

E-cigarettes: Evidence of harm and effectiveness

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Overview

Harms of vaping compared with smoking/ not smoking

Effectiveness for smoking cessation

Declarations of interest

My salary is funded by King's College London through NIHR grants. I do not take funding from the tobacco or vaping industry.

I'm a Trustee of ASH

In mental health settings – there's a challenge of balancing potential known and unknown risks of vaping with ensuring people have access to evidence-based cessation aids - give people the best chance of quitting smoking



How harmful is vaping compared with

1. smoking

2. not smoking or vaping?

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

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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

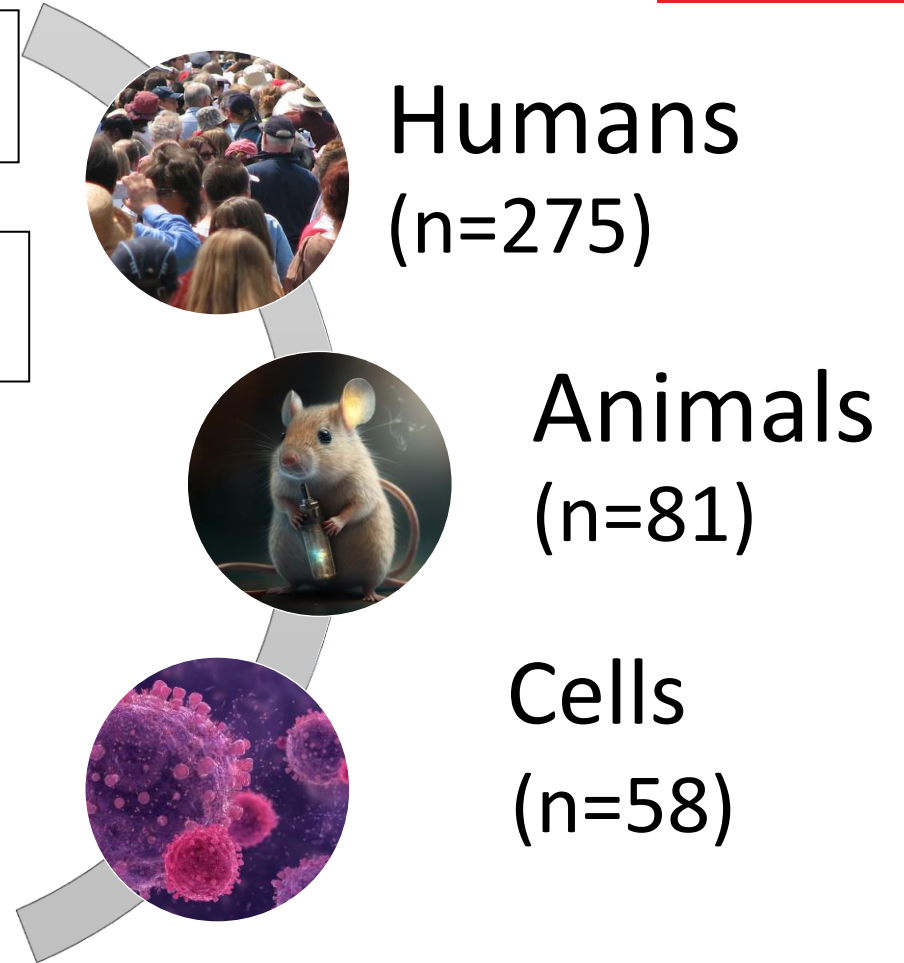
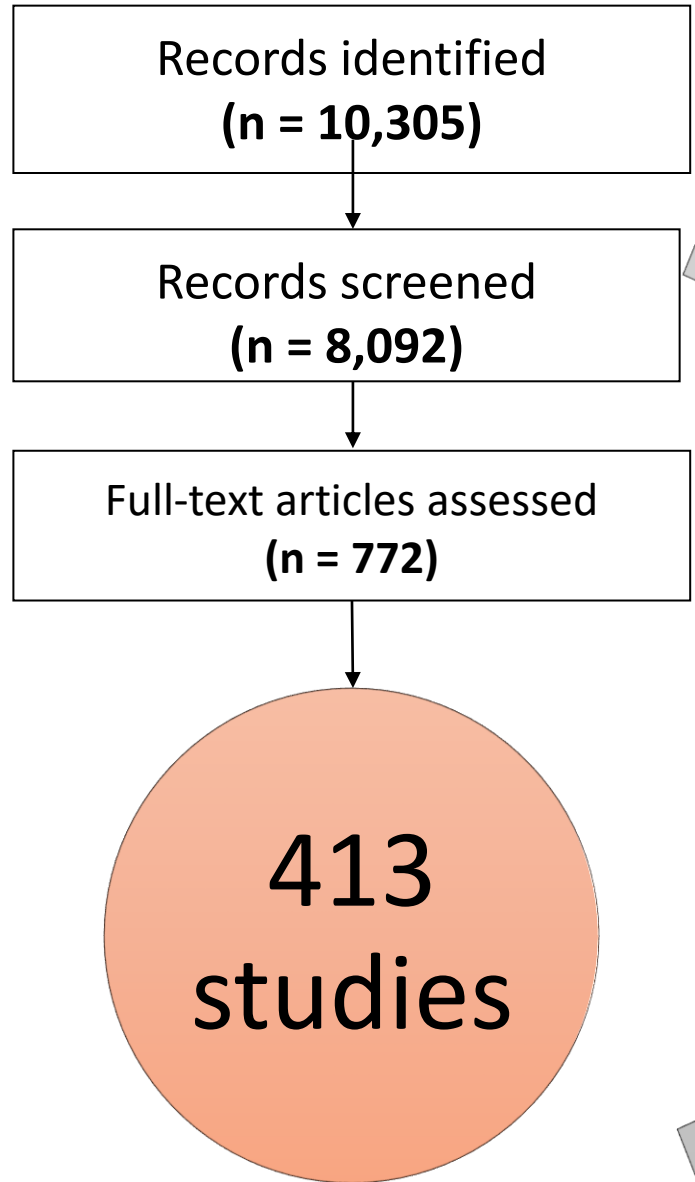
2021

Vaping in
England

Focus on
smoking
cessation

Searched & reviewed literature published from **Aug 2017 to July 2021** about

- 1) effect of vaping on disease risk and
- 2) effects on disease outcomes



Biomarker of exposure (BoE)

- A measure of how much of a substance (toxicant), or its metabolite is in the body (in urine, saliva, blood or hair)
- Nicotine
- Cancer causing toxicants – volatile organic compounds, polycyclic aromatic carbons, metals

We defined length of exposures as

Acute single use to 7 days

Short to medium 8 days to 12 months

Long term more than 12 months

Biomarker of potential harm (effect)

- Objective medical sign used to measure the effect of a substance on the body, or the presence or progress of disease
- Simple to measure e.g. blood pressure, white blood cell count, lung function
 - Complex to measure e.g. the effect on DNA

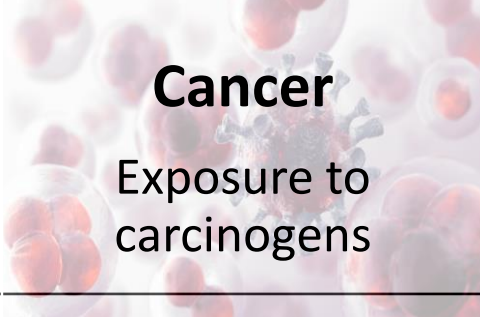

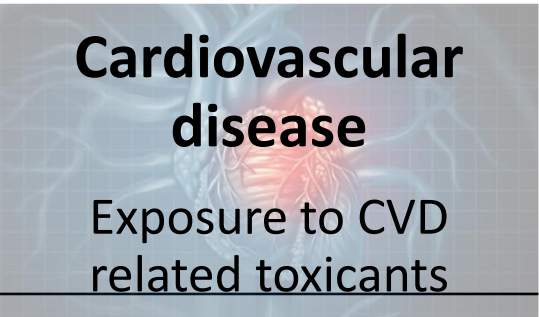
Specific diseases

Cancers

Respiratory disease

Cardiovascular disease

Biomarkers of **exposure** related to specific diseases

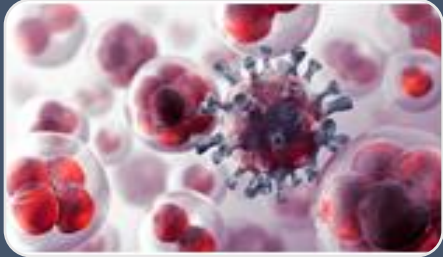
	 <p>Cancer Exposure to carcinogens</p>	 <p>Respiratory disease Exposure to respiratory related toxicants</p>	 <p>Cardiovascular disease Exposure to CVD related toxicants</p>
Vaping vs smoking	Significantly lower	Significantly lower	Significantly lower
Vaping vs non use	Similar Higher for some	Similar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

Metabolites (toxicants)	Vaping vs Smoking (relative risk)	Vaping vs Non-use (absolute risk)
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	↓	–

Illustrative results from meta-analyses

- ↓ significantly lower
- ↑ significantly higher
- = no significant difference
- not enough data to meta-analyse

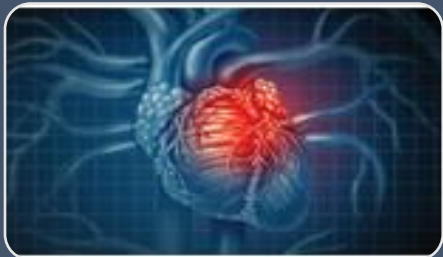
Risk of potential harm



Cancer: Vaping is not having the same effect on cells as smoking

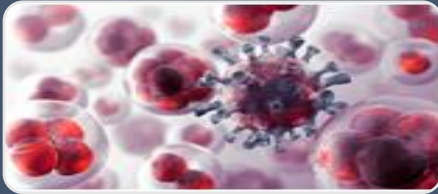


Lungs: Acute exposure (up to 7 days) Mostly no significant differences
Long term (similar respiratory health between vapers & non vapers
(small study)



Heart rate and blood pressure: lower than smoking, similar to non-use
after longer-term vaping

People with existing health conditions

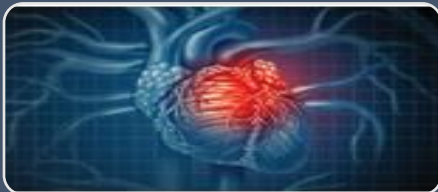


CANCER: No studies about effect of vaping on people with current or past



ASTHMA: 4 studies - vaping may negatively affect lung function

COPD and smoking: 2 publications from 1 study - switching to vaping may reduce COPD exacerbations

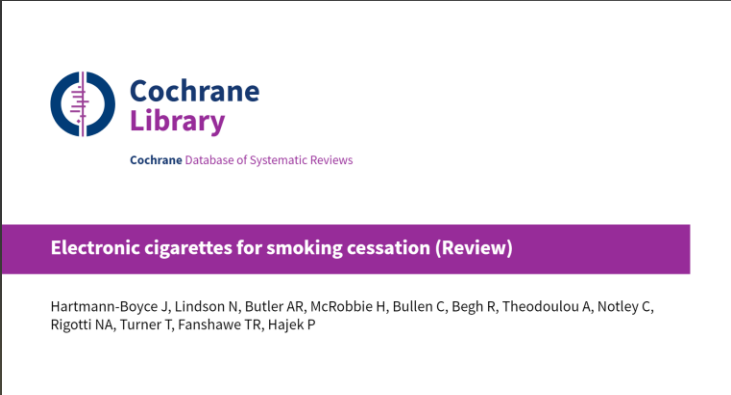


CVD: No studies about effect of people with current or past CVD



Schizophrenia: 1 study – no effect on respiratory health

Do e-cigarettes help
people stop smoking?



Systematic review of RCTs

Survey data from
observational studies

Clinical data

Systematic
review & meta-
analysis of 78
studies (40
RCTS)
~ 22, 000
participants

Quit rates were higher in people randomised
to receiving a **nicotine containing e-cigarette**
compared with

NRT

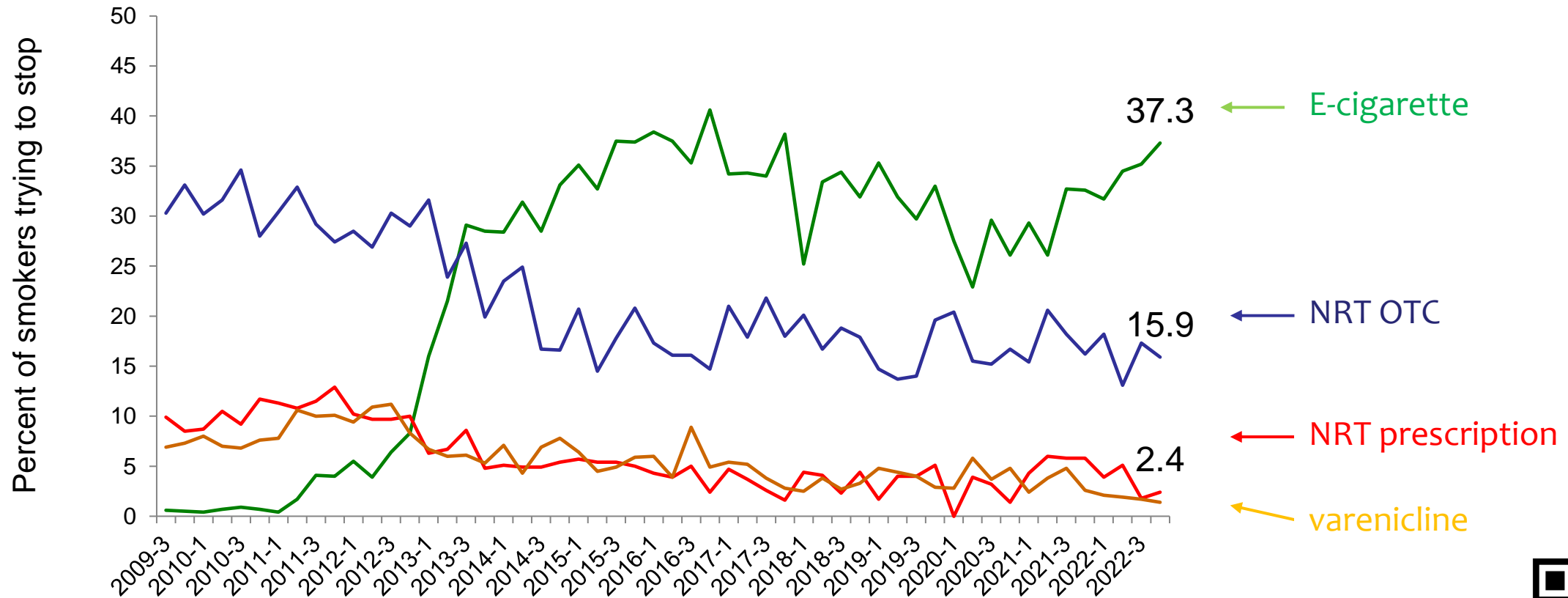
A non-nicotine e-cigarette

Behavioural support only /no
support

ASH Briefing on
the Cochrane
review



Aids used in most recent quit attempt



N=19014 adults who smoke and tried to stop or who stopped in the past year; method is coded as any (not exclusive) use

STS graphs →



E-cigarettes or varenicline were more effective than not using any support.

NRT bought from a shop did not increase the chance of quitting and NRT on Px, was only effective in smokers over 45 years.

As e-cigarettes are much more popular among smokers trying to quit smoking compared with varenicline they help more smokers quit (as they have far greater reach)

Unadjusted quit rates

• 21%

E-
cigarettes



• 20%

Varenicline



• 14.1%

Px NRT



Adjusted odds ratios

OR= 1.95,
95% (CI) = 1.69–2.24

OR= 1.82,
95% (CI) = 1.51–2.21

OR= 1.58,
95% (CI) = 1.25–2.1

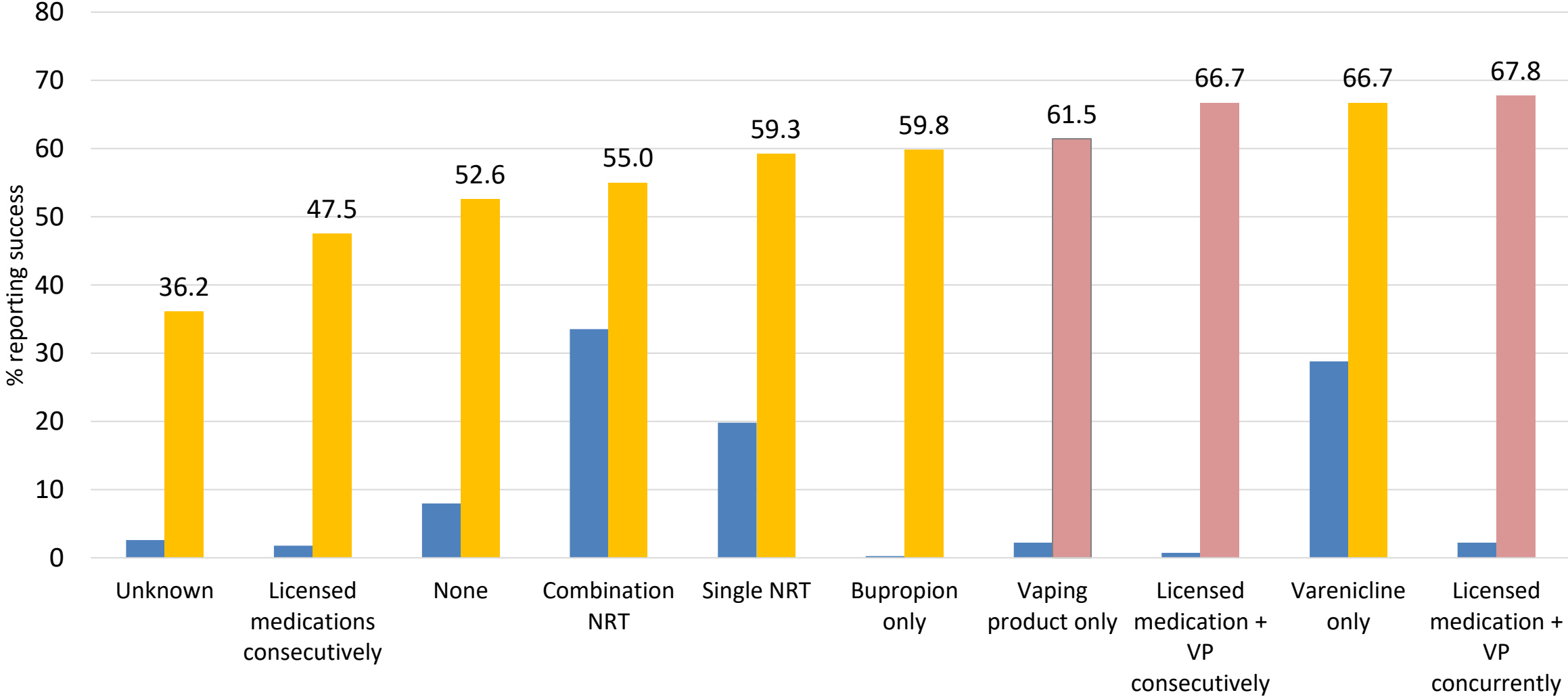
Did NOT increase chance of quitting

- NRT bought from a shop
- Bupropion
- Behavioural support
- Telephone support
- Written materials
- Hypnotherapy

E-cigarettes within smoking cessation services 2020/21

(NHS Digital, 2022)

N=178,815



■ Percentage using type of support ■ Percentage successful (self-reported)

Optimising quit success with e-cigarettes

Device type



Refillable, rechargeable tank style devices better at delivering nicotine than pod/disposable devices

Nicotine strength and type



- Higher concentration better than low
- Nicotine salts better than freebase nicotine e-liquid

Flavours









Non-nicotine flavours are important for starting and maintaining vaping

Frequency of use



Daily use better than non daily use
Little and often (graze) rather than all in one go (binge)

E-cigarettes for smoking cessation in people with a mental health condition




	Caponnetto 2013	Pratt 2014	O'Brien 2014	Valentine 2018	Hickling 2019	Caponnetto* 2020
Diagnosis	Schizophrenia	Schizophrenia or bipolar	Px'd mental health meds	Dual diagnosis	Psychosis	Schizophrenia
Sample size	14	19	86	43	50	40
Study design	Single group, pre post	Single group, pre post	Secondary analysis of RCT data	Single group, pre post	Single group, pre post	Single group, pre post
Motivated/ intent to quit	No	No	Yes	No	No	No
Device type	Rechargeable cigalike 	Refillable, rechargeable 	Rechargeable cigalike 	Refillable, rechargeable 	Disposable cigalike 	Rechargeable Pod 
Nicotine strength	7.5mg/ml	?	16mg/ml vs 0mg vs 21mg NRT patch	12/ 24/ 27mgs/ml	45mg/ml	50mg/ml
Quit rate (longest follow up)	14% (1yr)	10% (4 weeks)	6% (6mo)	7% (4 weeks)	7% (6 weeks)	40% (3 mo)

McNeill, Brose, Calder, Bauld & Robson (2020) Vaping in England – PHE Report

* Caponnetto et al (2021) NTR 23(4) DOI:[10.1093/ntr/ntab005](https://doi.org/10.1093/ntr/ntab005)

No adverse effect on mental health

Harm perceptions of nicotine-containing products and associated sources of information in UK adults with and without mental ill health: A cross-sectional survey

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Máirtín S. McDermott¹ | Ann McNeill^{1,3}  | Leonie S. Brose^{1,3} 

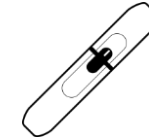
Online cross-sectional survey

N=3, 400 past year smokers

- 51% female
- Mean age 46.2

Past month mental health status was measured using the K6 psychological distress scale

- No/low mental distress 45.3% (n=1541)
- Moderate mental distress 37.5% (n=1274)
- Serious mental distress 17.2% (n=585)



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Compared with smoking tobacco cigarettes, overall

- 66.9% thought that NRTs were less harmful,
- 51.1% that ECs were less harmful
- 35.9% that HTPs were less harmful

People **with** serious mental distress compared to people with low/no distress, were more likely to hold less accurate views about the relative harm of cigarettes compared with NRT & EC.



Summary

Vaping poses only a small fraction of the risk of smoking

Vaping is not risk free, particularly if you have never smoked

Vaping is an effective smoking cessation aid

Better communication about the effectiveness and relative harm e-cigarettes (and NRT) is needed for people with poor mental health

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Acknowledgements

- A McNeill
- E. Simonavicius
- L. Brose
- E. Taylor
- K. East
- E. Zuikova
- R. Calder