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

KING'S College LONDON

Authors, collaborators & acknowledgements

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

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Methods

- We used routine survey data for assessing youth & adult vaping behaviours
  - Action on Smoking and Health
  - Smoking Toolkit Study
- We carried out 2 new systematic reviews:
  - Systematic review of health risks of vaping
  - Systematic review of vaping risk perceptions & communications

Topline message

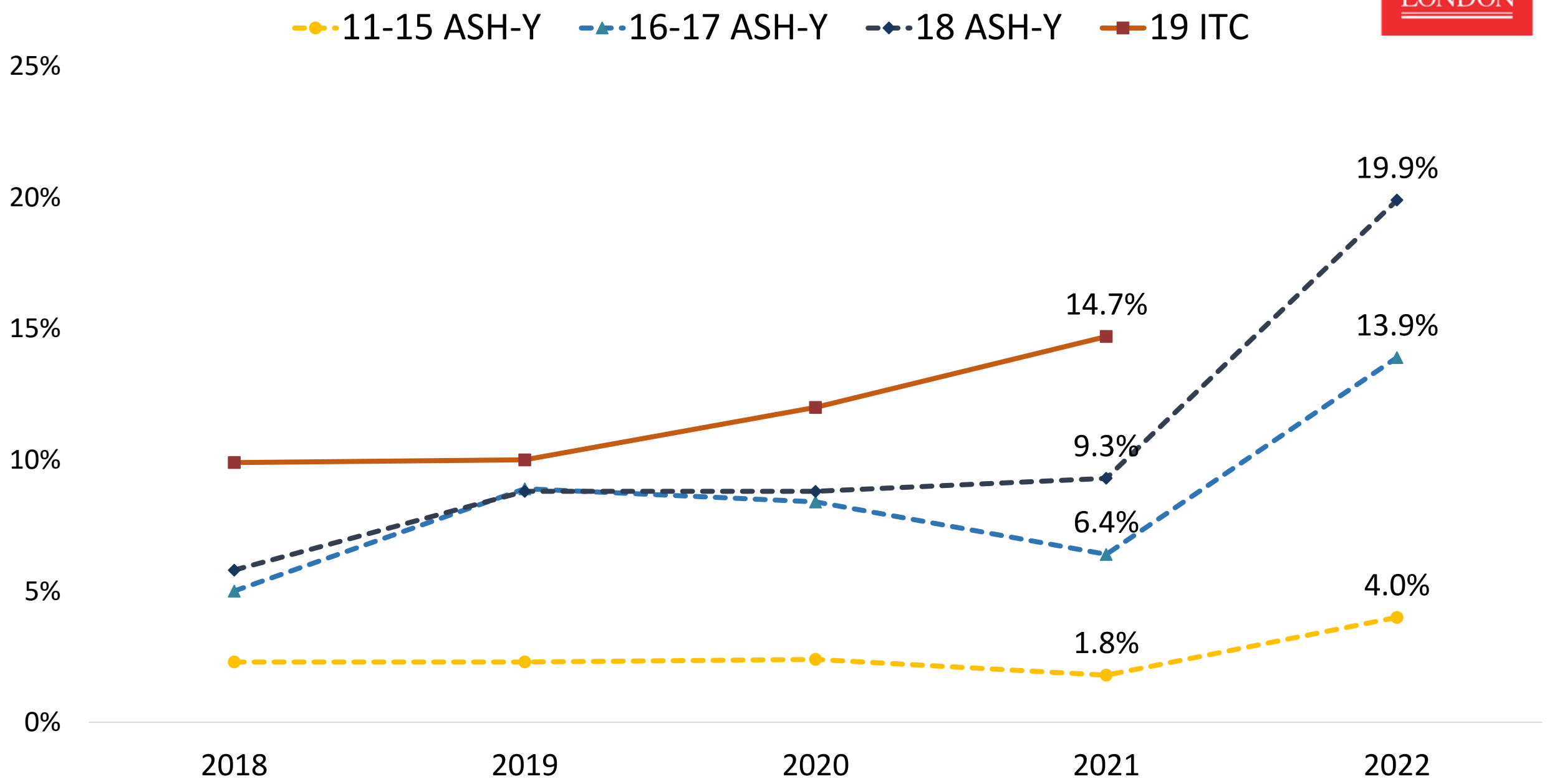
Vaping poses only a small fraction of the risks of smoking in short-to-medium term

This does not mean vaping is risk-free, particularly for people who have never smoked

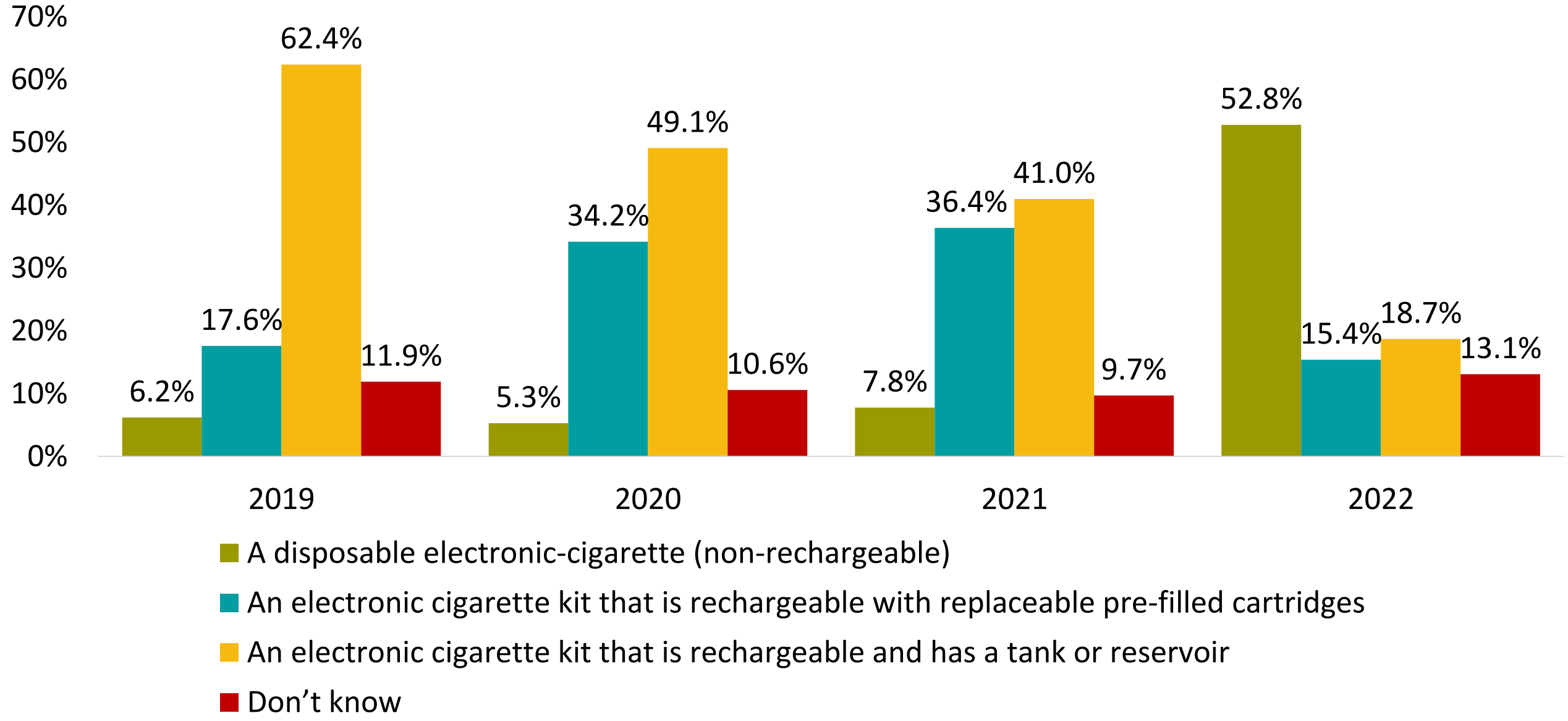
Smoking & vaping among young people in England

ASH Surveys	2019	2020	2021	2022
Smoking status %				
Never tried	79.7	80.9	83.5	80.2
Tried only	9.0	8.3	8.6	8.1
Former	3.4	3.0	3.0	3.7
Current	**6.3**	**6.7**	**4.1**	**6.0**
Vaping status %				
Never tried	83.6	82.8	86.3	80.9
Tried only	9.4	10.0	8.6	9.1
Former	0.9	1.8	1.2	1.4
Current	**4.8**	**4.8**	**4.0**	**8.6**

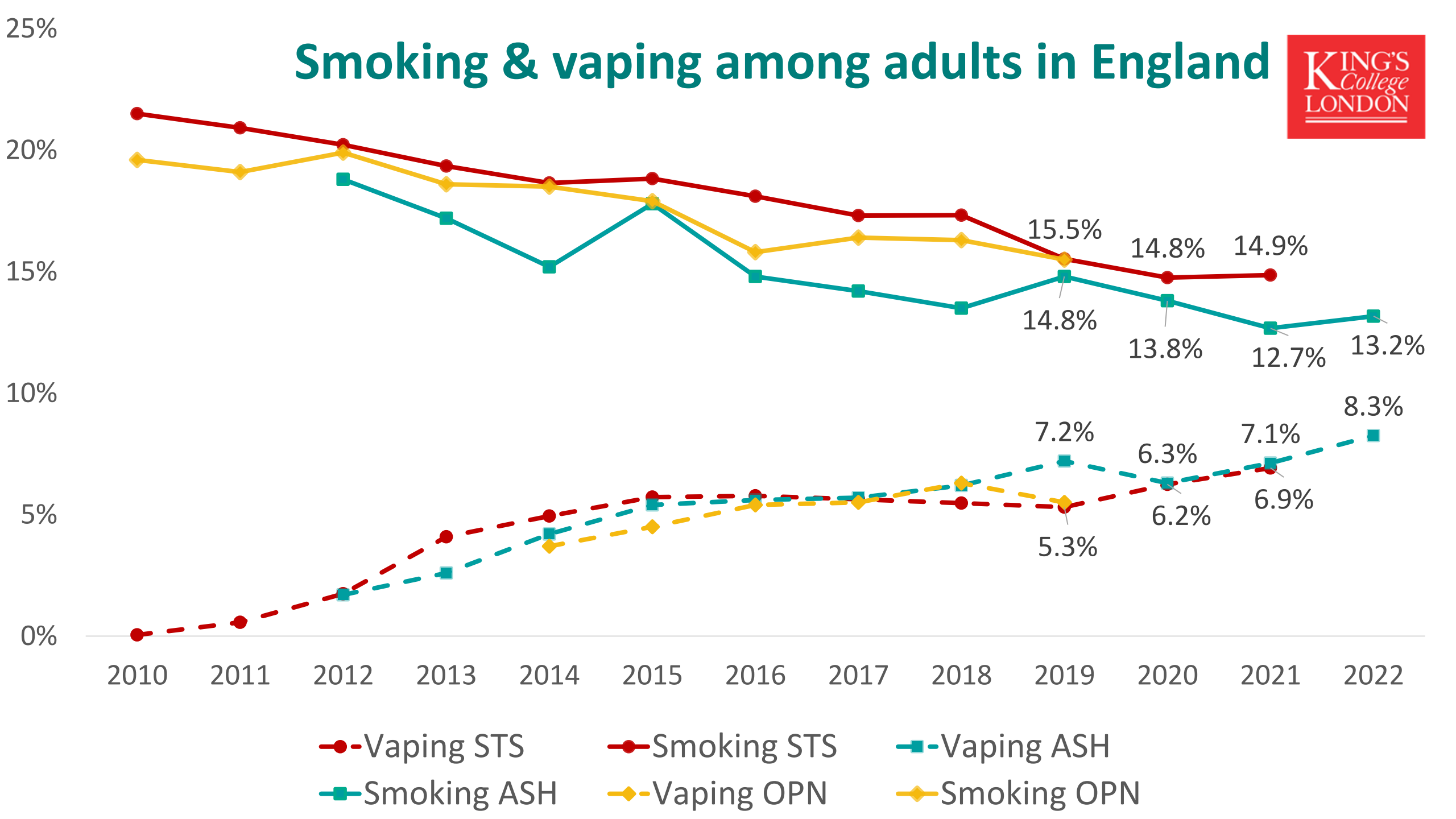
Vaping among young people in England



Type of vaping product used by people aged 11 to 18 who currently vape, England 2019-2022



Smoking & vaping among adults in England



Systematic literature review: Health risks of vaping

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PROSPERO
International prospective register of systematic reviews

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A systematic review of the health risks and health effects of vaping

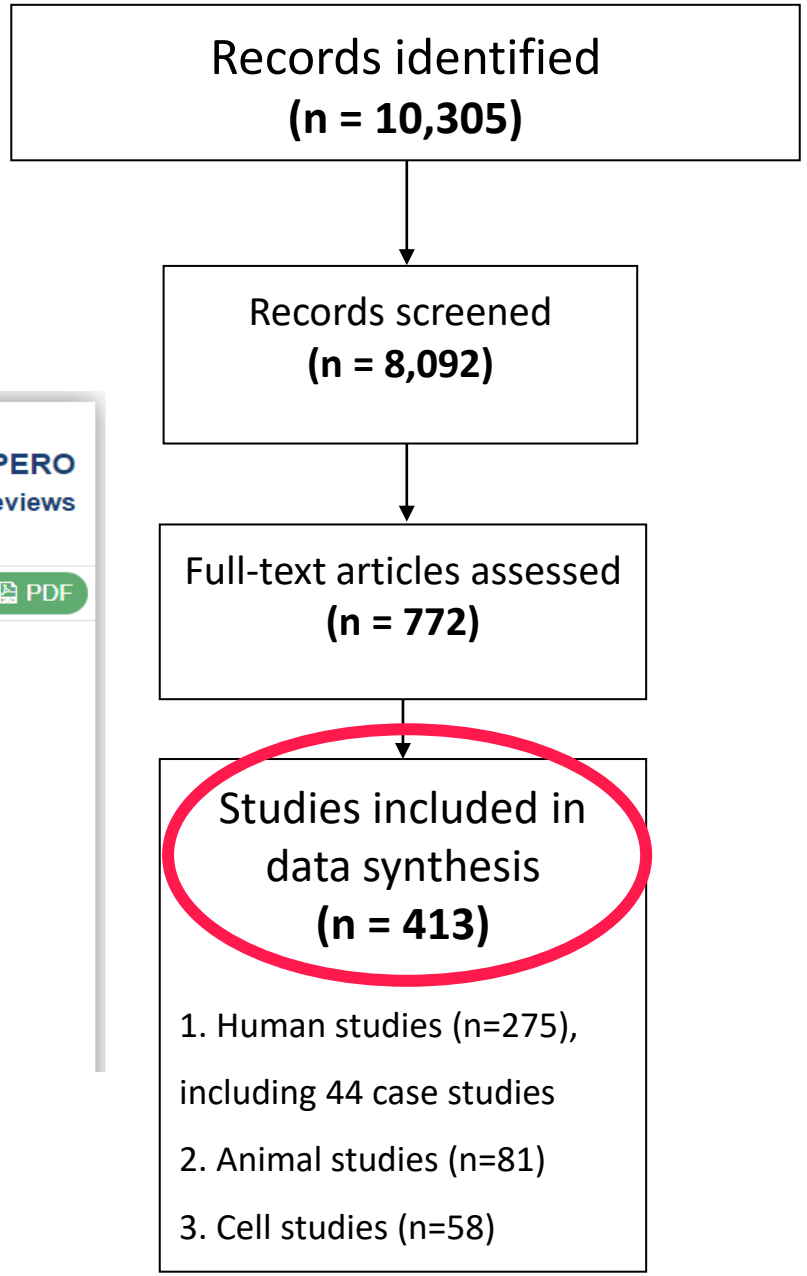
Debbie Robson, Leonie Brose, Robert Calder, Eve Taylor, Linda Bauld, Ann McNeill

Citation

Debbie Robson, Leonie Brose, Robert Calder, Eve Taylor, Linda Bauld, Ann McNeill. A systematic review of the health risks and health effects of vaping. PROSPERO 2020 CRD42020215915 Available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42020215915

Review question

1. What effect does vaping (active and second-hand) have on the risk of getting cancers, respiratory disease, cardiovascular disease and other health conditions?
2. Among people with existing health conditions (as above), what are the effects of vaping on disease outcomes?



Biomarkers of exposure to nicotine & potential toxicants

- Associations of vaping with WHO biomarkers of priority toxicants (nicotine, carbon monoxide, tobacco-specific nitrosamines, volatile organic compounds, metals and other potential toxicants)
- 55 meta-analyses

Metabolites (toxicants)	Vaping vs Smoking (relative risk)	Vaping vs Non-use (absolute risk)
↓ significantly lower, ↑ significantly higher, = no significant difference, – not enough data to meta-analyse		
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	↓	–

Please note:

These are findings from a small number of studies that have been meta-analysed. The larger part of the included studies were narratively reviewed and summary of their findings is provided in Chapter 7 of the report.

Biomarkers of exposure to nicotine & potential toxicants

Overall

- Toxicant exposure was **significantly lower** among vapers than smokers
- Toxicant exposure was **similar or higher** among vapers than non-users

For secondhand exposure to vaping

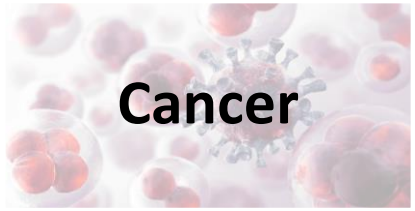
- Several studies found that acute secondhand exposure to vaping aerosol resulted in non-significant changes in levels of toxicant biomarkers

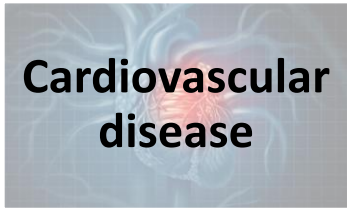
Biomarkers of potential harm to health

- Associations of vaping with biomarkers of potential harm:
    1) Specific to cancer, respiratory, cardiovascular & other diseases
    2) Cutting across multiple diseases

- **Mixed evidence** about negative vaping effects on biomarkers of potential harm
- **No major causes of concern** regarding vaping harm to health in acute and short-to-medium term

Biomarkers of exposure to potential toxicants



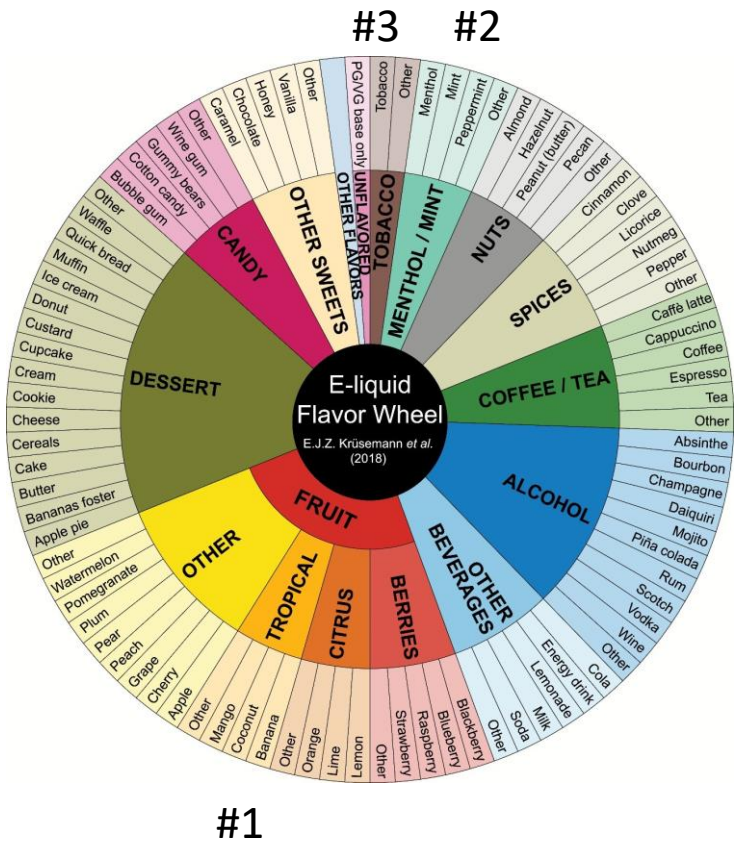


Vaping vs smoking	Exposure to carcinogens is *significantly lower*	Exposure to respiratory related toxicants is *significantly lower*	Exposure to CVD-related toxicants is *significantly lower*
Vaping vs non use	Exposure to carcinogens *similar* or, in cases of some carcinogens, *higher*	Exposure to *most* respiratory related toxicants *similar*	Exposure to CVD-related toxicants *similar*

Nicotine & Flavours

- Acute vaping vs smoking = lower exposure to nicotine
- Short-to-medium and longer-term vaping vs smoking = similar exposure

Krüsemann et al. (2019) NTR; 10 (p1310-1319)



- Non-tobacco flavours are important for helping smokers start and stay vaping – and stop smoking
- **Limited evidence** on health effects in people
- Some cell and animal studies indicated that cinnamaldehyde flavouring in e-liquids may be a potential concern (but less of a concern than exposure to tobacco smoke)
- More research needed on cinnamaldehyde in vaping products

Poisonings

Incidents of poisonings can be serious but are rare

National Poisons Info Service 2021:
187 out of ~40,000 enquiries about vaping products; just under half involved children aged ≤5

2 case reports from UK of intentional poisoning (1 person died 2017)

Non-UK 16 deaths were reported, exposure intentional or unknown

Fires

London Fire Brigade 2017-2021:

- 5606 fires from smoking
- 15 fires from vaping

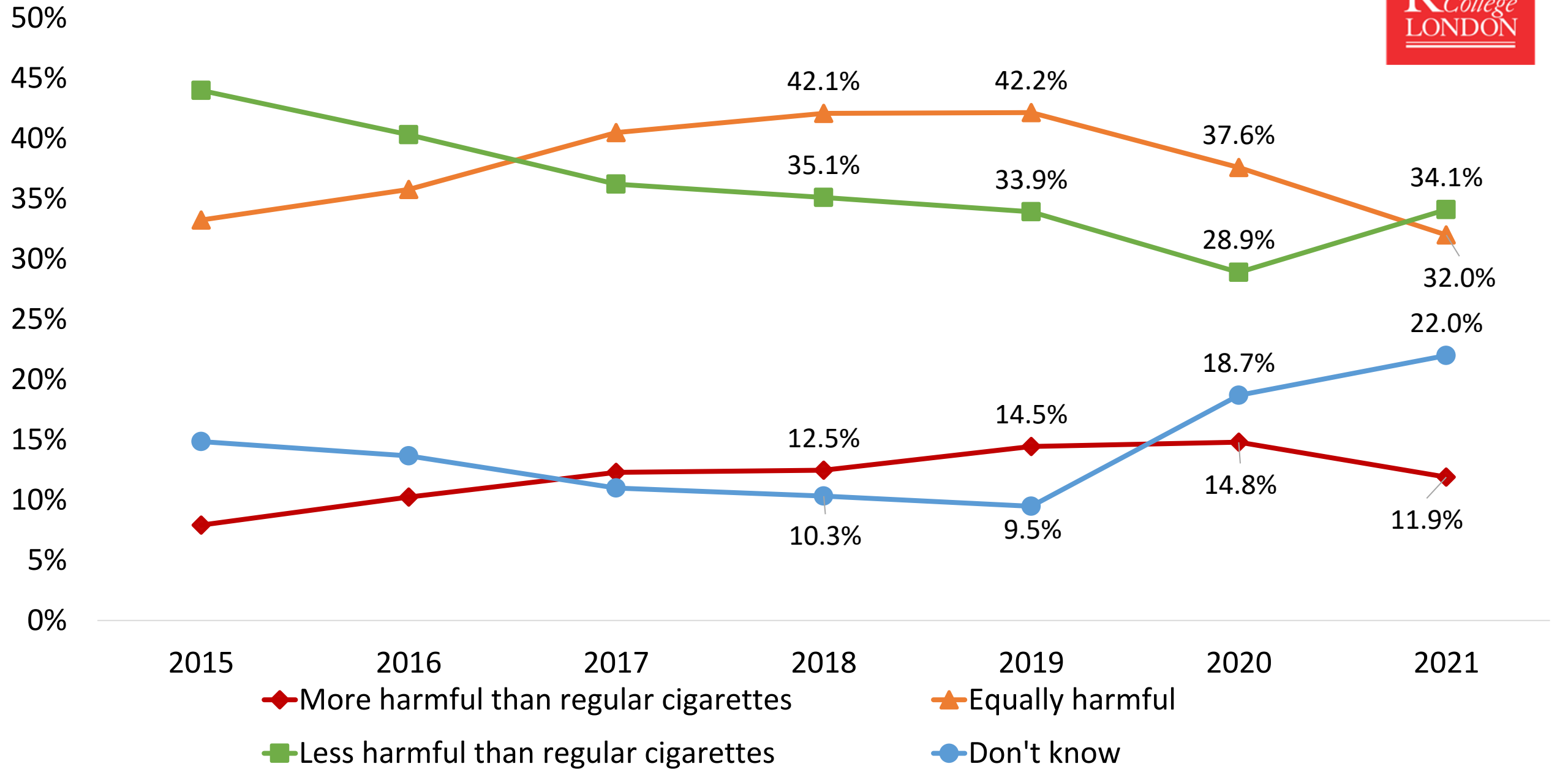
Explosions

Incidents of exploding devices can be serious but are very rare

2 case reports of non-fatal accidents involving 4 people in the UK

23 reports outside the UK. 1 fatality

Vaping risk perceptions among adult smokers in England



Systematic literature review: Vaping risk perceptions & communication

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E-cigarette risk perceptions and communications: a systematic review

Katherine East, Erikas Simonavicius, Debbie Robson, Leonie Brose, Eve Taylor, Lynn Kozlowski, Ann McNeill

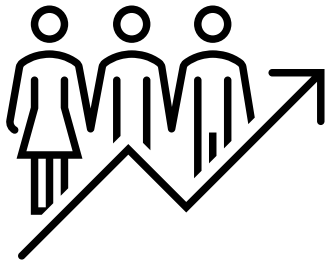
Citation

Katherine East, Erikas Simonavicius, Debbie Robson, Leonie Brose, Eve Taylor, Lynn Kozlowski, Ann McNeill. E-cigarette risk perceptions and communications: a systematic review. PROSPERO 2021 CRD42021247890
Available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42021247890

Review question

1. What interventions have been effective in changing vaping risk perceptions?
2. To what extent are vaping risk perceptions predictive of any changes in vaping and smoking behaviours?

Systematic literature review: Vaping risk perceptions & communication



Vaping harm perceptions can influence subsequent vaping (& smoking) behaviours (21 articles)

Vaping: Lower vaping risk perceptions (including less harmful than smoking) predicted vaping initiation/increases

Smoking: Less evidence, but 1 study found that perceiving vaping as less harmful than smoking predicted quitting smoking among adults

Communicating vaping risks can change vaping harm perceptions (32 articles)

Correcting misperceptions of relative risks of vaping & nicotine harms: most research was from adults

Increasing absolute perceptions of vaping harms: most research was among youth

Vaping risk perceptions & communication
Take-home messages

1. Communicating accurate information about the relative harms of vaping can help to correct misperceptions of vaping particularly among adults

2. This is important because vaping harm perceptions can change vaping (& smoking) behaviours

3. Interventions on absolute harms of vaping need to be carefully designed so as not to misinform young people (particularly smokers) about the relative harms of smoking & vaping

Some implications for research

Research

- Need to isolate vaping effects from:
  - Prior smoking
  - Environmental exposures
  - Confounders (e.g., diet, age)
- Need consistent definitions of vapers, smokers & non-users
- Need consistent exposure periods
- Need more studies among people with existing health conditions on disease outcomes

Overall findings & implications

Vaping poses only a small fraction of the risks of smoking in the short to medium term. As we have also previously stated and reiterate, this does not mean vaping is risk-free, particularly for people who have never smoked.

- Vaping can be used as an alternative to smoking to reduce the health harms of smoking
- Never, or long-term former smokers should be discouraged from taking up vaping (unless they would smoke instead)

Thank you!

Vaping poses only a small fraction of the risks of smoking

- Impact of vaping depends on:
  - WHO vapes eg a person's previous or current smoking history, their medical history
  - HOW people vape, eg frequency, intensity and duration
  - WHAT people vape:
    - type of device
    - e-liquid composition (e.g. PG/VG ratio)
    - nicotine strength
    - flavours
  - HOW they are regulated and the enforcement of that regulation

- For some biomarkers there is indeed evidence that toxicant levels are at least 95% lower in vapers than smokers with most being close to levels in non-smokers
- Based on the evidence, we believe that the 'at least 95% less harmful estimate' (smoking is at least 20 times more harmful to users than vaping) remains broadly accurate at least over short- and medium-term periods
- Summarising a complex multi-dimensional construct such as the relative risks of vaping vs smoking across a range of heterogeneous products & behaviours & assessed across multiple biomarkers can be simplistic & misinterpreted