


REVIEW ARTICLE

EAP and ECPCP urge ban on novel nicotine- (NNCPS) and non-nicotine-containing products (NNDS) to youth

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Abstract

Aim: We want to verify the correlation between the increasing use of novel nicotine-containing products (NNCPS) and non-nicotine delivery products (NNDPs) among young individuals and the escalating negative health consequences, necessitating their prohibition.

Methods: We performed a comprehensive analysis of the most relevant literature about the utilisation of NNCPS and NNDPs among young individuals and their health effects.

Results: Despite being initially seen as less harmful alternatives, for smokers aiming to quit, these products have become more popular due to misleading marketing claims. Teenagers using NNCPS and NNDPs, despite having no smoking history, are more

Abbreviations: COPD, chronic obstructive pulmonary disease; COVID, coronavirus disease; ECs, electronic cigarettes; ESPAD study, European School Survey Project on Alcohol and Other Drugs; EVALI syndrome, E-cigarette, or Vaping, Product Use-Associated Lung Injury; FCTC, Framework Convention on Tobacco Control; FDA, the food and drug administration; NNCPS, novel nicotine-containing products; NNDPs, non-nicotine delivery products; NYTS, national youth tobacco survey; RCPCH, the royal college of paediatrics and child health; THC, tetrahydrocannabinol; T-TAS, total thrombus formation analysis system.

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likely to transition to tobacco smoking. Consistent use can lead to health issues like pulmonary damage, asthma, and cardiovascular and ocular problems.

Conclusion: The EAP and the ECPCP endorse the WHO's appeal to outlaw these hazardous products. They urge European governments to forbid the sale of NNCPs and NNDPs to children and adolescents in order to safeguard their well-being. They also propose specific recommendations (box 4) to support this cause.

KEYWORDS

dual addiction, e-cigarettes, non-nicotine delivery products (NNDPs), novel nicotine-containing products (NNCPs), smoking

1 | BACKGROUND

Novel nicotine-containing products (NNCPs) and non-nicotine delivery products (NNDPs) (See Visual Dictionary online)¹ were introduced to the market during the early 2000s with the intention of providing cigarette addicts with a viable alternative that would aid in their cessation of smoking.^{2,3} Nevertheless, clinical trials have not definitively proven their efficacy in facilitating smoking cessation.³⁻⁶ Notably, the primary adverse effect examined in relation to the NNCPs and NNDPs was the carcinogenic risk associated with conventional cigarette smoking.³⁻⁵

With regards to inhaled nicotine, (e-cigarettes and heated tobacco products), the long-term health consequences of electronic cigarettes (ECs) are still under investigation due to their novelty and ongoing studies.^{7,8} However, growing data suggest that e-cigarette use may increase the risk of developing specific types of cancer. Carcinogens found in e-cigarette users' bodily fluids indicate a risk of neoplastic transformation. Nicotine in aerosols or e-cigarette liquids can persist on surfaces for extended periods, forming nitrates and tobacco-specific nitrosamine compounds. These compounds are carcinogenic and can be inhaled, ingested or come into contact with the skin.⁹ While the correlation between nicotine and cancer is currently being examined, specific constituents in conventional cigarettes, such as tar, have been scientifically established to be carcinogenic. Therefore, studies have focused on individuals with smoking addiction and primarily examined the effectiveness of NNCP and NNDP in helping them quit traditional cigarettes and reduce the risk of developing lung cancer.^{7,8} Anyway, there is evidence that nicotine is a dangerous drug with well-established side effects and a high potential for addiction, especially among youth.¹⁰⁻¹² A growing body of research indicates a range of negative and dose-dependent health consequences for adolescents and young adults from smoking and e-cigarette use.⁷⁻¹¹ The utilisation of NNCPs and NNDPs has experienced a surge in popularity as a result of pervasive and misleading marketing with the promise of a free-of-risk substance. Therefore, after the prevalence of smoking among adolescents has been continuously declining in numerous European countries in recent years, after the introduction of NNCPs and NNDPs, this

Key notes

- Regulatory measures are urgently needed for novel nicotine-containing products and non-nicotine delivery products due to their adverse health effects on youth.
- The usage of these products among young people is increasing due to misleading marketing promises of a risk-free substance, while adverse effects reports are increasing.
- Understanding the potential carcinogenicity and other harmful effects of nicotine and its compounds is crucial for better regulating their usage and to acquire further research suggestions.

trend has reversed and resulted in a resurgence of adolescent smokers and vapers.^{7,8}

2 | NICOTINE TOXICITY

Since the 1980s, an increasing body of research has demonstrated that nicotine possesses high addictive properties. Nicotine consumption elicits dependence symptoms, such as intense desire and withdrawal unconscious behaviours, and it can have detrimental effects on the development of the brain, resulting in enduring repercussions for children and adolescents, especially.^{3,10-11} Moreover, prenatal exposure can also have adverse effects on foetal development, leading to outcomes such as reduced birth weight, premature delivery and stillbirth in pregnant women. Quitting use reduces that risk.^{3,13}

Remarkably, a single 1 mL cartridge of e-cigarette liquid may contain up to 20 mg of nicotine, of which approximately 25% is inhaled. In comparison, each stick of a heated tobacco product typically contains around 4.1 mg of nicotine¹⁴ and a conventional cigarette typically contains approximately 0.9 mg of nicotine.¹⁵ The presence of nicotine in NNCPs at levels up to 20 times greater than those found in traditional cigarettes is of significant concern, considering the

impact of dose-dependent nicotine effects and their accessibility to adolescents and children.

3 | POTENTIAL TOXICITY OF OTHER CHEMICALS IN NNCPs AND NNDPs

NNCPs and NNDPs contain a range of other chemicals that, apart from nicotine, have the potential to irritate the lungs and lead to respiratory problems.^{8,16} There are potentially toxic chemicals such as polycyclic aromatic compounds, heavy metals, aldehydes and nicotine derivatives.⁸ Even vapes without nicotine contain potentially harmful substances such as lead, nickel, propylene glycol and vegetable glycerine, the primary constituents of e-liquid, which, when heated, form aldehydes with possible acute toxic effects, while little is known about long-term effects.¹⁷ These chemicals can irritate the mouth and airways, and they can trigger the release of an inflammatory response.^{8,16} Sweet-flavouring additives, such as candy or fruity flavours, may also be hazardous to the lung. Cinnamaldehyde, a cinnamon-flavouring component, can damage immune cells in the lungs even without nicotine. Additionally, the sweet Crème Brûlé flavouring has been linked to increased tumour necrosis factor, interleukin levels and oxidative stress.⁸ Lastly, disposable vapes are also difficult to recycle and have a worrisome impact on the environment.¹⁷⁻¹⁹

4 | THE USE OF NNCPs AND NNDPs IS GROWING AMONG ADOLESCENTS

According to the Global Youth Tobacco Surveys conducted between 2014 and 2019 in 75 countries, including 13 European countries, almost 50% of young people are familiar with NNCPs and NNDPs, and approximately 33% have actually used them. Boys exhibited higher rates of usage than girls. The study emphasises the necessity for more stringent regulations and efficient prevention strategies to tackle the increasing prevalence of these substances among young people.²⁰

E-cigarette use data became available for the first time in all 35 European countries in the 2019 ESPAD study.²¹ It shows that 40% of 15–16-year-olds ever used e-cigarettes, and 14% during the preceding month. In all, 11% of the students had tried e-cigarettes at age 13 or younger, and 1.7% of students had begun using e-cigarettes on a daily basis at age 13 or younger. Boys were generally more likely than girls to have tried e-cigarettes (46% vs. 34% for girls). With regard to the frequency of use in the last 30 days, overall, 10% of students reported e-cigarette use less than once per week, 4.1% reported use at least once a week, and 3.1% reported use almost every day or every day.²¹ Moreover, those who used disposable e-cigarettes at baseline are more likely to continue using e-cigarettes and use them more frequently compared to those who used only non-disposable devices. It should be considered in tobacco product regulation designed to protect adolescents and young adults.²²

5 | MISLEADING MESSAGING TO ADOLESCENTS AND CHILDREN ABOUT NNCPs AND NNDPs

Manufacturers recognised the marketing opportunities and introduced attractive products specifically designed to cater to younger consumers, considering their preferences for designs, colours and flavours. Deceptive advertisements for a product that allowed nicotine consumption without the typical risks of conventional cigarettes quickly captured the market. This led to a significant increase in sales, especially among young people. Adolescents and young adults are frequently drawn to the refined and contemporary designs of NNCPs and NNDPs.²³ They generally have a limited understanding of the potential hazards linked to the utilisation of such products. Simultaneously, there was an increase in negative consequences (such as EVALI syndrome, E-cigarette, or Vaping, Product Use-Associated Lung Injury and other cognitive impairments) among young individuals who were not regular cigarette smokers but began using NNCPs and NNDPs due to their perception of being trendy.^{20,21,24} This phenomenon was observed on a worldwide scale, with certain variations in different regions.²¹

6 | SAFETY CONCERNS WITH NNCPs AND NNDPs

The utilisation of NNCPs and NNDPs entails inherent risks, particularly when employed on a regular basis.⁸ Prolonged use of these products can lead to adverse effects, such as an elevated risk of addiction to other substances, known as the 'gateway effect'. This includes alcohol, cannabis and traditional cigarettes, resulting in a 'dual addiction'.^{24,26}

6.1 | Respiratory problems

NNCP and NNDP use were associated with numerous respiratory disorders, including cough, wheezing, shortness of breath, asthma and bronchitis²⁷ and with an increased risk of developing symptoms of chronic obstructive pulmonary disease (COPD).²⁸ The potential adverse effects on respiratory health may result from the induction of inflammation and oxidative stress in lung tissue. Inhaling chemicals and particles from NNCPs and NNDPs appear to be the cause.²⁹ Pregnant women included their foetuses, and those with pre-existing respiratory conditions are among the most susceptible populations. It is of the utmost importance to inform these groups regarding the possible dangers that may be linked to using these products.³⁰ EVALI syndrome is a severe respiratory condition linked to the use of e-cigarettes. The incidence of EVALI cases is rising and has become a significant public health concern, particularly among young adults.^{29,31} After numerous cases of lung injury in teenagers caused by vaping and e-cigarette use, which were apparently linked to the presence of THC (tetrahydrocannabinol) and vitamin E acetate in vape products, resulting in symptoms such as increased heart rate, difficulty breathing, coughing and higher susceptibility to COVID,

the FDA issued a warning in 2019 on the FDA's website.³² Moreover, adolescents who regularly use e-cigarettes are significantly more likely to have asthma and other respiratory issues.³³

6.2 | Neurodevelopmental problems

Nicotine use has been linked to negative impacts on cognition in foetal and adolescent brain development.^{34,35} Because of continuing brain development and modifications to neural circuits, the adolescent brain is susceptible to the harmful effects of nicotine exposure, which during this crucial period can affect various cognitive functions, including attention, memory, learning and decision making.^{34,35} The special vulnerability of the adolescent brain extends to areas involved in higher cognitive function, such as the prefrontal cortex, responsible for inhibitory control, where circuit formation continues into the 20s.^{35,36} During this maturational phase, acetylcholine and dopamine-regulated neural pathways experience significant remodelling. Dopamine is necessary for reward function, and acetylcholine is necessary for cognitive development, including executive function through the prefrontal cortex.³⁴⁻³⁶ Since it can change the brain's reward system and cause addiction and dependency, it can serve as a gateway drug that raises the risk of substance abuse later in life.^{35,36}

6.3 | Cardiovascular problems

A number of studies have shown that the nicotine in e-cigarettes mainly impacts arterial stiffness and endothelial dysfunction markers, such as platelet activation, thrombus formation (T-TAS) and extracellular microvesicles.³⁷⁻⁴⁰ This results in increased thrombogenicity and impaired microvascular function. Indeed, the use of e-cigarettes (NNCP and NNDP) has been linked to various clinical adverse cardiovascular effects, including alterations in heart rate, blood pressure and arterial rigidity.^{41,42} Based on this evidence, it can be concluded that NNCP and NNDP are not considered reliable alternatives for tobacco control, especially when it comes to cardiovascular health.³⁷⁻⁴²

6.4 | Ocular problems

Ocular discomfort, including pain, burning, itching, redness, dryness, glare, blurriness, strain and headaches, was also found to be higher in NNCP and NNDP users compared to traditional cigarette smokers and even more frequent among dual users. Frequent NNCP and NNDP users and those who started using them at a younger age were more likely to experience ocular symptoms.⁴³ Prominent ocular surface dryness and poor tear film quality are more frequent among electronic cigarette (e-cigarette) smokers (or vapers) than among non-smokers. The chemicals and additives found in NNCPs and NNDPs may contribute to these symptoms.⁴⁴

7 | POLICY STATEMENTS ON NNCPs AND NNDPs

Owing to potential detrimental impacts, particularly on respiratory and cardiovascular health, the American Society of Anesthesiologists Committee on Pediatric Anesthesia published a statement⁴⁵ on the impact of NNCPs and NNDPs on adolescents and, in particular, in relation to perioperative care. They concluded that regular preoperative screening and postoperative outcome studies should be conducted in relation to smoking and vaping. Practice guidelines by the American College of Preventive Medicine recommend screening for the use of NNCPs and NNDPs, the implementation of a harm reduction model to assist smokers in quitting, and policy and regulatory actions to reduce the public's consumption of NNCPs and NNDPs and regulate their composition.⁴⁶

8 | POLICIES IN WESTERN COUNTRIES OUTSIDE THE EUROPEAN UNION

USA. In April 2020, the FDA finalised its enforcement policy on unauthorised flavoured cartridge-based e-cigarettes that appeal to children, including fruit and mint, against the epidemic of youth use of e-cigarettes.⁴⁷ The ban, which did not apply to single-use products, did not prevent a surge in unauthorised disposable e-cigarettes from entering the market. Middle and high school students' overall e-cigarette use decreased in 2022, according to the National Youth Tobacco Survey (NYTS); however, disposable e-cigarette use increased substantially. Around 40% of the students reported frequent use, while 25% reported daily use. The report found that middle and high school students use any form of NNCPs or NNDPs. To stop middle and high school students from using these harmful products, the FDA needs to regulate and enforce long-term national, state, and local tobacco prevention and control strategies.⁴⁸

United Kingdom. British paediatricians recently called for a ban on disposable e-cigarettes due to concerns about both children's health and the environment.⁴⁹ According to NHS data, 20% of 15-year-olds used electronic cigarettes in 2021, and the percentage of 11-15-year-olds who vape increased from 6% in 2018 to 9% in 2021.⁵⁰ The British Pediatric Respiratory Society also supports the RCPCH ban, citing the chemicals' direct harm to the lungs.⁴⁹ Moreover the UK government declared a crackdown on child vaping, which included a reassessment of regulations governing the distribution of nicotine-free vapes and prohibitions for establishments selling illicit vapes or to individuals under the age of 18. However, leaders in public health advocate for further measures, such as the prohibition of free samples and the restriction of marketing directed at children.⁵⁰

Australia. E-cigarettes-containing nicotine-containing products are now classified as prescription-only medications in Australia, based on recently introduced stricter regulations. The proposed policies have the following objectives: plugging loopholes, limiting imports, prohibiting personal importation and restricting single-use

disposable and flavoured e-cigarettes. However, without special authorisation, any physician may prescribe electronic cigarettes; therefore, the efficacy of Australia's model for regulating electronic cigarettes is uncertain.⁵¹

New Zealand. implemented a bold framework to end the cigarette epidemic, including reducing nicotine levels in all tobacco products and decreasing the number of tobacco retailers.⁵²

9 | POLICIES IN SELECTED EUROPEAN UNION COUNTRIES

France. On 5 December 2023, the French parliament voted unanimously to prohibit single-use electronic cigarettes, also referred to as 'puffs' or 'autres tabacs à fumer' in France, on the grounds that they pose environmental and youth health risks. By prohibiting smoking in public parks, forests, beaches and areas near schools, France aims to produce 'the first tobacco-free generation' by 2032. Depending on Senate approval, the prohibition might go into effect by September 2024.⁵³

Germany. Germany, the only member state of the European Union to permit tobacco advertising as of 1 January 2021 has enacted stringent regulations in response to apprehensions regarding health risks and the absence of industry oversight. Furthermore, even though e-cigarettes are not subject to the German Non-Smoking Protection Act (Nichtraucherschutzgesetz), to diminish the allure of electronic cigarettes among adolescents and to safeguard public well-being, starting 1 January 2024. 'Heat Not Burn goods' cannot be marketed on posters, advertising columns and giant lights, but this ban does not extend to outdoor areas or shop windows of e-cigarette retailers.⁵⁴

Italy. Since 2013, the sale of e-cigarettes has been banned in Italy. In accordance with Legislative Decree No. 6 of 12 January 2016, which implements Directive 2014/40/EU, manufacturers and importers of electronic cigarettes and tobacco products are obligated to provide a comprehensive notification of their products. Italy has completely incorporated the regulations set forth by the European Union regarding tobacco use, NNCPs and NNDPs. Nonetheless, monitoring effective compliance with this regulation is challenging.⁵⁵

Spain. Spain implemented a ban on the use of flavours, such as menthol, in heated tobacco products in January 2024, which came into effect in April 2024. These products, now defined as heated tobacco products, are required to have health warning labels, following the same regulations as boxed cigarettes and roll-your-own tobacco (Royal Decree 47/2024 of 16 January 2024).⁵⁶

European Union actions. In accordance with the Tobacco Products Directive (2014/40/EU), NNCPs and NNDPs are subject to some regulation by the European Union (box 1).⁵⁷ This directive imposes restrictions on the sale and merchandising of tobacco and tobacco-related products within the European Union. Despite the regulatory framework it establishes concerning the production, distribution and acquisition of tobacco and related products (such as

TABLE 1 Aims of the European Union Tobacco Products Directive (2014/40/EU) and subsequent updates⁵⁷

- Prohibit smoking and roll-your-own tobacco with defining flavours.
- Mandate tobacco industry reporting to EU countries on tobacco ingredients.
- Mandate health warnings on tobacco and related products.
- Set minimum dimensions for warnings.
- Ban promotional and misleading elements, introduce EU-wide tracking to combat illicit trade.
- Allow internet sales of tobacco and related products, and set safety, quality, and notification requirements for electronic cigarettes.
- Require manufacturers and importers to notify EU countries about novel tobacco products before placing them on the market.
- Prohibit promotional and misleading elements in labelling.
- Prohibit cross-border selling of tobacco products.
- Prohibit smoking in paediatric hospital and scientific hospitalisation and treatment institutes, and in vehicles with minors or pregnant women.
- Introduce safety requirements for electronic cigarettes and nicotine refill containers.

electronic cigarettes), a multitude of areas remain subject to domestic laws. Only a few countries have completely banned their use in public places and implemented advertising bans.⁵⁸ Furthermore, in regard to refillable electronic cigarettes and refill mechanism technical specifications, the European Commission has requested a report from an external contractor.⁵⁹

The European School Survey Project on Alcohol and Other Drugs (ESPAD) 2019 study discovered that adolescents and children frequently use NNCPs and NNDPs, particularly in high-income countries.²¹ Youth prevalence rates for dual and exclusive use were, on average, greater in countries with laxer regulations. A correlation has been observed between the use of NNCPs and NNDPs and smoking behaviour. Specifically, the exclusive use of NNCPs and NNDPs may act as an entry point to traditional cigarette smoking, whereas dual users are more likely to have developed an established smoking habit^{23,25} (See Table 1).

10 | WORLD HEALTH ORGANISATION (WHO) ACTIONS

10.1 | WHO Framework Convention on Tobacco Control (FCTC) 2018

In 2018, the WHO Framework Convention on Tobacco Control proposed a regulation of e-cigarette use aimed at reducing their appeal and harm to the population (Box 2). The decision on new tobacco products (FCTC Decision/COP8 (22)) requested comprehensive reports on health, addiction, attractiveness and smoking cessation.⁶⁰ (Table 2).

According to the last Global Progress Report on the Implementation of the WHO FCTC (February 2024), only a few parties have incorporated the WHO FCTC guidelines (Articles 9 and 10)

TABLE 2 WHO Framework Convention on Tobacco Control 2018.⁶¹

The regulation of e-cigarettes, to reduce their appeal and harm to the population, includes:

- Banning all flavouring agents and prohibiting promotional features.
- Limiting nicotine concentration and quantity.
- Setting the maximum cartridge volumes, battery power and device features that enable information transmission.
- Prohibiting additives with carcinogenic, mutagenic and reproductive toxic properties.
- Ensuring the public is protected from misleading claims
- Prohibiting the sale of e-cigarettes to children

for controlling new and emerging tobacco and nicotine products into their national legislation.⁶¹

The ninth WHO report on the global tobacco epidemic (July 2023)⁶² shows that 73 countries track e-cigarette use through national population-based surveys, involving over 3 billion people in 59 countries. Countries like Brazil, the Netherlands, Vietnam, Cabo Verde and Kyrgyzstan have implemented policies to ban or reduce e-cigarette visibility. The report emphasises once again that e-cigarettes pose clear health risks and require adequate regulation; moreover, there is a need for robust measures to protect people from the tobacco industry's promotion of e-cigarettes as a safer alternative to cigarettes. The report calls for strict regulations on advertising, sale and use of tobacco products, as well as effective smoking cessation programs and public health campaigns targeting adolescents and children. The necessity of such actions is reiterated in the World Health Organisation's (WHO) 12/14/23 caLL (box 3),⁶³ where the WHO urges countries to implement strict measures to prevent uptake and protect citizens, especially children and young people. Governments should regulate e-cigarettes as medicines rather than consumer goods. Monitoring and surveillance must be strengthened to guide regulatory action, ensuring the measures are effective.⁶³ Information about the harmful effects of e-cigarette use must be shared with the public because sharing knowledge can help lower the use of NNCPs and NNDPs even more because of the strong link between family and peer behaviour about their use and because education is a key factor in shaping teens' knowledge about tobacco and vaping-related issues and protecting them from these harmful products⁶⁴ (see Table 3).

10.2 | Previous recommendations of the European Academy of Pediatrics (EAP)

In 2021, the European Academy of Pediatrics (EAP) recommended 10 measures to protect children and young people from harmful e-cigarettes.⁶⁵

These included legislation against exposure, bans on public spaces, advertising bans and penalties for selling to underage children. Nevertheless, the sale of all NNCPs and NNDPs, especially disposable ones, has clearly increased globally as well as in Europe, despite the restrictive regulations promulgated.^{58,61-64}

TABLE 3 WHO Electronic cigarettes call to action, 14 February 2023.⁶³

Countries should strengthen

- e-cigarette bans and regulations to support public health interventions.
- e-cigarettes should not be allowed as consumer products.
- Stricter regulations should be implemented to reduce their appeal and harm.
- These actions should be combined with tobacco cessation strategies, such as healthcare advice, toll-free lines and approved therapies.
- Cessation objectives should consider national circumstances, risk of uptake and other cessation strategies.
- e-cigarettes should be regulated as medicines rather than consumer products

11 | ETHICAL CONTROVERSY

Evidently, an ethical problem of harm reduction arises. Both the interests of smokers in reducing cancer risks and young people in avoiding nicotine short- and long-term harm are important, but the growing body of evidence of preventable harm to youth underlines that the rights of healthy children and adolescents, who likely would never have vaped if NNCPs and NNDPs were not offered, must be strictly protected.^{66,67}

12 | CONCLUSIONS

Based on the convincing body of evidence, following their mission to protect children's and adolescents' health, EAP and ECPCP demand that the European Commission and governments of European countries comply without delay with WHO's requests for stricter sales regulations, stronger enforcement, and higher NNCP and NNDP taxations^{4,62-63} (Table 4).

EAP and ECPCP also demand banning the sales, including online sales, of non-disposable and disposable NNCPs and NNDPs to children and adolescents. Access for smokers to replace cigarette smoking should be granted through a medical prescription.

Informative campaigns targeting families and schools are also crucial in disseminating knowledge on the dangers of NNCPs and NNDPs.⁶⁴

VISUAL DICTIONARY

E-Cigarette, or Vaping, Products Visual Dictionary: https://www.cdc.gov/tobacco/basic_information/e-cigarettes/pdfs/ecigarette-or-vaping-products-visual-dictionary-508.pdf

AUTHOR CONTRIBUTIONS

Laura Realì: Conceptualization; writing – original draft; writing – review and editing; data curation; methodology. **Lorenza Onorati:** Writing – original draft; writing – review and editing; investigation. **Berthold Koletzko:** Supervision; writing – review and editing; data

TABLE 4 Recommendations of the European Academy of Paediatrics and the European Confederation of Primary Care Paediatrics

EAP and ECPCP call upon the European Parliament, Commission and all European national governments to align their actions with the proposals put forth by the WHO and promptly carry out the following measures:

- Prohibit the sale of non-disposable and disposable NNCPs and NNDPs to youth.
- Restrict their sale only to people with smoking addictions based on a medical prescription.
- Implement strict regulatory measures for online sales and augment taxation to prevent minors from gaining access to these products.
- Prohibit promotional activities for NNCP and NNDP, including so-called informational initiatives targeting families, schools, as well as children and adolescents.
- Healthcare professionals, particularly those who work with adolescents, are strongly encouraged to take advantage of every opportunity to inquire about adolescents' smoking habits.
- Offer NNCPs and NNDPs only to smoke-addicted adolescents as a medication intervention to help them manage their dependence.
- Establish a structured collaboration between pertinent student associations in the field and European associations of healthcare professionals, including pharmacists and nurses.
- Collaborate with broader networks to bolster and increase public engagement and visibility in preventive activities by assisting in the dissemination of accurate information, debunking myths and exchanging best practices.

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CONFLICT OF INTEREST STATEMENT

The authors declare that the research was conducted without any commercial or financial relationships that could be interpreted as a potential conflict of interest.

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REFERENCES

1. E-Cigarette, or Vaping, Products Visual Dictionary. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/pdfs/ecigarette-or-vaping-products-visual-dictionary-508.pdf
2. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. E-Cigarette Use Among Youth and Young Adults: A Report of the Surgeon General [Internet]. Centers for Disease Control and Prevention (US); 2016 Chapter 1, Introduction, Conclusions, and Historical Background Relative to E-Cigarettes. <https://www.ncbi.nlm.nih.gov/books/NBK538684/>
3. US Preventive Services Task Force, Krist AH, Davidson KW, et al. Interventions for tobacco smoking cessation in adults, including pregnant persons: US preventive services task force recommendation statement. *JAMA*. 2021;325(3):265-79. doi:10.1001/jama.2020.25019
4. Levett JY, Filion KB, Reynier P, Prell C, Eisenberg MJ. Efficacy and safety of E-cigarette use for smoking cessation: a systematic review and meta-analysis of randomized controlled trials. *Am J Med*. 2023;136(8):804-813.e4. doi:10.1016/j.amjmed.2023.04.014
5. Hartmann-Boyce J, Lindson N, Butler AR, et al. Electronic cigarettes for smoking cessation. *Cochrane Database Syst Rev*. 2022;11:CD010216. doi:10.1002/14651858.CD010216.pub7
6. United States Public Health Service Office of the Surgeon General; National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. Smoking Cessation: A Report of the Surgeon General [Internet]. US Department of Health and Human Services; 2020 Chapter 6, Interventions for Smoking Cessation and Treatments for Nicotine Dependence. <https://www.ncbi.nlm.nih.gov/books/NBK555596/>
7. Benowitz NL. Pharmacology of nicotine: addiction, smoking-induced disease, and therapeutics. *Annu Rev Pharmacol Toxicol*. 2009;49:57-71. doi:10.1146/annurev.pharmtox.48.113006.094742
8. Lyzwiniski LN, Naslund JA, Miller CJ, Eisenberg MJ. Global youth vaping and respiratory health: epidemiology, interventions, and policies. *NPJ Prim Care Respir Med*. 2022;32(1):14. doi:10.1038/s41533-022-00277-9
9. Sahu R, Shah K, Malviya R, et al. E-cigarettes and associated health risks: an update on cancer potential. *Adv Respir Med*. 2023;91(6):516-31. doi:10.3390/arm91060038
10. Tzortzi A, Kapetanstratiki M, Evangelopoulou V, Beghrakis P. A systematic literature review of E-cigarette-related illness and injury: not just for the Respirologist. *Int J Environ Res Public Health*. 2020;17(7):2248. doi:10.3390/ijerph17072248
11. US Department of Health and Human Services Health Consequences of Smoking. Nicotine addiction: a report of the surgeon general 1988 [internet]. Office of Smoking and Health. 1988 <https://profiles.nlm.nih.gov/101584932X423>
12. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. E-cigarette use among youth and young adults: A report of the surgeon general [Internet]. Centers for Disease Control and Prevention (US); 2016 Chapter 3, Health Effects of E-Cigarette Use Among U.S. Youth and Young Adults. <https://www.ncbi.nlm.nih.gov/books/NBK538688/>
13. Cardenas VM, Fischbach LA, Chowdhury P. The use of electronic nicotine delivery systems during pregnancy and reproductive outcomes: a systematic review of the literature. *Tob Induc Dis*. 2019;1(17):52. doi:10.18332/tid/104724
14. National Academies of Sciences, Engineering, and Medicine; Health and Medicine Division; Board on Population Health and Public Health Practice. Committee on the review of the health

- effects of electronic nicotine delivery systems. In: Eaton DL, Kwan LY, Stratton K, eds. *Public Health Consequences of E-Cigarettes*. National Academies Press (US); 2018 Jan 23. 4, Nicotine. <https://www.ncbi.nlm.nih.gov/books/NBK507191/>
15. Benowitz NL, St Helen G, Liakoni E. Clinical pharmacology of electronic nicotine delivery systems (ENDS): implications for benefits and risks in the promotion of the combusted tobacco endgame. *J Clin Pharmacol*. 2021;61(Suppl 2):S18-S36. doi:10.1002/jcph.1915
 16. Chun L, Moazed F, Calfee C, Matthay M, Gotts J. Pulmonary toxicity of e-cigarettes. *Am J Physiol*. 2017;313:193.
 17. Sleiman M, Logue JM, Montesinos VN, et al. Emissions from electronic cigarettes: key parameters affecting the release of harmful chemicals. *Environ Sci Technol*. 2016;50:9644-51.
 18. Ngambo G, Hanna EG, Gannon J, Marcus H, Lomazzi M, Azari R. A scoping review on e-cigarette environmental impacts. *Tob Prev Cessat*. 2023;9:30-8. doi:10.18332/tpc/172079
 19. Pourchez J, Mercier C, Forest V. From smoking to vaping: a new environmental threat? *Lancet Respir Med*. 2022;10(7):e63-e64. doi:10.1016/S2213-2600(22)00187-4
 20. Sreeramareddy CT, Acharya K, Manoharan A. Electronic cigarettes use and 'dual use' among the youth in 75 countries: estimates from global youth tobacco surveys (2014-2019). *Sci Rep*. 2022;12(1):20967. doi:10.1038/s41598-022-25594-4
 21. ESPAD, <https://data.espad.org/electronic-cigarette/>; 2019
 22. Han DH, Harlow AF, Feldstein Ewing SW, et al. Disposable E-cigarette use and subsequent use patterns in adolescents and young adults. *Pediatrics*. 2024;153(4):e2023063430. doi:10.1542/peds.2023-063430
 23. Brown JL, Rosen D, Carmona MG, Parra N, Hurley M, Cohen JE. Spinning a global web: tactics used by big tobacco to attract children at tobacco points-of-sale. *Tob Control*. 2023;32(5):645-51. doi:10.1136/tobaccocontrol-2021-057095
 24. Fadus MC, Smith TT, Squeglia LM. The rise of e-cigarettes, pod mod devices, and JUUL among youth: factors influencing use, health implications, and downstream effects. *Drug Alcohol Depend*. 2019;1(201):85-93. doi:10.1016/j.drugalcdep.2019.04.011
 25. Chen G, Rahman S, Lufty K. E-cigarettes may serve as a gateway to conventional cigarettes and other addictive drugs. *Adv Drug Alcohol Res*. 2023;3:11345. doi:10.3389/adar.2023.11345
 26. Glantz SA, Bareham DW. E-cigarettes: use, effects on smoking, risks, and policy implications. *Annu Rev Public Health*. 2018;1(39):215-35. doi:10.1146/annurev-publhealth-040617-013757
 27. Chaffee BW, Barrington-Trimis J, Liu F, et al. E-cigarette use and adverse respiratory symptoms among adolescents and young adults in the United States. *Prev Med*. 2021;153:106766. doi:10.1016/j.yjmed.2021.106766
 28. Osei AD, Mirbolouk M, Orimoloye OA, et al. Association between E-cigarette use and chronic obstructive pulmonary disease by smoking status: behavioral risk factor surveillance system 2016 and 2017. *Am J Prev Med*. 2020;58(3):336-42. doi:10.1016/j.amepre.2019.10.014
 29. Jonas A. Impact of vaping on respiratory health. *BMJ*. 2022;18(378):e065997. doi:10.1136/bmj-2021-065997
 30. Vilcassim MJR, Stowe S, Majumder R, Subramaniam A, Sinkey RG. Electronic cigarette use during pregnancy: is it harmful? *Toxics*. 2023;11(3):278. doi:10.3390/toxics11030278
 31. Rebuli ME, Rose JJ, Noël A, et al. The E-cigarette or vaping product use-associated lung injury epidemic: pathogenesis, management, and future directions: an official American Thoracic Society workshop report. *Ann Am Thorac Soc*. 2023;20(1):1-17. doi:10.1513/AnnalsATS.202209-7965T
 32. The Federal Response to the Epidemic of E-Cigarette Use, Especially Among Children, And the Food and Drug Administration's Compliance Policy. Last accessed on 01 March 2024. <https://www.fda.gov/news-events/congressional-testimony/federal-response-epidemic-e-cigarette-use-especially-among-child-ren-and-food-and-drug#:~:text=In%20the%20summer%20of%202018,enforcement%20effort%20in%20FDA's%20history>
 33. Chaiton M, Pienkowski M, Musani I, et al. Smoking, e-cigarettes and the effect on respiratory symptoms among a population sample of youth: retrospective cohort study. *Tob Induc Dis*. 2023;21:8. doi:10.18332/tid/156839
 34. England LJ, Aagaard K, Bloch M, et al. Developmental toxicity of nicotine: a transdisciplinary synthesis and implications for emerging tobacco products. *Neurosci Biobehav Rev*. 2017;72:176-89.
 35. Castro EM, Lotfipour S, Leslie FM. Nicotine on the developing brain. *Pharmacol Res*. 2023;190:106716. doi:10.1016/j.phrs.2023.106716
 36. Goriounova NA, Mansvelter HD. Short- and long-term consequences of nicotine exposure during adolescence for prefrontal cortex neuronal network function. *Cold Spring Harb Perspect Med*. 2012;2:a012120.
 37. Antoniewicz L, Brynedal A, Hedman L, Lundbäck M, Bosson JA. Acute effects of electronic cigarette inhalation on the vasculature and the conducting airways. *Cardiovasc Toxicol*. 2019;19(5):441-50. doi:10.1007/s12012-019-09516-x
 38. Mobarrez F, Antoniewicz L, Hedman L, Bosson JA, Lundbäck M. Electronic cigarettes containing nicotine increase endothelial and platelet derived extracellular vesicles in healthy volunteers. *Atherosclerosis*. 2020;301:93-100. doi:10.1016/j.atherosclerosis.2020.02.010
 39. Lyytinen G, Brynedal A, Anesäter E, et al. Electronic cigarette vaping with nicotine causes increased thrombogenicity and impaired microvascular function in healthy volunteers: a randomised clinical trial. *Cardiovasc Toxicol*. 2023;23(7-8):255-64. doi:10.1007/s12012-023-09802-9.
 40. Lyytinen G, Brynedal A, Anesäter E, et al. Electronic cigarette vaping with nicotine causes increased thrombogenicity and impaired microvascular function in healthy volunteers: a randomised clinical trial. *Cardiovasc Toxicol*. 2023;23(7-8):255-64. doi:10.1007/s12012-023-09802-9
 41. Siddiqi TJ, Rashid AM, Siddiqi AK, et al. Association of Electronic Cigarette Exposure on cardiovascular health: a systematic review and meta-analysis. *Curr Probl Cardiol*. 2023;48(9):101748. doi:10.1016/j.cpcardiol.2023.101748
 42. Meng XC, Guo XX, Peng ZY, Wang C, Liu R. Acute effects of electronic cigarettes on vascular endothelial function: a systematic review and meta-analysis of randomized controlled trials. *Eur J Prev Cardiol*. 2023;30(5):425-35. doi:10.1093/eurjpc/zwac248
 43. Nguyen AX, Gaiha SM, Chung S, Halpern-Felsher B, Wu AY. Ocular symptoms in adolescents and young adults with electronic cigarette, cigarette, and dual use. *JAMA Ophthalmol*. 2023;31:e233852. doi:10.1001/jamaophthalmol.2023.3852
 44. Md Isa NA, Koh PY, Doraj P. The tear function in electronic cigarette smokers. *Optom Vis Sci*. 2019;96(9):678-85. doi:10.1097/OPX.0000000000001422
 45. Rusy DA, Honkanen A, Landrigan-Ossar MF, et al. Vaping and E-cigarette use in children and adolescents: implications on perioperative care from the American Society of Anesthesiologists Committee on pediatric anesthesia, Society for Pediatric Anesthesia, and American Academy of Pediatrics section on anesthesiology and pain medicine. *Anesth Analg*. 2021;133(3):562-8. doi:10.1213/ANE.00000000000005519
 46. Livingston CJ, Freeman RJ, Costales VC, et al. Electronic nicotine delivery systems or E-cigarettes: American College of Preventive Medicine's practice statement. *Am J Prev Med*. 2019;56(1):167-78. doi:10.1016/j.amepre.2018.09.010
 47. FDA policy on unauthorized flavored cartridge-based e-cigarettes that appeal to children including fruit and mint. <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/enforcement-priorities-electronic-nicotine-delivery-system-ends-and-other-deemed-products-market>

48. Cooper M, Park-Lee E, Ren C, Cornelius M, Jamal A, Cullen KA. Notes from the field: E-cigarette use among middle and high school students - United States, 2022. *MMWR Morb Mortal Wkly Rep.* 2022;71(40):1283-5. doi:10.15585/mmwr.mm7140a3
49. Mahase E. Government 'crackdown' on free vapes for children is too little and very late, say public health leaders. *BMJ.* 2023;31(381):1239. doi:10.1136/bmj.p1239
50. Children's doctors call for an outright ban on disposable e-cigarettes. <https://www.rcpch.ac.uk/news-events/news/childrens-doctors-call-outright-ban-disposable-e-cigarettes>
51. Cohen JE, Gartner C, Edwards R, Hammond D. Australia tightens its prescription-only regulation of e-cigarettes. *BMJ.* 2023;6(381):1216. doi:10.1136/bmj.p1216
52. New Zealand plans to gut public health policies on tobacco sales. <https://ash.org/new-zealand-plans-to-gut-public-health-policies-on-tobacco-sales/>
53. French lawmakers approve bill to ban disposable e-cigarettes to protect youth drawn to their flavors. [https://apnews.com/article/france-smoking-single-use-ecigarettes-ban-18c36006172bc052844258d741f2694e#:~:text=PARIS%20\(AP\)%20%E2%80%94%20France's%20National,products%20known%20as%20%E2%80%9Cpuffs.%E2%80%9D](https://apnews.com/article/france-smoking-single-use-ecigarettes-ban-18c36006172bc052844258d741f2694e#:~:text=PARIS%20(AP)%20%E2%80%94%20France's%20National,products%20known%20as%20%E2%80%9Cpuffs.%E2%80%9D)
54. Germany's Strict Regulations on E-cigarettes. 2Firsts news. <https://www.2firsts.com>
55. Ministero della Salute. Fumo - Prodotti del tabacco - Sigarette elettroniche. Normativa dell'area fumo. <https://www.salute.gov.it/portale/fumo/archivioNormativaFumo.jsp>
56. Spain: Ban of flavours in heated tobacco products and requiring health warnings on these products. <https://extranet.who.int/fctcapps/node/19211>
57. Tobacco Products Directive (TPD) or European Tobacco Products Directive (EUTPD) (2014/40/EU). https://health.ec.europa.eu/system/files/2016-11/dir_201440_en_0.pdf
58. Ollila H, Tarasenko Y, Ciobanu A, Lebedeva E, Raitasalo K. Exclusive and dual use of electronic cigarettes among European youth in 32 countries with different regulatory landscapes. *Tob Control.* 2023;tc-2022-057749. doi:10.1136/tc-2022-057749
59. (PRECISE). https://health.ec.europa.eu/document/download/5b11cecc-9068-4729-adbc-2f61fdb8fe4b_en?filename=potentialrisks_specs_refillableecigarettes.pdf
60. Eighth session of the conference of the parties (COP8) to the WHO FCTC. (Framework Convention on Tobacco Control). Geneva, Switzerland, 1-6 October 2018. <https://fctc.who.int/who-fctc/governance/conference-of-the-parties/eighth-session-of-the-conference-of-the-parties>
61. Global Progress Report in implementation of the WHO Framework Convention on Tobacco Control. <https://fctc.who.int/publications/m/item/global-progress-report-in-implementation-of-the-who-framework-convention-ontobacco-control>
62. WHO report on the global tobacco epidemic. protect people from tobacco smoke. 2023 <https://www.who.int/publications/i/item/9789240077164>
63. WHO. Electronic cigarettes: call to action. <https://www.who.int/publications/m/item/electronic-cigarettes-call-to-action>
64. Le TT. Key risk factors associated with electronic nicotine delivery systems use among adolescents. *JAMA Netw Open.* 2023;6(10):e2337101. doi:10.1001/jamanetworkopen.2023.37101
65. Bush A, Lintowska A, Mazur A, et al. E-cigarettes as a growing threat for children and adolescents: position statement from the European academy of Paediatrics. *Front Pediatr.* 2021;9:698613. doi:10.3389/fped.2021.698613
66. Bareham D, Ahmadi K, Elie M, Jones AW. E-cigarettes: controversies within the controversy. *Lancet Respir Med.* 2016;4(11):868-9. doi:10.1016/S2213-2600(16)30312-5
67. Fenton E, Robertson L, Hoek J. Ethics and ENDS. *Tob Control.* 2023;32(e2):e243-e246. doi:10.1136/tobaccocontrol-2021-057078

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