

HEATED TOBACCO PRODUCTS

Evidence and Health Harms

Heated tobacco products (HTPs) are tobacco products that require the use of an electronic device to heat an insert containing tobacco. Though marketed by the tobacco industry as a smoke-free product, the tobacco insert is heated to a temperature high enough to produce smoke. HTP systems are fully integrated so that the heating device and inserts for each system must be used together.

Smoke is produced whenever substances are heated beyond a temperature at which pyrolysis occurs, whether such temperatures are achieved through combustion or other means. Emerging tobacco products, particularly HTPs, emit pyrolysis products such as volatile aldehydes; therefore, these aerosols are clearly within the scientific definition of “smoke,” and any smoke emitted by HTPs is unambiguously “tobacco smoke.”¹

Though HTPs make up a small fraction of the global tobacco market, their share has rapidly grown as the tobacco industry invests in HTPs to make up for shrinking sales of cigarettes and markets them aggressively in select countries like Japan.² Between 2015 and 2024, the volume of inserts sold globally increased from 0.6 billion inserts to over 178 billion, and the HTP share of the global tobacco market

increased from less than 1% to over 3% (based on market retail value).³ The market for HTPs is dominated by multinational tobacco companies whose conventional products have addicted generations and killed millions annually around the globe.

Evidence suggests relatively few cigarette smokers switch to HTPs completely, instead becoming dual users with little, if any, reduced risk. While tobacco companies promote HTPs as devices that reduce harm to smokers who switch, the evidence on harm is evolving.

Further, the tobacco industry makes harm reduction claims for the use of HTPs, while simultaneously opposing policies to prevent the use of both HTPs and conventional cigarettes among youth and never smokers. HTPs are marketed to a broader audience than just existing smokers, risking potential addiction of youth and never smokers that offsets any potential health benefit at the population level. Indeed, research has shown that HTPs users are more likely to be young adults than any other age category.⁴ Regulation according to the WHO Framework Convention on Tobacco Control (FCTC) is critical to ensure that public health is prioritized — not the continued profits of the tobacco industry.

Health Harms

More independent research is needed to better understand the short- and long-term health impacts of HTPs. A systematic review on HTPs found discrepancies between independent and industry-funded studies on measured levels of tar, tobacco-specific nitrosamines (TSNAs), and secondhand emissions, with manufacturer studies generally showing more favorable results.⁵ While the evidence on harms to health from HTPs continues to develop, a 2023 review found that, “there are no long-term toxicity data [for HTPs] and, therefore, the claims of the tobacco industry regarding HTPs as a safer alternative to traditional [conventional] combustible cigarettes are unsubstantiated.”⁶

Moreover, evidence demonstrates that HTPs produce smoke,⁷ and their use is not harmless, particularly among never smokers and youth.

- Smoke from HTPs exposes the user to many of the same harmful compounds found in cigarette smoke.⁸ These compounds cause health complications including heart, cancer, and other lung diseases. Though HTPs were found to produce lower concentrations of many harmful constituents compared to conventional cigarettes, research has found that as many as 20 harmful chemicals, such as propylene glycol, are found in greater concentrations in HTP smoke.⁹ In 2020, the US FDA determined there was not sufficient

evidence to conclude that IQOS reduced the risk of tobacco-related disease.¹⁰ In 2024, Philip Morris International (PMI) requested FDA to renew its reduced exposure claims for IQOS, which is pending as of this publication date.

- Nicotine exposure is the same for exclusive HTP users and exclusive conventional cigarette users.¹¹ In addition to being highly addictive, nicotine can also harm the cardiovascular system. During pregnancy, nicotine exposure negatively affects maternal and fetal health, contributing to preterm

delivery and stillbirth. Nicotine exposure during fetal development and adolescence has lasting negative consequences for brain development.^{12,13}

Secondhand exposure to HTP smoke can also be harmful. A study including 18,839 non-smokers in Japan found that individuals exposed to secondhand emissions from HTPs were more likely to report respiratory symptoms including asthma attacks, asthma-like symptoms, and persistent cough, compared to participants not exposed to emissions from HTPs.¹⁴

Preliminary Clinical Evidence

- Laboratory studies examining the effects of exposure to IQOS emissions found evidence of cell poisoning and inflammation in lung cells which could lead to lung damage.¹⁵
- Another laboratory study found that exposure to IQOS emissions may lead to negative effects on the cardiovascular system, including increased blood pressure¹⁶, heart rate, endothelial dysfunction, and arterial stiffness.¹⁷
- A randomized crossover study found that even brief use of HTPs by healthy young adults may result in adverse vascular function, including platelet thrombus formation, a known risk factor for atherosclerosis.¹⁸
- HTP use may compromise immune system function, increase susceptibility to respiratory infection, and suppress responses to vaccinations.¹⁹

Evidence of Heated Tobacco Products for Smoking Cessation Is Inconclusive

Even if HTPs are found to be less harmful than conventional cigarettes, only smokers who switch completely are likely to benefit. To date however, research suggests that most smokers who use HTPs have not quit using cigarettes, and extensive dual use of HTPs and conventional cigarettes has been documented in several countries.⁹ In 2020, the US FDA concluded that the risk for disease or mortality is unlikely to be substantially reduced as a result of reduced exposure in dual users of cigarettes and IQOS.¹¹

Even those users who switch completely from cigarettes to HTPs may also not experience a significant benefit. A recent Cochrane Review found that there is insufficient evidence for a difference in risk of adverse events between smokers who switched to HTPs and those who continued smoking cigarettes.²⁰ Another comprehensive systematic review that included prospective studies found that in real life, HTPs are not effective smoking-cessation tools. In

fact, several studies included in the review found that current cigarette smokers that use HTPs were less likely to quit altogether.⁴

Leaked documents from Philip Morris Japan (a subsidiary of Philip Morris International) demonstrate how the tobacco company intended to manufacture support for IQOS through manipulated science.²¹

Evidence of use patterns from several countries demonstrates that HTPs often result in dual use rather than complete cessation of conventional cigarettes. A recent review of studies on HTP use estimated that 68.3% of current HTP users are dual users.⁵ Japan and the Republic of Korea, two established markets for HTPs, provide clear examples of the dual use phenomenon.

- In Japan, the largest market for HTPs globally, a national longitudinal study of more than 7,000 adults concluded that HTP use did not assist current conventional cigarette smokers in quitting.²²

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- The study followed cigarette smokers over the course of three years and found that long-term HTP use did not prevent former smokers from relapsing.²²
- It found that any use of HTPs was significantly associated with a lower likelihood of cessation and likelihood of being completely tobacco-free.²²
- In the Republic of Korea, where HTPs were first introduced in early 2017 and quickly became popular, several surveys have documented high rates of dual use:
 - A survey of 21,100 adults in one province found that 96.25% of current HTP users were also current smokers of conventional cigarettes.²³
- A nationally representative survey of 6,182 adults found that 90% of current HTP users were also currently smoking, using e-cigarettes, or both.²⁴
- Results from a survey of 2,831 adult tobacco users found that dual users of conventional cigarettes and HTPs were less motivated to quit HTPs and less likely to attempt quitting both conventional cigarettes and HTPs, compared to individuals using conventional cigarettes only.²⁵
- A study of 10,839 adults in 11 European countries found that the majority of HTP users were dual conventional cigarette users.²⁶

Marketing of Heated Tobacco Products

Leaked documents from Philip Morris Japan outline marketing strategies aimed at recruiting non-smokers, directly opposing their so-called “smoke-free future” goals.²⁷ Even if proven to be less harmful, so-called reduced harm products may only be beneficial to public health if they actually help people completely switch from conventional cigarettes and these benefits are not offset by marketing that induces youth and non-users to begin using tobacco. Sophisticated marketing tactics reveal that tobacco companies are not advertising exclusively — and likely not even primarily — to smokers but rather targeting broad audiences that include youth and non-users to normalize tobacco use and attract new users.

- Companies use social media platforms and influencers to market HTPs. Images feature influencers who have been paid to model with HTPs, speak about and promote the products, and attend glamorous parties and dinners that make HTP brands like IQOS look like part of a desirable and appealing lifestyle.*
- British American Tobacco (BAT), manufacturer of the HTP glo, promotes their product at events and festivals and uses flashy advertising tactics like light shows to advertise their product (see *image at bottom right*).²⁸

- To glamorize the product and link it to sophistication and fashion, Philip Morris International (PMI) has sponsored fashion and design events, such as Mercedes-Benz Fashion Days in Ukraine; partnered with designers such as Karim Rashid to create limited-edition IQOS charger covers; and entered into partnerships with several women’s magazines, including in Russia and Italy, for projects that include designing IQOS covers and empowering women in the workplace.



* Additional examples of IQOS marketing on social media are available at: <https://www.tobaccofreekids.org/media/2019/iqos-marketing>

Key Takeaways

- The short- and long-term health harms of HTPs remain relatively unknown. However, current evidence does suggest that HTPs are likely as addictive as conventional cigarettes and emit many of the same harmful toxic emissions.
- More independent research (short and long-term) is needed to understand the specific health harms caused by HTPs.
- There is not sufficient evidence to suggest that HTPs are an effective strategy to quit conventional cigarette use, and dual use of HTPs and conventional cigarettes is common, with little or no health benefit to those who do not switch completely.
- Governments should apply tobacco control provisions that are fully compliant with the WHO FCTC to regulate HTPs, including both the HTP heating devices and their inserts. This is especially critical to ensure that these products are marketed and sold exclusively to current smokers — as the companies claim.

References

1. WHO FCTC Convention Secretariat. FCTC/COP/10/9. Challenges posed by and classification of novel and emerging tobacco products. Paragraphs 8-12. July 11, 2023. Accessed December 17, 2025. <https://iris.who.int/server/api/core/bitstreams/99526a9c-c372-4b42-86e3-f3401be3ebd9/content>.
2. Heated tobacco products. Tobacco Tactics. <https://tobaccotactics.org/wiki/heated-tobacco-products/>. Published February 3, 2023. Accessed March 28, 2023.
3. Euromonitor International. 2025. Ed. <https://www.euromonitor.com/our-expertise/passport>.
4. Scala M, Dallera G, Gorini G, et al. Patterns of Use of Heated Tobacco Products: A Comprehensive Systematic Review. *Journal of Epidemiology*. 2025;35(5):213-221. doi:10.2188/jea.JE20240189. 567891013141718192022325262728
5. Simonavicius E, McNeill A, Shahab L, Brose LS. Heat-not-burn tobacco products: a systematic literature review. *Tob Control*. 2019;28(5):582-594. doi:10.1136/tobaccocontrol-2018-054419
6. Upadhyay S, Rahman M, Johanson G, Palmberg L, Ganguly K. Heated Tobacco Products: Insights into Composition and Toxicity. *Toxics*. 2023;11(8):667. doi:10.3390/toxics11080667.
7. Uguna CN, Snape CE. Should IQOS Emissions Be Considered as Smoke and Harmful to Health? A Review of the Chemical Evidence. *ACS Omega*. 2022;7(26):22111-22124. doi:10.1021/acsomega.2c01527.
8. Centers for Disease Control. Heated Tobacco Products, What's the Bottom Line?. Nov. 10, 2022. Available from: <https://www.cdc.gov/tobacco/other-tobacco-products/heated-tobacco-products.html>.
9. Li X, Luo Y, Jiang X, et al. Chemical Analysis and Simulated Pyrolysis of Tobacco Heating System 2.2 Compared to Conventional Cigarettes. *Nicotine Tob Res*. 2019;21(1):111-118. doi:10.1093/ntr/nty005.
10. U.S. Food and Drug Administration, FDA. (2020, July 7). Scientific Review of Modified Risk Tobacco Product Application (MRTPA) Under Section 911(d) of the FD&C Act - Technical Project Lead. U.S. Food and Drug Administration, FDA. <https://www.fda.gov/media/139796/download>.
11. Goniewicz M., Miller C., Page M., et al., Findings from the ITC Japan-Canada Biomarkers Study. March 1-4, 2023. Society for Research on Nicotine and Tobacco. Slide 12
12. How tobacco smoke causes disease: The biology and behavioral basis for smoking-attributable disease: A report of the surgeon general. U.S. Centers for Disease Control and Prevention, U.S. National Center for Chronic Disease Prevention and Health Promotion, U.S. Office on Smoking and Health: National Center for Biotechnology Information. <https://pubmed.ncbi.nlm.nih.gov/21452462/>. Published 2010. Accessed March 28, 2023.
13. U.S. Department of Health and Human Services. E-cigarette Use Among Youth and Young Adults: A Report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2016.
14. Yoshioka T, Shinozaki T, Hori A, Okawa S, Nakashima K, Tabuchi T. Association between exposure to secondhand aerosol from heated tobacco products and respiratory symptoms among current non-smokers in Japan: a cross-sectional study. *BMJ Open*. 2023;13(3):e065322. doi:10.1136/bmjopen-2022-065322
15. Sohal SS, Eapen MS, Naidu VGM, Sharma P. IQOS exposure impairs human airway cell homeostasis: direct comparison with traditional cigarette and e-cigarette. *ERJ Open Res*. 2019;5(1):00159-02018. doi:10.1183/23120541.00159-2018.
16. Hu H, Nakagawa T, Honda T, Yamamoto S, Mizoue T. Association of conventional cigarette smoking, heated tobacco product use and dual use with hypertension. *Int J Epidemiol*. 2024;53(5):dyae114. doi:10.1093/ije/dyae114.
17. Franzen KF, Belkin S, Goldmann T, et al. The impact of heated tobacco products on arterial stiffness. *Vasc Med*. 2020;25(6):572-574. doi:10.1177/1358863X20943292.
18. Lyytinen G, Melnikov G, Brynedal A, et al. Use of heated tobacco products (IQOS) causes an acute increase in arterial stiffness and platelet thrombus formation. *Atherosclerosis*. 2024;390:117335. doi:10.1016/j.atherosclerosis.2023.117335
19. Bhat TA, Kalathil SG, Leigh N, et al. Acute Effects of Heated Tobacco Product (IQOS) Aerosol Inhalation on Lung Tissue Damage and Inflammatory Changes in the Lungs. *Nicotine Tob Res*. 2021;23(7):1160-1167. doi:10.1093/ntr/ntaa267.
20. Tattan-Birch H, Hartmann-Boyce J, Kock L, et al. Heated tobacco products for smoking cessation and reducing smoking prevalence. Cochrane Tobacco Addiction Group, ed. Cochrane Database Syst Rev. 2022;2022(4). doi:10.1002/14651858.CD013790.pub2.
21. Braznell S, Laurence L, Fitzpatrick I, Gilmore AB. "Keep it a secret": Leaked Documents Suggest Philip Morris International, and Its Japanese Affiliate, Continue to Exploit Science for Profit. *Nicotine Tob Res*. 2025;27(5):794-804. doi:10.1093/ntr/ntae101
22. Odani S, Tsuno K, Agaku IT, Tabuchi T. Heated tobacco products do not help smokers quit or prevent relapse: a longitudinal study in Japan. *Tob Control*. 2024;33(4):472-480. doi:10.1136/tc-2022-057613.
23. Hwang JH, Ryu DH, Park SW. Heated tobacco products: Cigarette complements, not substitutes. *Drug Alcohol Depend*. 2019;204:107576. doi:10.1016/j.drugalcdep.2019.107576.
24. Kim SH, Cho HJ. Prevalence and correlates of current use of heated tobacco products among a nationally representative sample of Korean adults: Results from a cross-sectional study. *Tob Induc Dis*. 2020;18(August). doi:10.18332/tid/125232.
25. Lee CM, Kim CY, Lee K, Kim S. Are Heated Tobacco Product Users Less Likely to Quit than Cigarette Smokers? Findings from THINK (Tobacco and Health IN Korea) Study. *IJERPH*. 2020;17(22):8622. doi:10.3390/ijerph17228622.
26. Gallus S, Lugo A, Liu X, et al. Use and Awareness of Heated Tobacco Products in Europe. *J Epidemiol*. 2022;32(3):139-144. doi:10.2188/jea.JE20200248.
27. Stopping Tobacco Organizations and Products (STOP). Today Japan, Tomorrow the World Philip Morris Japan's Leaked Marketing Blueprint for IQOS. Feb 2024. Available from: https://exposetobacco.org/wp-content/uploads/PMJ-leaked-marketing-blueprint_EN.pdf. Accessed July 3rd, 2024.
28. Gali K, Fuchs H, Prochaska JJ. 'Do both': glo events and promotion in Germany. *Tob Control*. 2022;31(e1):e78-e79. doi:10.1136/tobaccocontrol-2020-056289.