Evidence Update on the Health Risks of Emerging Tobacco and Nicotine Products.

Synthesizing Population Health Metrics, Epidemiological Evidence, and Regulatory Frameworks.

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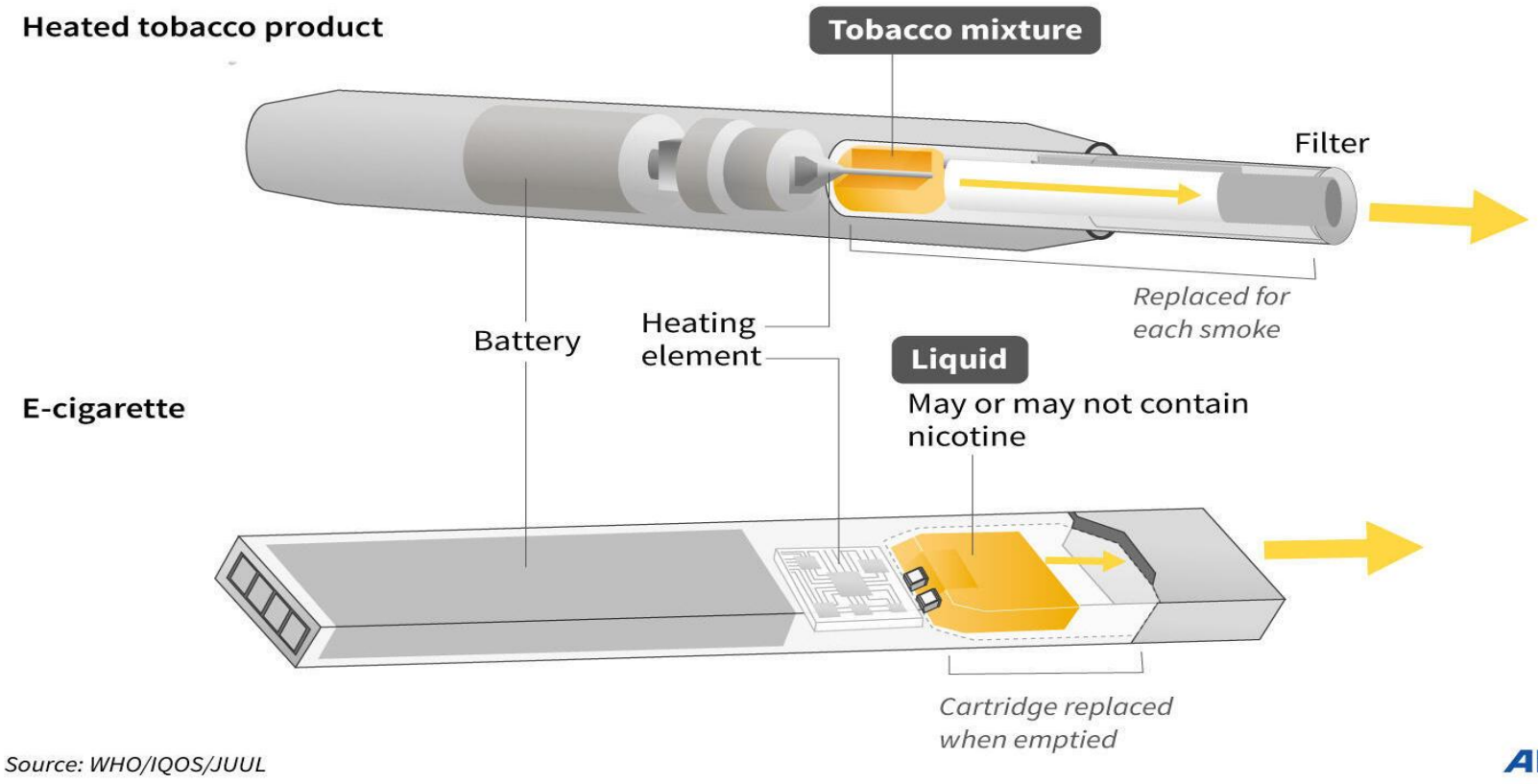
OUTLINE

- The emerging nicotine products
- Migration of nicotine addiction
- Health risks: toxicity of flavours, Ingredients and emissions (aerosols) from ENDS/HTP
- Health risks to users
- The invisible threat of secondhand exposure to aerosols
- Comparing some biological harms across product categories
- The “tobacco harm reduction” paradox
- The dilemma of dual and triple products use
- Conclusion

THE EMERGING NICOTINE PRODUCTS: E-CIGARETTES (VAPES), HEATED TOBACCO PRODUCTS (HTPS) & ORAL NICOTINE POUCHES (ONPS)



While 1.25 billion people who use tobacco products define the baseline, the exponential, largely unregulated surge of new and emerging nicotine products represents the most significant epidemiological pivot in tobacco control in the last one or two decades.

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THE EPIDEMIOLOGICAL TRANSITION: MIGRATION OF ADDICTION, NOT ERADICATION

- Baseline crisis:
  - Global tobacco users are over 1.2billion and tobacco causes over 8million deaths annually
- Market capture:
  - Emerging products (ENDS, HTPs, ONPs) are capturing new market segments (children, youth and women) while penetrating old markets under the guise of ‘harm reduction’
- Sustained nicotine dependence
  - Nicotine concentrations in new products aggressively maintain neurobiological nicotine dependence, sustaining the user base

ALGORITHMIC TOXICOLOGY: BYPASSING DECADES OF TRADITIONAL PROFILING OF TOXICANTS

180+ Commercial Vape Flavors

AI Predictive Thermal Decomposition

127 Acutely Toxic Chemicals

153 Health Hazards

225 Irritants

The sheer volume of e-liquid configurations (15,000+ flavors) renders traditional decades-long testing obsolete.

AI-driven thermal decomposition analysis reveals massive chemical heterogeneity previously masked by basic profiling.

Heating fruit and sweet flavors (e.g., melon, blueberry) induces volatile carbonyls, direct precursors to chronic airway obstruction and carcinogenesis.

Source: Kishimoto, A., Wu, D. & O'Shea, D.F. ***Forecasting vaping health risks through neural network model prediction of flavour pyrolysis reactions***. Sci Rep 14, 9591 (2024). https://doi.org/10.1038/s41598-024-59619-x

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1740 UNIQUE SUBSTANCES REMAINED FOR THE TWO PRODUCTS COMBINED (INGREDIENTS AND EMISSIONS)

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Review

SRNT OXFORD

Health Hazards of E-Cigarettes and Heated Tobacco Products: a Comprehensive Analysis of Hazardous Substances and Regulatory Gaps

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Table 1. Counts of substances identified via EU-CEG and literature review for both e-cigarettes and heated tobacco products in emissions and ingredients (as of June 2023)

Product	Substances categorized	Ingredients	Emissions	Category1		Category 2		Category 3	
				Ingredients	Emissions	Ingredients	Emissions	Ingredients	Emissions
Electronic cigarette	1585	1301 substances declared by manufacturers	284 from literature review	45	103	100	45	1156	140
Heated tobacco product	468	88 substances declared by manufacturers	380 from literature review	4	85	13	51	71	244

Category 1
(Total unique substances = 134)

Substances with carcinogenic, mutagenic or reproduction toxicity (CMR) properties. Have the most serious health hazards (58 found in both EC and HTPs)

Category 2

- Substances for which there is insufficient carcinogenic evidence or there is data on acute toxicity and other hazards such as skin or eye irritation

Category 3

- Substances for which there is a lack of hazard data in the currently applied classification systems

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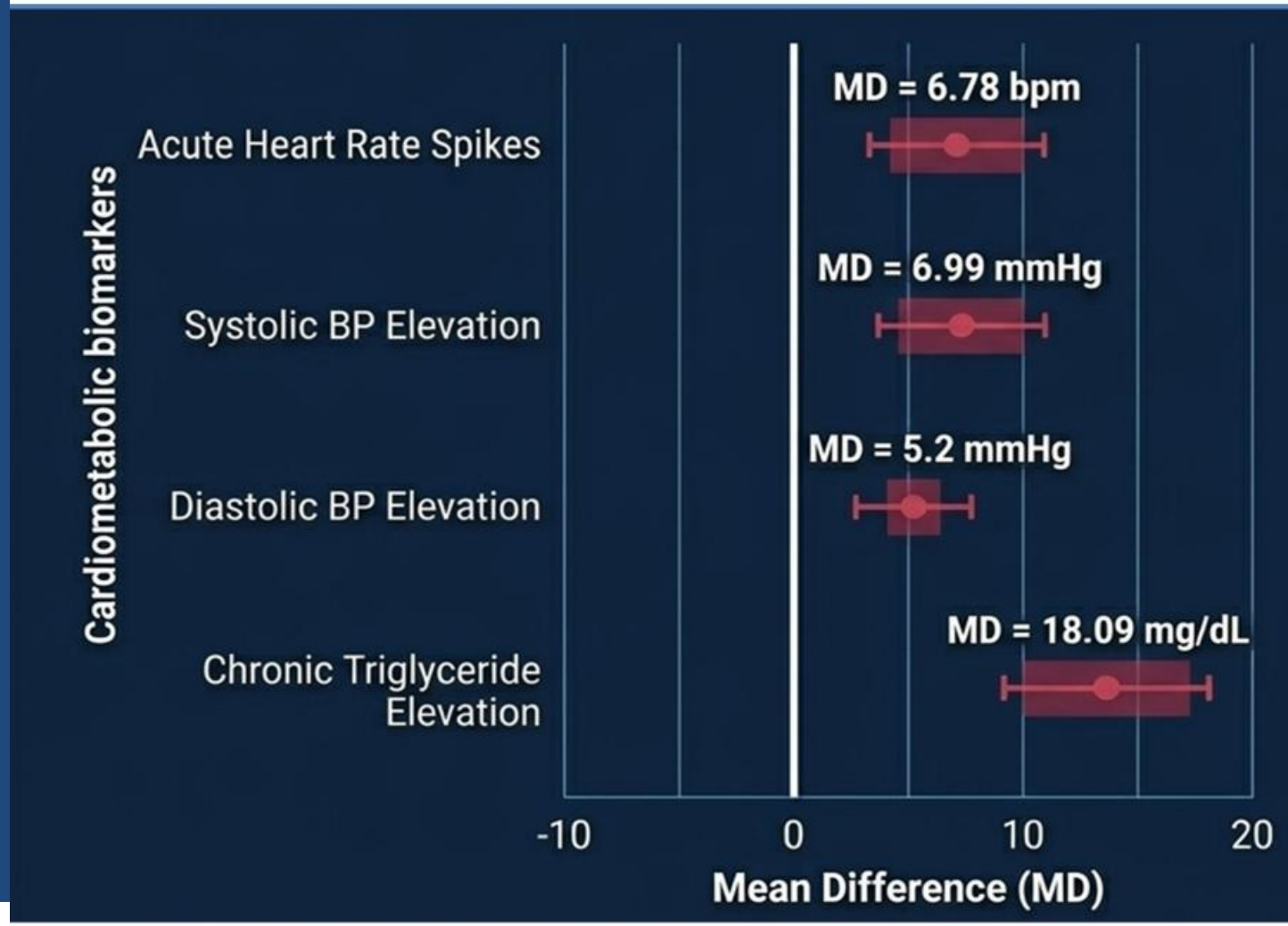
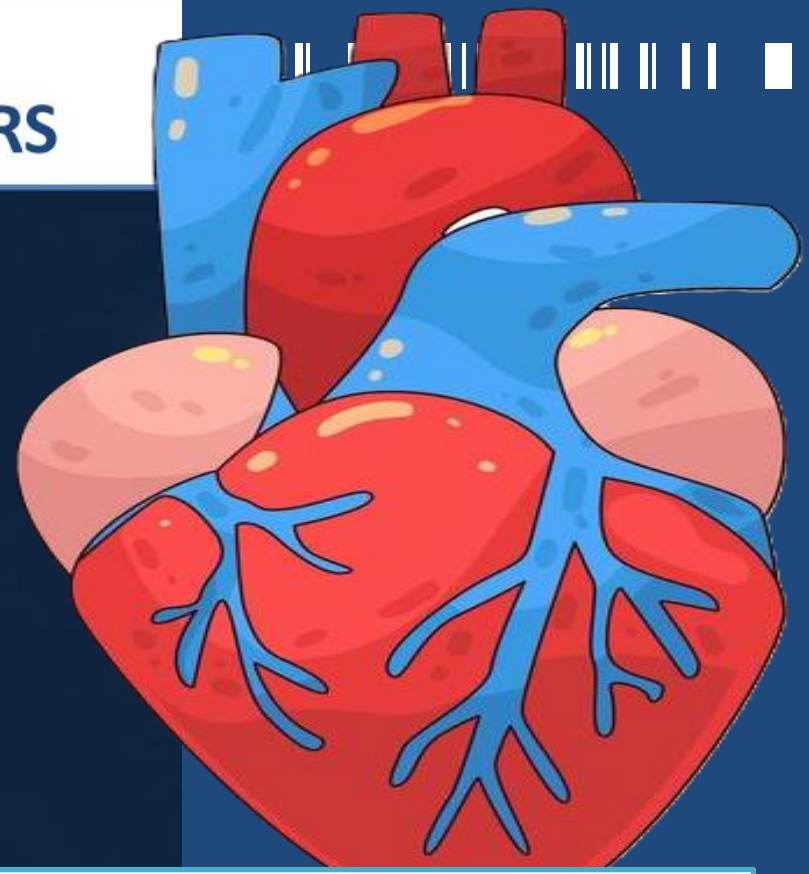
RESULTS FROM META-ANALYSES: CARDIOVASCULAR AND METABOLIC STRESSORS





Conclusion: Biomarkers for platelet activation (2,3-d-TXB2) and systemic inflammation (IL-6) confirm aerosols from ENDS/HTPs are not inert metabolically but initiate active atherogenic pathways

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Kopa-Stojak *et al. BMC Public Health* (2026) 26:1458
https://doi.org/10.1186/s12889-026-27067-z

BMC Public Health

SYSTEMATIC REVIEW Open Access

Comparison of the health-related outcomes for traditional cigarettes, e-cigarettes, heat-not-burn cigarettes and snus: a systematic review and meta-analysis

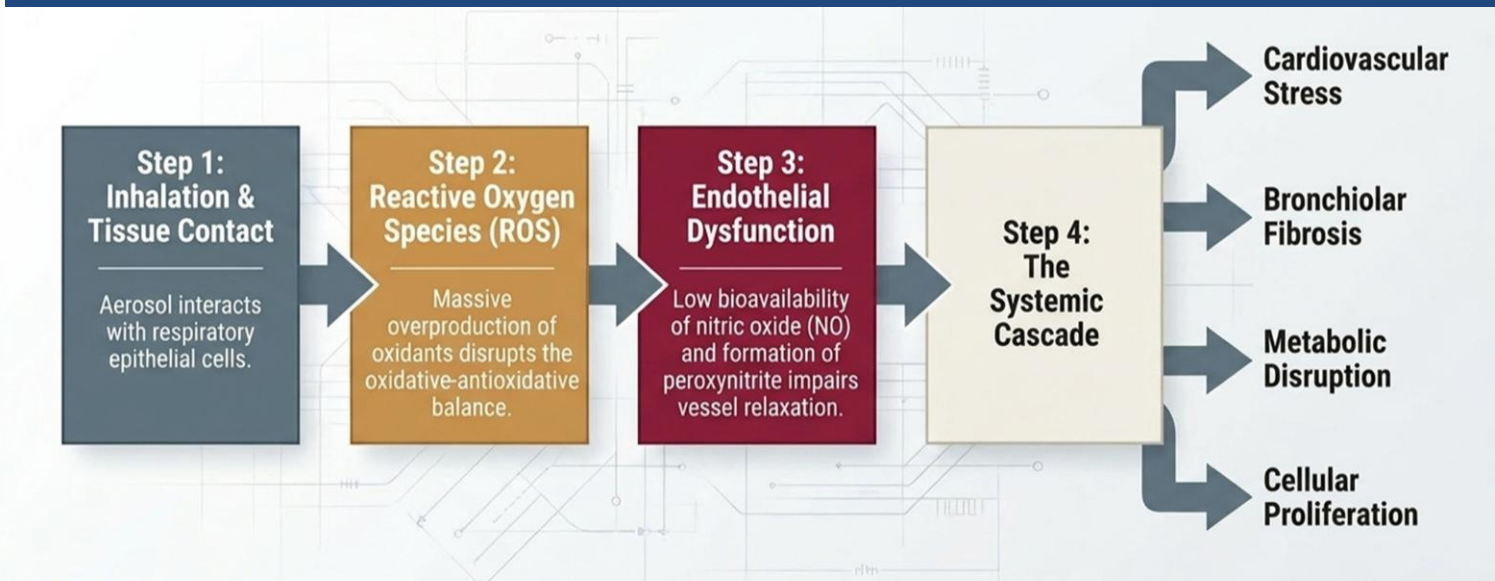
Paulina Natalia Kopa-Stojak[1], Marharyta Sobczak[1] and Rafal Pawliczak[1*]

Abstract

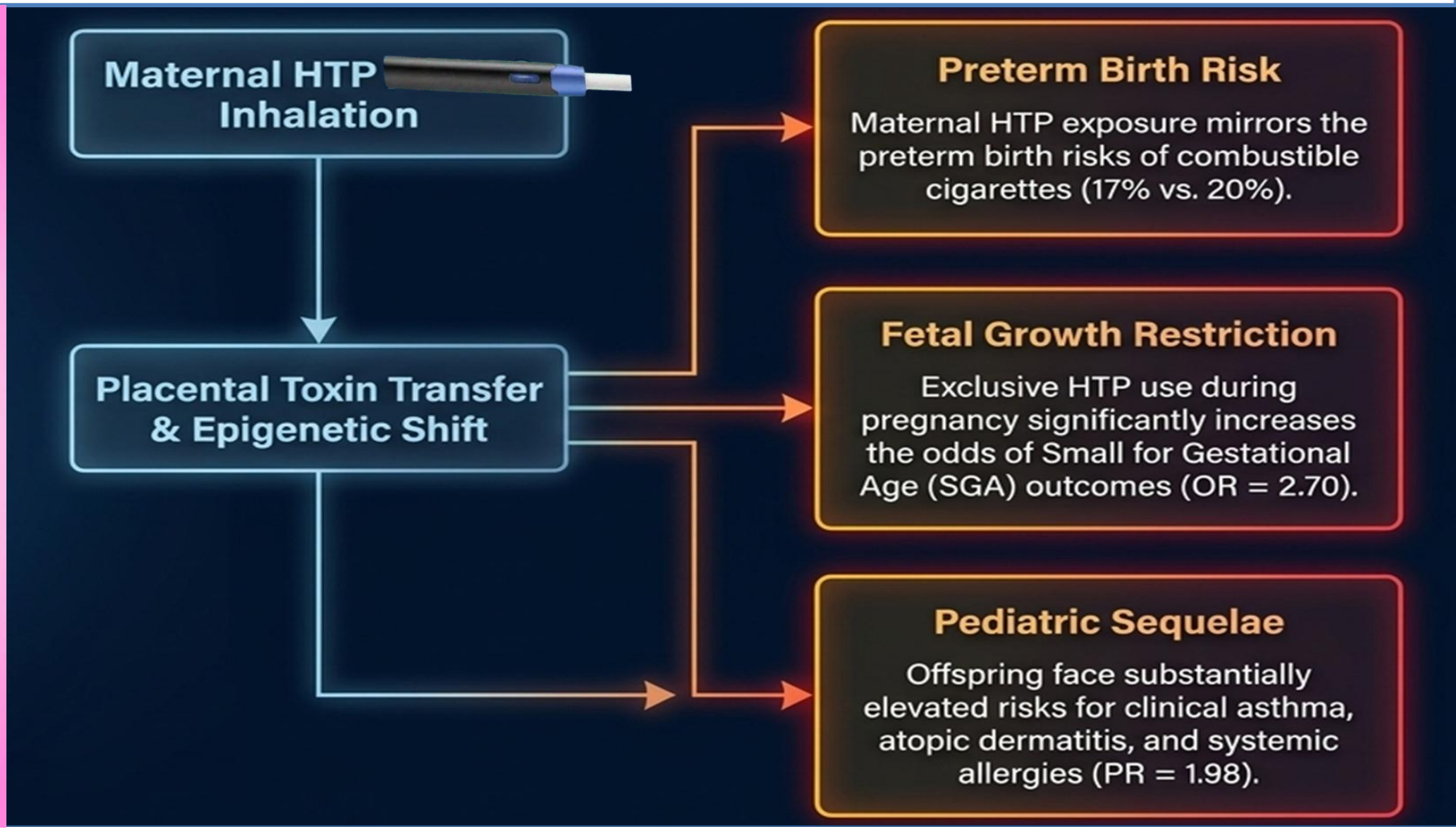
Background Tobacco products using is a global public health problem. The aim of this systematic review and meta-analysis was to assessed the health-related outcomes associated with acute and chronic using of traditional cigarettes (TCs), e-cigarettes (ECs), heated tobacco products (HTPs) and snus.

Methods PubMed, EMBASE, Web of Science, Scopus and the Cochrane Central Register of Controlled Trials databases were searched by the terms: 'cigarette', 'conventional cigarette', 'ENDS', 'electronic nicotine delivery system', 'electronic cigarette', 'e-cigarette', 'heat-not-burn product', 'heat-not-burn cigarette', 'tobacco heating product', 'heated tobacco product', 'snus', 'Swedish snuff', 'oral nicotine pouches', 'nicotine pouches', 'health', 'health effect', 'health impact'. Random effects model was used to calculate effect sizes. I^2 statistic was used to evaluate the heterogeneity of studies. Funnel plot and Egger's regression test were used to assess publication bias. Statistical analysis of the data was performed in R (version 4.2.2).

Results Acute exposure to analyzed tobacco products significantly affects heart rate (MD = 6.78; 95% CI [4.86; 8.69];



EVIDENCE FROM EPIGENESIS: REPRODUCTIVE OUTCOMES AND GENERATIONAL CONSEQUENCES (HTPS)



Source: Znyk, Małgorzata, and Dorota Kaleta. 2025. "The Health Effects of Heated Tobacco Product Use—A Narrative Review" Healthcare 13, no. 16: 2042. https://doi.org/10.3390/healthcare13162042

THE INVISIBLE THREAT: SECONDHAND AEROSOL AND INDOOR AIR QUALITY

Suspended Particulate Matter

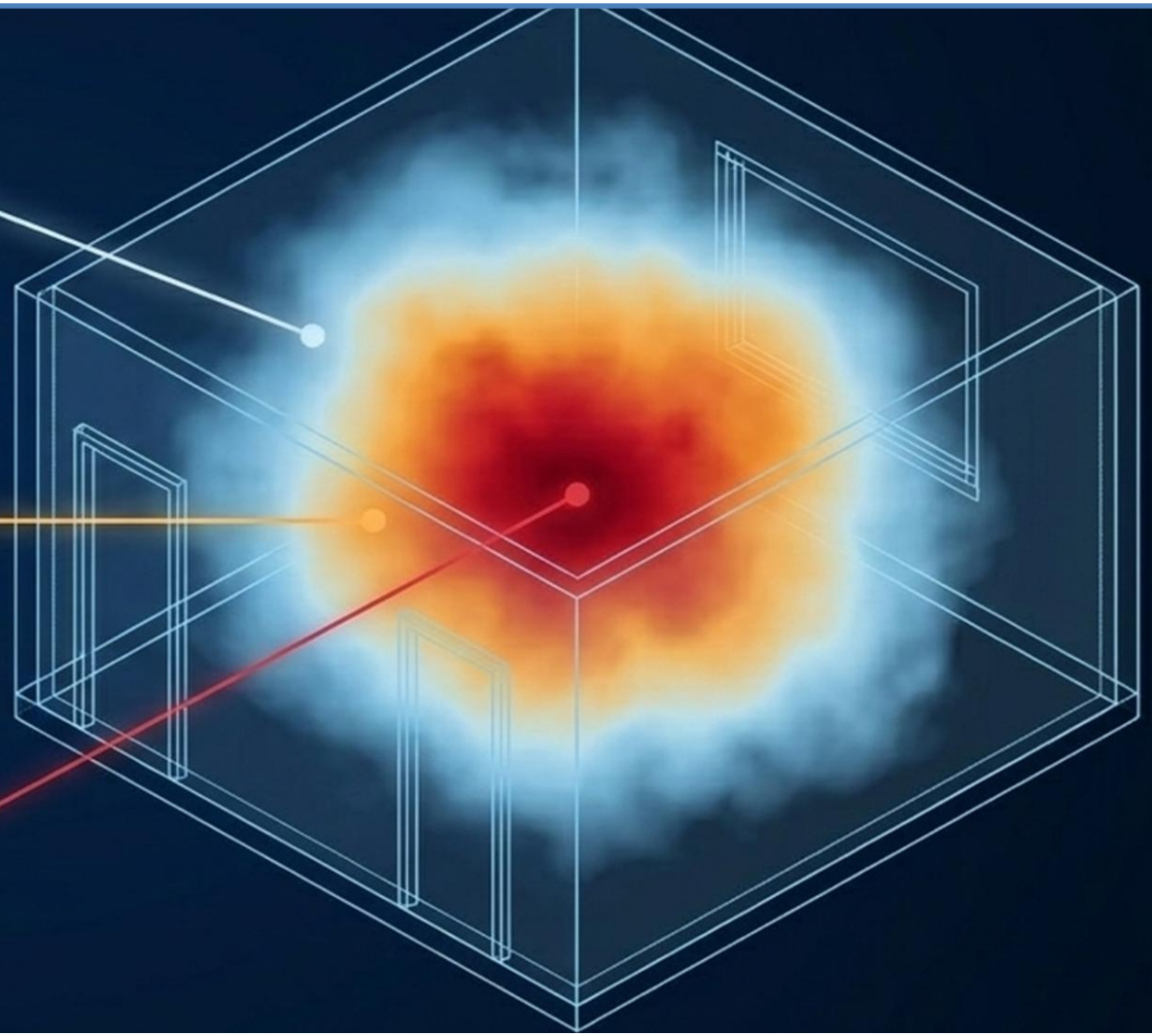
HTP and ENDS emissions are not transient water vapor. They consist of suspended particulate matter (PM), nicotine, and volatile organic compounds (VOCs).

Toxic Chemical Breach

Indoor concentrations of formaldehyde cyanohydrin and acrylamide reliably breach safe ambient thresholds during sustained indoor use.

Collateral Pathology

Epidemiological tracking links secondhand heated-aerosol exposure directly to increased asthma attack incidence and chest pain in non-smokers.



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COMPARING SOME BIOLOGICAL HARMS ACROSS PRODUCT CATEGORIES

Toxicological Dimension	Traditional Cigarettes	ENDS (E-Cigarettes)	Heated Tobacco (HTPs)
Combustion Status	Yes	No (Vapor)	No (Heat <350°C)
Chemical Complexity	Extreme	High (15,000+ flavorings)	High (Formaldehyde/VOCs)
Oxidative Stress (ROS)	Extreme	High	High (Generates similar ROS)
Cardiovascular Stress	Extreme	High (Heart Rate spikes)	High (Equal platelet aggregation)
Dual-Use Risk	N/A	Extremely High	Extremely High

KEY TAKEAWAY: A reduction in the amount of toxicants does not mathematically equate to a proportional reduction in physiological harm. This is the blind spot that is avoided in the discussion

Source: El Bouz, M., Neto, C., Mansuy, T., Becher, R., Valen, H., Mariussen, E., Blanco-Escauriaza, D. A., González-Marrón, A., Zervas, E., Havermans, A., Talhout, R., & Staal, Y. C. M. (2026). Health Hazards of E-Cigarettes and Heated Tobacco Products: a Comprehensive Analysis of Hazardous Substances and Regulatory Gaps. Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco, 28(5), 710–719. https://doi.org/10.1093/ntr/ntaf246

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THE 'TOBACCO HARM-REDUCTION' PARADOX:

WHAT IS THE PARADOX?

"Tobacco Harm Reduction" assumes that people will substitute one product for the other. E.g., that cigarettes smokers will switch to using only e-cigs

REALITY:

But e-cigs promote dual use while encouraging young people who have never smoked cigarettes to vape. Therefore, the population-level harm frequently outweighs the individual benefit **some** people may have.

CONCLUSION:

Without strict regulatory containment, so-called reduced risk products will become harm maximization at the population level

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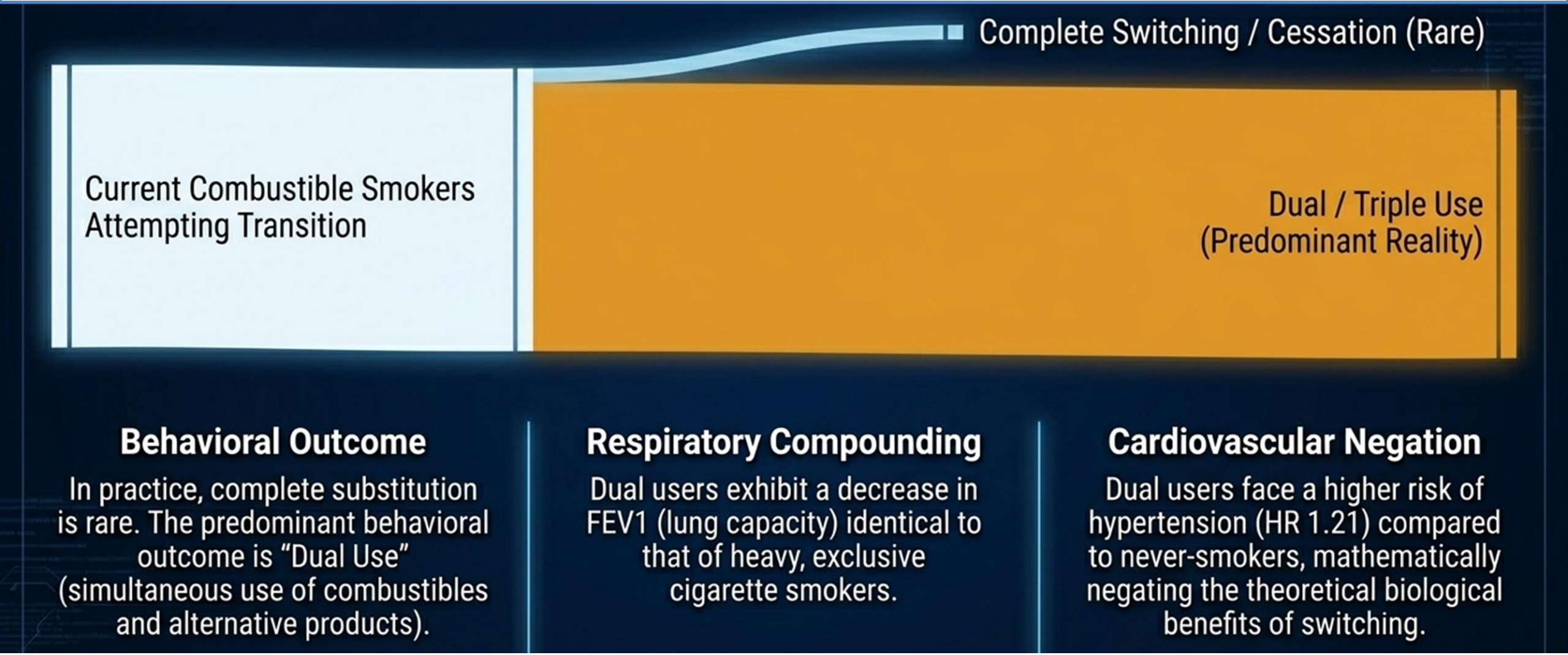
BEHAVIOURAL EPIDEMIOLOGY: THE DILEMMA OF DUAL/TRIPLE USE OF NICOTINE PRODUCTS



Behavioral Outcome

In practice, complete substitution is rare. The predominant behavioral outcome is "Dual Use" (simultaneous use of combustibles and alternative products).

Respiratory Compounding

Dual users exhibit a decrease in FEV1 (lung capacity) identical to that of heavy, exclusive cigarette smokers.

Cardiovascular Negation

Dual users face a higher risk of hypertension (HR 1.21) compared to never-smokers, mathematically negating the theoretical biological benefits of switching.

The assumption that dual use is a transition period towards e-cigarette only use or tobacco abstinence is mostly NOT the reality

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NEJM Evidence

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DOI: 10.1056/EVIDoa2300229

ORIGINAL ARTICLE

Population-Based Disease Odds for E-Cigarettes and Dual Use versus Cigarettes

Stanton A. Glantz, Ph.D.,[1] Nhung Nguyen, Ph.D.,[2] and Andre Luiz Oliveira da Silva, Ph.D.[2]

Abstract

BACKGROUND E-cigarettes are promoted as less harmful than cigarettes. There has not been a direct comparison of health effects of e-cigarettes or dual use (concurrently using e-cigarettes and cigarettes) with those of cigarettes in the general population.

Table 1. Pooled Adjusted* Odds Ratios of Each Disease Outcome (95% Confidence Intervals) from the Meta-analyses.

Comparisons	Cardiovascular	Stroke	Metabolic Dysfunction	Asthma	COPD	Oral Disease
Comparison to cigarette use						
E-cigarettes vs. cigarettes	0.81 (0.58–1.14)	0.73 (0.47–1.13)	0.99 (0.91–1.09)	0.84 (0.75–0.95)	0.53 (0.38–0.74)	0.87 (0.76–1.00)
Dual use vs. cigarettes	1.23 (0.99–1.54)	1.26 (1.06–1.50)	1.22 (1.15–1.31)	1.20 (1.12–1.28)	1.41 (1.12–1.64)	1.27 (1.15–1.39)
Comparison to no use						
E-cigarette vs. nonuse	1.24 (1.05–1.46)	1.32 (0.99–1.76)	1.25 (1.18–1.33)	1.24 (1.19–1.30)	1.46 (1.31–1.61)	1.47 (1.19–1.82)
Dual use vs. nonuse	2.23 (1.59–3.14)	2.39 (2.02–2.83)	1.49 (1.17–1.91)	1.56 (1.22–2.00)	3.29 (1.97–5.51)	1.78 (1.49–2.12)
Cigarette vs. nonuse	1.64 (1.24–2.16)	2.08 (1.91–2.27)	1.27 (1.17–1.37)	1.56 (1.34–1.80)	2.99 (2.29–3.92)	1.69 (1.40–2.03)

* Adjusted for covariates listed in Table S3. COPD denotes chronic obstructive pulmonary disease.

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THANK YOU

ngiyathokoza!

ro livhuwa!

ke a leboga!

enkosi!

dankie!

thank you!

ndo livhuwa!

inkomu!

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ke a leboha!

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World No Tobacco Day 2026

Unmasking the Appeal - Countering Nicotine and Tobacco Addiction

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