

Vapes

Health Impacts

Modelling

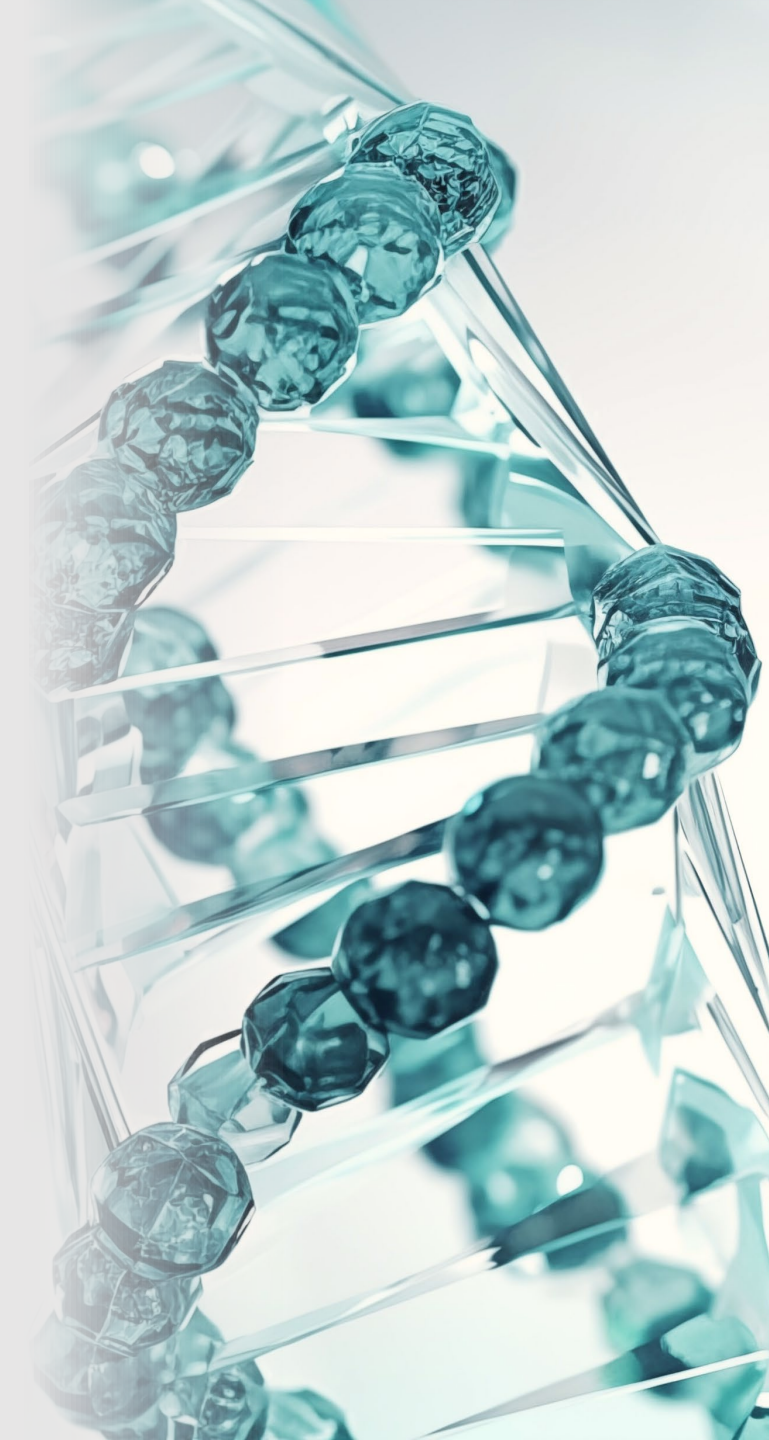
Nicky Draper

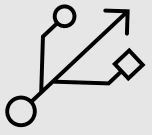
Chris Martin



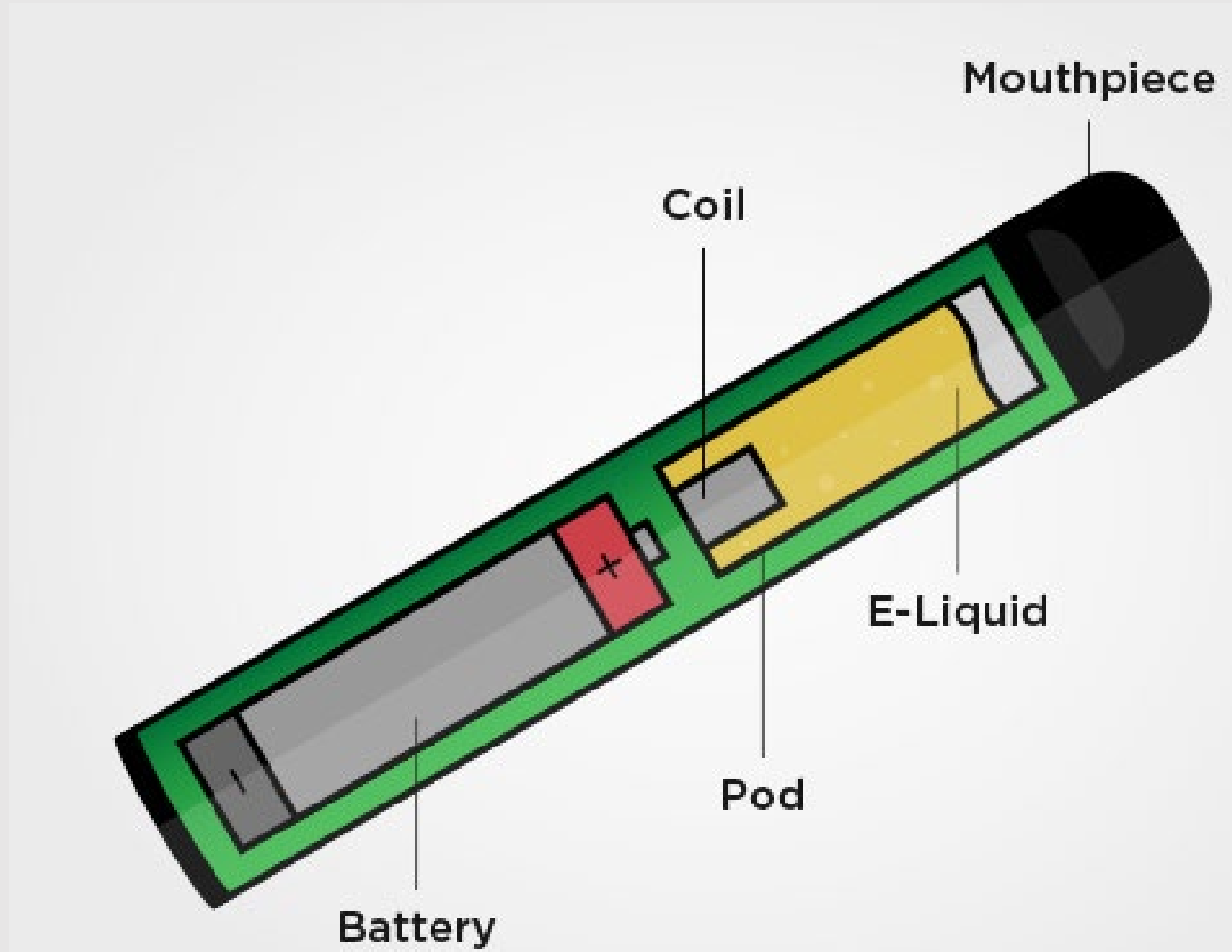
Health Impacts Agenda

- What is a vape device
- Legislative landscape
- Prevalence of use
- Health impacts





What is a vape





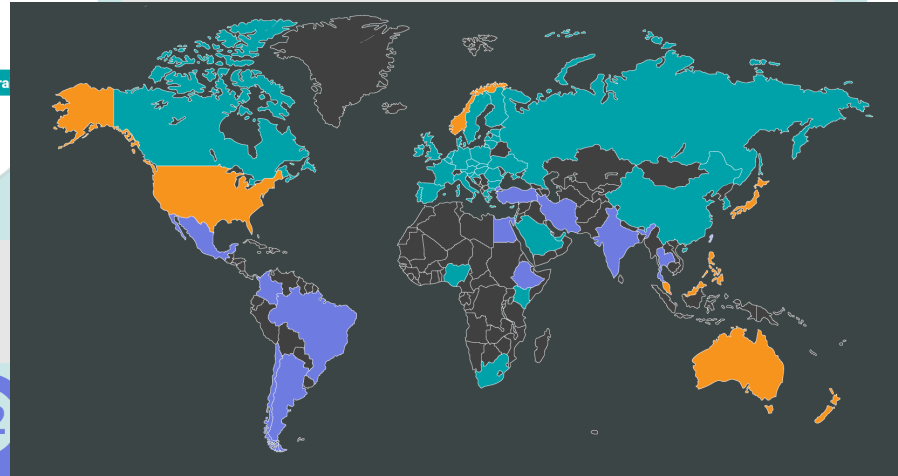
Worldwide regulations



01

COUNTRIES IN WHICH VAPING PRODUCTS ARE LEGAL TO USE AND SELL:

- Canada**
provinces allowed to have their own regulations
- China**
online selling and online advertising banned
- EU**
members allowed to have their own regulations
- Israel**
advertising banned
- Kenya**
- Nigeria**
- Russia**
advertising and online sales banned
- Saudi Arabia**
some flavours restricted
- South Africa**
- South Korea**
- UAE**
100% 'sin tax'
- UK**
advertising severely restricted
- Ukraine**



03

COUNTRIES IN WHICH VAPING PRODUCTS ARE LEGAL BUT WITH STRICT LIMITATIONS ON SALES

(flavour bans, nicotine not allowed, prescription required etc).

- Australia**
nicotine requires prescription, states allowed to have their own regulations
- Japan**
only nicotine-free products can be sold legally
- Malaysia**
only nicotine-free products can be sold legally
- New Zealand**
partial flavour ban, advertising banned
- Norway**
only nicotine-free products can be sold legally
- Philippines**
vaping in public can lead to arrest
- USA**
partial flavour ban, postal delivery ban, states allowed to have their own regulations

02

COUNTRIES IN WHICH VAPING PRODUCTS ARE LEGAL TO USE BUT ILLEGAL TO SELL /ADVERTISE/IMPORT:

- Argentina**
- Brazil**
- Chile**
- Colombia**
- Egypt**
- Ethiopia**
- India**
- Iran**
- Mexico**
- Thailand**
vaping in public can lead to arrest/jail/deportation
- Taiwan**
nicotine-free products not covered by ban
- Turkey**

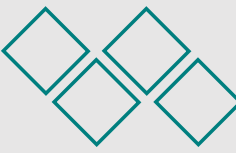
04

COUNTRIES IN WHICH VAPING PRODUCTS ARE ILLEGAL TO USE AND SELL:

- Singapore**



Tobacco and Vapes Bill 2027



Restrictions on flavours

- **Introduction of regulations on the contents**
- **Reduce appeal to younger people**

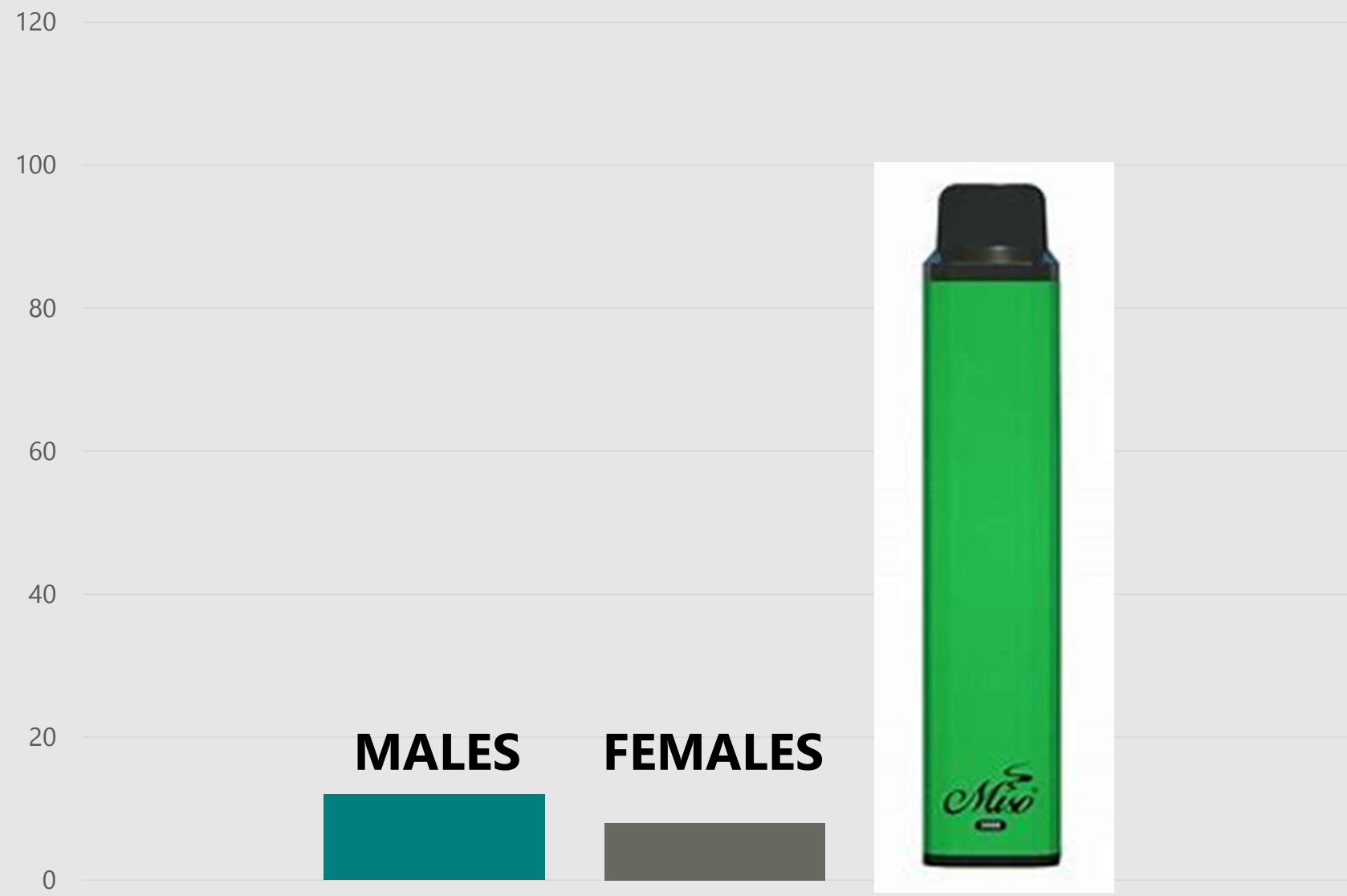
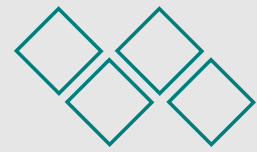
Regulate point of sale displays

- **? Similar approach to cigarette and tobacco point of sale displays**

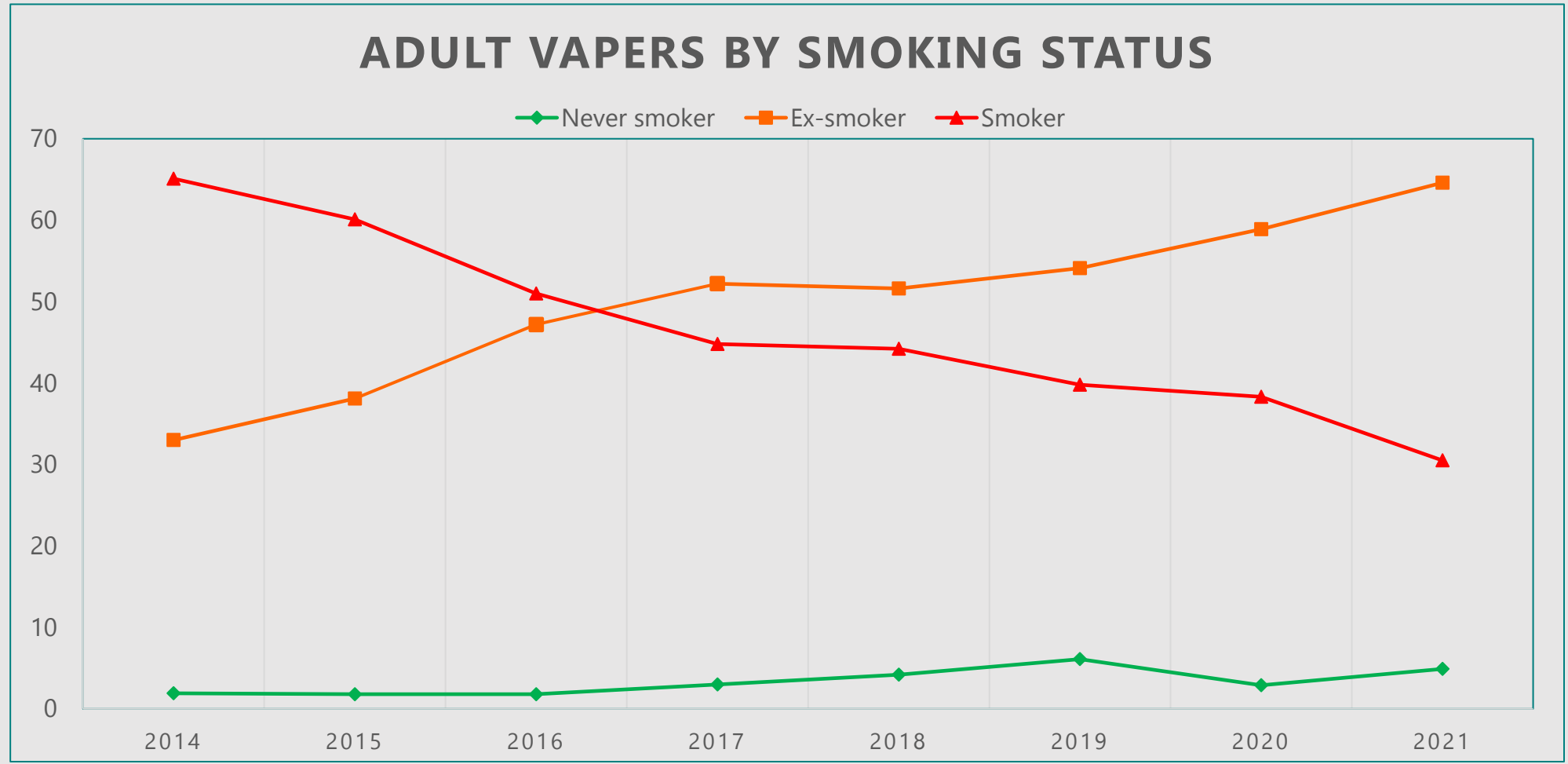
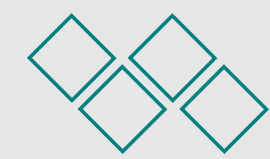
Regulate packaging and product presentation

- **? Plain packaging**
- **Reduce appeal to younger people**

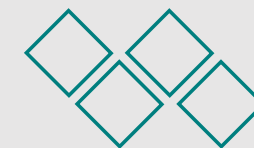
Global vaping



Adult vapers, GB

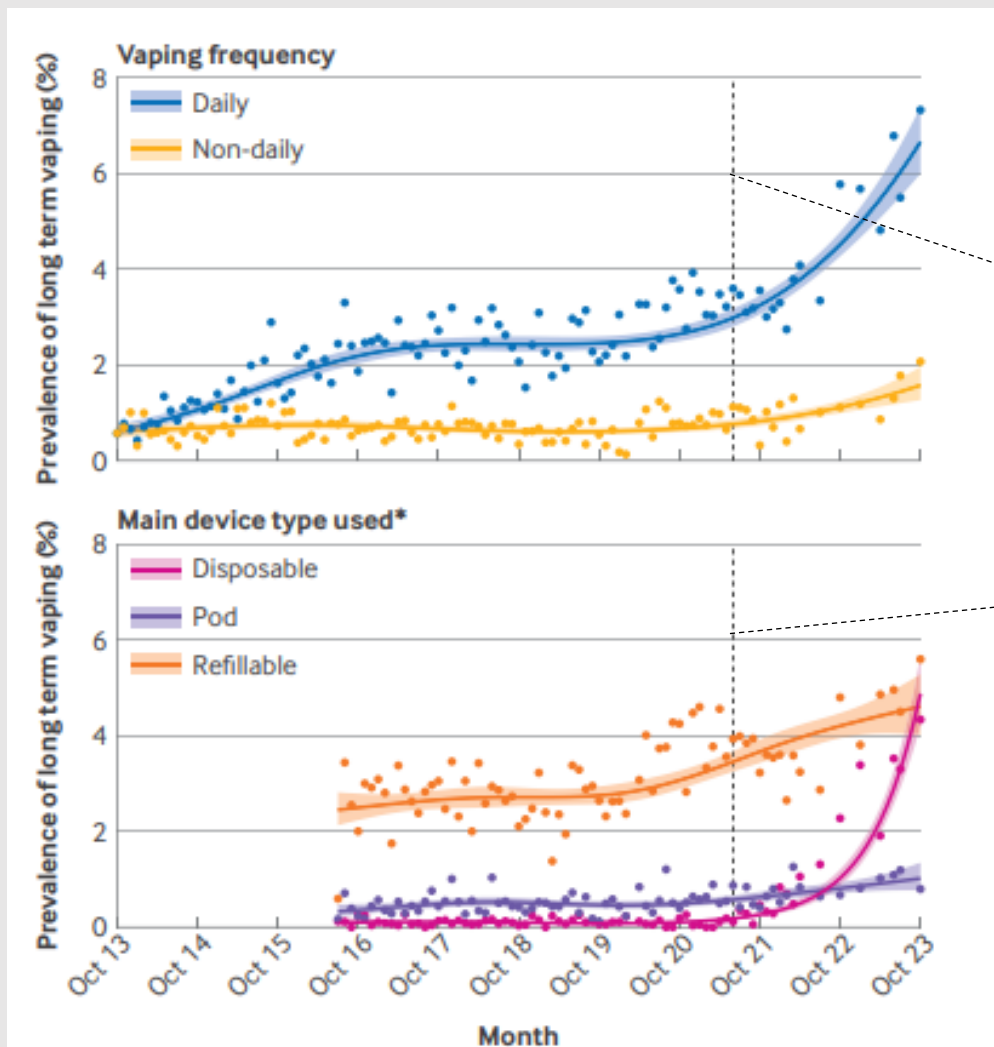


ASH Smokefree GB Adults Surveys
<https://ash.org.uk/resources/view/use-of-e-cigarettes-among-adults-in-great-britain>



Trends in long term vaping among adults in England, 2013-23

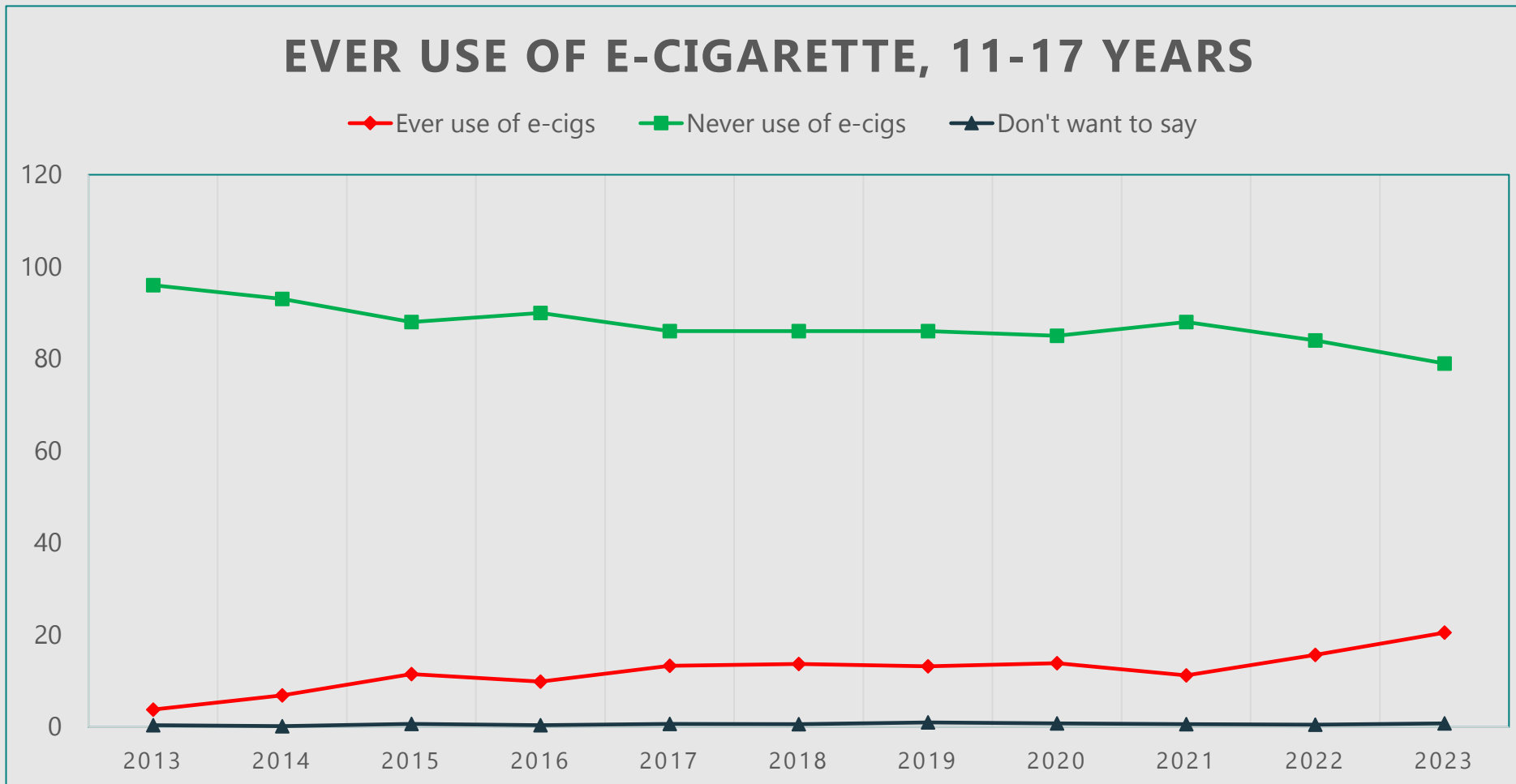
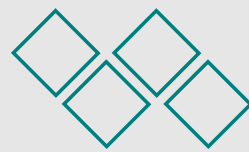
BMJ2024;386:e079016 <http://dx.doi.org/10.1136/bmj-2023-079016>



Vertical dashed line indicates start of the rise in popularity of vaping using disposable devices in June 2021

Trends in long term vaping by frequency and main device type among adults in England, October 2013 to October 2023

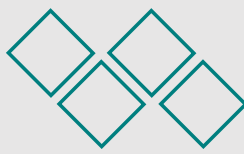
Vaping in young people, GB



ASH Smokefree GB Youth Survey

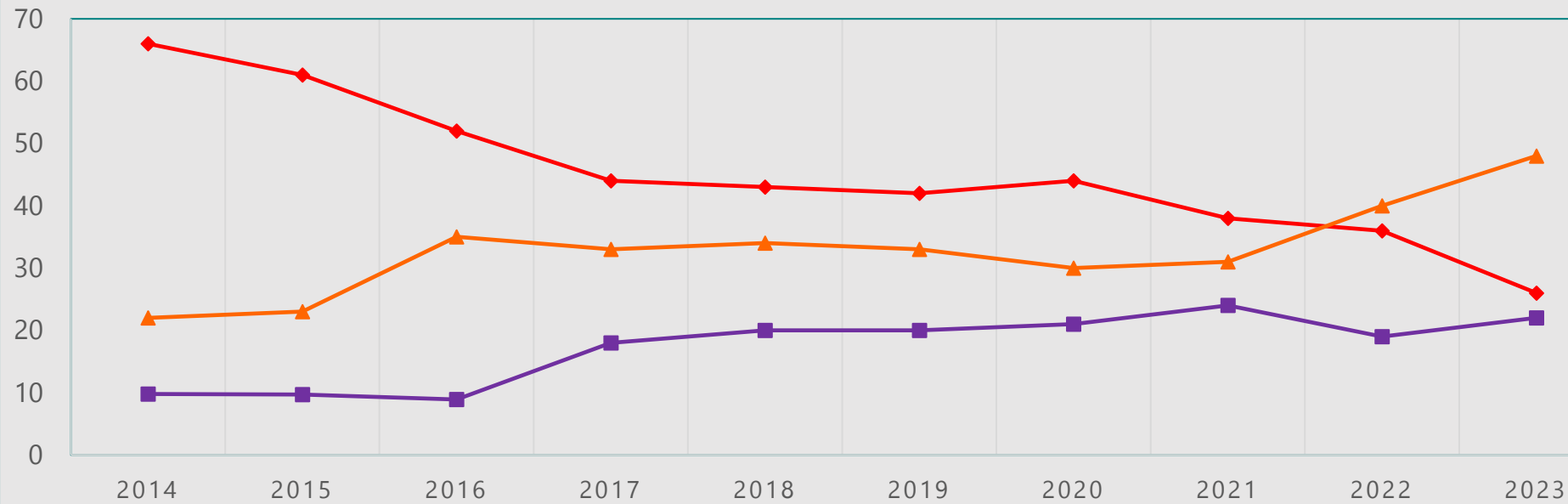
<https://ash.org.uk/resources/view/use-of-e-cigarettes-among-young-people-in-great-britain>

Vaping in young people, GB



PATTERN OF VAPING AND SMOKING, 11-17 YEAR OLDS

- ◆ Tried smoking real cigarette before using an e-cig
- Tried using an e-cigarette before smoking a real cigarette
- ▲ Never smoked a real cigarette but have tried an e-cigarette

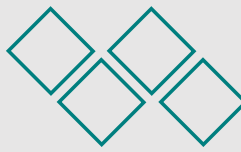


ASH Smokefree GB Youth Survey

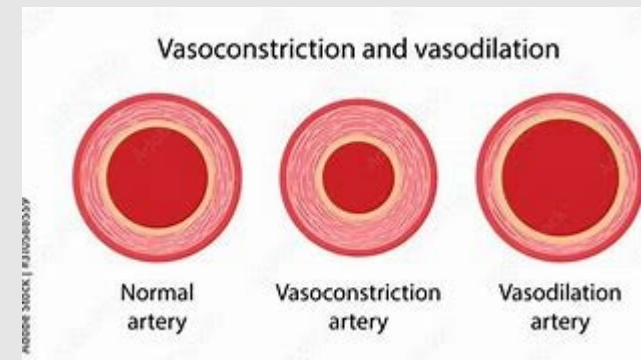
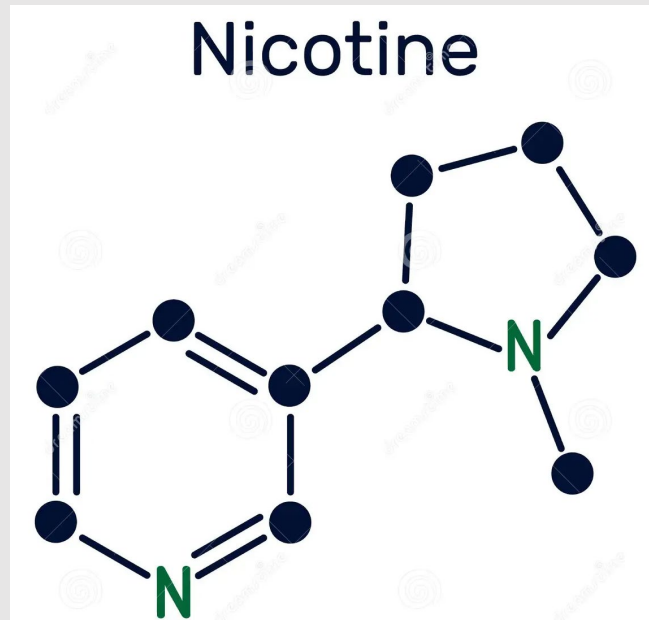
<https://ash.org.uk/resources/view/use-of-e-cigarettes-among-young-people-in-great-britain>



Nicotine

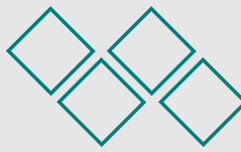


**Nicotine is
NOT harmless**

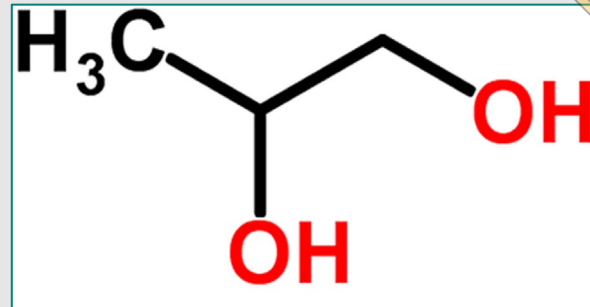
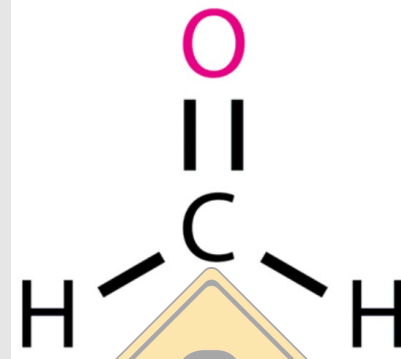




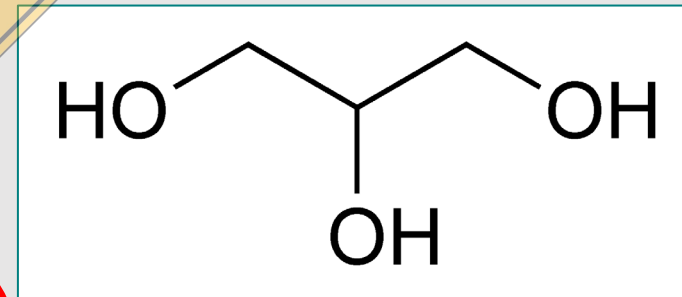
Hemiacetal production



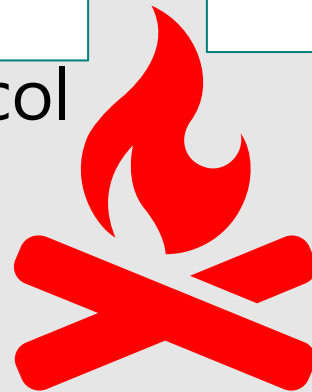
Formaldehyde



Propylene Glycol

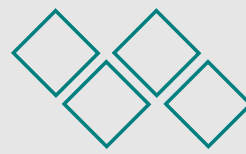


Glycerol





Other compounds



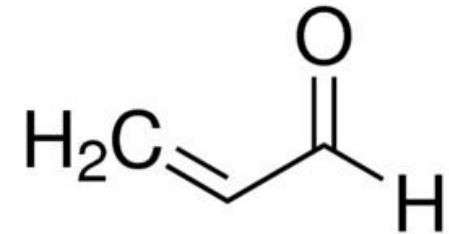
- Naturally occurring chemical compound
- Buttery flavour and aroma
- Bronchiolitis Obliterans

Diacetyl



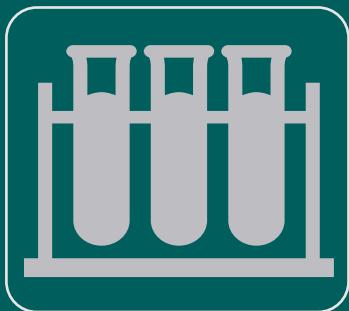
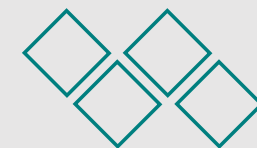
- Oxidative stress
- Respiratory damage
- Cardiovascular implications
- Carcinogenic potential

Acrolein





Effects in non-human studies



Invitro testing

- Surface dehydration
- Induction of cell death
- Decrease in barrier function
- Changes in gene expression



Animal models

- Oxidative stress
- Activation of abnormal cellular response
- Increase in airway hyperresponsiveness

Tsai, M., Byun, M., Shin, J., Alexander, L. Effects of e-cigarettes and vaping devices on cardiac and pulmonary physiology J Physiol 598.22 (2020) pp 5039–5062

Banks, E., Yazidjoglou, A., Brown, S., Nguyen, M., Martin, M., Beckwith, K., Dulawatta, A., Campbell, S., Joshy, G. Electronic cigarettes and health outcomes: umbrella and systematic review of the global evidence Med J Aust . 2023 Apr 3;218(6):267-27



Cardiorespiratory effects

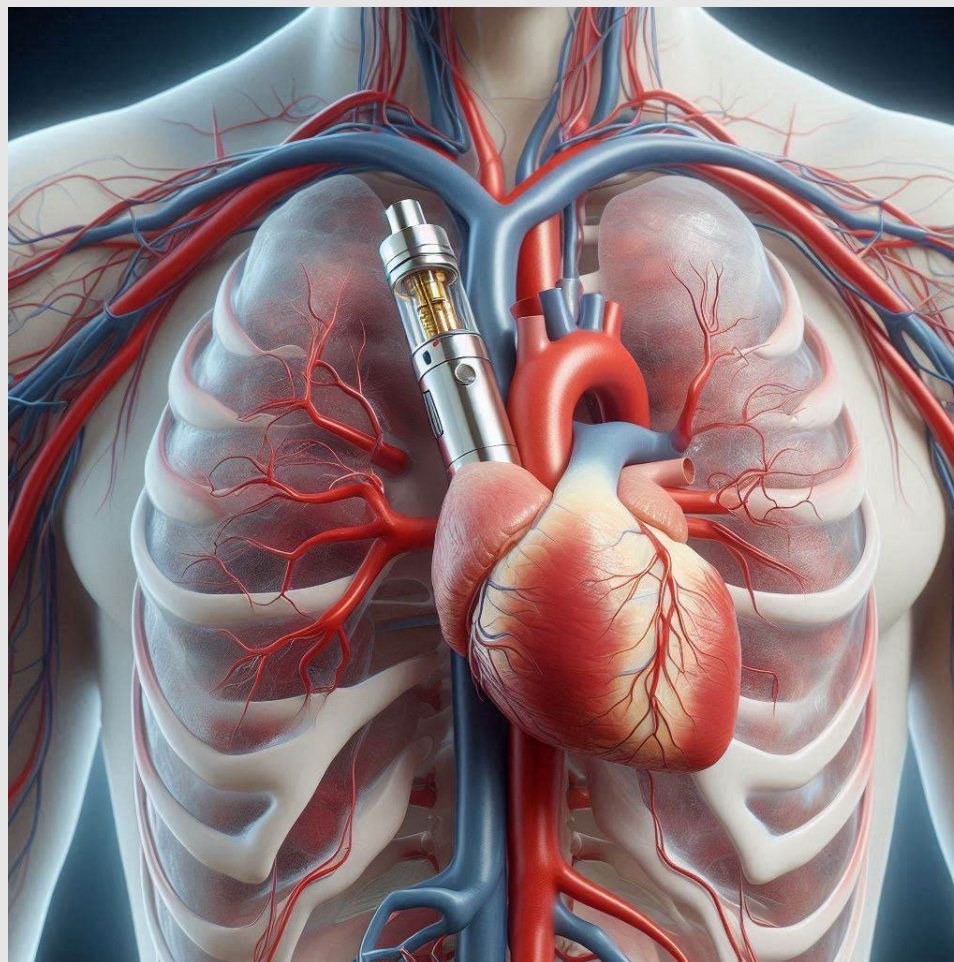


Increased airway resistance ←

Increased airway reactivity ←

Emphysema ←

Airway obstruction & inflammation ←



→ Increased blood pressure

→ Increased aortic stiffness

→ Increased heart rate

→ LV shortening & decreased EF

Image created using OpenArt AI

Tsai, M., Byun, M., Shin, J., Alexander, L. Effects of e-cigarettes and vaping devices on cardiac and pulmonary physiology J Physiol 598.22 (2020) pp 5039–5062

Banks, E., Yazidjoglou, A., Brown, S., Nguyen, M., Martin, M., Beckwith, K., Dulawatta, A., Campbell, S., Joshy, G. Electronic cigarettes and health outcomes: umbrella and systematic review of the global evidence Med J Aust . 2023 Apr 3;218(6):267-27



Respiratory outcomes

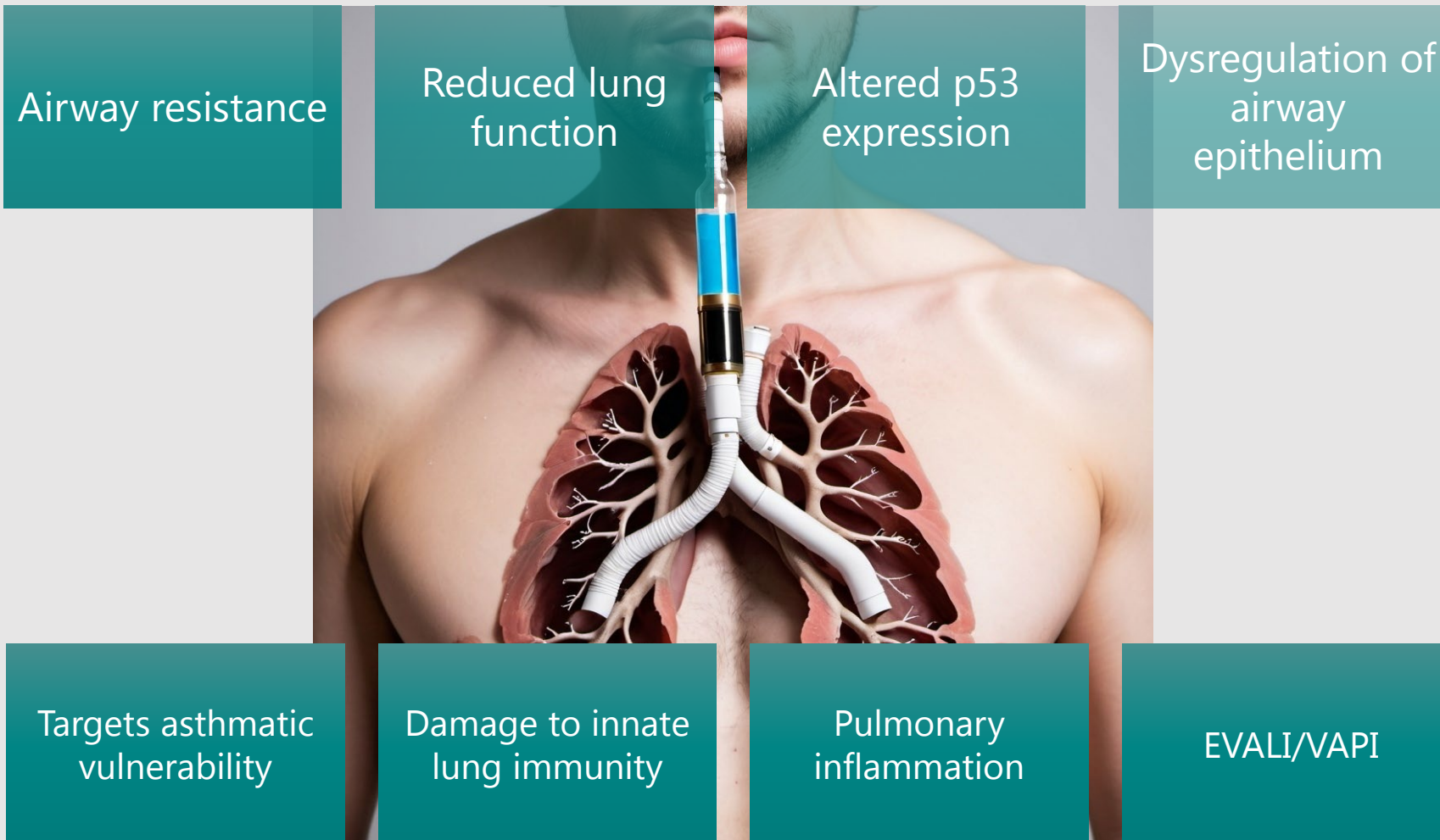


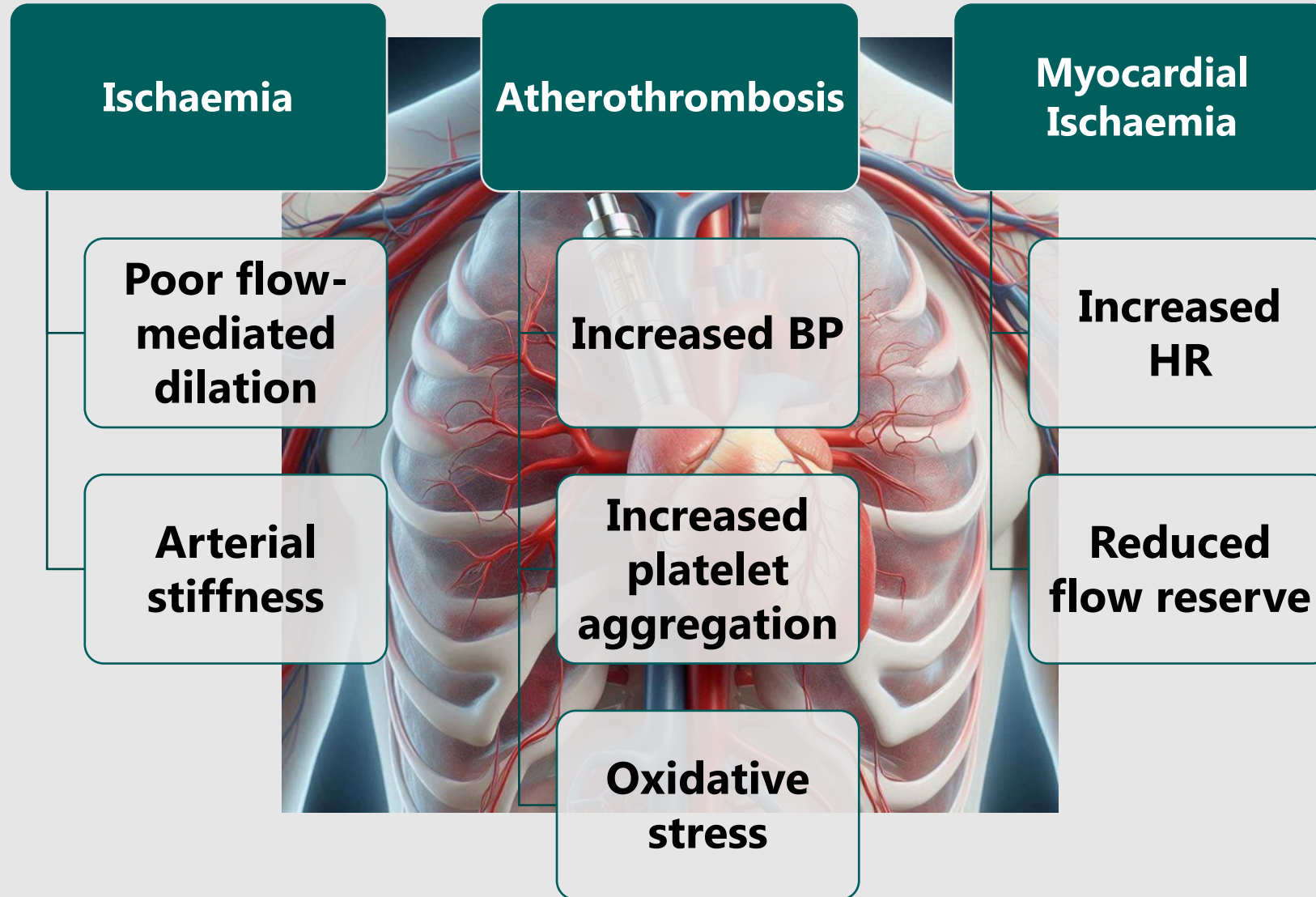
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Cardiovascular outcomes





Press release

Disposable vapes banned to protect children's health

Disposable vapes will be banned in the UK as part of ambitious government plans to tackle and protect children's health.

From: [Department of Health and Social Care, Prime Minister's Office, Department for Environment, Food & Rural Affairs](#)
[The Rt Hon Andrea Leadsom MP](#)

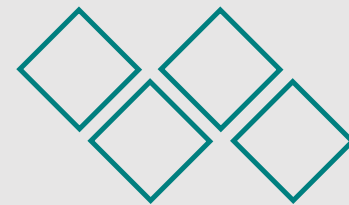
[Show 3 more](#)

Published 28 January 2024

Are you not worried that a ban on disposable vapes will turn adults towards smoking?

No. Adults who vape responsibly will be able to continue to do so.

We are not banning vapes as a whole, just disposable vapes – given the huge impact they have on the environment. Banning disposables will also prevent young people from accessing them.



Nicotine, e-cigarette liquids and some specific additives demonstrate toxic profiles.

There are clear health hazards related to use of vapes/e-cigarettes.

There is an increasing uptake amongst non-smoking young people.

Legislation in the UK aims to ban the sale of disposable vapes.

Long-term large-scale studies required to establish the long-term health impacts.



Modelling potential impacts

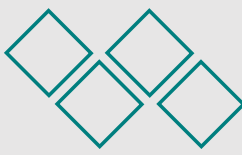
Here we will explore the potential consequences of regular, lifelong use of vapes based on assumptions for Low, medium and high-risk assumptions.

Cause of death modelling is used, by applying risk ratios to:

- Lung cancer
- Chronic obstructive pulmonary disease
- Laryngeal carcinoma
- Lung fibrosis



Modelling background

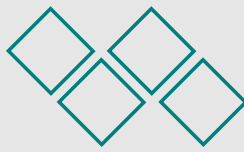


- Several common ingredients of vapes are known to cause respiratory problems.
 - Diacetyl – butter flavouring, e.g. for popcorn. Can cause bronchiolitis obliterans risk ratio ~ 4.
 - Acroline – an irritant that is a component of tobacco smoke. May contribute to the risk of lung cancer.
 - Formaldehyde – classed as a carcinogen. A component of tobacco smoke.

For reference

- Tobacco smoke increases the risk of respiratory cancers and COPD by about 20 times in regular long-term users.
- Cigarettes were invented in the 1890s. It was the 1950s before it was demonstrated to be carcinogenic and it then took decades for those risks to be universally accepted.

Modelling assumptions

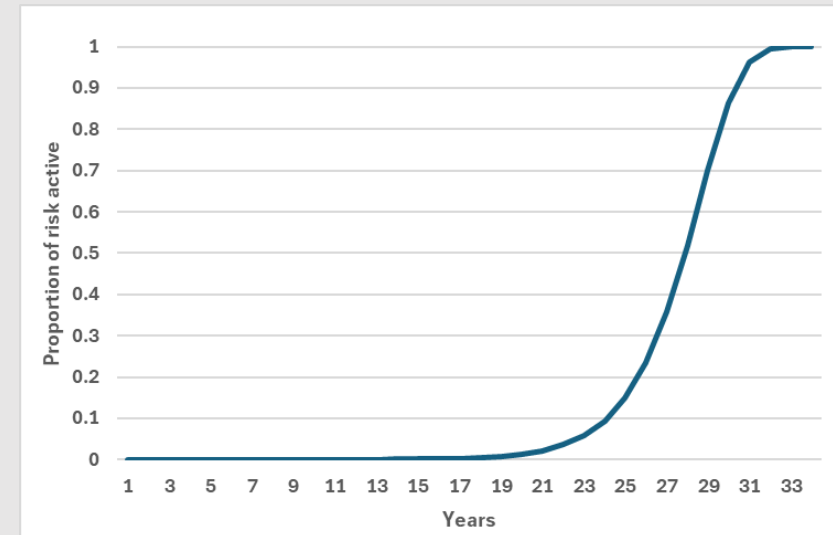


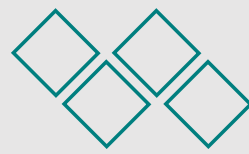
- **Hazard ratio choices**

	COPD	Lung CA	Laryngeal Ca	Lung fibrosis
Low	2	2	2	2
Medium	12.5	10	10	5
High	25	20	20	10

- **Growth of risk**

- **The time taken for the increased risk to emerge**

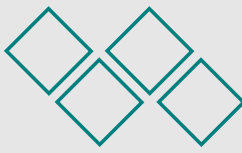




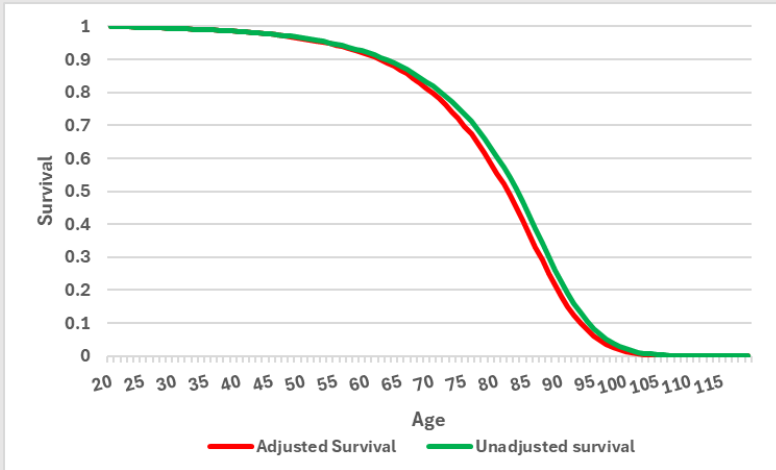
Modelling assumptions

- Exemplar is a 20-year-old male in 2019 (England and Wales) who becomes a persistent regular vaper – no quitting or breaks.
- Vaping consumption remains the same over time.
- No mortality improvement rates.
- Background smoking prevalence in the population remains unchanged over the next 100 years.

Results



Low



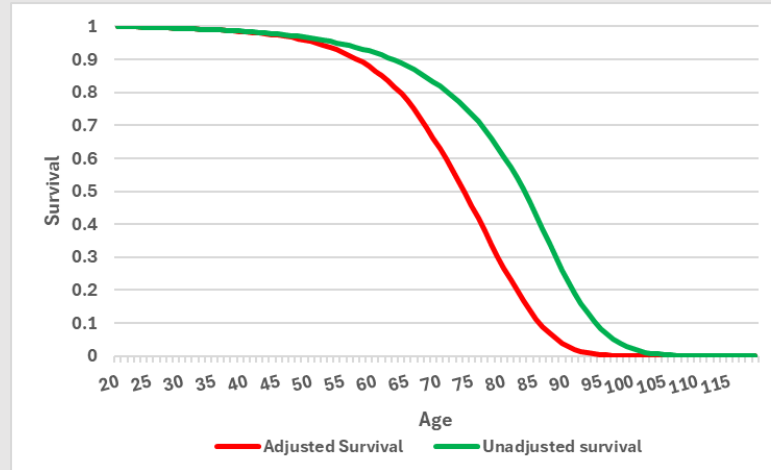
Median survival

Unadjusted – 81.6

Adjusted – 83.1

$\Delta = 1.5$ years

Medium



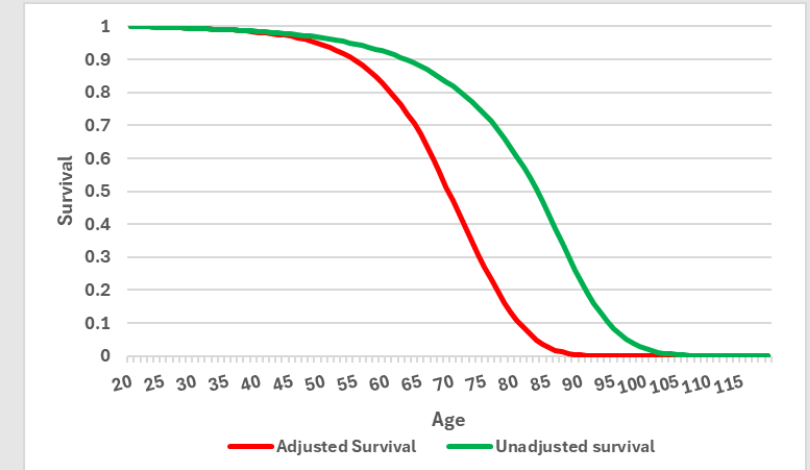
Median survival

Unadjusted – 81.6

Adjusted – 73.8

$\Delta = 7.8$ years

High

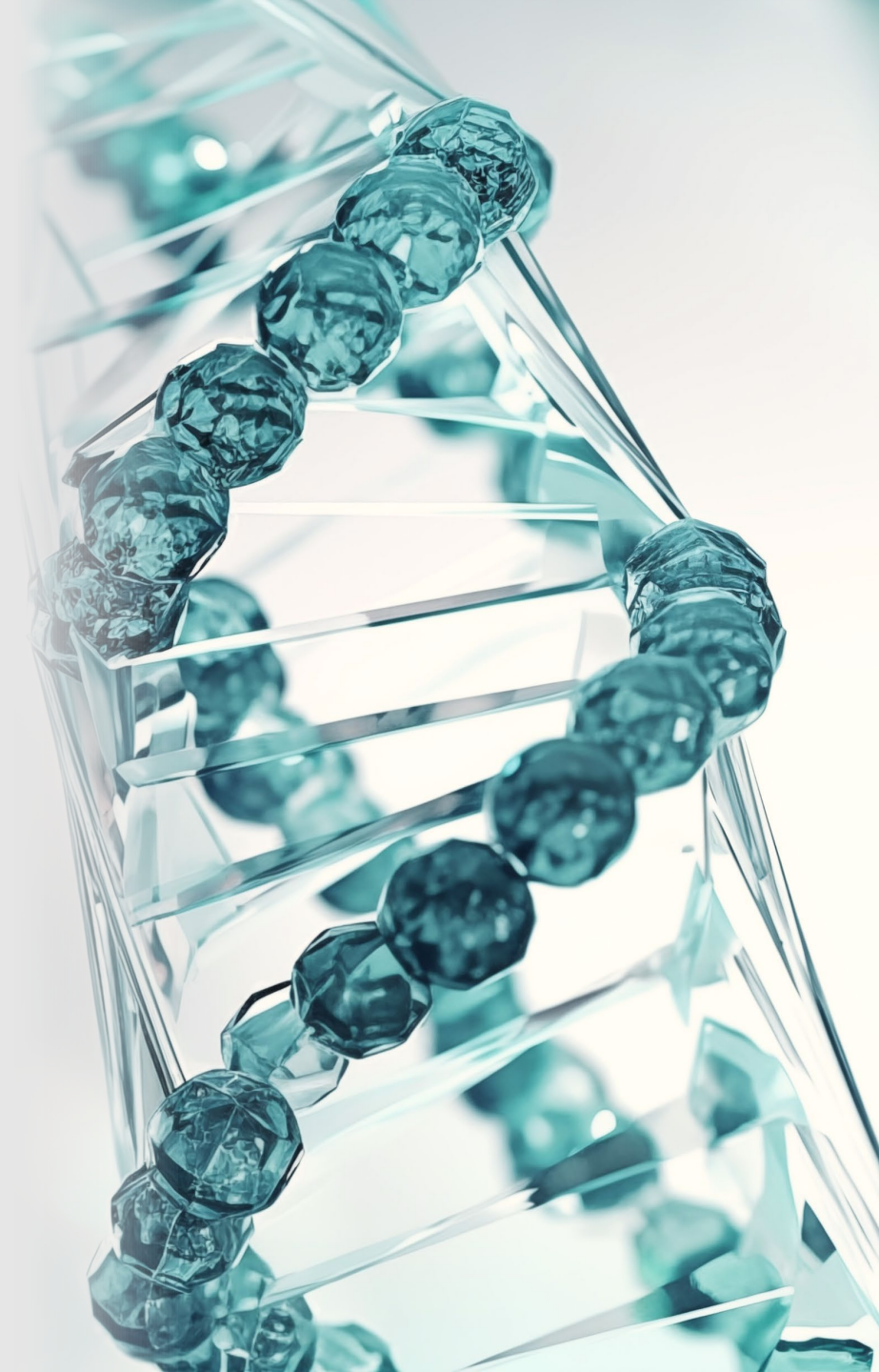
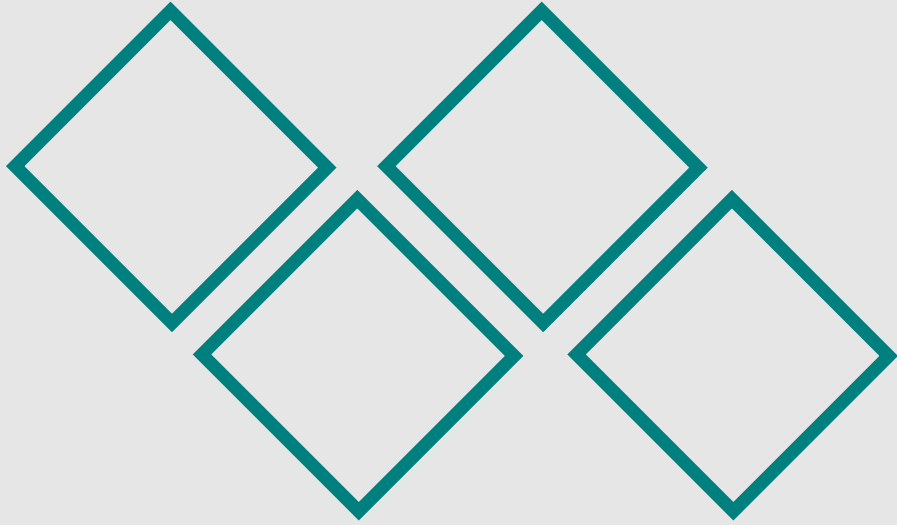


Median survival

Unadjusted – 81.6

Adjusted – 69.3

$\Delta = 12.3$ years



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