2024. <https://www.fda.gov/news-events/press-announcements/youth-e-cigarette-use-remains-serious-public-health-concern-amid-covid-19-pandemic>
11. American Heart Association. E-cigarettes threaten the “tobacco endgame”. American Heart Association website. Accessed January 25, 2024. <https://www.heart.org/en/healthy-living/healthy-lifestyle/quit-smoking-tobacco/tobacco-endgame-and-e-cigarettes>
12. Tatum Z, Leventhal A, Wipfli HL. Playtime: vaping devices designed as cartoons and toys may appeal to kids. *Tob Control*. 2024;33(5):693–694.
13. Cai H, Wang C. Graphical review: the redox dark side of e-cigarettes; exposure to oxidants and public health concerns. *Redox Biol*. 2017;13:402–406.
14. Wilhelm AK, Kingsbury JH, Eisenberg ME, Shyne M, Helgertz S, Borowsky IW. Local tobacco 21 policies are associated with lower odds of tobacco use among adolescents. *Nicotine Tob Res*. 2022;24(4):478–483.