

Evidence on vaping

Presentation to City
& Hackney (draft)

Ann McNeill
May 2025



Conflicts of interest

- My salary is paid for by King's College London
- My funding comes from a variety of governmental & non-governmental sources
- I do not take funding from tobacco or vaping companies

Summary

- Introduction & context
- Evidence - what do we know about vaping:
 - Risks
 - Do they help people to stop smoking?
 - Impact on adolescents & adolescent smoking
- What is the best regulatory framework for vaping?

Introduction & context

Tobacco smoke is uniquely deadly

- >7,000 chemicals in tobacco smoke
- >250 known to be harmful, including hydrogen cyanide, carbon monoxide & ammonia
- ~70 known to cause cancer including arsenic, benzene & cadmium



Globally:
~ 1.1 billion smokers
~ 7 million die every year from
a smoking related disease

Separating the nicotine from the tobacco smoke



"Smokers smoke for the nicotine, but die from the tar"
Professor Mike Russell, Maudsley Smokers Clinic, 1979

Different nicotine products



Skin patch



Gum



Lozenges



Inhalator



Microtabs



Nasal spray



Mouth Spray

Licensed nicotine replacement therapies



'Cigalikes'



'Tanks'



'Mods'



'Pods'



'Puff' bars

E-cigarettes/nicotine vaping products

Other types include Heated Tobacco Products, Nicotine Pouches etc

Skin patch: © Debbie Robson. Gum: © AndreyPopov / Getty Images / iStock (symbolic image with model). Inhalator: © PhotoSG / Stock.adobe.com. Lozenges, microtabs, nasal & mouth spray: © NCST.

Vaping



Smoking



CONTAINS	CONTAINS
Propylene glycol &/or vegetable glycerine	Tobacco
Flavouring	Additives
Nicotine*	Nicotine
Heated	Burned
100-250 °C	600-900 °C

*Not all e-liquid contains nicotine

Government-commissioned evidence updates

2022

Nicotine vaping in England: an evidence update including health risks and perceptions, 2022

A report commissioned by the Office for Health Improvement and Disparities

Published 29 September 2022

Authors

Ann McNeill, Erikas Simonavičius, Leonie Brose, Eve Taylor, Katherine East, Elizabeth Zuikova, Robert Calder, Debbie Robson



2015

E-
cigarettes:
an evidence
review

2018

Evidence
review of EC
& HTP

Focus on
cessation
and health
risks

2019

Vaping in
England

Focus on
SE
indicators

2020

Vaping in
England

Focus on
mental
health &
pregnancy

2021

Vaping in
England

Focus on
smoking
cessation

Updated by RCP in 2024



What do we know about vaping? Risks

Nicotine dependence

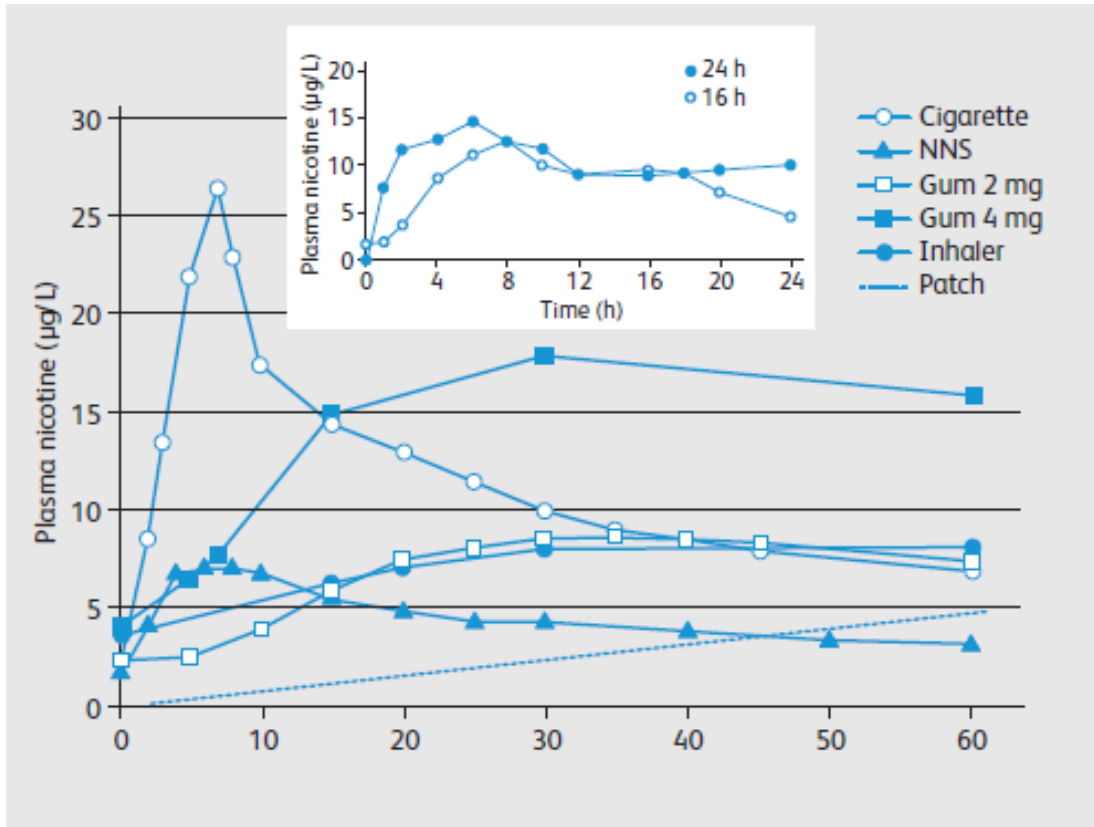
Addictive, depending on
How it's delivered
How ***fast*** nicotine reaches
the brain
In what ***form*** it's delivered
What it's ***mixed*** with
If its **burned**



Dependency of nicotine depends on the delivery system: speed of delivery & dose

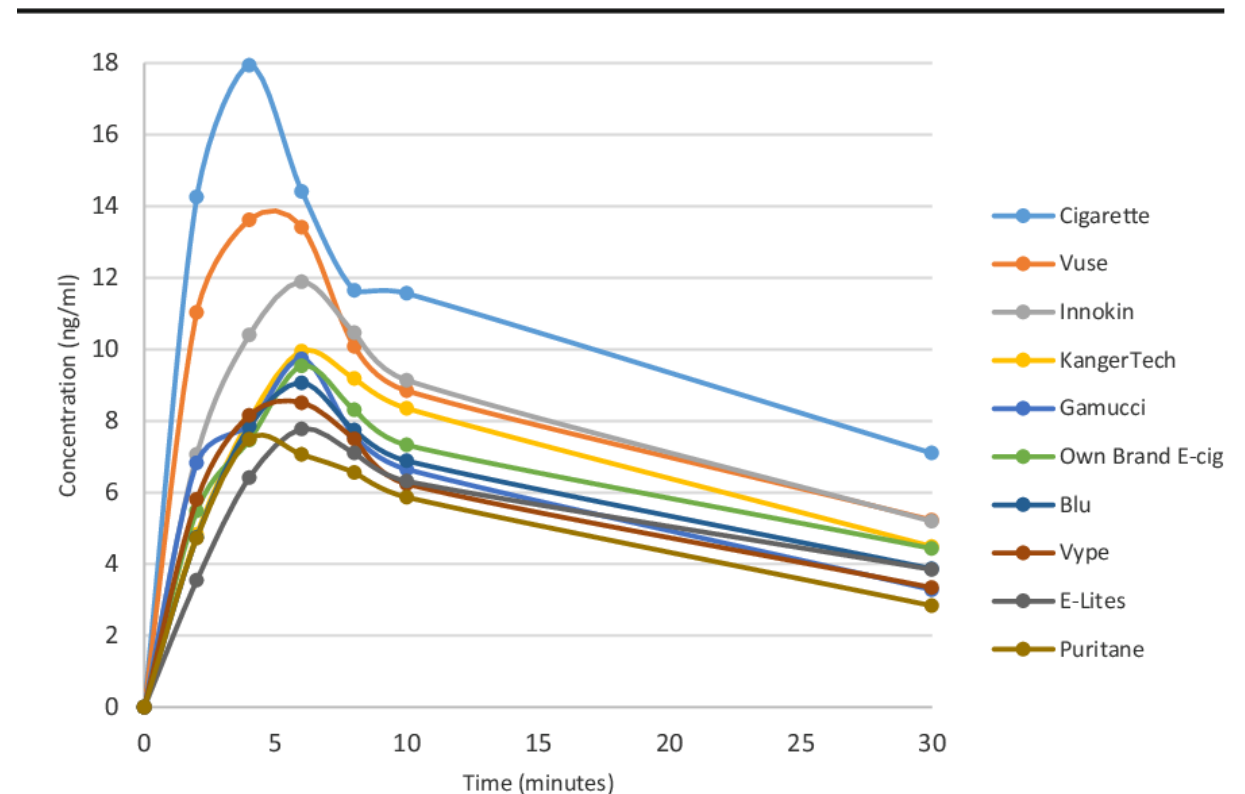
(RCP Nicotine without smoke report, 2016)

Cigarettes & NRT



NNS= nicotine nasal spray; inset = nicotine transdermal patch

Cigarettes & E-cigarettes



Hajek, P et al (2016) Nicotine delivery to users from cigarettes and from different types of e-cigarettes, *Psychopharmacology*. doi: 10.1007/s00213-016-4512-6

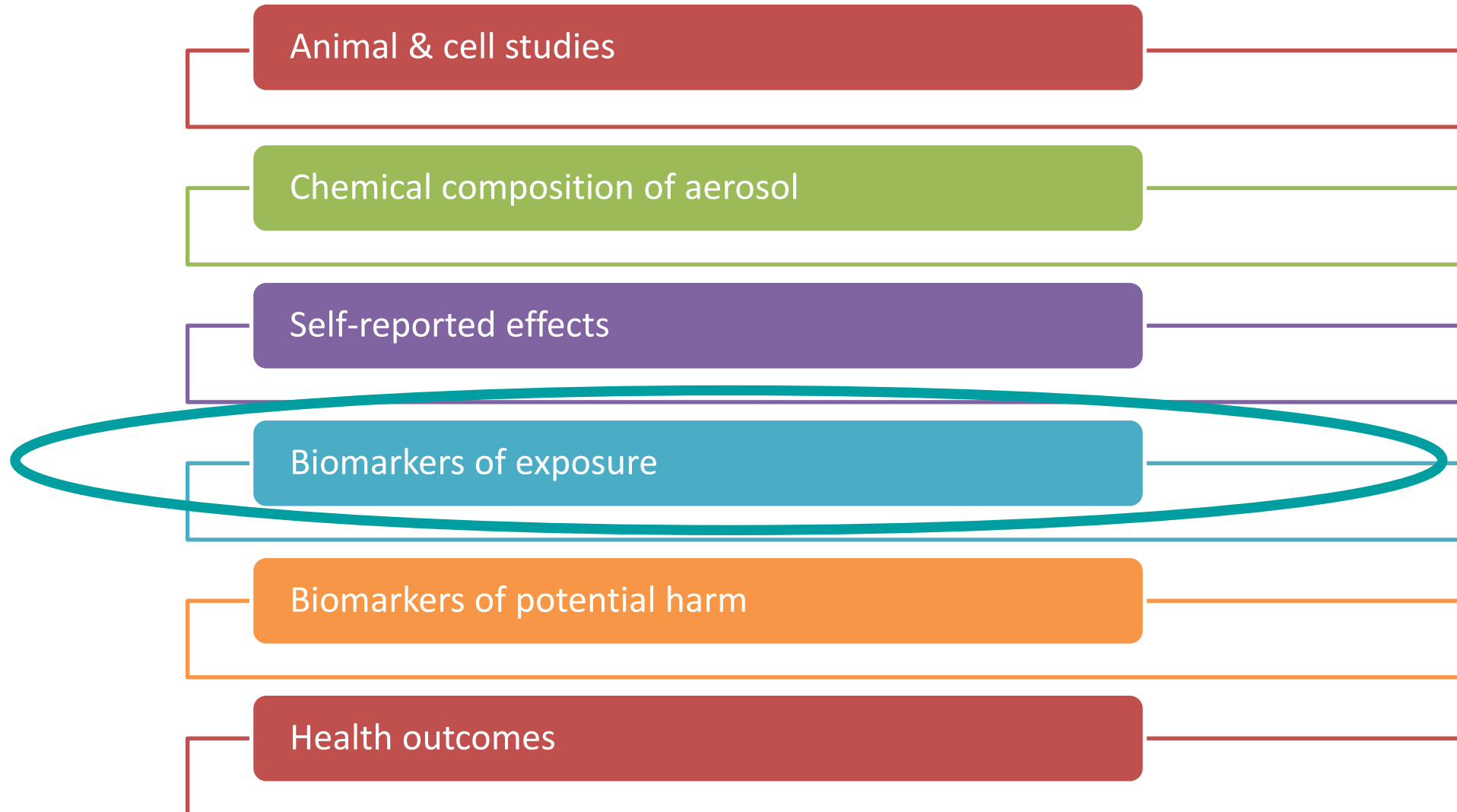


Nicotine dependence

Addictive, depending on

- ***How*** it's delivered
 - How ***fast*** nicotine reaches the brain
 - In what ***form*** it's delivered
 - What it's ***mixed*** with
 - If its **burned**
-
- Sustains tobacco addiction, but.....
 - Nicotine **does not** cause cancer
 - Does not cause respiratory problems
 - Temporarily increases heart rate by ~8bpm

Assessing health risks of vaping – hierarchy (McNeill et al, 2018)



OHID

Searched & reviewed
literature published
Aug 2017 to July 2021

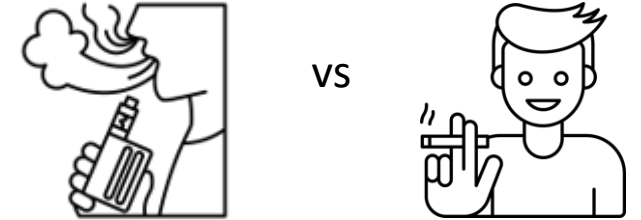
231 human
biomarker
studies

RCP

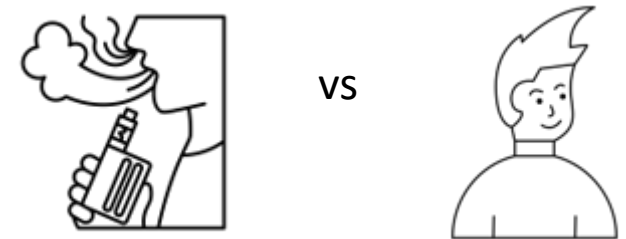
Searched & reviewed
literature published
Aug 2021 to Feb 2023

30 human
biomarker
studies

Relative risks



Absolute risks



Biomarker of exposure

A measure of how much of a substance (toxicant), or its metabolite is in the body (in urine, saliva, blood or hair)

WHO biomarkers of priority toxicants (& metabolites) for *tobacco* (WHO Study Group on Tob Prod Reg, 2019)

Nicotine	Carbon Monoxide	Tobacco-specific nitrosamines	Volatile organic compounds	Metals	Other potential toxicants (eg PAHs)
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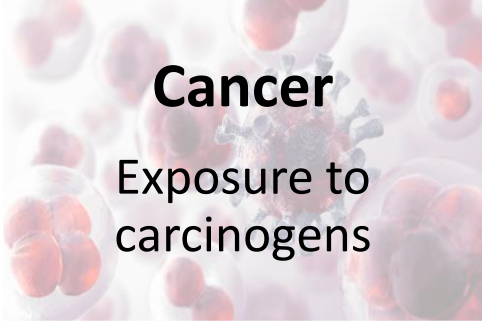

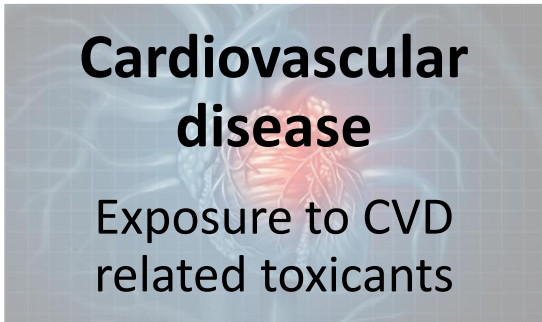
Metabolites (toxicants)	Vaping vs Smoking (relative risk)	Vaping vs Non-use (absolute risk)	Illustrative results from meta-analyses
Tobacco-specific nitrosamines			
NNAL (NNK)	↓	↑	
NNN	↓	–	
NAB	↓	↑	
NAT	↓	↑	
Volatile organic compounds			
AAMA (Acrylamide)	=	=	
GAMA (Acrylamide)	↓	=	
CEMA (Acrolein)	=	=	
3-HPMA (Acrolein)	↓	=	
CNEMA (Acrylonitrile)	↓	↑	
S-PMA (Benzene)	=	=	
MU (Benzene)	=	–	
MHBMA (1,3-Butadiene)	↓	=	
DHBMA (1,3-Butadiene)	=	=	
HMPMA (Crotonaldehyde)	↓	=	
S-BMA (Toluene)	=	=	
Carbon monoxide	↓	–	

Biomarkers of exposure to potential toxicants summary

Significantly lower among people who vaped than smoked

Similar or higher among people who vaped than non-users

Biomarkers of exposure to toxicants related to specific diseases

	 <p>Cancer Exposure to carcinogens</p>	 <p>Respiratory disease Exposure to respiratory related toxicants</p>	 <p>Cardiovascular disease Exposure to CVD related toxicants</p>
Vaping vs smoking	Significantly lower	Significantly lower	Significantly lower
Vaping vs non use	Similar Higher for some	Similar for most	Similar

Secondhand exposure

8 studies across both reports:

- 2 studies exposed people to atypically high levels of vaping emissions
- Typically lack of secondhand smoking exposure for comparison

Acute secondhand exposure to vaping aerosol resulted in **non-significant changes** in toxicant **biomarkers of exposure**

One newer study of at least some daily second-hand exposure to vaping over a year found a significantly higher level of an inflammatory cytokine among those exposed.



Poisonings

- Incidents of poisonings can be serious but are rare



Explosions

- Incidents of exploding batteries can be serious but are very rare



Fires: London Fire Brigade (2017-2021)

	Cigarettes	Vaping products
Ignition source	5706	15
Injuries	676	0
Fatalities	46	0

Overall findings

Vaping poses only a small fraction of the risks of smoking in the short to medium term

Vaping is not risk-free, particularly for people who have never smoked

Methodological limitations across the studies – need more research

More recent reviews from Canada

Addictive Behaviors 163 (2025) 108243



Contents lists available at [ScienceDirect](#)

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Systematic review

Evidence update on e-cigarette dependence: A systematic review and meta-analysis

Anasua Kundu^a, Sherald Sanchez^a, Siddharth Seth^a, Anna Feore^b, Megan Sutton^c,
Kyran Sachdeva^d, Nada Abu-Zarour^e, Michael Chaiton^{a,f,g}, Robert Schwartz^{f,g,h,*}

Cardiovascular health effects of vaping e-cigarettes: a systematic review and meta-analysis

Anasua Kundu^a,¹ Anna Feore², Sherald Sanchez¹, Nada Abu-Zarour³,
Megan Sutton⁴, Kyran Sachdeva⁵, Siddharth Seth¹, Robert Schwartz^{6,7},
Michael Chaiton^{6,7}

Review Paper

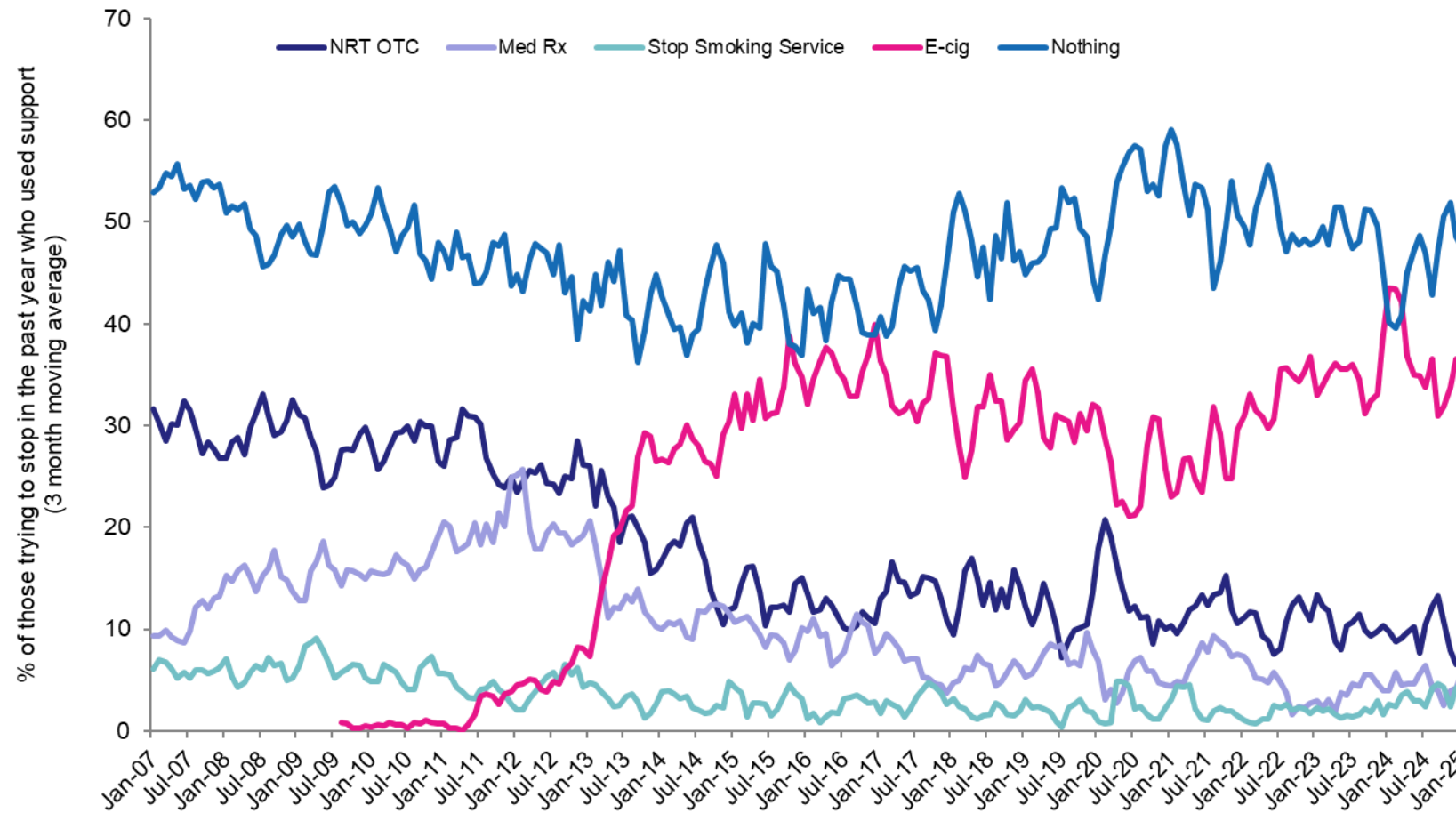
Tobacco Induced Diseases

Evidence update on the cancer risk of vaping e-cigarettes: A systematic review

Anasua Kundu¹, Kyran Sachdeva², Anna Feore³, Sherald Sanchez¹, Megan Sutton⁴, Siddharth Seth², Robert Schwartz^{5,6},
Michael Chaiton^{1,5,6}

What do we know about vaping? Do they help people to stop smoking?

Support used in quit attempts



NRT OTC: Nicotine replacement therapy bought over the counter; Med Rx: Prescription medication; : E-cigarette. Method is coded hierarchically with smokers using more than one method classified into most intensive by the following scheme: 1. Nothing, 2. NRT OTC, 3. E-cigarette, 4. Med Rx, 5. SSS. In updates until June 2015, NRT OTC was coded above e-cigarette - earlier figures have now been revised.



**Cochrane
Library**

Cochrane Database of Systematic Reviews

Electronic cigarettes for smoking cessation (Review)

Lindson N, Butler AR, McRobbie H, Bullen C, Hajek P, Begh R, Theodoulou A, Notley C, Rigotti NA, Turner T, Livingstone-Banks J, Morris T, Hartmann-Boyce J



88 studies
47 RCTs
~27,000 ppts

There is high-certainty evidence that e-cigarettes with nicotine increase quit rates compared to licensed nicotine replacement therapies

Comment

<https://doi.org/10.1038/s41591-022-02201-7>

Nicotine e-cigarettes as a tool for smoking cessation

Kenneth E. Warner, Neal L. Benowitz, Ann McNeill & Nancy A. Rigotti

Check for updates

There is abundant evidence that e-cigarettes can help some individuals to quit smoking, so they should be more widely recommended as smoking cessation aids.

was high certainty that [smoking] quit rates were higher in people randomized to nicotine [electronic cigarettes] than in those randomized to nicotine replacement therapy". The authors also found evidence of cessation benefits when comparing nicotine e-cigarettes with non-nicotine e-cigarettes, and with behavioral support or no treatment.

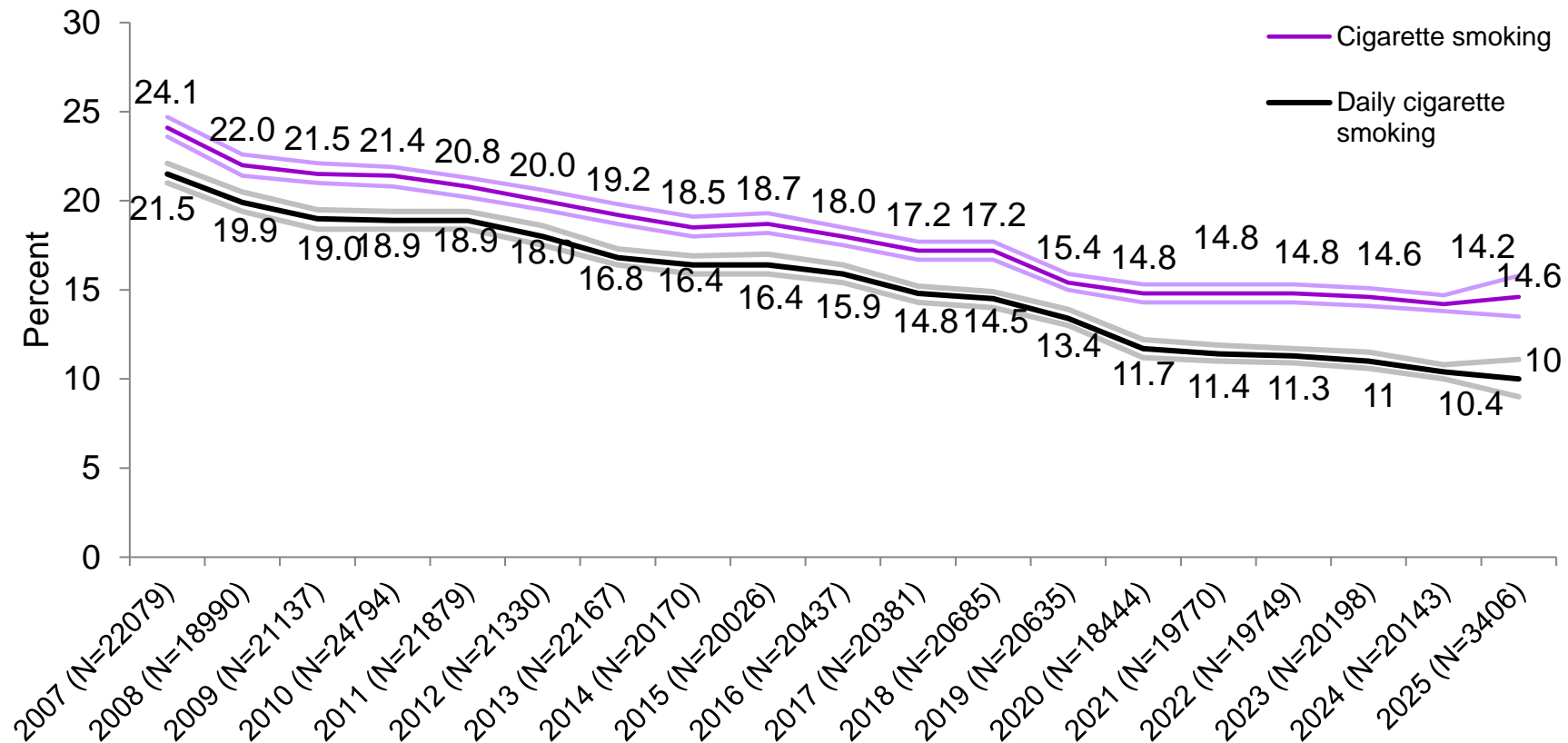
Population studies support the randomized controlled trial find-

Vapes – additional quits every year



In the UK, vapes may have helped an additional 30-50,000 additional quits every year since they became popular in 2013

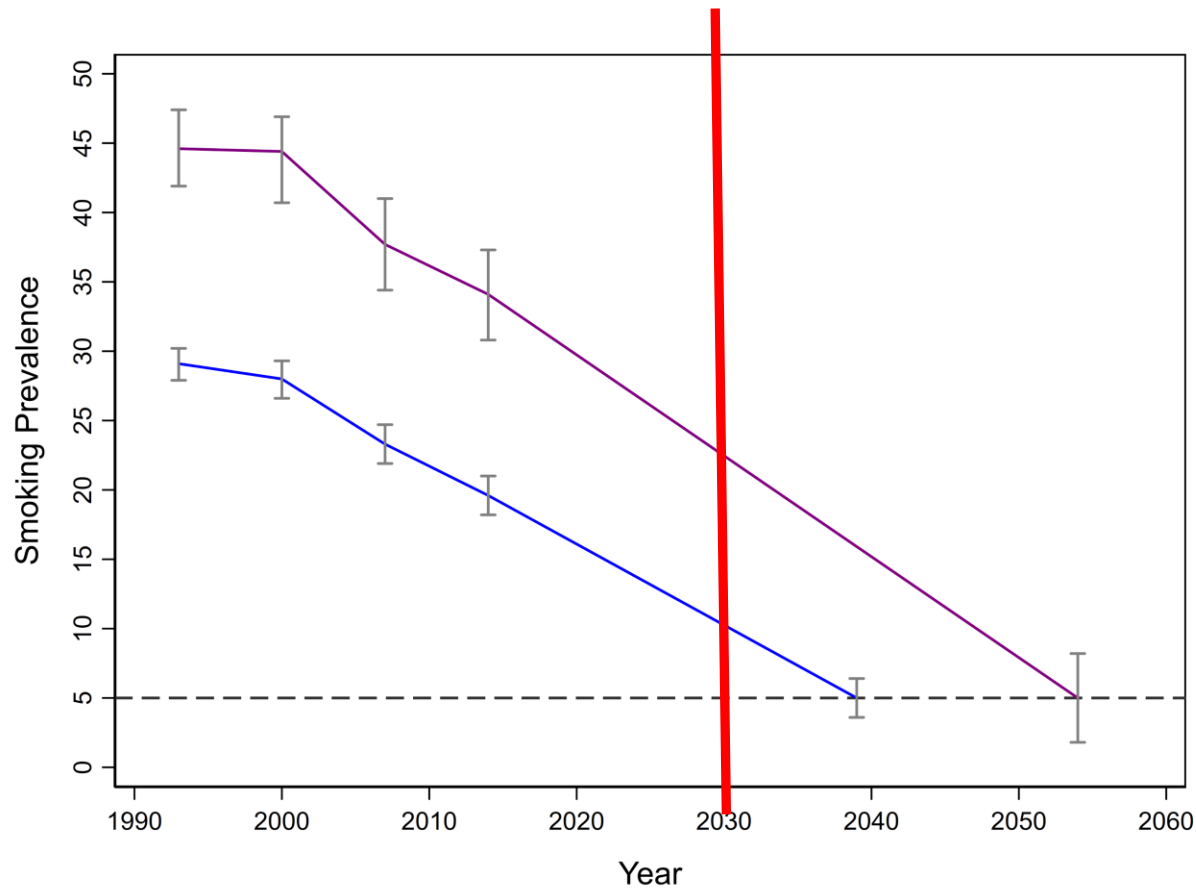
Cigarette smoking prevalence



Base: Adults (16 and over till Feb 20; 18 and over from April 20; 16 and over from Jan 22)

Graph shows prevalence estimate and upper and lower 95% confidence intervals

E-cigarettes are also attractive to more disadvantaged smokers - Smokefree 2030 for all?



— Without a mental health condition
— With a mental health condition

Assuming no change - based on mean annual percentage point (i.e. not percentage rate) decrease in smoking prevalence estimated using weighted APMS data from Great Britain overall

No mental health condition¹: smoking prevalence in this group will reach **5% in 2039** (18 years from 2020; 95% CI: 17.6 to 20.4 years).

Mental health condition²: smoking prevalence in this group will reach **5% in 2054** (34.3 years from 2020; 95% CI: 31.1 to 37.5 years).

¹Based on 0.60% percentage-point decrease in smoking prevalence per year for non-MHC group and ²0.74% percentage-point decrease in smoking prevalence per year for MHC group

What do we know about vaping? Impact on adolescents & adolescent smoking

Do e-cigarettes lead to cigarette smoking?

O'Brien et al. *BMC Public Health* (2021) 21:954
<https://doi.org/10.1186/s12889-021-10935-1>

BMC Public Health

RESEARCH ARTICLE

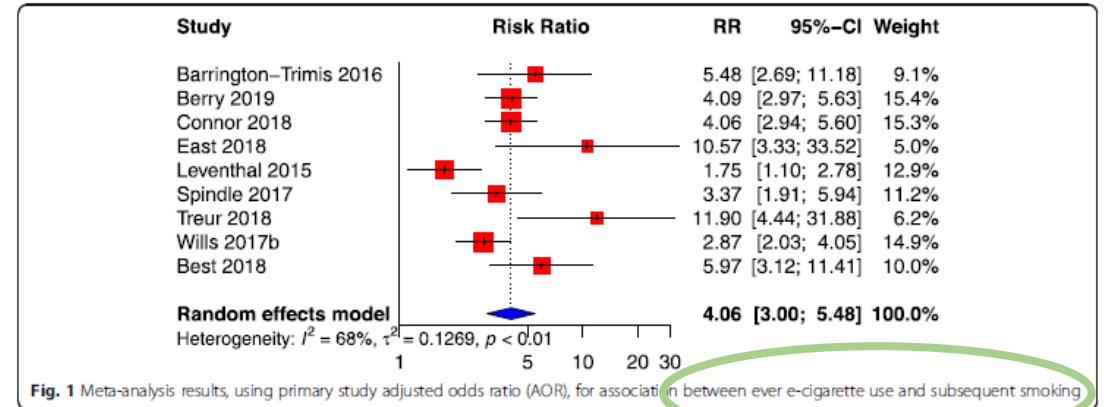
Open Access

Association between electronic cigarette use and tobacco cigarette smoking initiation in adolescents: a systematic review and meta-analysis

Doireann O'Brien¹, Jean Long^{1*}, Joan Quigley¹, Caitriona Lee¹, Anne McCarthy¹ and Paul Kavanagh²



Adolescents who have **never smoked** at baseline, subsequently smoking & initiating smoking at f/u



'We identify a 4-fold increased likelihood between e-cigarette use & initiating smoking tobacco cigarettes in adolescents in a combined analysis of 9 cohort studies conducted with follow-up periods between 4 & 24 months'

But.. cigarette smoking also leads to vaping & using vapes to stop smoking

Journal of Adolescent Health 62 (2018) 539–547



ELSEVIER

JOURNAL OF
ADOLESCENT
HEALTH

www.jahonline.org

Original article

The Association Between Smoking and Electronic Cigarette Use in a Cohort of Young People



Katherine East, MS.c. ^{a,b,*}, Sara C. Hitchman, Ph.D. ^{a,b}, Ioannis Bakolis, Ph.D. ^{c,d}, Sarah Williams ^{e,f}, Hazel Cheeseman, MS.c. ^f, Deborah Arnott, M.B.A. ^f, and Ann McNeill, Ph.D. ^{a,b}

^a Addictions Department, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK

^b UK Centre for Tobacco and Alcohol Studies, Clinical Sciences Building, University of Nottingham, Nottingham, UK

^c Department of Biostatistics and Health Informatics, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK

^d Centre for Implementation Science, Department of Health Services and Population Research, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK

^e Public Health England, London, UK

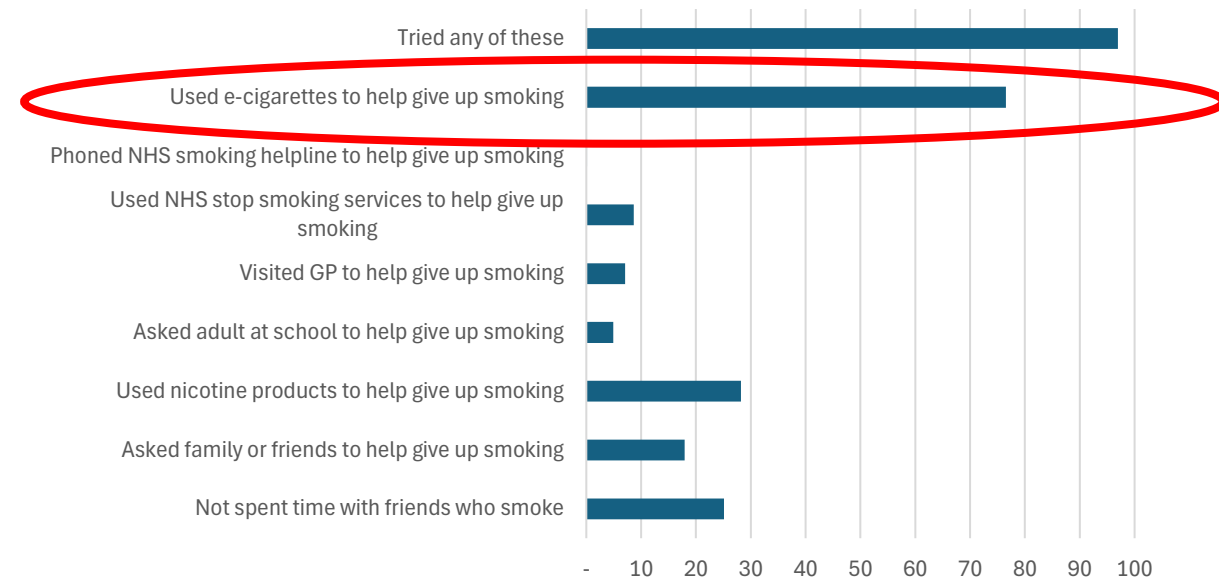
^f Action on Smoking and Health UK, London, UK

Article history: Received July 7, 2017; Accepted November 28, 2017

Keywords: Smoking; Electronic cigarettes; E-cigarettes; Young people; Youth; Adolescent; Longitudinal studies; Nicotine; Tobacco

‘In conclusion, this study provides further support for the association between ever e-cigarette use and smoking initiation, & additionally finds that **ever smoking is associated with e-cigarette initiation, among young people**’

% of current smokers who have tried to stop smoking










Sources of help to stop smoking among 11-15 year olds who smoke or recently smoked in England

REVIEW

ADDICTION

SSA

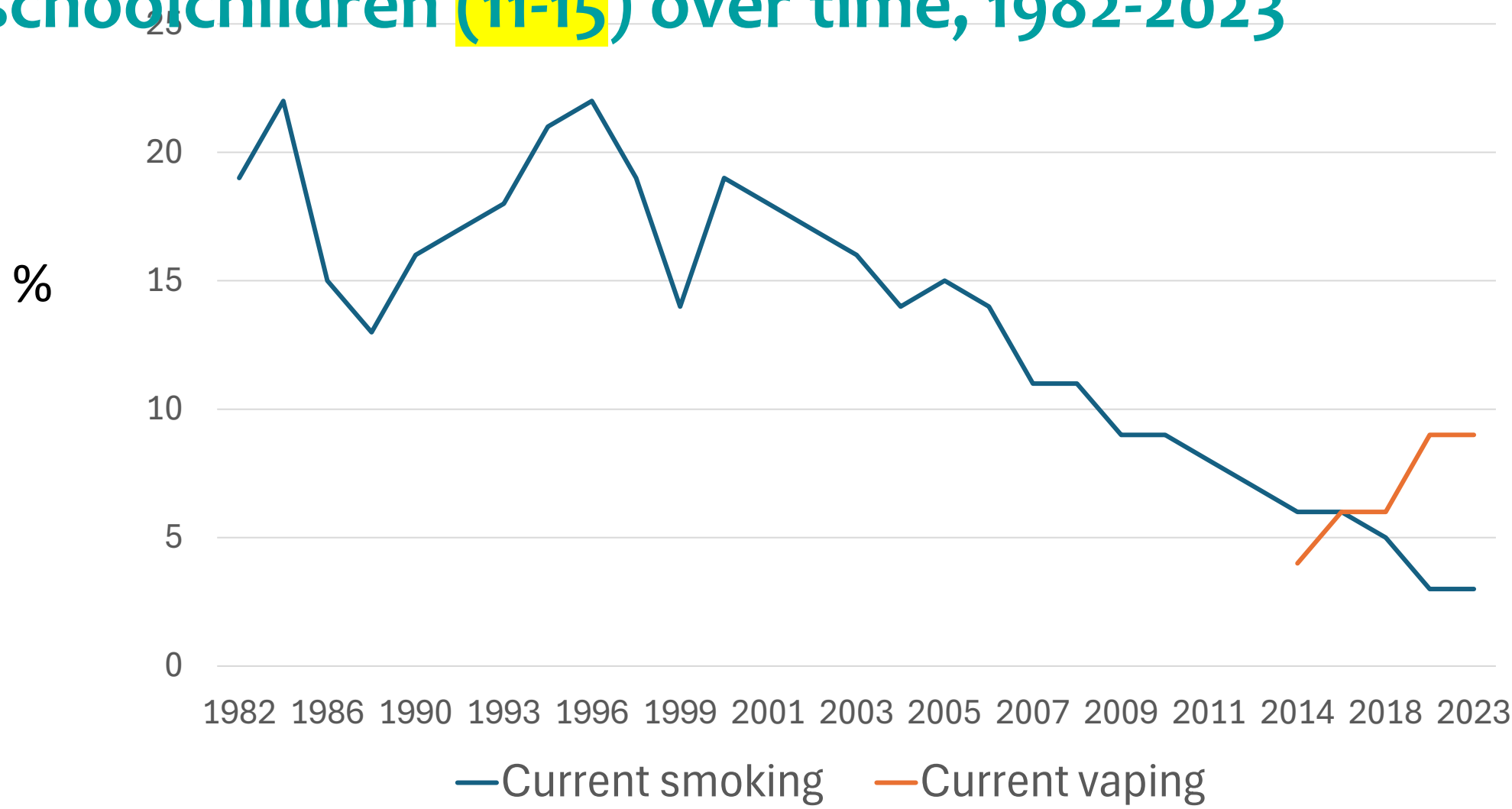
Electronic cigarettes and subsequent cigarette smoking in young people: A systematic review

Rachna Begh¹ | Monserrat Conde¹  | Thomas R. Fanshawe¹ | Dylan Kneale² |
Lion Shahab³  | Sufen Zhu¹ | Michael Pesko⁴  |
Jonathan Livingstone-Banks¹  | Nicola Lindson¹  | Nancy A. Rigotti⁵ |
Kate Tudor⁶ | Dimitra Kale³  | Sarah E. Jackson³  | Karen Rees⁷ |
Jamie Hartmann-Boyce⁸

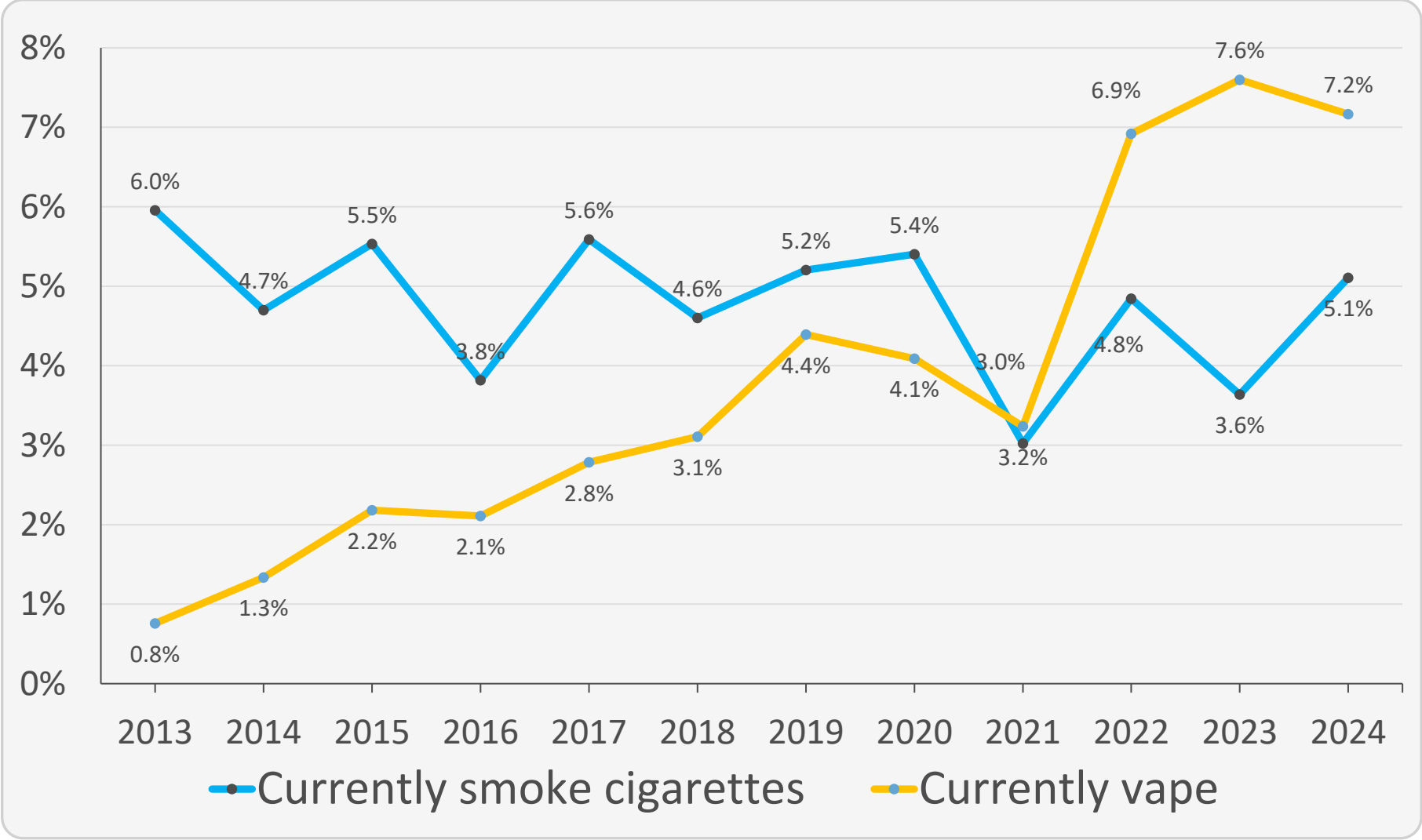
Very low certainty evidence suggests that youth
vaping & smoking could be inversely related

126 studies
98 from US

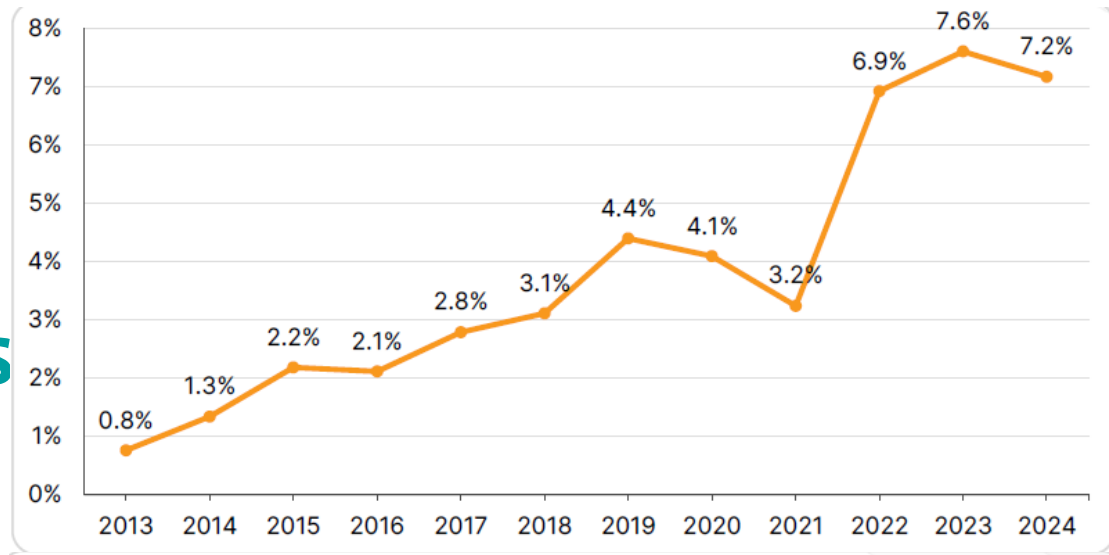
Current use of cigarettes & vapes by England schoolchildren (11-15) over time, 1982-2023



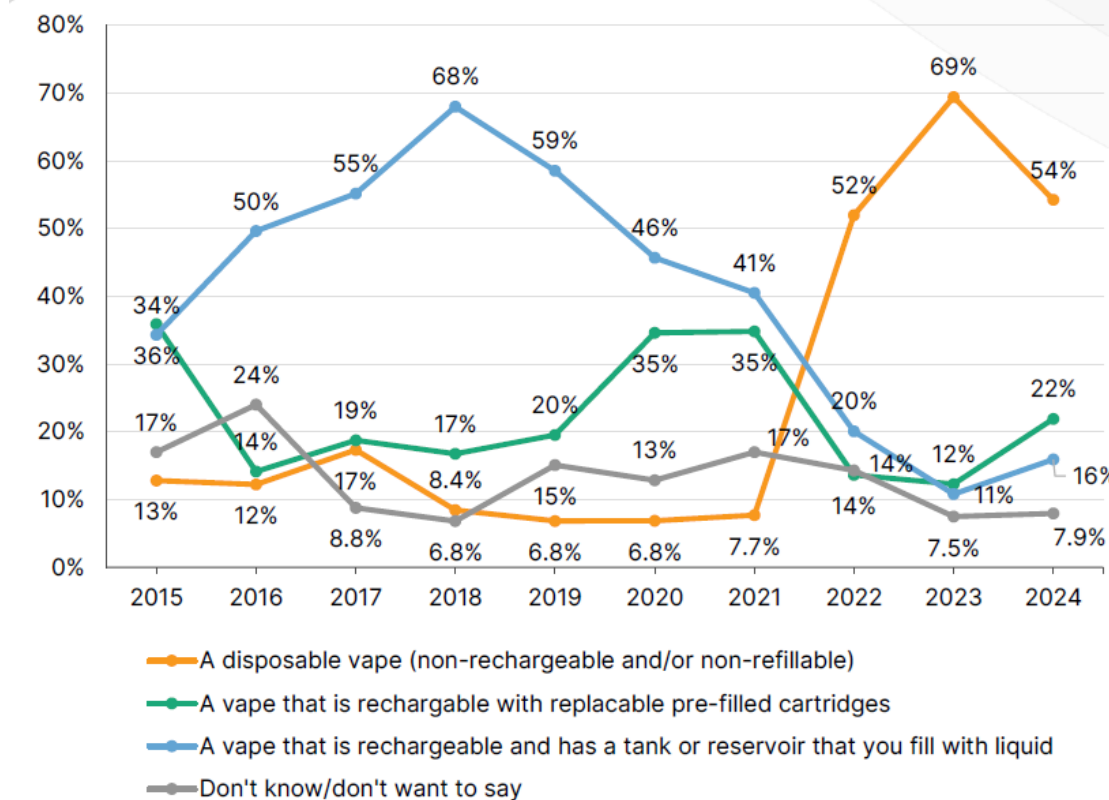
Current use of cigarettes and vapes by GB youth (11-17), 2013-2024



In GB, rise in 11-17 yr old vaping associated with arrival of new disposables

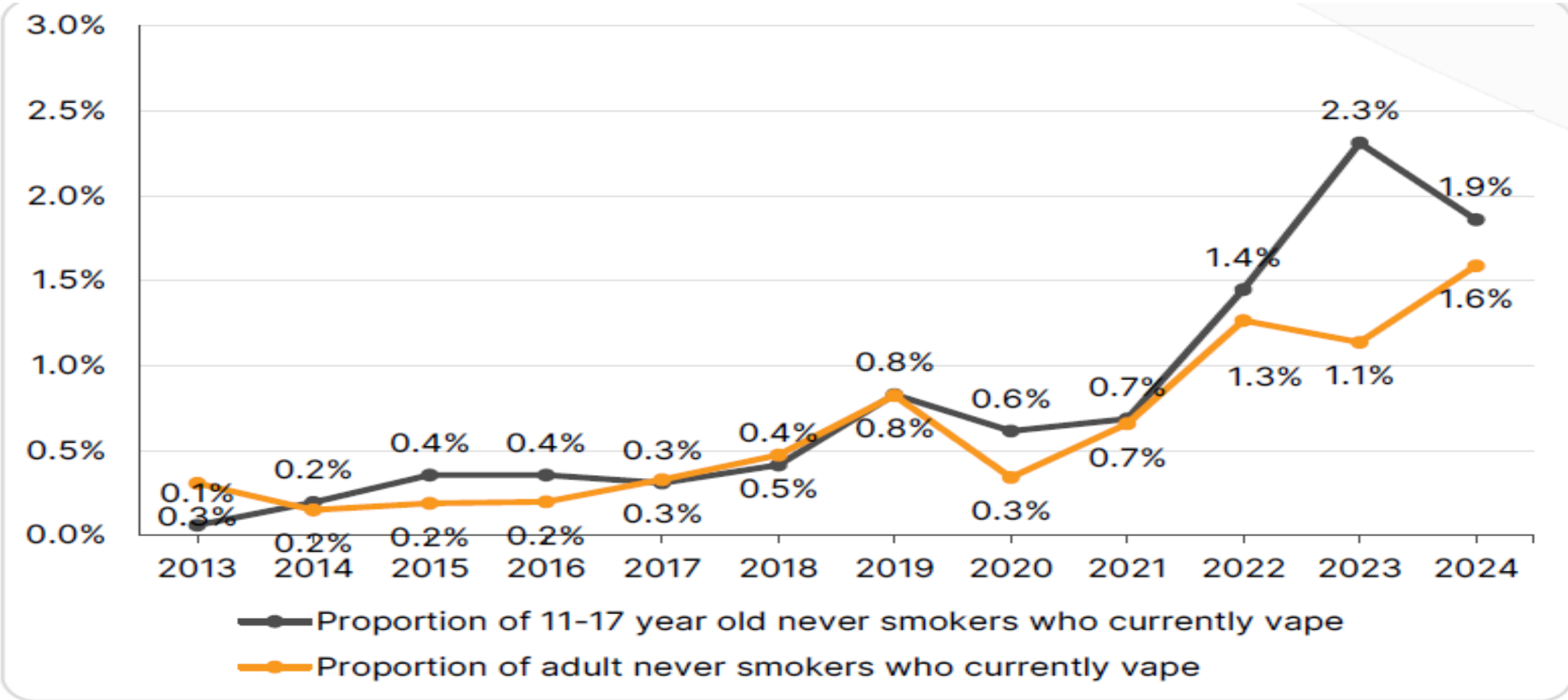


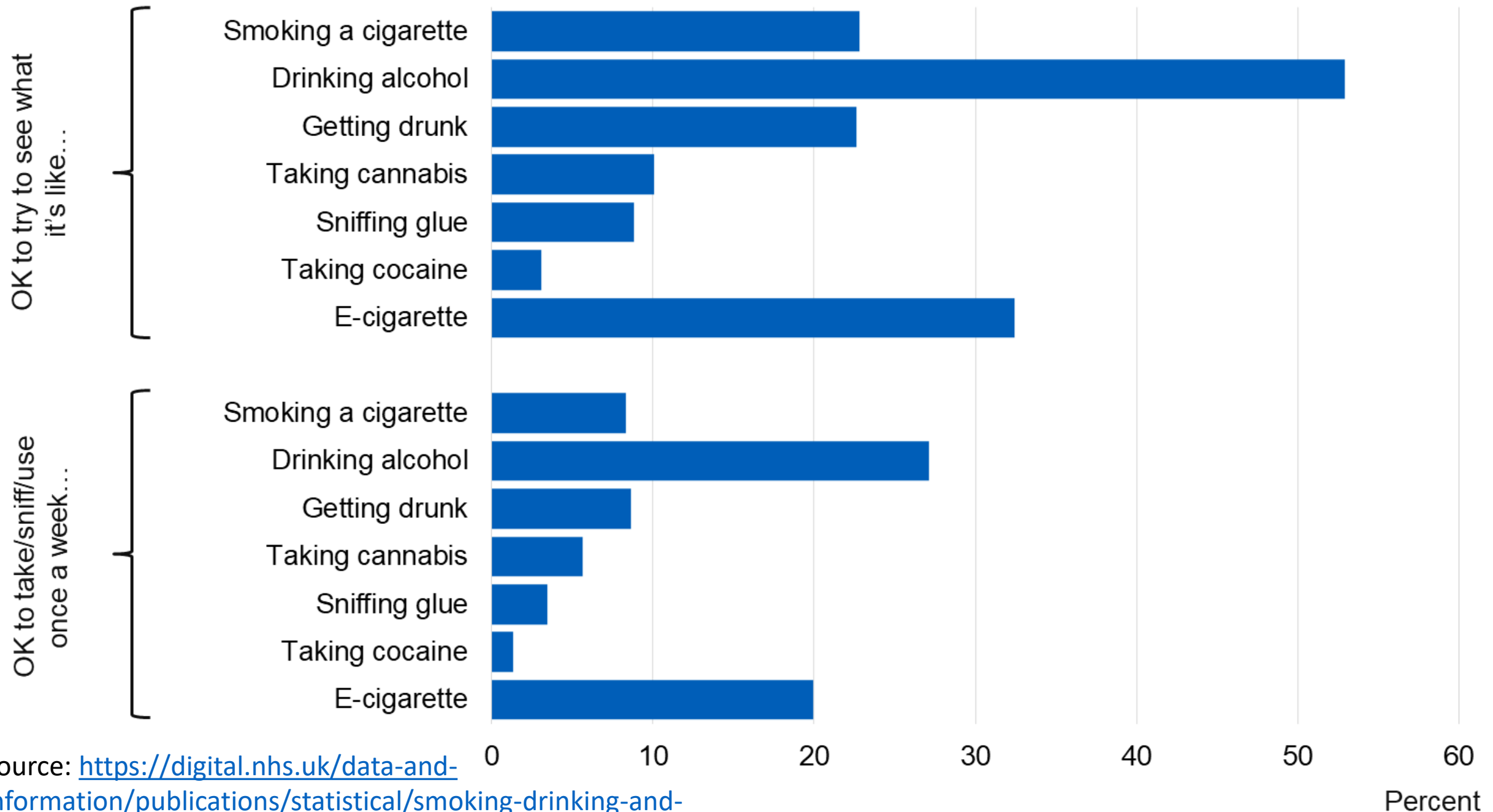
Current
vaping



Use of
different
e-cigarette
models in
current
vapers

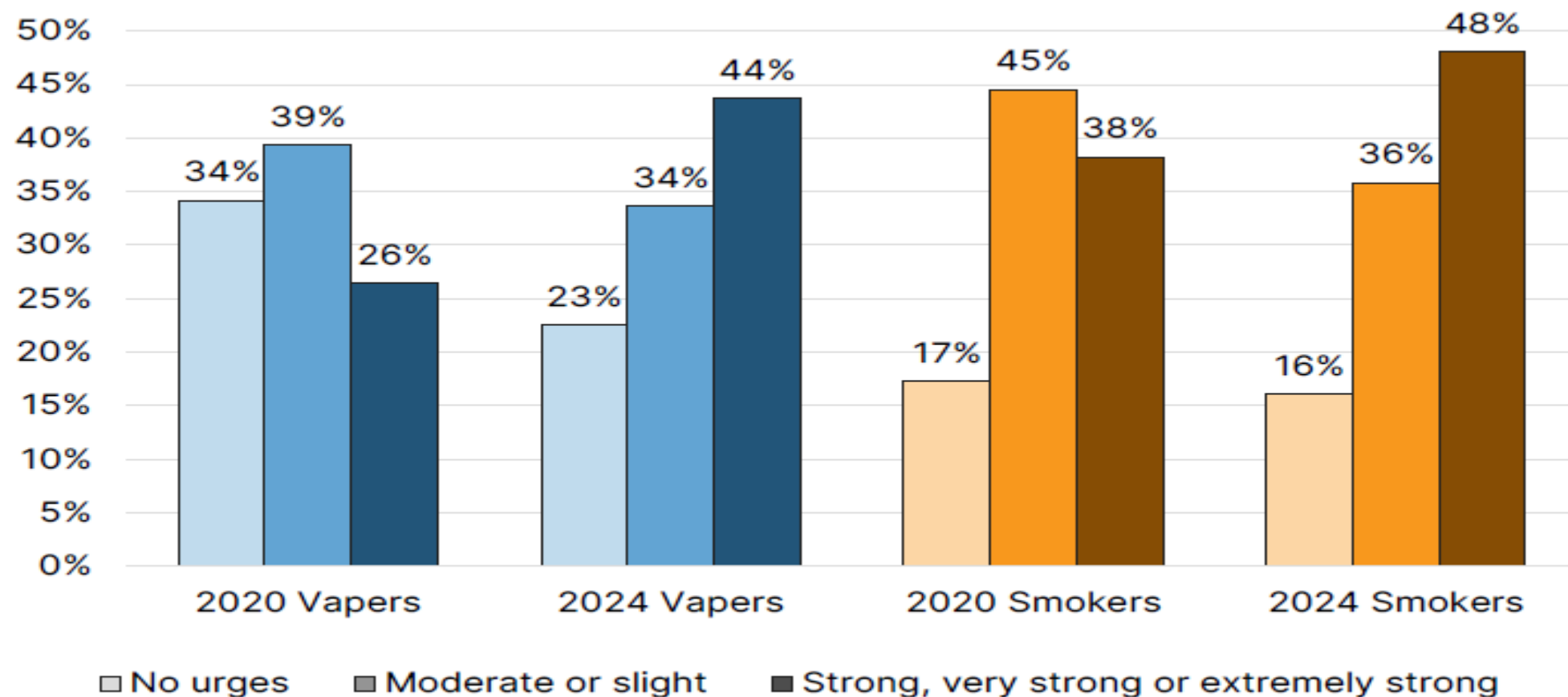
Never smokers who currently vape, GB, 2024 (mostly experimental)





Source: <https://digital.nhs.uk/data-and-information/publications/statistical/smoking-drinking-and-drug-use-among-young-people-in-england/2021>

Figure 12. Reported urge to vape among vapers and reported urge to smoke among smokers, GB youth (11-17), 2020 & 2024



ASH Smokefree GB Youth Survey, 2024. *Unweighted base: 11–17-year-olds, (current vapers 2020=94, current vapers 2024=213, current smokers 2020=76, current smokers 2024=138)*

Recent papers on youth nicotine & toxin exposure



Original Investigation | Substance Use and Addiction

Nicotine Exposure From Smoking Tobacco and Vaping Among Adolescents

David Hammond, PhD; Jessica L. Reid, MSc; Maciej L. Goniewicz, PhD; Ann McNeill, PhD; Richard J. O'Connor, PhD; Danielle Corsetti, MSc; Ashleigh C. Block, MS; Leonie S. Brose, PhD; Deborah Robson, PhD

Abstract

CANCER EPIDEMIOLOGY, BIOMARKERS & PREVENTION

ABOUT ▾ ARTICLES ▾ FOR AUTHORS ▾ ALERTS NEWS CANCER HALLMARKS WEBINARS

RESEARCH ARTICLE | MARCH 19 2025

Biomarkers of Toxicant Exposure among Youth in Canada, England, and the United States Who Vape and/or Smoke Tobacco or Do Neither 🛒

David Hammond ; Jessica L. Reid ; Maciej L. Goniewicz ; Ann McNeill ; Richard J. O'Connor ; Danielle Corsetti ; Leonie S. Brose ; Bradley Schurr ; Deborah Robson



Overall findings

Review evidence suggests e-cigarettes unlikely to be a gateway to smoking (more common liability)

Young people's vaping increased, with some increase among never smoking youth, but much is experimental

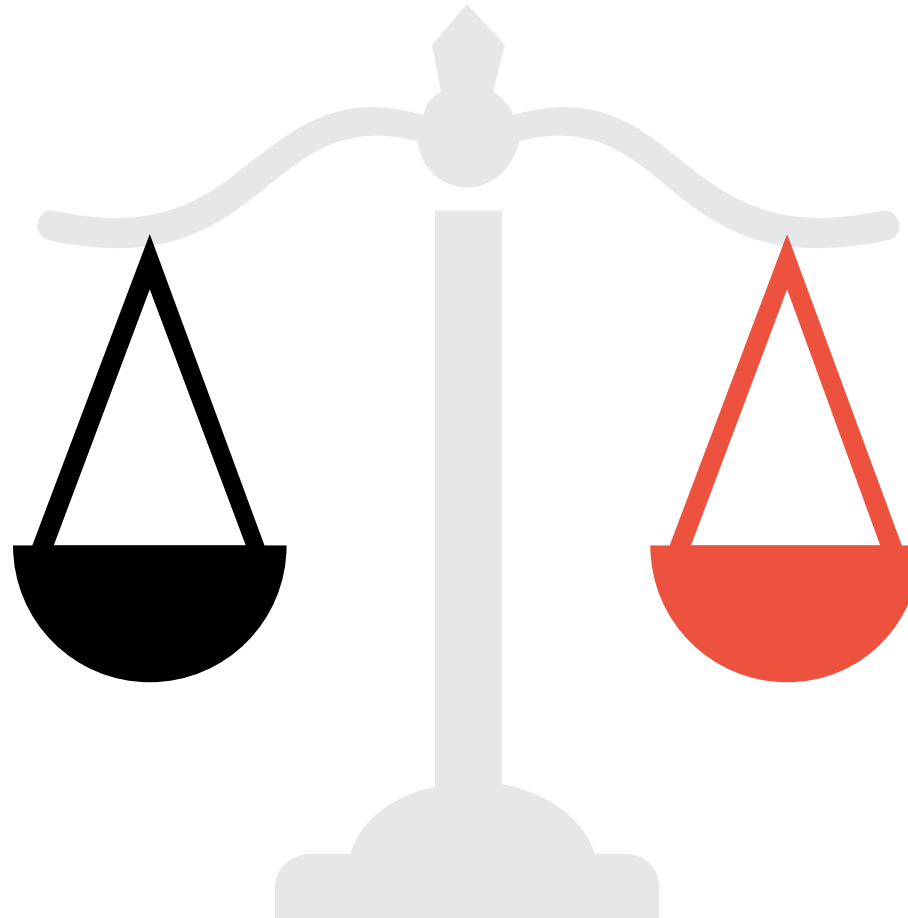
Evidence that some young people who vape are dependent

What is the best regulatory framework for vapes?

One that maximises the benefits, minimises the risks

Maximise smoking
cessation

Ensure use of
regulated, legal vapes



Minimise youth &
never smoker uptake

Minimise use of illicit
vapes

Minimise risks of
vape products

Addictiveness? Affordability? Appeal? Accessibility?



Geek Bar Disposable Pod – £2.99



£2.99 ~~£5.99~~

✓ GET THIS DEAL

New legislation & regulations UK should drive down youth smoking but also limit attractiveness of vapes to young people



TOBACCO & VAPES BILL

**THE ENVIRONMENTAL PROTECTION (SINGLE-USE VAPES)
(ENGLAND) REGULATIONS 2024**

VAPING PRODUCTS TAX

Thank you for listening!



Thanks to King's Nicotine Research Group & other co-authors of evidence updates & Dr Debbie Robson for several slides

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