GGTC FACT SHEET

Novel and Emerging Tobacco and Non-Tobacco Products (NENTPs): Electronic Nicotine Delivery Systems and Electronic Non-Nicotine Delivery Systems

Global Center for Good Governance in Tobacco Control

Terminology

One of the most popular forms of novel and emerging tobacco products is the vaping device, which falls under "Electronic Nicotine Delivery Systems" (ENDS) or "Electronic Non-Nicotine Delivery Systems" (ENNDS), depending on whether it is marketed as being free of nicotine or not. A variety of commercial and colloquial terms are being used to describe ENDS / ENNDS, as shown below in Table 1.

1. "Electronic Nicotine Delivery Systems" (ENDS) - ENDS heat a liquid to create aerosols inhaled by the user. These "e-liquids" contain nicotine (but not tobacco) and other additives, including flavors and chemicals, some of which are toxic to people's health.

2. "Electronic Non-Nicotine Delivery Systems" (ENNDS) - ENNDS are essentially the same as ENDS, but the e-liquid used is marketed as free of nicotine.[1]

ENDS and ENNDS, colloquially known as e-cigarettes, are sold as consumer lifestyle and recreational products marketed aggressively to young people,[2,3,4] including children, via social media[5,6] and influencers.[7,8] These products come in over 16,000 flavors,[9] such as fruit and candy, which appeal to the youth and children. ENDS and ENNDS products are discreetly marketed, resembling items like smartwatches, lipsticks, and bags, that are easy to conceal.[10]

According to the Global Youth Tobacco Survey[11] trends, youth in countries with complete bans on addictive products fare better than those with access restrictions.[12]

ENDS and ENNDS have been authorized in the open market. Forty-One (41)[13] countries ban the sale of e-cigarettes, eighty-two (82)[14] countries have regulated their sale and distribution, among which thirty-eight (38)[15] countries regulate the nicotine content. Seventy-four (74) countries have no regulations in place for these harmful products.[16]

Classification and Brands

A number of terms are being used for a variety of novel and emerging tobacco products. Three broad categories have emerged, but there is a wide variety of products under the ENDS / ENNDS with many of the terms used interchangeably.

Umbrella Name	Broad Category	Term Used	Commonly used Brands
New and Emerging Tobacco Products[17]	**Electronic Nicotine Delivery Systems / Electronic Non-Nicotine Delivery Systems**[18]	**E-Cigarette,**[19] **Vape, vaping devices, Vaporizer,**[20] **"Juul"**[21]	Vype / Vuse (British American Tobacco)[22] Blu e-cigs (Imperial Brands) SMOK (SMOK LLC) Logic cig-a-like (Japan Tobacco International) Juul (Juul Labs Inc) Puff Bar NJOY (NJOY LLC) Joyetech Vaporesso (SMOORE Group)
		Disposable vapes[23]	Elfbar (Shenzhen iMiracle) Blu e-cigs (Imperial Brands) CHIC (BAT)[24]
		E-cigars[25]	Innokin (Shenzhen Innokin Technology Inc)
	HTPs	Heated Tobacco Products[26]	GLO (BAT / RJ Reynolds) IQOS (PMI and Altria) Pulze (Imperial Tobacco) Ploom (JTI)
	Oral Tobacco	Nicotine Pouch[27]	Zyn (Swedish Match) Lyft (British American Tobacco Sweden AB)
		Snus Pouch	Swedish Match (Philip Morris Holland Holdings B.V.)

Note – Brands have been updated using GGTC's 'How the tobacco industry undermines cessation' fact sheet

Harms Caused by Nicotine

a. **Addiction and teen dependency:** Nicotine is as addictive as cocaine or heroin.[28,29,30] It is so addictive that a quarter of teenagers can develop dependency[31] after smoking three or four cigarettes, and this figure rises to nearly 60% after smoking five packs.[32]

b. **Impact on adolescent brain and mental health:** Nicotine affects parts of the brain responsible for learning and memory. In the adolescent brain, the effect can become permanent.[33] Nicotine can also impair decision-making ability in the long term and worsen anxiety,[34] irritability,[35] impulsivity,[36] depression, and other mental health disorders.[37] Moreover, youth who smoke are at increased risk of developing mental disorders such as major depressive disorder, agoraphobia, generalized anxiety disorder, panic disorder,[38] while also worsening attention-deficit/hyperactivity disorder (ADHD).[39]

c. **Impact on fetal development and brain function:** Nicotine can adversely affect the development of the fetus in a pregnant woman and can affect the development of children's and adolescents' brain.[40] Prolonged nicotine exposure upregulates receptors in the Pre-frontal Cortex, and this disruption can lead to persistent cognitive and behavioral deficits, which have been associated with depression and anxiety.[41]

d. **Lethal nicotine concentration in e-liquids:** Studies show that a 30 ml e-liquid vial with a 1.8% nicotine concentration would have around 1,080 mg of nicotine. This would be more than enough to kill a 90 kg person, while a 70 mg dose would be lethal for a 10 kg toddler.[42]

e. **Environmental impact of nicotine extraction:** The process of extracting and purifying nicotine from tobacco plants necessitates a significant amount of water and results in the production of non-recyclable halogenated waste and pollution.[43]

Harms Caused by NENTPs

NENTPs cover ENDS and ENNDS, including e-cigarettes, vaping devices, and disposable vapes. Although ENNDS are labelled as non-nicotine, numerous studies have shown that they often contain nicotine.[44] ENDS and ENNDS products cause harm in various ways, affecting both users and those exposed to the environment.

1. Harms Caused to the Users
    a. **High levels of nicotine:** The nicotine content of e-liquids in pre-filled devices can be very high, sometimes exceeding 60 mg/mL, while "do-it-yourself" liquids can reach levels of about 130 mg/mL.[45] These are higher compared to cigarettes that have 8.4 mg on average.[46]
    b. **Linked to increased risk of health conditions:** The exposure to fine and ultrafine particles, volatile organic compounds, heavy metals,[47] and nicotine, is linked to increased risks of heart disease,[48] myocardial infarctions,[49] lung cancer,[50] increased risk of strokes, and immediate nicotine toxicity.[51]
    c. **Exposure to respiratory irritants:** Studies show that ENDS and ENNDS emissions contain propylene glycol and vegetable glycerin, both of which are respiratory irritants when aerosolized during use.[52] The user inhales these fine and ultrafine particles upon use[53] The toxicant levels vary enormously across and within brands.[54]
    d. **Risk of accidents:** There is a risk of injury due to burns and explosions. Reports of spontaneous explosions and / or fires of e-cigarettes have been reported, and cases are predominantly attributed to the malfunction of lithium-ion batteries.[55]
    e. **Risk of ingestion and skin exposure to e-liquids:** The e-liquids in ENDS/ENNDS refills contain toxic chemicals that can cause poisoning in children,[56] or even death,[57] if ingested or comes into contact with the skin.

2. Harms Caused to those Exposed
    a. **Exposure to aerosolized chemicals:** The smoke exhaled by ENDS and ENNDS users[58,59] contains a variety of chemicals. This raises the concentration of particulate matter[60] in indoor environments. It also contains nicotine and other potentially toxic substances.[61,62]
    b. **Exposure to harmful metals:** One study[63] measured metals in second-hand aerosol and found increased levels of aluminum (2.4 times greater than background levels), which are associated with impaired lung function, asthma and pulmonary fibrosis.[64] One study found nickel (associated with chronic bronchitis), zinc (associated with impaired pulmonary function), and silver (associated with breathing problems) in second-hand aerosols.[65]

3. Harms Caused to the Environment
    a. **Air pollution:** ENDS and ENNDS vapors are potent sources of air pollution such as aldehydes, carbon monoxide, particulate matter, volatile organic compounds, heavy metals, and nicotine.[66]
    b. **Use of non-biodegradable casing:** ENDS and ENNDS products utilize non-biodegradable plastic casings. Like many plastics, these pose a risk to marine organisms and animals, and endanger aquatic ecosystems.[67]
    c. **E-waste generation:** ENDS and ENNDS products also contain a heating element atomizer, batteries, microcontroller chips, and chargers.[68] Many of these products are single-use disposable[69] products made with non-biodegradable and non-recyclable materials[70] that can cause damage to the environment.[71]
    d. **Hazardous waste classification of vaping liquids:** The presence of hazardous chemicals in vaping liquids worsens the harm, as the nicotine e-liquid within these vapes categorizes them as acute hazardous waste according to EPA standards.[72]
    e. **Plastic and heavy metal pollution:** The disposable and addictive nature of these products, as well as its proliferation in resource-restricted[73] countries, guarantee a

constant increase in plastic and heavy metal pollution. The World Health Organization[74] called for an immediate ban, phaseout, or stringent control of plastics in ENDS and ENNDS to address their hazardous waste and pollution. Additionally, governments worldwide have reached a consensus on addressing the hazardous waste generated by plastic pollution from NENTPs.[75]

4. Harms to the Youth
   a. **Undermining taxation and smoke-free measures:** The tobacco industry uses new and emerging nicotine and tobacco products, especially ENDS and HTPs, to circumvent existing measures, such as taxation[76] and smoke-free area restrictions,[77] which have been proven to help consumers quit.[78]
   b. **Renormalization of smoking behavior:** The use of ENDS poses a risk of normalizing smoking behavior particularly among younger populations. This undermines the progress made in denormalizing smoking, especially in indoor public spaces,[79] and also undermines tobacco control efforts.[80]
   c. **Gateway to conventional smoking:** The use of ENDS has been shown to have a gateway effect[81] to conventional smoking among young people.[82]

5. Harms Caused to those Trying to Quit
   a. **Manipulation of effectiveness evidence:** Empirical evidence does not support the effectiveness of ENDS and ENNDS products as smoking cessation devices at the population level.[83] However, the tobacco industry manipulates scientific evidence[84] to undermine the best available data demonstrating the ineffectiveness of these products.
   b. **Discrediting proven quit-smoking methods:** The tobacco industry spreads misinformation by dismissing evidence-based cessation methods as 'Quit or Die' approaches. They claim that failing to recognize NENTPs as cessation tools hinders efforts to help people quit.[85]
   c. **Misleading 95% safer claim:** The tobacco industry has perpetuated a false claim[86,87] which has been debunked by various sources,[88,89] that ENDS and ENNDS products are 95% safer than traditional smoking. This claim has resulted in the public, including children and young adults, believing that ENDS use is "safe".[90,91]
   d. **Impact on quit-smoking efforts:** Although NENTPs are marketed as cessation tools that reduce addiction and encourage quitting, the products are designed in a manner that allows users to increase the level of nicotine they ingest with each puff.[92]

There are a wide variety of toxic contents and emissions in the e-liquids that have yet to be discovered[93] and studied for their health impact. However, there is enough evidence to show that ENDS and ENNDS products pose a danger to human health, harm environmental health, and lure children to addiction.

The WHO uses both 'Novel' and 'New' interchangeably in the acronym NENTPs, with no difference in context between the two terms. However, the WHO FCTC Secretariat exclusively uses 'Novel,' and therefore, this paper uses the word 'Novel' to remain consistent with the WHO and the FCTC Secretariat.

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[1] "*ENDS and electronic non-nicotine delivery systems (ENNDS) do not necessarily contain tobacco and instead vaporize a solution composed of numerous compounds, which include nicotine in the case of ENDS, or may not contain nicotine in the case of ENNDS*"
"*ENNDS are essentially the same as ENDS but the e-liquid used is marketed as free of nicotine*." Source: .World Health Organization, "WHO report on the global tobacco epidemic, 2023: Protect people from tobacco smoke" (2023). Available at https://iris.who.int/bitstream/handle/10665/372043/9789240077164-eng.pdf?sequence=1

[2] "*ENDS are heavily marketed towards youth through the use of flavoring and promotional strategies. Apart from the known harmful effects of nicotine on the developing brain, nicotine is addictive and could lead people, particularly young people, to take up more harmful forms of nicotine or tobacco consumption*." Source: World Health Organization, 'WHO report on the global tobacco epidemic 2019: offer help to quit tobacco use' (2019). Available at: https://www.who.int/publications/i/item/9789241516204

[3] "*…including on social media to target their products at young people. ENDS are targeted specifically at children and young adults and marketed in thousands of flavours, the majority of which increase the palatability of the products and are appealing to younger people*" Source: World Health Organization, "WHO report on the global tobacco epidemic, 2023: Protect people from tobacco smoke" (2023). Available at https://iris.who.int/bitstream/handle/10665/372043/9789240077164-eng.pdf?sequence=1 ; Citing:

1. Struik LL, Dow-Fleisner S, Belliveau M, Thompson D, Janke R. Tactics for drawing youth to vaping: content analysis of electronic cigarette advertisements. J Med Internet Res. 2020;22(8):e18943. doi: 10.2196/18943
2. Pepper JK, Ribisl KM, Brewer NT. Adolescents' interest in trying flavoured e-cigarettes. Tob Control. 2016;25(2):ii62–6. doi: 10.1136/ tobaccocontrol-2016-053174.

[4] "*the use of ENDS and/or ENNDS by children and adolescents is of international concern, especially given the availability of flavored products that appeal to this age group, which has led to an increase in the use of these products in some countries*." Source: WHO FCTC, Report by the World Health Organization, 'Progress report on technical matters related to Articles 9 and 10 of the WHO FCTC (Regulation of contents and disclosure of tobacco products, including waterpipe, smokeless tobacco and heated tobacco products)' (2023). Available at: https://storage.googleapis.com/who-fctc-cop10-source/Main%20documents/fctc-cop10-7-en.pdf

[5] " *The (Tobacco) industry has launched an aggressive US$ 1.4 billion marketing campaign that leans heavily on social media, concerts and sporting events*" Source: World health Organization, 'New Products, old tricks? Concerns big tobacco is targeting youngsters.' (2021). Available at: https://www.who.int/news-room/feature-stories/detail/new-products-old-tricks-concerns-big-tobacco-is-targeting-youngsters#:~:text=But%20as%20these%20sponsorships%20make,8%20million%20people%20a%20year.

[6] "*Even brief exposure to e-cigarette content on social media is associated with greater intention to use these products, as well as more positive attitudes toward e-cigarettes.*" Tobacco: E-cigarettes, World Health Organisation. Available at: https://www.who.int/news-room/questions-and-answers/item/tobacco-e-cigarettes

[7] "*the products are promoted at youth friendly events such as music festivals, and manufacturers use social media influencers that appeal to young audiences to promote them*" Source: World Health Organization, "Who Report On The Global Tobacco Epidemic, 2021, Addressing new and emerging products" (2021). Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf

[8] "*Despite FDA's actions against any e-cigarette ads targeting youth and the Instagram ban on sponsored e-cigarette content, in 2020 influencers were still collaborating with e-cigarette companies and promoting specific brand-related content on the youth-popular social media site, Instagram*." Source: Julia Vassey et al., 'E-cigarette brands and social media influencers on Instagram: a social network analysis' (2023), *Tobacco Control* 32(e2). Available at: https://tobaccocontrol.bmj.com/content/32/e2/e184.info

[9] "*E-cigarettes target children through social media and influencers, with at least 16 000 attractive flavours. Some of these products use cartoon characters and have sleek designs, which appeal to the younger generation.* Source: World Health Organization, "Tobacco: E-cigarettes Q/A" (2024). Available at: https://www.who.int/news-room/questions-and-answers/item/tobacco-e-cigarettes

[10] "*Many e-cigarettes are also designed to allow discreet use, marketed as such, and some can be integrated into hoodies, or resemble lipsticks and watches, so they can be hidden, especially from teachers and parents*" Source: World Health Organisation, 'Technical note on the call to action on electronic cigarettes' (December 2023). Available at https://cdn.who.int/media/docs/default-source/tobacco-hq/regulating-tobacco-products/ends-call-to-actionbackground.pdf?sfvrsn=7dd2856e_11&download=true ; Citing; Vaping prevention

& education. How to spot stealth and disposable E-cigarettes. Silver Spring (MD): US Food and Drug Administration; Tobacco Education Resource Library; 2023 (https://digitalmedia.hhs.gov/tobacco/educator_hub/prevention_tips/how_to_spot_stealth_and_disposable_e_cigarettes). See also "*Some of the products resemble their conventional tobacco counterparts; others are shaped like pens, USB memory sticks, or basic cylinders*." Source: World Health Organization, "Who Report On The Global Tobacco Epidemic, 2021, Addressing new and emerging products" (2021). Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf

[11] World Health organization, 'Global Youth Tobacco Survey' Available at: https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/global-youth-tobacco-survey

[12] Global Youth Voices Speech at COP10 plenary session., 'item 5 Part 3' at 34:00 (February 2024). Available at: https://ggtc.world/library/global-youth-voices-resource-packages

[13] Global Center for Good Governance in Tobacco Control, 'E-Cigarette Ban and Regulation: Global Status as of October 2023' (2023). Available at: https://ggtc.world/knowledge/novel-emerging-tobacco-products-and-product-regulation/e-cigarette-ban-regulation-global-status-as-of-october-2023

[14] Ibid

[15] Ibid

[16] "*E-cigarettes have been allowed on the open market and aggressively marketed to young people. Thirty-four countries ban the sale of e-cigarettes, 88 countries have no minimum age at which e-cigarettes can be bought and 74 countries have no regulations in place for these harmful products.*"
Source: World Health Organization, 'Urgent action needed to protect children and prevent the uptake of e-cigarettes' (2023). Available at: https://www.who.int/news/item/14-12-2023-urgent-action-needed-to-protect-children-and-prevent-the-uptake-of-e-cigarettes

[17] "*New and Emerging products: Addressing Electronic Nicotine Delivery Systems*
Some of the nicotine and tobacco products fast emerging in different markets – including ENDS, heated tobacco products (HTPs) and nicotine pouches – pose serious health concerns. Source: World Health Organization, "Who Report On The Global Tobacco Epidemic, 2021, Addressing new and emerging products" (2021). Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf

[18] *"E-cigarettes are the most common type of electronic nicotine delivery systems (ENDS) and electronic non-nicotine delivery systems (ENNDS)*." Source: World Health Organization Publication, 'Electronic Cigarettes (E-cigarettes) (2024). Available at: https://www.who.int/westernpacific/publications/i/item/WPR-2024-DHP-001

[19] E-cigarette is the generic term used to encompass the most widely used ENDS such as e-shishas and e-cigars. However, this is done only for the sake of brevity, and the broad category E-cigarettes fall under will remain ENDS. Source: WHO, 'Electronic Cigarettes Call to action' (2023). Available at: https://www.who.int/publications/m/item/electronic-cigarettes---call-to-action#:~:text=Download%20(366.4%20kB)-,Overview,health%20harms%20to%20the%20population.

[20] Vaporizers is the term used by the Tenth Conference of the Parties to the WHO FCTC to refer to electronic delivery systems (nicotine and non-nicotine). "*Noting that WHO has recommended an immediate ban on cigarette filters and vaporizers in its submission to the Intergovernmental Negotiating Committee on Plastic Pollution;*" Source: WHO FCTC, 10th Conference of the Parties Decision FCTC/COP10(14), 'Implementation of Article 18 of the WHO FCTC' (Panama, 10 February 2024). Available at: https://storage.googleapis.com/who-fctc-cop10- source/Decisions/fctc-cop-10-14-en.pdf.

[21] "Juul", a leading brand in the e-cigarette market has become a generic term used for such products.

[22] "*In 2015, BAT launched Vype in France, Germany, Italy, Poland and Colombia, which the company claimed gave them "the largest vapour business in the world outside of the US". It subsequently also expanded its e-cigarette business within the US, with Vuse, after the acquisition of RAI in 2017*." Source: Tobacco Tactics, 'E-cigarettes: British American Tobacco' (2023). Available at: https://tobaccotactics.org/article/e-cigarettes-british-american-tobacco/

[23] Disposable vapes are differentiated into two types. One type is designed to look exactly like cigarettes, while the other type come in various youth-appealing designs and colors.

[24] *"In December 2015, BAT bought CHIC, a Polish e-cigarette business with around 65% of the Polish market... According to Euromonitor data, in 2018 Poland was by far BAT's biggest European e-cigarette market by value, worth over UK£835 million (US$1 billion), four times the value in the UK"* Source: Tobacco Tactics, 'E-cigarettes: British American Tobacco' (2023). Available at: https://tobaccotactics.org/article/e-cigarettes-british-american-tobacco/

[25] "*Tobacco and related industries market e-cigarettes and other new and emerging nicotine and tobacco products as alternatives and/supplementary products to conventional cigarettes that can be used in indoor*

public areas, even where smoking bans exist. These products include nicotine pouches, e-shishas, e-pipes and e-cigars." Source: WHO report on the global tobacco epidemic, 2023 Protect people from tobacco smoke (2023). Available at: https://iris.who.int/bitstream/handle/10665/372043/9789240077164-eng.pdf?sequence=1

[26] "*No, HTPs should not be confused with e-cigarettes/ ENDS. HTPs heat tobacco to generate nicotine and are not "vape products" as often referred to by tobacco and related industries. E-cigarettes/ENDS heat a liquid containing nicotine and do not contain tobacco.*" Source: World Health Organization, 'Heated Tobacco Products information sheet' (2020). Available at: https://iris.who.int/bitstream/handle/10665/331297/WHO-HEP-HPR-2020.2-eng.pdf

[27] "*Tobacco and related industries market e-cigarettes and other new and emerging nicotine and tobacco products as alternatives and/supplementary products to conventional cigarettes that can be used in indoor public areas, even where smoking bans exist. These products include nicotine pouches, e-shishas, e-pipes and e-cigars*." Source: WHO report on the global tobacco epidemic, 2023 Protect people from tobacco smoke (2023). Available at: https://iris.who.int/bitstream/handle/10665/372043/9789240077164-eng.pdf?sequence=1

[28] "*Nicotine, a drug found naturally in the tobacco plant, is highly addictive, as with such drugs as cocaine and **heroin**; activates the brain's reward circuits; and reinforces repeated nicotine exposure*" Source : US Department of Health and Human Services, 'Smoking Cessation: A Report of the Surgeon General: Chapter 1' (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health 2020). Available at: https://www.ncbi.nlm.nih.gov/books/NBK555595/

[29] "*When inhaled, nicotine gets to a person's brain in seven seconds, twice as fast as intravenous drugs. Nicotine affects the brain and central nervous system by changing the level of neurotransmitters and chemicals that regulate mood, learning, alertness and ability to concentrate. Nicotine increases the heart rate, but it constricts the blood vessels, thereby reducing circulation. It can act like a stimulant or a sedative, depending on the level of nicotine in the body and time of day.*" Source: Oral Cancer Foundation, 'Tobacco and Addiction' (2024). Available at: https://oralcancerfoundation.org/understanding/tobacco/tobacco-and-addiction/

[30] "*Using ENDS poses the risk of nicotine addiction, including among children and adolescents. Research findings show that ENDS users are more likely to become cigarette smokers, exposing them to the harmful effects of smoking*" Source: World Health Organization, 'Report On The Global Tobacco Epidemic, 2021 Addressing new and emerging products. (2021) Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf?sequence=1 ; Citing: O'Brien D, Long J, Quigley J, Lee C, McCarthy A, Kavanagh P. Association between electronic cigarette use and tobacco cigarette smoking initiation in adolescents: a systematic review and meta-analysis. BMC Public Health. 2021;21(954):e1-e10.

[31] "*Studies consistently show that young people that use e-cigarettes are almost three times more likely to use cigarettes later in life*." Source: World Health Organisation, 'Urgent action needed to protect children and prevent the uptake of e-cigarettes' (2023).
Available at: https://www.who.int/news/item/14-12-2023-urgent-action-needed-to-protect-children-and-prevent-the-uptake-of-e-cigarettes

[32] World Health Organization, 'Report On The Global Tobacco Epidemic, 2021 Addressing new and emerging products. (2021) Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf?sequence=1 ; Citing: Upspring WW, DiFranza JR. The loss of autonomy over smoking in relation to lifetime cigarette consumption. Addictive Behaviors. 2010;35(1):14–18.

[33] "*The prefrontal cortex, the brain area responsible for executive functions and attention performance, is one of the last brain areas to mature and is still in the process of developing during adolescence. This places the adolescent brain in a vulnerable state of imbalance, susceptible to the influence of psychoactive substances such as nicotine*." Source: Goriounova, N. and Mansvelder, H. Short- and Long-Term Consequences of Nicotine Exposure during Adolescence for Prefrontal Cortex Neuronal Network Function. (2012) Cold Spring Harbor Perspectives in Medicine. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3543069/

[34] "Factors comorbid with adolescent smoking and ND, including substance use (alcohol, marijuana) and mental health problems (depression, anxiety, disruptive disorders), predict poor health in young adulthood." Source: Pamela C. Griesler, 'Nicotine Dependence in Adolescence and Physical Health Symptoms in Early Adulthood' (2016), *Nicotine and Tobacco Research*. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5942607/
See Also: "*The most consistent evidence supports smoking and nicotine dependence as increasing the risk of panic disorder and generalized anxiety disorder.*" Source: Steven Moylan et. al., 'Cigarette smoking, nicotine dependence and anxiety disorders: a systematic review of population-based, epidemiological studies' (2012), *BMC Medicine*. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3523047/#:~:text=The%20most%20consistent%20evidence%20supports,and%20nicotine%20dependence%20is%20inconsistent.

[35] DiFranza, J. et al. (25 May2020). Initial Symptoms of Nicotine Dependence in Adolescents. Tobacco Control. Retrieved from https://tobaccocontrol.bmj.com/content/9/3/313.short .

[36] Chase, H. and Hogarth, L. (1 December 2015). Impulsivity and Symptoms of Nicotine Dependence in a Young Adult Population. Nicotine & Tobacco Research. Retrieved from https://academic.oup.com/ntr/article/13/12/1321/996614

[37] Becker TD, Arnold MK, Ro V, et al. Systematic review of electronic cigarette use (vaping) and mental health comorbidity among adolescents and young adults. Nicotine Tob Res. 2021;23:415–425. doi: 10.1093/ntr/nt
See also: Lechner WV, Janssen T, Kahler CW, Audrain-McGovern J, Leventhal AM. Bi-directional associations of electronic and combustible cigarette use onset patterns with depressive symptoms in adolescents. Prev Med. 2017 Mar;96:73-78. doi: 10.1016/j.ypmed.2016.12.034. Epub 2016 Dec 23. PMID: 28024859; PMCID: PMC5510594.

[38] Prochaska, J. et al. (2013). Tobacco use and its treatment among young people in mental health settings: a qualitative analysis. Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco. Retrieved from https://www.ncbi.nlm.nih.gov/ pmc/articles/PMC3715391/

[39] Dvorsky MR, Langberg JM. 'Cigarette and e-cigarette use and social perceptions over the transition to college: The role of ADHD symptoms.' Psychol Addict Behav. 2019 May;33(3):318-330. doi: 10.1037/adb0000450. Epub 2019 Mar 14. PMID: 30869922; PMCID: PMC6483890.

[40] Source: World Health Organization, 'Technical Note on Call to Action on electronic cigarettes' (2023). Available at: https://cdn.who.int/media/docs/default-source/tobacco-hq/regulating-tobacco-products/ends-call-to-action-background.pdf?sfvrsn=7dd2856e_11&download=true citing:

1. WHO report on the global tobacco epidemic 2021: addressing new and emerging products. Geneva: World Health Organization; 2021 (https://www.who.int/publications/i/item/9789240032095).
2. Banks E, Yazidjoglou A, Brown S, Nguyen M, Martin M, Beckwith K et al. Electronic cigarettes and health outcomes: systematic review of global evidence. Report for the Australian Department of Health. Canberra: National Centre for Epidemiology and Population Health; 2022

[41] "*Prolonged exposure to nicotine leads to the upregulation of receptors in the prefrontal cortex, which is responsible for executive functions and is not fully developed until the mid-20s. Such disruption of neural circuit development can lead to persistent cognitive and behavioral deficits and has been associated with the development of depression and anxiety.*" Source: Arman, Ayse. (2023). Exploring The Impact of Emerging Forms of Nicotine on Adolescent Mental Health. Addicta The Turkish Journal on Addictions. 10. 222-228. 10.5152/ADDICTA.2023.23139. Available at: https://www.researchgate.net/publication/377400539_Exploring_The_Impact_of_Emerging_Forms_of_Nicotine_on_Adolescent_Mental_Health Citing;

1. Jenssen, B. P., & Boykan, R. (2019). Electronic Cigarettes and Youth in the United States: A Call to Action (at the Local, National and Global Levels). Children, 6(2), 30.

[42] "*E-liquid solutions have mean nicotine concentrations ranging from 0 to 36 mg of nicotine taking into account that refills are sold in 5, 10, 20 or 30 mL vials, a 30 ml vial marked as 36 mg of nicotine would therefore contain a total dose of 1080 mg of nicotine.... estimated that more than 500 mg of oral nicotine is requested to kill an adult, and about 70 mg would be lethal for a 10 kg toddler: consequently, a 30 mL e-liquid vial of 1.8% nicotine solution would contain considerably more than enough to kill a 90-kg person.*" Source: Giovanni Maina, 'Transdermal nicotine absorption handling e-cigarette refill liquids' (2016), *Regulatory Toxicology and Pharmacology,* 74. ; Citing: Basset et. al, 'Nicotine Poisoning in an Infant' (2014), *The New England Journal of Medicine* 37(23). Available at: https://www.nejm.org/doi/full/10.1056/NEJMc1403843

[43] Gabrielle Ngambo, 'A scoping review on e-cigarette environmental impacts' (2023), *Tobacco Prevention and Cessation* 9(30). Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10542855/

[44] "*E-cigarette emissions typically contain nicotine and other toxic substances that are harmful to both users and non-users who are exposed to the aerosols second-hand. Some products claiming to be nicotine-free (ENNDS) have been found to contain nicotine.*" Source: World Health Organization, 'Tobacco: E-cigarettes' (2024). Available at: https://www.who.int/news-room/questions-and-answers/item/tobacco-e-cigarettes

[45] World Health Organization, 'Technical Note on Call to Action on electronic cigarettes' (2023). Available at: https://cdn.who.int/media/docs/default-source/tobacco-hq/regulating-tobacco-products/ends-call-to-action-background.pdf?sfvrsn=7dd2856e_11&download=true citing: WHO study group on tobacco product regulation. Report on the scientific basis of tobacco product regulation: eighth report of a WHO study group (WHO Technical Report Series, No. 1029). Geneva: World Health Organization; 2021 (https://www.who.int/publications/i/item/9789240022720).

[46] Oral Cancer Foundation, 'Tobacco and Addiction' (2024). Available at: https://oralcancerfoundation.org/understanding/tobacco/tobacco-and-addiction/

[47] "*nicotine, solvent carriers (propylene glycol, ethylene glycol and glycerol), tobacco-specific nitrosamines, volatile organic compounds, phenolic compounds, flavourings, tobacco alkaloids, aldehydes, free radicals, reactive oxygen species, furans and metals. Toxicological studies indicate that exposure to these substances can result in adverse health effects. Nicotine is highly addictive and there is evidence from basic human and animal studies that it adversely affects cardiovascular measures and brain development and functioning*." Source: Banks E, Yazidjoglou A, Brown S, Nguyen M, Martin M, Beckwith K et al. 'Electronic cigarettes and health outcomes: systematic review of global evidence. Report for the Australian Department of Health. Canberra' (National Centre for Epidemiology and Population Health; 2022). Available at: https://www.nhmrc.gov.au/sites/default/files/documents/attachments/ecigarettes/Electronic_cigarettes_and_health_outcomes_%20systematic_review_of_evidence.pdf

[48] "*Exposure to electronic cigarettes acutely increased Heart rate (pooled weighted MD = 2.27, 95% CI: 1.64 to 2.89, p,0.0001). Significant heterogeneity was observed among analysed studies (I^2=70%, P,0.001)."* Source: Skotsimara G, Antonopoulos AS, Oikonomou E, Siasos G, Ioakeimidis N, Tsalamandris S et al. Cardiovascular effects of electronic cigarettes: a systematic review and metaanalysis. European Journal of Preventive Cardiology. 2019;26(11):1219–1228. Cited by: World Health Organization, 'Report On The Global Tobacco Epidemic, 2021 Addressing new and emerging products. (2021) Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf?sequence=1

[49] "*daily ENDS use has been shown to be associated with increased risk of myocardial infarction. In addition, studies on the impact of ENDS use on respiratory health show measurable adverse effects on organ and cellular health in humans, in animals, and in vitro, and is likely to be associated with asthma and chronic obstructive pulmonary disease*" Source: World Health Organization, 'Report On The Global Tobacco Epidemic, 2021 Addressing new and emerging products. (2021) Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf?sequence=1 ; Citing Gotts JE, Jordt S-E, McConnell R, Tarran R. What are the respiratory effects of e-cigarettes? British Medical Journal. 2019;366.Wills TA, Soneji SS, Choi K, Jaspers I, Tam EK. E-cigarette use and respiratory disorders: an integrative review of converging evidence from epidemiological and laboratory studies. European Respiratory Journal. 2021;57(1): e1-e16.

[50] "*Aldehydes like vanilla and cinnamaldehyde flavoring, for example, have been shown to contribute to toxicity and the component used to bring about buttery flavors is known for causing bronchiolitis obliterans (sometimes called "popcorn lung")"* Source: World Health Organization, 'Report On The Global Tobacco Epidemic, 2021 Addressing new and emerging products. (2021) Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf?sequence=1 ; citing: Gotts JE, Jordt S-E, McConnell R, Tarran R. What are the respiratory effects of e-cigarettes? British Medical Journal. 2019;366.

[51] "*E-cigarettes generate substances some of which are known to cause cancer and, on their own, they are associated with increased risk of lung disorders, poisoning, injuries and burns and immediate nicotine toxicity through inhalation*." Source: World Health Organization, 'Technical note on the call to action on electronic cigarettes' (December 2023). Available at https://cdn.who.int/media/docs/default-source/tobacco-hq/regulating-tobacco-products/ends-call-to-actionbackground.pdf?sfvrsn=7dd2856e_11&download=true ; Citing ;

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2. Banks E, Yazidjoglou A, Brown S, Nguyen M, Martin M, Beckwith K et al. Electronic cigarettes and health outcomes: systematic review of global evidence. Report for the Australian Department of Health. Canberra: National Centre for Epidemiology and Population Health; 2022

[52] " *These devices use an electrically powered heating element to vaporize a liquid consisting of a propylene glycol (PG)–vegetable glycerin (VG) solvent system in which nicotine, flavorants, and other additives are dissolved. As the vapors flow through the ECIG they cool and condense to form a dense, visible aerosol that is drawn into the mouth of the user.*" Source: Mohamad Baassiri, 'Clouds and "throat hit": Effects of liquid composition on nicotine emissions and physical characteristics of electronic cigarette aerosols' (2017). *Aerosol Science and Technology* 11(51). Available at: https://www.tandfonline.com/doi/full/10.1080/02786826.2017.1341040

[53] World Health Organization Report, 'WHO study group on tobacco product regulation' (2019). Available at: https://iris.who.int/bitstream/handle/10665/329445/9789241210249-eng.pdf?sequence=1 cited by [53] World Health Organization, 'Technical Note on Call to Action on electronic cigarettes' (2023). Available at:

https://cdn.who.int/media/docs/default-source/tobacco-hq/regulating-tobacco-products/ends-call-to-action-background.pdf?sfvrsn=7dd2856e_11&download=true

[54] "*Carbonyls such as formaldehyde and acetaldehyde were generally found at lower levels in EC aerosols and e-liquids compared to CCs, with levels substantially differing between and within EC samples depending on device type and the specific study*"
"Reviews consistently found that, upon exposure to EC aerosol and e-liquid, there was evidence of reduced cell viability, increased apoptosis, DNA damage, oxidative stress, impaired immune function, and an increase in inflammatory cytokines" Source: Travis N, et al. 'Chemical profiles and toxicity of electronic cigarettes: an umbrella review and methodological considerations.' Int J Environ Res Public Health. 2023;20(3):1908. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9914618/

[55] "*In the majority of cases (65%), e-cigarettes exploded in pockets, compared to exploding in the face or hand. Common burned areas included the thigh, hand, genitals, and face. Burn severity was typically second-degree burns (35%) or a combination of second-degree and third-degree burns (20%). In all, 48 patients required skin grafting, with 19 reporting a median hospital stay of 5 days*." Source: Christopher M. Seitz and Zubair Khan, 'Burn Injuries caused by e-cigarette explosions: A systemic review of published cases' (2018), *Tobacco Prevention and Cessation*. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7205087/

[56] "*Poisonings caused by accidental ingestion of e-liquids containing a nicotine concentration of 1.8% or 2.4% have been reported in children. Nicotine is a weak base, easily absorbed through the skin.*" Source: Giovanni Maina et. al., 'Skin contamination as pathway for nicotine intoxication in vapers' (2017), Toxicology in Vitro, 41. Citing: Basset et. al, 'Nicotine Poisoning in an Infant' (2014), *The New England Journal of Medicine* 37(23). Available at: https://www.nejm.org/doi/full/10.1056/NEJMc1403843

[57] *"E-liquids, especially those containing even small amounts of nicotine, can be dangerous to children if they touch or drink it."*
"Harmful effects can include seizure, coma (long period of unconsciousness), respiratory arrest (which happens when a person stops breathing), and death. Children may also accidentally be exposed to e-liquids and their contents, including nicotine, through contact in the mouth, contact on the skin (i.e., spilled e-liquid), or by inhaling the e-liquid aerosol." U.S Food and Drug Administration, 'How to properly store E-liquids and Prevent Accidental Exposure of e-liquids to Children' (2023). Available at: https://www.fda.gov/consumers/consumer-updates/how-properly-store-e-liquids-and-prevent-accidental-exposure-e-liquids-children#:~:text=E%2Dliquid%20exposure%20can%20cause,are%20changes%20in%20your%20vision.

[58] "*the E-cigarette does not produce side-stream smoke. As a result, the second-hand smoke of the E-cigarette is composed of the exhaled fog of the E-cigarette user."* Source: Guangwei Zhang: Safety Assessment of Electronic Cigarettes and Their Relationship with Cardiovascular Disease (2018), *'International Journal of Environmental Research and Public Health'* 15(1). Available at: https://doi.org/10.3390/ijerph15010075

[59] "*Individuals may be exposed second-hand to exhaled air following a puff. The compounds identified in exhaled air of electronic cigarette users include particulate matter, nicotine, glycerol, propylene glycol, formaldehyde and acetaldehyde, volatile organic compounds (VOCs), metals and, in rare case, polycyclic aromatic hydrocarbons (PAH).*" Source: SCHEER (Scientific Committee on Health, Environmental and Emerging Risks), 'Scientific Opinion on electronic cigarettes' (2021). Available at: https://health.ec.europa.eu/system/files/2022-08/scheer_o_017.pdf

[60] "*In an experimental study of secondhand aerosol exhaled by three volunteers, the median of the droplet size exhaled by the e-cigarette users were 0.34 µm in e-cigarettes with nicotine and 0.29 µm in the e-cigarettes without nicotine* "
"*In the investigation of emissions of particulate matter and ultrafine particles generated by e-cigarettes under mimicking real-life conditions … total suspended particles emissions were systematically higher in vapor from e-cigarettes without nicotine (11.6 µg/m^3) than from e-cigarettes with nicotine (1.2 µg/m^3), but ultrafine particle concentrations were similar (641 particles/cm^3 among e-cigarettes without nicotine and 566 particles/cm^3 among e-cigarettes with nicotine)"* Source: Esteve Fernandez et al., 'Particulate Matter from Electronic Cigarettes and Conventional Cigarettes: a Systematic Review and Observational Study' (2015). Available at: https://link.springer.com/article/10.1007/s40572-015-0072-x cited by; Who Report On The Global Tobacco Epidemic, 2021, Addressing new and emerging products" (2021). Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf

[61] "*The aerosols generated by ENDS typically raise the concentration of particulate matter in indoor environments and contain nicotine and other potentially toxic substances. ENDS emissions therefore pose potential risks to both users and non-users*." Source: World Health Organization Q/A, 'Tobacco: E-cigarettes' (2024). Available at: https://www.who.int/news-room/questions-and-answers/item/tobacco-e-cigarettes#:~:text=Are%20e%2Dcigarettes%20dangerous%3F,to%20the%20aerosols%20second%2Dhand.

[62] "*The authors found an increase in fine particles, ultrafine particles, and VOCs after the use of the* (smoking proxy electronic inhaling systems) *SEIS. The detected concentrations of certain aldehydes and other compounds were over the limit of quantification; the authors also detected a high amount of 1,2-propanediol (propylene glycol) and nicotine in the exhaled air.*" Source: World Health Organization Tobacco Control Unit, Barcelona, 'Exposure to aerosols from smoking-proxy electronic inhaling systems: a systematic review, Institut Català d'Oncologia; 2016. Available at: https://cdn.who.int/media/docs/default-source/regulating-tobacco-products/backgroundpapersends1-4november.pdf?sfvrsn=e8ddac84_4 citing ; Schripp T, Markewitz D, Uhde E, Salthammer T. Does e-cigarette consumption cause passive vaping? Indoor Air. 2013;23:25–31.

[63] Saffari A, Daher N, Ruprecht A, De Marco C, Pozzi P, Boffi R et al. Particulate metals and organic compounds from electronic and tobacco-containing cigarettes: comparison of emission rates and secondhand exposure. Environmental Science: Processes and Impacts. 2014;16:2259–67.

[64] Source: World Health Organization Tobacco Control Unit, Barcelona, 'Exposure to aerosols from smoking-proxy electronic inhaling systems: a systematic review, Institut Català d'Oncologia; 2016. Available at: https://cdn.who.int/media/docs/default-source/regulating-tobacco-products/backgroundpapersends1-4november.pdf?sfvrsn=e8ddac84_4 citing ; Agency for Toxic Substances and Disease Registry. Toxicological profile: aluminum. Atlanta: U.S. Department of Health and Human Services; 2008.

[65] "*Nickel (IARC group 1) is associated with chronic bronchitis, reduced lung function and lung inflammation, while zinc is associated with metal fume fever, impaired pulmonary function, chest pain, coughing and shortness of breath , and silver is associated with breathing problems, lung and throat irritation, and stomach pain*" Source: World Health Organization Tobacco Control Unit, Barcelona, 'Exposure to aerosols from smoking-proxy electronic inhaling systems: a systematic review, Institut Català d'Oncologia; 2016. Available at: https://cdn.who.int/media/docs/default-source/regulating-tobacco-products/backgroundpapersends1-4november.pdf?sfvrsn=e8ddac84_4 citing ;

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2. Agency for Toxic Substances and Disease Registry. Toxicological profile for zinc. Atlanta: U.S. Department of Health and Human Services; 2005.
3. Agency for Toxic Substances and Disease Registry. Toxicological profile for silver. Atlanta: U.S. Department of Health and Human Services; 1990.

[66] Gabrielle Ngambo, 'A scoping review on e-cigarette environmental impacts' (2023), *Tobacco Prevention and Cessation* 9(30). Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10542855/ citing ;

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3. Lee MS, LeBouf RF, Son YS, Koutrakis P, Christiani DC. Nicotine, aerosol particles, carbonyls and volatile organic compounds in tobacco- and menthol-flavored e-cigarettes. Environ Health. 2017;16(1):42. doi:10.1186/s12940- 017-0249-x

[67] "*Disposable vapes are encased in plastic shells that never fully degrade." "While cigarette pollution takes up to 10 years to degrade, disposable vapes are non-biodegradable and 'endanger ocean creatures that inadvertently consume the plastics*.'" Source: Vape Waste: The environmental harms of disposable vapes, U.S. PIRG Education Fund. Available at: https://pirg.org/edfund/resources/vape-waste-theenvironmental-harms-of-disposable-vapes/

[68] "*Disposable e-cigarettes are generally discarded as a single item, but they contain multiple components: the battery, liquid container, and atomizer. They are uniform in shape and size, and the various products contain essentially the same configuration of components. E-cigarettes are similar to other small, battery-powered devices such as digital watches or medical devices currently classified as waste electrical and electronic equipment (WEEE) in the European Union (EU).*" Source: Max J. Krause et al., Hazardous Waste Status of discarded electronic cigarettes (2015), *Waste Management.* Available at: https://www.sciencedirect.com/science/article/abs/pii/S0956053X15000884?via%3Dihub

[69] "*The sheer volume of e-cigarette waste that is created in a year can be estimated by looking at national sales data. Data collected by the CDC Foundation capturing units of e-cigarette sales per month between 2016-2020 showed over 201 million new devices in the US in 2020.*"
"*this could potentially translate into 201 million pieces of plastic, aluminum, lithium ion, and packaging that ends up in landfill as a result*" Source: A toxic, plastic problem: E-cigarette waste and the environment, Truth Initiative,

March 8, 2021, available at: https://truthinitiative.org/research-resources/harmfuleffects-tobacco/toxic-plastic-problem-e-cigarette-wasteand-environment.

[70] "*broken devices can leach heavy metals (including mercury, lead, and bromines), battery acid, and nicotine into the local environment and urban landscape, affecting humans and other organisms*." Source: Hendlin YH. Alert: Public Health Implications of Electronic Cigarette Waste. Am J Public Health. 2018;108(11):1489- 1490. doi:10.2105/AJPH.2018.304699.

[71] "*Increased use of e-cigarettes has led to a rise in the release of e-cigarette waste and related contaminants into the environment. Some e-cigarettes are designed to be completely disposable, while others are rechargeable. Disposable e-cigarettes and vaping pods, spent e-cigarette capsules or replaceable pods, pose the most significant potential environmental burden. Vaping pods are an example of plastic waste because they are not biodegradable and are poorly recyclable*" Source: Gabrielle Ngambo, 'A scoping review on e-cigarette environmental impacts' (2023), *Tobacco Prevention and Cessation* 9(30). Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10542855/ citing ;

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[72] "*Nicotine is a commercial chemical product listed in 40 CFR 261.33(e) and is an acute hazardous waste (EPA waste code P075) when disposed*." Source: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460, MAY 0 8 2015. Available at: https://rcrapublic.epa.gov/files/14850.pdf

[73] "*While 84% of high-income countries have either a regulation or a sales ban in effect, half of middle-income countries and three-quarters of low-income countries have taken no regulatory action concerning ENDS"* Source: World Health Organization, "World Health Organization, "WHO report on the global tobacco epidemic, 2023: Protect people from tobacco smoke" (2023). Available at https://iris.who.int/bitstream/handle/10665/372043/9789240077164-eng.pdf?sequence=1

[74] "*WHO and the Secretariat of the WHO FCTC aim to highlight the pervasive use of plastics in nicotine and tobacco products:*

- *Plastic and electronic waste (e-waste) from heated tobacco products and devices, electronic nicotine (and non-nicotine) delivery systems (including single use e-cigarettes)."*

Source: World Health Organisation, 'Pre-session Submisisons: Input on the potential areas of intersessional work to inform the work of INC-3 (following the lists compiled by the co-facilitators of the two contact groups)' (August 2023). Available at: https://resolutions.unep.org/resolutions/uploads/who_partb_28082023_1.pdf

[75] "*Considering the pollution of soil and water resources by waste from tobacco products and related electronic devices, including filters of cigarettes as well as batteries, plastic cartridges and metals*"
"(e*) to urge Parties to coordinate their efforts to address plastic waste of tobacco products and related electronic devices with the objectives of the WHO FCTC in relation to national policies and international treaties and fora dealing with plastics and hazardous waste, as appropriate;"* Source: Source: WHO FCTC, 10th Conference of the Parties Decision FCTC/COP10(14), 'Implementation of Article 18 of the WHO FCTC' (Panama, 10 February 2024). Available at: https://storage.googleapis.com/who-fctc-cop10-source/Decisions/fctc-cop-10-14-en.pdf

[76] "*Of the 50 countries where data are available for open-system ENDS, 20 countries (40%) impose no excise tax on open-system e-liquids. And of the 48 countries where data are available for rechargeable closed systems, 21 countries (43.8%) impose no excise tax on closed-system e-liquids (commonly sold as pods). Finally, of the 48 countries where data are available for disposable products, 23 countries (47.9%) impose no excise tax on the product."* Source: World Health Organization, "Who Report On The Global Tobacco Epidemic, 2021, Addressing new and emerging products" (2021). Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf

[77] "*New and emerging nicotine and tobacco products, like ENDS and HTPs, have enabled the industry to appropriate the term "smoke-free" for its own gain."* Source: World Health Organization, WHO report on the global tobacco epidemic, 2023: Protect people from tobacco smoke" (2023). Available at https://iris.who.int/bitstream/handle/10665/372043/9789240077164-eng.pdf?sequence=1

[78] "*Smoke-free public places protect non-smokers, in particular, from the harmful effects of second-hand smoke. But they also have many other benefits, such as providing smokers with a strong incentive to cut down or quit, as well as discouraging people – especially youth – from starting to smoke. They also benefit businesses, as families with children, most non-smokers and even smokers, themselves, often prefer smoke-free establishments. Smoke-free public places provide a low-cost method for reducing exposure to tobacco smoke*." Source: World Health Organization Europe, 'Driving the creation of smoke-free public places' (2021). Available at: https://www.who.int/europe/activities/driving-the-creation-of-smoke-free-public-places See also ; "*Smoking cessation can be increased by …, adopting comprehensive smokefree policies, … and maintaining comprehensive statewide tobacco control programs.*" Source: US Department of Health and Human Services, 'Smoking Cessation: A Report of the Surgeon General: Chapter 1' (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health 2020). Available at: https://www.ncbi.nlm.nih.gov/books/NBK555595/

[79] "*Using ENDS in public places where smoking is banned can re-normalize smoking in public. Only 42 countries completely ban the use of ENDS in all indoor public places, workplaces and public transport… An additional 45 countries ban e-cigarette use in some public places but not all. The remaining 108 countries have either no smoke-free places (37 countries), or ENDS are not explicitly covered by smoke-free measures where they exist for cigarettes (71 countries).*" Source: World Health Organization, "WHO report on the global tobacco epidemic, 2023: Protect people from tobacco smoke" (2023). Available at https://iris.who.int/bitstream/handle/10665/372043/9789240077164-eng.pdf?sequence=1

[80] "*ENDS proponents argue that the presence of "less-harmful" alternatives can help reduce the prevalence of tobacco use and improve the health of the population. But while innovation in cessation products is to be welcomed, ENDS are currently marketed to attract new users (i.e., not limited to tobacco users wanting to quit) and misinform the public about the risks associated with their use in the absence of robust evidence (or indeed in the face of growing evidence to the contrary). ENDS currently pose significant challenges to public health and could undermine some of the hard-won progress in tobacco control achieved to date*." Source: World Health Organization, "Who Report On The Global Tobacco Epidemic, 2021, Addressing new and emerging products" (2021). Available at: https://iris.who.int/bitstream/handle/10665/343287/9789240032095-eng.pdf

[81] "*nicotine has been considered a gateway drug to alcohol and other addictive drugs and e-cigarettes containing nicotine may have the same effects.*"
"*Along with the toxic effects of e-cigarettes, its pharmacological effects may also extend to its potential as a gateway drug for conventional cigarette use.*"
Source: Chen G, Rahman S and Lutfy K (2023) E-cigarettes may serve as a gateway to conventional cigarettes and other addictive drugs. *Adv. Drug Alcohol Res.* 3:11345. doi: 10.3389/adar.2023.11345. Available at: https://www.frontierspartnerships.org/articles/10.3389/adar.2023.11345/full

[82] "*The current replication study confirms that e-cigarette use by non-smoking adolescents is associated with increased odds of subsequent combustible tobacco smoking initiation; that more frequent e-cigarette use is associated with more frequent subsequent tobacco smoking;*" Source: Thomas Martinelli et al., 'Exploring the gateway hypothesis of e-cigarettes and tobacco: a prospective replication study among adolescents in the Netherlands and Flanders' (2023), Tobacco Control 32(2).

[83] "*… e-cigarettes as used in the real-world, have not been proven to be effective for smoking cessation at the population level*" Source: World Health Organisation, 'Technical note on the call to action on electronic cigarettes' (December 2023). Available at https://cdn.who.int/media/docs/default-source/tobacco-hq/regulating-tobacco-products/ends-call-to-actionbackground.pdf?sfvrsn=7dd2856e_11&download=true ; Citing ;

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[84] "*The tobacco industry has a history of funding researchers, including through third parties, and using public relations strategies to promote misinformation. Even at the height of the declaration of COVID-19 pandemic, groups funded indirectly through PMI cast doubt on the harms of vaping while a scientist with past ties to PMI published a flawed study on protective effects of nicotine and smoking*" Source: Global Center for the Good Governance in Tobacco Control, 'How the Tobacco Industry Undermines Cessation' (2021). Available at: https://ggtc-bucket.s3-ap-southeast-1.amazonaws.com/uploads/2021-07-02/18-19-32-328800/Cessation%20V7_ATCA_ENSP_ERS.pdf citing ;

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2. STOP. 13 May 2021. How Philip Morris is trying to subvert the 'Future of Asia'. Available from: https:// exposetobacco.org/news/subvert-future-of-asia/
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[86] "*Because vaping systems don't burn tobacco and don't even contain tobacco, DVS and CVS emit on average 99% lower levels of harmful chemicals (except nicotine) compared with cigarettes, making it for adult smokers who don't quit a better alternative than continued smoking.*" Source: Philip Morris International Science, 'E-cigarettes and vaping products'. Available at: https://www.pmiscience.com/en/products/electronic-cigarettes/#:~:text=Because%20vaping%20systems%20don't,better%20alternative%20than%20continued%20smoking.

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[88] "*The levels of risk associated with using ENDS or tobacco products are likely to depend on a range of factors, some relating to the products used and some to the individual user. Factors include product type and characteristics, how the products are used, including frequency of use, how the products are manufactured, who is using the product, user behaviour – user's puffing style – and whether product characteristics are manipulated post-sale."* Source: World Health Organization, "Tobacco: E-cigarettes Q/A" (2024). Available at: https://www.who.int/news-room/questions-and-answers/item/tobacco-e-cigarettes

[89] "*E-cigarettes generate substances some of which are known to cause cancer and, on their own, they are associated with increased risk of lung disorders, poisoning, injuries and burns and immediate nicotine toxicity through inhalation . E-cigarettes can have negative effects on cardiovascular health, including increased heart rate and blood pressure. Exposure to emissions from e-cigarettes also poses risks to bystanders*" Source: World

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[90] "*Despite this lack of hard evidence, Public Health England and the Royal College of Physicians endorsed and publicized the "95% less harmful" assertion. Senior Public Health England staff emphasized the "evidence" underlying the 95% figure, despite the evidence being lacking*"
"There is ample evidence that the range of e-cigarette products available today is very different from that in July 2013. The differences are such that, even if the 2013 estimate was valid then, it can no longer apply today."
"*Also, e-cigarette liquids have changed considerably from 2013, with widespread availability of thousands of flavors that use chemicals "generally recognized as safe" to eat but with unknown pulmonary toxicity*" Source: Thomas Eissenberg et al., 'Invalidity of an Oft-Cited Estimate of the Relative Harms of Electronic Cigarettes. (2019), *American Journal of Public Health*. Available at: *https://ajph.aphapublications.org/doi/10.2105/AJPH.2019.305424*

[91] In an interview with Dr. Mike McKean, VP of Policy at the Royal College of Pediatrics and Child Health he stated that the messaging has led to many young people taking up smoking, who are now likely addicted. Source: Hugh Pym and Lucy Watkinson, 'Vapes '95% safer' than cigarettes messaging backfired' (2023). Available at: https://www.bbc.com/news/health-66852503

[92] "*Disposable' (non-rechargeable and non-refillable) e-cigarettes sold in the USA have nearly tripled in nicotine strength (dubbed as the "nicotine strength arms race"), quintupled in e-liquid capacity, and dropped in price by nearly 70% between 2017 and 2022*"
"*The current generation of disposable e-cigarettes in the USA contain nicotine levels comparable to several cartons of cigarettes (28,29). In contrast to 2017, in which nearly no disposable e-cigarettes contained among the highest levels of nicotine (at least 5% nicotine strength), by 2022, more than 95% of disposable e-cigarettes sold in the USA did*"

[93] "*Much remains unknown about all the contents of the wide variance in e-liquids, as well as their emissions*" Source: World Health Organization, 'Technical Note on Call to Action on electronic cigarettes' (2023). Available at: https://cdn.who.int/media/docs/default-source/tobacco-hq/regulating-tobacco-products/ends-call-to-action-background.pdf?sfvrsn=7dd2856e_11&download=true
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