Public Health England

Vaping in England: an evidence update including vaping for smoking cessation, February 2021

A report commissioned by Public Health England

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Conflict of interest statement

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Acronyms and abbreviations

Acronym	Meaning
AMSTAR	A MeaSurement Tool to Assess systematic Reviews
APS	Annual Population Survey
ASH	Action on Smoking and Health
ASH-A	Smoke-free Great Britain Adult survey
ASH-Y	Smoke-free Great Britain Youth survey
CDC	The United States Centers for Disease Control and Prevention
CI	Confidence Interval
CM	Contingency Management
CO	Carbon Monoxide
COT	The independent Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment
COVID-19	Coronavirus Disease 2019
CPD	Cigarettes per day
‘EVALI’	‘E-cigarette, or Vaping, product use-Associated Lung Injury’
FDA	The United States Food and Drug Administration
GRADE	Grading of Recommendations, Assessment, Development and Evaluations
HnB / HTP	Heat-not-burn / heated tobacco products
ICGB	Internet Cohort Great Britain survey
ITC	International Tobacco Control Policy Evaluation Project survey
JBI	Joanna Briggs Institute
MedDRA	Medical Dictionary for Regulatory Activities
MHRA	Medicines and Healthcare products Regulatory Agency
MINORS	Methodological Index for Non-Randomised Studies
NICE	National Institute for Health and Care Excellence
NRT	Nicotine replacement therapies
NVP	Nicotine containing vaping products
OPN	Opinions and Lifestyle Survey
OR	Odds Ratio

Acronym	Meaning
OTC	Over the counter
PHE	Public Health England
PMTA	Pre-Market Tobacco Product Application
PROSPERO	International prospective register of systematic reviews
RCT	Randomised controlled trial
ROBINS-I	Risk Of Bias In Non-randomised Studies - of Interventions
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
SCHEER	The Scientific Committee on Health Environmental and Emerging Risks
SES	Socio-economic status
TPD/ EU TPD	Tobacco Products Directive / European Union Tobacco Products Directive
TRPR	Tobacco and Related Products Regulations 2016
VP	Vaping products

Executive summary

Aim of the report

This is the seventh report in a series of independent reports commissioned by Public Health England to summarise evidence on vaping products to inform policies and regulations.

Smoking remains the largest single risk factor for death and years of life lived in ill-health and is a leading cause of health inequalities in England and in other parts of the world.

Alternative nicotine delivery devices, such as nicotine vaping products, could play a crucial role in reducing the enormous health burden caused by cigarette smoking.

This report covers the latest evidence on prevalence and characteristics of vaping in young people and adults in England, with a particular focus on data emerging since the last vaping evidence report published in 2020.

This report also includes an update of the evidence on the impact of vaping products on smoking cessation, last examined in detail in the 2018 e-cigarettes and heated tobacco products evidence report.

Terminology

The term ‘vaping products’ describes e-cigarettes and refill containers and e-liquids.

The term ‘vapers’ refers to people who regularly use vaping products and ‘vaping’ as the act of using a vaping product. These terms do not include cannabis vaping or the vaping of other illegal substances, which are not the subject of this report.

Recent developments

COVID-19 has had a devastating impact worldwide. For the purposes of this report, it has affected the implementation of routine surveys and has also likely affected both vaping and smoking behaviours in England.

The COVID-19 pandemic is the subject of much ongoing research and it is too early to assess its full impact on vaping and smoking at the time of writing.

The government has introduced new regulations (The Tobacco Products and Nicotine Inhaling Products (Amendment) (EU Exit) Regulations 2020) to make sure the UK meets its obligations in relation to tobacco control and vaping product policies under the European Union (Withdrawal Agreement) Act 2020. The new regulations include the notification mechanisms for the sale of vaping products in Great Britain (a new system)

and Northern Ireland (the previous EU system). These regulations ensure fees are only paid once when products are notified to both databases. The government is also reviewing other regulations in relation to the European Union (Withdrawal Agreement) Act 2020.

The UK government has committed to review the Tobacco and Related Products Regulations 2016 (TRPR) (which govern nicotine vaping products) by 20 May 2021, to assess whether the regulations have met their objectives.

Since non-nicotine containing vaping products are less strictly regulated (through the General Product Safety Regulations 2005) than nicotine-containing products, they may need to be reviewed along with the review of the TRPR. As other non-tobacco nicotine products, such as nicotine pouches, emerge in England it seems appropriate to review regulations for these products at the same time.

Medicinally licensed nicotine vaping products are exempt from the TRPR and currently there is no licensed product in England.

Selling vaping products to anyone aged under 18 and buying vaping products for anyone under 18 are prohibited. Violations of the age of sale law for nicotine vaping products (and cigarettes) have been reported. A 5-year report on these regulations is due. There is a loophole in the legislation which allows free samples of vaping products to be given to people of any age.

Between 20 May 2016 (implementation of TRPR) and 5 January 2021, the Medicines and Healthcare products Regulatory Agency (MHRA) received 231 reports of 618 adverse reactions believed to be associated with nicotine containing vaping products through its Yellow Card scheme. Each report represents a person for whom more than one adverse reaction could have been reported. A report is not proof that the reaction was caused by a vaping product, just that the reporter thought it might have been.

Since 20 May 2016, the MHRA reported that there have been 3 fatalities in the UK linked with vaping products, one of which appeared to meet the criteria for ‘e-cigarette, or vaping product, use-associated lung injury’ (‘EVALI’).

A safety review by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) concluded that the risk of adverse health effects from vaping products is expected to be much lower than from cigarettes. The review found that exposure to particulate matter and nicotine could be associated with adverse health effects and that the effects of inhaling flavouring ingredients is uncertain. The COT also suggested people who had not smoked tobacco but vaped would likely experience some adverse health effects.

A government consultation in 2019 outlined a new ambition to go smokefree in England by 2030. It also included an ultimatum to industry to make smoked tobacco obsolete by 2030, with smokers quitting or moving to reduced risk nicotine delivery systems, such as vaping products.

The government's Tobacco Control Plan for England, which sets out ambitions for 2022, remains in place, although a new Tobacco Control Plan for England is expected to be published in July 2021.

Implications

The smokefree 2030 goal, developing a new Tobacco Control Plan and reviewing the TRPR provide an opportunity to review all vaping (and other nicotine and tobacco) regulations to ensure that they are appropriate and help smokers quit, while managing the risk of uptake for never smokers.

As outlined in the Smokefree Action Coalition's roadmap to a smokefree 2030, becoming smokefree by 2030 will require greater resources and the Coalition proposed legislating to require tobacco manufacturers finance a 'Smokefree 2030 Fund'.

The next Tobacco Control Plan for England provides an opportunity to set intermediate targets for smoking in different disadvantaged groups.

The lack of a medicinally licensed product needs also to be urgently reviewed.

Research is needed on the areas of concern outlined in the COT review.

Methods

The report uses 2 surveys for information on vaping and smoking among young people in England:

1. The Action on Smoking and Health Smokefree Great Britain Youth Survey of 11 to 18 year olds, 2020 (ASH-Youth, 2020).
2. The International Tobacco Control Policy Evaluation Project Youth Tobacco and Vaping Survey of 16 to 19 year olds, 2019 (ITC Youth).

For information on vaping among adults in England, the report uses information from 4 surveys:

1. The Smoking Toolkit Study, 2020 (STS).
2. Action on Smoking and Health Smokefree Great Britain Adult Survey, 2020 (ASH-Adult, 2020).
3. The Opinions and Lifestyle Survey, 2019 (OPN).

4. The Internet Cohort Great Britain survey, 2019 (ICGB).

The 2019 Annual Population Survey (APS) was used to estimate smoking prevalence.

To identify the available evidence on vaping for smoking cessation and reduction, we conducted a systematic review of the available, peer-reviewed literature.

Data from NHS Digital were used to provide information on stop smoking services in England between April 2019 and March 2020.

The MHRA provided information on suspected adverse events for vaping products between May 2016 and January 2021.

Vaping among young people

Main findings

Data reported in this chapter were collected in September 2019 (from the ITC Youth survey) and in March 2020 (from the ASH-Youth survey). So, conclusions in this chapter do not consider the potential impact of COVID-19 on vaping and smoking among youth.

ASH-Youth survey data (11 to 18 year olds) showed:

- smoking prevalence (including those who smoked sometimes or more than once a week) in March 2020 was 6.7% (compared with 6.3% in March 2019) and has changed little since 2015 when it was 7.1%
- little change in levels of vaping over the last few years with current vaping (at least once per month) prevalence being 4.8% in March 2020, the same as in March 2019

ITC Youth survey data (16 to 19 year olds) showed:

- smoking prevalence at 6.2% (defined as smoking more than 100 cigarettes in their life and having smoked in the past 30 days)
- current vaping prevalence at 7.7% (defined as vaping on more than 10 days in their lifetime and having vaped in the past 30 days)

Based on the socioeconomic status of 11 to 18 year olds, the estimates for smoking and vaping prevalence were higher among more advantaged groups in social grades A, B and C1 (7.1% for smoking, 5.3% for vaping) than for more disadvantaged groups in social grades C2, D and E (5.7% for smoking, 3.5% for vaping).

Most young people who had never smoked had also never vaped. Between 0.8% and 1.3% of young people who had never smoked were current vapers.

Most current vapers were either former or current smokers.

The main reasons for vaping were to “give it a try”, “for fun/I like it” and “liking the flavours”.

Of the 11 to 18 year olds who vaped, 11.9% reported doing so to quit smoking.

More 11 to 18 year olds who had tried vaping had smoked first (45.4%), 20.6% said they had vaped before they smoked and 28.9% said they had tried a vaping product and never tried smoking.

Tank models, which are reusable and rechargeable kits that users can refill with liquid, were the most popular model of vaping product, used by 49.1% of 11 to 18 year olds who currently vaped. The use of models which use prefilled cartridges has increased from 17.6% in 2019 to 34.2% in 2020.

Fruit flavours were the most popular among current vapers. This was followed by “menthol/mint”, then “chocolate/dessert/sweet/candy" flavours.

Three-quarters of current vapers aged 11 to 17 bought their vaping products despite sales to under-18s and proxy purchases being illegal.

Under half (43.0%) of 11 to 18 year olds who were current and former vapers reported always using vaping products that contained nicotine and 17.3% reported always using nicotine free products. Three out of 5 (61.3%) 16 to 19 year olds who had vaped in the past 30 days used nicotine in their current product and 17.3% said their product did not contain nicotine.

The most common nicotine strength used by 16 to 19 year olds who had vaped in the past 30 days was under 20 milligrams per millilitre (mg/mL) (54.0%). One-fifth (19.6%) of participants did not know the strength of their vaping liquid, 18.0% used a strength of 20 mg/mL or over, and 6.6% used 40 mg/mL or over.

Over half (56.6%) of 16 to 19 year olds who vaped in the past 30 days currently used nicotine salts, 30.6% did not use nicotine salts and 12.8% were unsure.

Over half (58.2%) of 16 to 19 year olds who had vaped in the past 30 days did not feel addicted to vaping but 38.5% said they felt a little or very addicted.

Just under a fifth (18.4%) of current vapers aged 11 to 18 reported experiencing urges to vape almost all the time or all the time.

The proportion of 11 to 18 year olds who thought that vaping was less harmful than smoking had declined to 43.3% in 2020, from 66.7% in 2015.

Current use of heated tobacco products was rare among 11 to 18 year olds (0.5%). Among 16 to 19 year olds, 2.6% reported ever using nicotine pouches (half of those used them in the last month) and 4.1% reported ever using smokeless tobacco (a third of those used them in the last month).

Implications

Vaping and smoking prevalence among young people in England both appear to have stayed the same in recent years and should continue to be closely monitored.

Enforcement of age of sale regulations for vaping (and smoking) needs to be improved.

Misperceptions of the relative harms of smoking and vaping should be addressed.

More research is needed on the apparent differences in the prevalence of smoking and vaping in different socioeconomic groups among young people (higher in more advantaged groups) and adults (higher in more disadvantaged groups).

More research is needed on the addictiveness of different types and strengths of nicotine vaping products among young people and the extent to which they are using illegal products.

Vaping among adults

Main findings

Data reported in this chapter came from 4 different surveys. Most data were from the STS, collected between January and October 2020, and the ASH-Adult survey, collected in February and March 2020. Other data were collected in 2019.

Smoking prevalence among adults in England continues to fall and was between 13.8% and 16.0% depending on the survey, equating to about 6 to 7 million smokers.

There was some variation in smoking prevalence by socio-demographics, such as a higher prevalence among adults from more disadvantaged groups. There was also variation between surveys, most notably for smoking prevalence in young adults (24.1% in STS compared with 10.8% in ASH-Adult for 18 to 24 year olds).

Vaping prevalence was lower than smoking prevalence across all groups and continues to be around 6% (between 5.5% and 6.3%), equating to about 2.7 million adult vapers in England.

There was some variation in vaping prevalence by socio-demographic groups and smoking status. Using STS data, 7.2% of men, 7.7% of people in the north of England and 7.6% of people from social grades C2, D and E vaped. Vaping prevalence was

between 17.5% and 20.1% among current smokers, around 11% among former smokers and between 0.3% and 0.6% among never smokers. Around 10% of long-term former smokers (quit for longer than one year) vaped compared with 24% of short-term former smokers (quit for less than one year).

The proportion of vapers who also smoke has declined since 2012, from 74% to 38% in the ASH-Adult and from 92% to 51% in the STS survey. The discrepancy is likely due to different definitions of smoking status.

Among adults who had ever vaped, over half (57.4%) of never smokers had tried it once or twice and 6.1% were vaping daily. Among those who had ever vaped, more than half (56.3%) of former smokers and around 30% of current smokers vaped daily.

Among long-term former smokers, a decreasing proportion used nicotine replacement therapy (NRT), and an increasing proportion used vaping products, between 2013 and 2020.

The proportion of current vapers who have vaped for more than 3 years appears to be increasing (23.7% in 2018, 29.3% in 2019, 39.2% in 2020). The proportion of new current vapers who have vaped for less than one month in 2020 was 2.6% (5.5% in 2018, 5.1% in 2019). People who had vaped in the past mostly stopped after 6 months of use or less (59.9% in 2020).

The most common reasons for vaping reported in the ASH-Adult survey were to quit (29.7%), stay off (19.4%) or reduce (11.2%) smoking tobacco. In the OPN 2019 survey, 52.8% of current vapers reported vaping to quit smoking.

Most vapers (around 75%) used tank models.

Strengths above those allowed by regulations (more than 20 mg/mL of nicotine) were used by less than 5% of vapers. Use of non-nicotine liquids may be more common among vapers from social grades C2, D and E.

Just over half of vapers (51%) reported reducing the strength of the nicotine liquid they use since starting to vape. Just 1.1% of people who started on non-nicotine liquids moved to vaping nicotine.

Fruit (31.6%), tobacco (25.2%) and "menthol/mint" (20%) were the most popular flavours among vapers.

In the ICGB survey of adults with a history of smoking and vaping, vapers tended to think they were less addicted to vaping than smoking. However, a perception of being more addicted to vaping than smoking may be more common among dual users who smoke and vape and those using disposable devices or nicotine salts.

Perceptions of the harm caused by vaping compared with smoking are increasingly out of line with the evidence. The STS survey found that:

- 29% of current smokers believed vaping was less harmful than smoking
- 38% believed vaping was as harmful as smoking
- 18% did not know whether vaping or smoking was more harmful
- 15% of smokers believed vaping was more harmful than smoking

Misperceptions were more pronounced among smokers from social grades C2, D and E.

Use of heated tobacco products by adults in England was estimated at 0.3% and use of nicotine pouches at 0.5% in 2020.

Implications

The proportion of long-term vapers is increasing over time and further research into this group is needed.

As recommended in previous reports in this series and as outlined in National Institute for Health and Care Excellence guidance on stop smoking interventions and services, all smokers should be supported to stop smoking completely, including dual users.

A greater emphasis needs to be placed on how best to communicate evidence of relative harm to smokers so that they can consider all the options available to them to quit smoking completely.

Vaping is more common among more disadvantaged adult groups in society. This mirrors smoking prevalence, and research should continue to explore the effect this has on health inequalities.

Further research should be carried out on addiction among vapers of different types of vaping products, nicotine types and flavours used.

Effect of vaping on smoking cessation and reduction

Main findings

The following are the main findings from nationally representative survey data (STS).

1. Using a vaping product is the most popular aid used by people trying to quit smoking. In 2020, 27.2% of people used a vaping product in a quit attempt in the previous 12 months. This compares with 15.5% who used NRT over the counter or on prescription (2.7%), and 4.4% who used varenicline.

2. Vaping is positively associated with quitting smoking successfully. In 2017, over 50,000 smokers stopped smoking with a vaping product who would otherwise have carried on smoking.
3. Prescription medication and licensing NRT for harm reduction were also positively associated with successfully quitting smoking. This shows how important it is for people who smoke to have access to a wide choice of cessation aids.
4. The extensive use of vaping products in quit attempts compared with licensed medication suggests vaping products may reach more people who smoke and so have more impact than NRT and varenicline.

The following are the main findings from English stop smoking services data.

1. Between April 2019 and March 2020, 221,678 quit dates were set with a stop smoking service and 114,153 (51%) of these led to self-reported quits 4 weeks after the quit date.
2. A vaping product was used in 5.2% of quit attempts. This was either using the vaping product alone, at the same time, or following use of a licensed medication.
3. Consistent with findings in our previous reports, the highest quit rates (74%) were seen when the quit attempt involved people using a licensed medicine and a vaping product one after another.
4. Quit rates were similar for people using a vaping product and licensed medication at the same time (60.0%), a vaping product alone (59.7%) and varenicline alone (59.4%).
5. Quit rates involving a vaping product were higher than any other method in every region in England. These ranged from 49% in the South West to 78% in Yorkshire and the Humber.

An ASH survey of tobacco control leads found that only 11% of local authority stop smoking services offered vaping products to some or all people making a quit attempt.

The following main findings are from systematic review data. This includes data from 6 systematic reviews and meta-analyses, 4 randomised control trials (RCTs) and 13 non-randomised studies published since the 2018 evidence review.

1. Three systematic reviews and meta-analyses of moderate to high quality included 15 RCTs that evaluated the effect of vaping on smoking cessation or reduction.
2. The 3 systematic reviews consistently found vaping products containing nicotine were significantly more effective for helping people stop smoking than NRT. This finding was supported by 2 non-randomised studies that reported higher quit rates among people using a vaping product who attended a stop smoking service, compared with those who used NRT.
3. Findings of meta-analyses of RCTs were inconclusive about whether vaping products with nicotine are more effective than those without nicotine or behavioural support. However, when studies with a high risk of bias were excluded, the pooled

results of RCTs suggested that nicotine containing vaping products were more effective.

4. Quit rates among participants in the non-randomised studies ranged from 7% to 36% in participants with a clinical condition (including a mental illness, substance misuse or HIV/AIDS) and from 11% to 62% in people recruited from non-clinical settings. It is important to note that most of these non-randomised studies were single group before and after studies and so were inherently biased.
5. Many of the vaping products used in the RCTs included in the systematic reviews are now outdated and used low nicotine strength. In most studies, tobacco flavour was the most common e-liquid flavour offered and participants were not given the choice of flavours. No RCT and only one non-randomised intervention study included a vaping product with nicotine salts.

Implications

Studies show that tens of thousands of smokers stopped as a result of vaping in 2017, similar to estimates in previous years.

Compared to the 2018 review, there is stronger evidence in this year's report that nicotine vaping products are effective for smoking cessation and reduction.

As suggested in previous evidence reviews, combining vaping products (the most popular source of support used by people making a quit attempt in the general population), with stop smoking service support (the most effective type of support), should be an option available to all people who want to quit smoking.

Local authorities should continue to fund and provide stop smoking services and all stop smoking services should have a consistent approach to using vaping products.

Further research is needed to assess whether smokers who use stop smoking services and vaping products differ from smokers who use the services and other smoking cessation aids.

Further research is needed into the barriers and enablers to using vaping products as part of a supported quit attempt in stop smoking services.

Studies including newer types of vaping products that have better nicotine delivery are needed.

As we have stated in previous reports, the strict inclusion and exclusion criteria of RCTs mean that they do not apply to many people in real-world clinical settings or people in the general population who smoke or vape. These RCTs require strict adherence to particular intervention measures (for example, type, dose, duration and frequency) which also does not reflect what happens in real life.

Vaping technology has become more sophisticated and varied, and the people who vape have become more heterogeneous. So, new and flexible ways of conducting observational studies and RCTs are needed to allow for user experimentation (for example trial and error of different types of vaping products, allowing for changes in preferences over time).

1. Introduction

1.1 Objective of the report

This report is the seventh in a series of independent reports commissioned by Public Health England (PHE) (1 to 6) to summarise evidence on vaping products to inform policies and regulations. Alternative delivery devices such as nicotine vaping products could play a critical role in reducing the enormous health burden caused by cigarette smoking which remains the largest single risk factor for death and years of life lived in ill-health and a leading cause of health inequalities in England, and the second most important risk factor for death and Disability Adjusted Life Years globally (7). However, the impact of vaping products will depend on how much they displace smoking completely, including among disadvantaged smokers, the extent of uptake among young people, and the absolute health effects of vaping, as well as the relative health effects compared with smoking. A comprehensive review of the health effects of vaping in collaboration with international experts will be covered in our next report, which is due to be published in early 2022. This current report covers: the latest evidence on prevalence and characteristics of vaping in young people and adults in England, with a focus on data emerging since our last report published in early 2020 (3); and an update of the evidence on the impact of vaping products on smoking cessation, last examined in detail in our 2018 report (5).

1.2 Terminology

Vaping products are a heterogeneous category of products which have in common a battery-powered heating element designed to aerosolise a solution (vaping liquid or e-liquid) of propylene glycol and/or glycerol, water, flavouring compounds, flavour enhancers and frequently nicotine. Nicotine can be either freebase or nicotine salts. We largely focus in this report on nicotine containing vaping products. We use the term vaper to refer to people who regularly use a vaping product. We do not cover cannabis vaping or the vaping of other illegal substances, which are not the subject of this report.

1.3 Vaping products

Vaping products are manufactured by tobacco industry companies and companies independent of the tobacco industry. Such products come in a variety of shapes and sizes which can be broadly categorised as:

- one-time disposable products (often referred to as cigalikes)
- reusable, rechargeable kits designed with replaceable cartridges or pods
- reusable, rechargeable kits designed to be refilled with liquid by the user (often referred to as tanks, but there are also refillable pods available)

- reusable, rechargeable kits often referred to as ‘mods’ (modifiables) that allow users to customise their product such as by regulating the power delivery from the batteries to the heating element (sometimes these are included with other tank models)

1.4 A note on COVID-19

Since our last report was published, COVID-19 - the infectious disease caused by the coronavirus SARS-CoV-2 – has had a devastating effect worldwide, with the first cases identified in England in early 2020. The relationship between smoking, nicotine, and COVID-19 has been the subject of much research (8) although there is very little focus on vaping and COVID-19. While this research is outside the scope of this evidence update, it is nevertheless important to note that COVID-19 impacted the implementation of routine surveys and also likely affected both smoking and vaping behaviour in England. Where appropriate, we have therefore noted these impacts in the relevant chapters.

1.5 Current vaping regulations in England

As detailed in our previous reports, non-nicotine containing vaping products fall under the General Product Safety Regulations 2005, enforced by local authority Trading Standards. Nicotine vaping products are regulated by the Revised European Union Tobacco Products Directive (2014/40/EC) (EUTPD), transposed into UK law by the Tobacco and Related Products Regulations 2016 (TRPR). The national competent authority for the TRPR regulations relating to vaping products is the Medicines and Healthcare products Regulatory Agency (MHRA), acting for the Secretary of State for Health and Social Care.

We have reproduced Table 1: from the 2020 report (3) which gives a brief overview of the regulations pertaining to nicotine vaping products in the UK. The regulations are similar to those in the European Union. The most up-to-date advice on regulations for consumer nicotine vaping products is in the MHRA's E-cigarettes: regulations for consumer products.

Recent developments are set out in subsequent sections which include changes required due to the European Union (Withdrawal Agreement) Act 2020.

Table 1: Summary of the nicotine-containing vaping product regulations

Notification requirements • EC manufacturers must submit a range of details to MHRA before putting a product on the market and update when products are manufactured or withdrawn
Maximum capacities and nicotine strength allowed • Tank capacity: 2mL • E-liquid refill container capacity: 10mL • Strength of e-liquid: 20mg/mL
Other safety and quality standards • Child-resistant and tamper evident packaging • Prohibition of certain additives such as colourings • Protection against breakage and leakage, and a mechanism for ensuring re-filling without leakage
Information provision • Health warning and provision of information on pack or device/bottle
Advertising • All broadcast media and cross-border advertising prohibited • Domestic advertising allowed such as outdoor, posters, cinema, and so on • All advertising must adhere to a Committee of Advertising Practice Code • Health claims on advertising are allowed under strict conditions (see below)
Age of sale law • 18 years and proxy purchasing also prohibited
Public places • No legislation but local proprietors or organisations can decide

Notes
Reproduced from Vaping in England: an evidence update including mental health and pregnancy, March 2020: a report commissioned by Public Health England. 2020

1.6 Products notified to the MHRA

The MHRA has a public facing database of products that have been notified including a list of withdrawn notifications.

Retailers are advised to check these lists when sourcing new supplies of any vaping product or vaping liquid. Consumers can also check these lists if interested.

The Tobacco Products and Nicotine Inhaling Products (Amendment) (EU Exit) Regulations 2020 were published on 18 November 2020 (9). Their purpose is to implement the European Union (Withdrawal Agreement) Act 2020, in particular the

Ireland/Northern Ireland Protocol, to ensure the UK meets its obligations in relation to tobacco control and vaping product policy under this agreement. In relation to vaping products, this affects the notification process, to ensure only one fee is paid if products are notified via both the Great Britain (new domestic) and Northern Ireland (the EU Common Entry Gate) systems. This is outlined in the updated government guidance (10).

1.7 MHRA Yellow Card scheme

As discussed in previous reports, the MHRA runs a Yellow Card reporting scheme for vaping products.

The Yellow Card scheme was established by the MHRA in the UK to collect and monitor information on suspected safety concerns or incidents involving medicines and medical devices and it relies on voluntary reporting by the public and health professionals. In relation to vaping products, anyone can report to the Agency an adverse reaction which they suspect may have been caused by vaping. It is not, by itself, proof of a side effect or causal link between vaping and an adverse reaction. It therefore includes all spontaneous reports submitted to the MHRA by consumers and healthcare professionals as well as reports of adverse reactions received from industry.

It is important to note that as news of possible vaping deaths (relating to 'E-cigarette, or Vaping, product use-Associated Lung Injury' – 'EVALI' – see below) was emerging from the United States in 2019, the MHRA made a request for all reports of respiratory reactions reported to industry to be shared with the MHRA. This means that the data are not directly comparable year on year.

The MHRA assesses all reports received in association with nicotine vaping products and, should any potential safety concerns be identified, regulatory action would be taken and communicated as appropriate. If the MHRA also hears of any potential safety concerns about specific products, it works with local Trading Standards teams to investigate as needed.

A data request to the MHRA identified that as of 5 January 2021, and since the Yellow Card scheme was put in place for vaping products on 20 May 2016, it had received 231 Yellow Card adverse reaction reports.

The MHRA with its internal team of expert medical assessors determines the seriousness of a report based on whether the reaction term is considered serious in the medical dictionary, MedDRA (11), which is used to code all adverse reaction reports, and the Council for International Organisations of Medical Sciences (12) seriousness criteria. The MHRA also allows a reporter to state that they consider a report serious for another reason.

By 5 January 2021, 108 of the reports were considered serious and 123 non-serious. In our 2020 report (3), we explained that the MHRA had received reports of 2 suspected fatal cases.

One death was of a person with an acute lung injury (identified in our last report but subsequently reclassified by the MHRA from ‘Lung Injury’ within ‘Injuries’ to ‘Acute Lung Injury’ within ‘Respiratory Disorders’). The MHRA has advised us that this appeared to meet the criteria for ‘EVALI’ as set out in their Drug Safety Update (13).

The second death we described in the 2020 report involved the sudden death of a person (classified under ’General Disorders’ in our 2020 report) and since reclassified to ‘non-infective Endocarditis’ within ‘Cardiac disorders’. The MHRA has advised us that this death did not meet the criteria for an ‘EVALI’ case and that there were also medicinal products listed as suspected causes as well as vaping products.

Since our 2020 report, MHRA have informed us of one further fatality, which was a case of a person with idiopathic pulmonary fibrosis (classified as ‘Respiratory Disorders’) (Table 2). This third death was a retrospective report where the person had died a few years earlier and although the reported fatal reaction was respiratory related, it was reported by a non-healthcare professional and there was not enough information to determine whether this could have been ‘EVALI’.

As noted above, the request by MHRA for reports on respiratory reactions in late 2019 probably explains the increased reports of respiratory disorder reactions (from 73 to 298) and the overall increase in reports (from 84 to 231) since our 2020 report.

Table 2: MHRA Yellow Card reports of adverse reactions associated with vaping 20/05/2016-05/01/2021

Reaction name	Number of reactions	Suspected Fatalities
Blood disorders	1	
Cardiac disorders	14	1
Ear disorders	1	
Endocrine disorders	1	
Eye disorders	4	
Gastrointestinal disorders	74	
General disorders	76	0 (a)
Immune system disorders	17	
Infections	11	
Injuries	16	0 (b)
Investigations	3	
Metabolic disorders	2	
Muscle and tissue disorders	5	
Nervous system disorders	37	
Pregnancy conditions	1	
Product label/physical/quality issues	31	
Psychiatric disorders	5	
Respiratory disorders	298	2
Skin disorders	18	
Vascular disorders	3	
Total reactions for drug	**618**	**3**
Total reports (c)	**231**	
Total fatal outcome reports		**3**

Notes:
(a) The fatal outcome reported in our 2020 report for 'General disorders' was reclassified by MHRA as 'non-infective Endocarditis' within 'Cardiac Disorders'.
(b) The fatal outcome reported in our 2020 report for 'Injuries' was reclassified by MHRA from 'Lung Injury' (classified as the higher level term 'injuries' as relates to physical trauma) to 'Acute Lung Injury' which is a respiratory term and hence reclassified as the higher level term 'Respiratory Disorders'.
(c) The number of reports is lower than the total reactions as each report constitutes an individual for whom more than one adverse reaction could have been reported.

1.8 Age of sale

Across the UK there is a minimum age of sale of 18 for vaping products and adults are prohibited from purchasing vaping products on behalf of someone under the age of 18 (proxy purchasing).

A survey of tobacco control activities in Trading Standards services was carried out by the Chartered Trading Standards Institute (CTSI) between 15 April 2020 and 20 May 2020 to capture tobacco control activities carried out in 2019 to 2020.

Of the participant councils (135 of 151), 66% (n=89) conducted activities in relation to underage sales of vaping products (compared to 79% for tobacco). Where respondents were able to provide detail (n=87), 218 complaints and enquiries were received: the highest ranked premises were specialist vaping product suppliers (50%) followed by convenience stores/grocers (15%). By comparison, of those councils able to provide detail on tobacco complaints and enquiries (n=97), 1,004 complaints and enquiries were received: the highest ranked premises were convenience stores/grocers (71%) followed by off-licences (13%).

Just over half (54%) of all councils conducted test purchase operations for vaping products with volunteer young people. Eighty-eight councils that conducted test purchases were able to report the total number of tests, at 548. Seventy-three councils were able to report the number of successful purchases, at 176. The report authors concluded that this resulted in a 32% test-purchase-to-sale rate, compared with the 2018/19 figure of 40%. Sales were most commonly made in mobile telephone shops and market stalls/car boot sales (62%) followed by specialist vaping product suppliers (32%), although it should be noted that the number of tests differed markedly by type of premises.

Nearly three-quarters (74%) of all councils conducted test purchase operations for tobacco products with volunteer young people. Seventy-eight councils that conducted test purchases were able to report the total number of tests, at 1,068. All 78 councils were able to report the number of test purchases where sales had occurred: 158 or 15% resulted in a sale, compared with the 2018/19 figure of 18%. Sales were most commonly made in independent newsagents (22%) and petrol station kiosks (16%), followed by national newsagents (15%) and large retailers (14%), although it should be noted that the number of tests differed markedly by type of premises.

One hundred and thirty-four councils provided information on the actions taken regarding underage sales of vaping products and tobacco; 37% of councils issued 134 warnings (verbal or written) and 4% prosecuted 6 businesses regarding underage sales of vaping products. This compared with 29% of councils that issued 213 warnings and 6% that prosecuted 21 businesses for underage sales of tobacco.

The same survey reported that 63 councils made 889 visits to assess compliance of nicotine containing vaping products with regulations; this compares with 42 councils which made 2,918 visits to assess compliance of tobacco products. Fifty councils were able to provide detail on where non-compliant nicotine vaping products were found. Non-compliant products were most commonly found in convenience stores/grocers (36%) followed by specialist vaping suppliers (21%) and independent newsagents (15%). Specialist vaping suppliers were the premises type where non-compliant refills were most likely to be found (52%), followed by convenience stores/grocers (21%). Of those councils (n=42) able to provide detail on where non-compliant tobacco products were found, convenience stores/grocers were the most common premise for non-compliant cigarettes at 43% followed by 21% of independent newsagents.

1.9 Medicinal nicotine vaping products

There are still no nicotine vaping products licensed as a medicine and available on the market. As outlined in our 2018 report, licensed vaping products would be exempt from the Tobacco and Related Products Regulations 2016 (TRPR) and subject to medicinal regulations instead. For example, this would enable higher nicotine content, the products to be promoted for smoking cessation, and would enable health professionals to prescribe the products, including to more disadvantaged smokers.

The MHRA's guidance remains the same as reported previously. In December 2018, the MHRA announced it would convene an Ad Hoc Working Group for E-cigarettes (14) which met in 2019 to 2020. The MHRA is considering how best to take forward the recommendations from that group (personal communication).

1.10 Advertising

We reported previously that the blanket ban on health claims on permitted forms of vaping product advertising (domestic channels) was lifted in November 2018, but that the guidance for health claims states that they need to be product specific and supported by evidence that the specific vaping product possessed the health benefit (3). To our knowledge, no marketers for vaping products have made a health claim. These conditions should therefore be part of the proposed review of vaping product regulations (see below).

We noted in our 2020 report complaints made and upheld about the use of social media to promote tobacco and nicotine products (3). The Advertising Standards Authority continues to assess compliance with its regulations in relation to social media and influencers.

1.11 UK government strategies, consultations and relevant commissioned work

Tobacco Control Plan for England

The ambitions set out in the 2017 Tobacco Control Plan for England (15) currently remain in place although a new Plan has recently been announced (see below). The ambitions set out in the 2017 Tobacco Control Plan are set out below, with comments about progress in meeting these ambitions.

“Ambition 1: The first smokefree generation

People should be supported not to start smoking, so we aim, by the end of 2022 to:

- Reduce the prevalence of 15 year olds who regularly smoke from 8% to 3% or less.
- Reduce smoking prevalence amongst adults in England from 15.5% to 12% or less.
- Reduce the inequality gap in smoking prevalence between those in routine and manual occupations and the general population.”

Prevalence of 15 year olds who regularly smoke was to be assessed by the Smoking, Drinking and Drug Use Survey; the latest data available are from 2018 and are 5% (16).

Prevalence of smoking among adults in England was to be assessed by the Annual Population Survey; the latest data available are from 2019 and are 13.9% (17).

Reducing the inequality gap in smoking prevalence between those in routine and manual occupations and the general population can be assessed by the Office for National Statistics (ONS) from the Annual Population Survey - a ratio of 26.5% in routine and manual category (2016) to adult smoking prevalence of 15.5% (2016); in 2019 the ratio was 23.4% in routine and manual category to adult smoking prevalence of 13.9%) (17)). Further information on smoking in youth and adults and inequalities is given in subsequent chapters in this report.

“Ambition 2: A smokefree pregnancy for all

Every child deserves the best start in life, so we aim, by the end of 2022 to:

- Reduce the prevalence of smoking in pregnancy from 10.7% to 6% or less.”

Prevalence of smoking in pregnancy was to be assessed by the Smoking Status at Time of Delivery – NHS; the latest data available are from 2019/2020 and are 10.4% (18).

“Ambition 3. Parity of esteem for those with mental health conditions

People with mental ill health should be given equal priority to those with physical ill health, so we aim to:

- improve data collected on smoking and mental health to help us to support people with mental health conditions to quit smoking
- make all mental health inpatient services sites smokefree by 2018."

Improvement in data collected on smoking and mental health to help support people with mental health conditions to quit smoking is variable. There are now better data about smoking prevalence from the annual General Practice Patient Survey. There have also been improvements in data collection about smoking status and the provision of brief advice for people in inpatient mental health settings through the Preventing ill health by risky behaviours: alcohol and tobacco Commissioning for Quality and Innovation (CQUIN) indicator. However, data collection in community mental health settings remains poor).

On the ambition to make all mental health inpatient services sites smoke-free by 2018, a survey by Action on Smoking and Health in 2019 found that 37 of 45 mental health trusts that responded to the survey (82%) prohibited smoking on all trust premises (19). Note there are 54 mental health Trusts in England overall.

"Ambition 4: Backing evidence based innovations to support quitting

We are committed to evidence-based policy making, so we aim to:

- help people to quit smoking by permitting innovative technologies that minimise the risk of harm
- maximise the availability of safer alternatives to smoking"

This report discusses progress made with vaping products in relation to supporting quitting. Vaping products are widely available in England, but perceived relative availability compared with tobacco cigarettes has not been assessed to our knowledge. Also, we comment on the lack of a licensed vaping product above which might increase accessibility to more disadvantaged smokers.

In conclusion therefore, while improvements have been made in recent years, the smokefree mental health services ambition appeared to have been missed in 2018, the smoking in pregnancy ambition looks very unlikely to be met, and the inequality gap does not appear to be reducing markedly. The adult and youth ambitions appear achievable.

Advancing our health: prevention in the 2020s

In July 2019, the government published Advancing our health: prevention in the 2020s - a Green Paper consultation document setting out a mission to ensure that 'people could

enjoy at least 5 years extra healthy independent years of life by 2035, while narrowing the gap between the richest and the poorest' (20). In the Green Paper, the government stated that its ambition was to go smoke-free in England by 2030. This built on the commitment made in 2017 in its Tobacco Control Plan (15), which set out its vision to create a smoke-free generation, stating this would be achieved when smoking prevalence was at 5% or below. In the Green Paper, the government included an ultimatum for industry to make smoked tobacco obsolete by 2030, with smokers quitting or moving to reduced risk nicotine delivery systems such as vaping products.

The Green Paper acknowledged that reaching the 2030 smoke-free goal 'is extremely challenging' and that inequalities in smoking rates across groups would be a 'core challenge in the years ahead', requiring 'bold action to both discourage people from starting in the first place, and to support smokers to quit'. Options for raising revenue were to be examined including the 'polluter pays' approach, such as a levy on tobacco companies. The document further stated that the government was 'committed to monitoring the safety, uptake, impact and effectiveness of e-cigarettes and to assess further innovative ways to deliver nicotine with less harm than smoking tobacco'. This PHE-commissioned evidence update is part of that commitment.

The next steps were due to have been set out by 6 January 2020 (12 weeks after the consultation on the Green Paper closed) (21). A parliamentary debate was held on Smoke-free England on 12 November 2020 (22) which discussed the Green Paper commitments. In December 2020 an announcement was made that the Department of Health and Social Care working with Public Health England were to develop and publish (expected July 2021) a new Tobacco Control Plan to deliver the Smokefree 2030 ambition (23).

1.12 A Roadmap to a Smokefree 2030

The Smokefree Action Coalition published a 'Roadmap to a Smokefree 2030' (24) in January 2020. It includes 8 steps to achieve the smokefree goal, endorsed by health organisations, individual clinicians, health professionals and members of the public:

1. Legislating to require tobacco manufacturers to finance a Smoke-free 2030 Fund.
2. Consulting on the policy proposals submitted in response to the Green Paper.
3. Ensuring the NHS Long Term Plan commitments to provide smoking cessation in the NHS in England are delivered.
4. Reviewing and revising vaping product regulations to ensure fit for purpose in helping smokers quit while managing and minimizing any risk of uptake by never smokers.
5. Implementing greater reductions in affordability of smoked tobacco through increased taxation.
6. Updating the Tobacco Control Plan for England in line with the Smokefree 2030 ambition (as stated above the development of a new Tobacco Control Plan has now been announced).
7. Renewing and refreshing the Government's strategy to control the illicit trade in tobacco.
8. Sustaining Government commitment to support World Health Organization Framework Convention on Tobacco Control (WHO FCTC) implementation abroad as well as at home.

Given the stark differences in smoking prevalence between disadvantaged and more advantaged groups in England, we would also recommend intermediate targets for smoking in different disadvantaged groups to be set. These would be helpful to monitor and accelerate progress across the whole population in England.

1.13 Other consultations and legislative updates

A report on the Nicotine Inhaling Products (Age of Sale and Proxy Purchasing) Regulations 2015 was due before the end of September 2020 but at the time of writing had not yet been published. While vaping products (and tobacco cigarettes) cannot be sold to those aged under 18, a loophole enables samples of vaping products to be given out for free which needs to be tightened moving forward.

As highlighted in our 2020 report, the UK government has a commitment to review the TRPR vaping regulations by 20 May 2021 to assess whether the regulations have met their objectives. In the parliamentary debate referred to above (22), the Minister for Health (Edward Argar) announced that the Department of Health and Social Care would be carrying out a post-implementation review of the TRPR (as well as the Standardised Packaging of Tobacco Products Regulations 2015). A public consultation would be part

of that review process and was due to start before the end of 2020 but at the time of writing had yet to be announced.

Based on this and our previous evidence updates, we would consider it appropriate that all aspects of vaping products (and other non-tobacco nicotine products) be reviewed, in particular:

- regulation of non-nicotine vaping products given they are governed by different regulations and bodies to nicotine vaping products
- regulation of other non-tobacco nicotine products such as nicotine pouches which entered the market after the implementation of the TRPR
- limits set on product characteristics, such as nicotine content, containers and tanks
- advertising restrictions
- labelling and packaging requirements
- regulations around harm reduction claims and validation
- licensing process for nicotine vaping products given no such products are yet available
- availability of products (free samples) and ease of purchasing by young people despite age of sale regulations (Chapter 3)

1.14 National Institute for Health and Care Excellence: guideline

The National Institute for Health and Care Excellence (NICE) is examining vaping products as part of producing its updated guideline 'Tobacco: preventing uptake, promoting quitting and treating dependence (update)' (25). The publication of this has been delayed, most recently due to COVID-19, until September 2021 (although the guidance will be published for consultation from 18 March to 29 April 2021).

1.15 Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment: safety review

In September 2020, the independent Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) published a review on the potential toxicological risks from nicotine and non-nicotine vaping products (26). The review, commissioned by the Department of Health and Social Care and PHE, considered the absolute risks associated with vaping products as well as relative risks compared with tobacco cigarettes. It also considered possible risks to bystanders when vaping products are used. Although a more recent search was conducted towards the end of the review, the Committee considered that the evidence presented in its review broadly covered literature up to mid-2019. Its assessment of toxicological risks reflected products

produced to good manufacturing standards and the scope of the review concerned only typical use of the products and not when used in a manner not intended by the producer.

The COT report will be covered in detail in our next report which will comprehensively review the safety aspects of vaping products. In summary, the COT report largely reinforced the scientific consensus on the relative harms of vaping compared with smoking. It determined: 'in considering the comparison of electronic nicotine delivery systems and electronic non-nicotine delivery systems (E(N)NDS) use with conventional cigarette smoking, the Committee concluded that the relative risk of adverse health effects would be expected to be substantially lower from E(N)NDS'. Overall, particulate matter and nicotine were identified as 2 principal exposures which could be associated with adverse health effects, with inhalation of flavouring ingredients as an area of uncertainty. Uptake of vaping products by people who had not smoked tobacco would likely be associated with some adverse health effects to which the user would not otherwise have been subject.

1.16 Selected international developments

United States

Postscript on 'E-cigarette, or vaping, product use-associated lung injury (EVALI)' outbreak

The 'EVALI' outbreak was discussed in detail in our 2020 report (3). On 25 February 2020 (while our 2020 report was in press), the US Centers for Disease Control and Prevention (CDC) published its final update (27) on the number of hospitalised cases and deaths nationally. Its conclusions included that: "tetrahydrocannabinol (THC)-containing e-cigarette, or vaping products, particularly from informal sources like friends, family, or in-person or online dealers, are linked to most EVALI cases and play a major role in the outbreak" and "Vitamin E acetate is strongly linked to the EVALI outbreak". This conclusion was recently endorsed in a published paper (28).

Authorisation process for vaping products

In our 2020 report we stated that the US intended to introduce an authorisation process for vaping products in May 2020. Manufacturers were requested to submit a Pre-Market Tobacco Product Application (PMTA) to receive approval to sell their products (29).

As a result of a court order and subsequent extension due to COVID-19, PMTAs were due to be submitted to the US Food and Drug Administration (FDA) by 9 September 2020 with a one-year period during which products with PMTA applications submitted were permitted to remain on the market pending the FDA review of the applications. As of 3 November 2020 (30), the FDA reported receiving 10,453 PMTAs in 2020 for all tobacco products (which in the US includes nicotine vaping products), and 10,870 since the process was set up.

Canada

We previously reported (6) that the federal government in Canada enacted the Tobacco and Vaping Products Act (TVPA) which came into force in May 2018 and regulates the manufacture, sale, labelling, content and promotion of tobacco and vaping products. In December 2019, Health Canada enacted the Vaping Products Labelling and Packaging Regulations (VPLPR) (31) and in June 2020, the Vaping Products Promotion Regulations (VPPR). In December 2020 Health Canada proposed regulations to establish a maximum nicotine concentration of 20 mg/mL for vaping products (32).

Provincial, territorial and municipal laws also regulate vaping products and their use.

European Union

Scientific Committee on Health, Environmental and Emerging Risks (SCHEER) Preliminary Opinion on electronic cigarettes (33)

In September 2020, the Scientific Committee on Health, Environmental and Emerging Risks (SCHEER), following a request from the European Commission, published a preliminary opinion on vaping products. This was to assist the Commission with its reporting obligations under Article 28 of the EU TPD and assist in assessing the need for any changes.

The SCHEER assessment focused on vaping products':

- use and adverse effects, risks associated with their technical design and chemical composition and in relation to the existing EU regulations
- their role as a gateway to smoking initiation
- their role in cessation of cigarette smoking.

The methodology was not reported in sufficient detail in the report or annex to be able to understand how the evidence summarised had been selected. Established guidelines for systematically reviewing evidence and the reporting of reviews (34) had not been followed. For example, search terms given for the review i) did not capture all of the questions covered in the opinion; ii) had a start date of January 2015 and hence included studies of vaping products marketed long before the TPD was in place and iii) had a cut-off of April 2019 which was 18 months before the publication of the preliminary opinion and hence a reliance on out-of-date data in this quickly moving field. The report included predominantly US studies which therefore involved products which were regulated very differently from the TPD regulations. There was also no information on the quality of the studies included.

Given these methodological concerns and that SCHEER was still carrying out a consultation on this preliminary Opinion at the time of writing, the report is not covered further here.

Australia

In Australia, it is illegal to import, possess or use nicotine liquid without a doctor's prescription. Under the Poisons Standard nicotine liquid is classified as either a prescription-only medicine or as a dangerous poison without a prescription.

Consumers can import nicotine liquid for vaping from overseas for personal use through the Therapeutic Goods Administration (TGA) Personal Importation Scheme with a doctor's prescription. A government proposal in June 2020 to amend the customs regulations to ban nicotine imports by consumers and impose a AUD $222,000 fine was deferred after concerns were raised.

From 1 October 2021, nicotine liquid will be also available for purchase from some Australian pharmacies on prescription. A streamlined process for the writing and approval of nicotine prescriptions under the Authorised Prescriber Scheme will be introduced along with training for doctors. Vape shops and other vendors are not able to sell or supply nicotine liquid.

The TGA has produced Questions and Answers for the change in regulations. There are currently no regulations for the safety and quality of nicotine liquid. However, child resistant closures will be mandatory from 1 October 2021.

The Australian Senate established a Select Committee on Tobacco Harm Reduction which released its report on 18 December 2020. The majority report recommended that all nicotine vaping products continue to be classified as therapeutic goods requiring a doctor's prescription. A dissenting minority report by the Chair and another committee member recommended that nicotine vaping products be regulated as consumer products up to a maximum nicotine concentration of 50mg/mL with an appropriate regulatory framework.

New Zealand

The Smoking Environments and Regulated Products (Vaping) Amendment Act 2020 (2020/62) was passed on 11 August 2020, with some of the provisions coming into force on 11 November 2020. The Act broadens the scope of products regulated under the Smoke-free Environments Act 1990 to include vaping products and heated tobacco products, with scope to add new regulated products if appropriate in the future. The Act acknowledges that vaping products and heated tobacco products have lower health risks than smoking and aims to strike a balance between supporting smokers to switch to the less harmful products while improving their safety and limiting young people's access and attraction to them. Regulations are needed to implement some parts of the Act, for example packaging and warnings requirements and nicotine content restrictions, and will be subject to public consultation.

Summary of key provisions pertaining to vaping

1. The Ministry of Health is to introduce a notification process for manufacturers and importers of vaping products with a searchable database of notified products.
2. Product safety requirements will also be introduced.
3. The sale of vaping products and toy vaping products to under -18s is prohibited.
4. Prohibition of indoor vaping in workplaces and at a number of business locations where smoking is prohibited.
5. Prohibition within and around school grounds and early childhood centres, and from 11 May 2021 prominently display notices that vaping within the premises is forbidden at all times.
6. The same restrictions on marketing of vaping products as smoked tobacco products will apply. Some specified exemptions to these prohibitions will be allowed in order to support people to quit smoking, such as advice or messages from suitably qualified health workers; public health messages issued by the Director-General of Health; publication and dissemination of research about vaping products; publication and dissemination of research about encouraging smokers to switch; publication of media articles, commentary and opinion that encourage people to switch providing not sponsored by the manufacturer, importer, retailer or distributer of the product.
7. Free or discounted vaping products can be supplied as part of a publicly funded stop smoking programme and the supply of flavoured vaping products as part of a publicly funded smoking cessation programme.
8. From 11 May 2021, prohibition of substance or mixture of substances that is intended to be vaporised or aerosolised by a notifiable product from containing a colouring substance
9. The concept of specialist and general retailers is introduced according to specific sales criteria, with different provisions and requirements for each. For example, from 11 August 2021, general retailers can sell vaping products if they are tobacco, mint or menthol flavoured, and specialist vape retailers may continue to sell products of any flavour not expressly prohibited.
10. From 28 November 2021, prohibition of vaping in motor vehicles carrying children.
11. From 11 February 2022, only ‘notified’ vaping products that meet safety requirements will be available for purchase from retailers.

1.17 Structure of the report

Following this introductory chapter, Chapter 2 describes the methods used in this report. Chapter 3 provides the latest evidence on vaping among young people and Chapter 4 the latest data on vaping among adults; these chapters focus on England, drawing on surveys from England, Great Britain and the UK as appropriate. Chapter 5 presents a systematic review of vaping for smoking cessation and reduction.

1.18 Conclusions

As in our 2020 report, we use the term ‘vaping products’ to describe e-cigarettes and refill containers (e-liquids), ‘vapers’ to refer to people who regularly use vaping products and ‘vaping’ as the act of using a vaping product.

COVID-19, the disease caused by the coronavirus SARS-CoV-2, has had a devastating impact worldwide. For the purposes of this report, it has affected the implementation of routine surveys and has also likely affected both vaping and smoking behaviours in England. This is the subject of much ongoing research and it is too early to assess its full impact on vaping and smoking at the time of writing.

The UK government has committed to review the Tobacco and Related Products Regulations 2016 (TRPR) by 20 May 2021 (which govern nicotine vaping products) to assess whether the regulations have met their objectives. Other regulations are also being reviewed in relation to the European Union (Withdrawal Agreement) Act 2020.

New regulations have already been introduced concerning the notification mechanisms in Great Britain (a new system) and Northern Ireland (the previous European Union system) and these regulations ensure fees are only paid once when products are notified to both databases.

Since non-nicotine containing vaping products are less stringently regulated (through the General Product Safety Regulations 2005) than nicotine-containing products, they may need to be reviewed along with the forthcoming review of nicotine vaping regulations. As other non-tobacco nicotine products, such as nicotine pouches, emerge in England it seems appropriate to review regulations for these products at the same time.

Medicinally licensed vaping products are exempt from the TRPR and currently there is no licensed product in England.

Selling vaping products to anyone aged under 18 and buying vaping products for anyone under 18 are prohibited. Violations of the age of sale law for nicotine vaping products (and cigarettes) have been reported (see also Chapter 3). A 5 year report on these regulations is due. There is a loophole in the legislation allowing free samples of vaping products to be given to people of any age.

Between 20 May 2016 (implementation of TRPR) and 5 January 2021, the Medicines and Healthcare products Regulatory Agency (MHRA) had received 231 reports of 618 adverse reactions (each report represents an individual for whom more than one adverse reaction could have been reported) believed to be associated with nicotine containing vaping products through its Yellow Card scheme. A report is not proof that the reaction was caused by a vaping product, just that the reporter thought it might have been. Since 20 May 2016, the MHRA reported that there have been 3 fatalities, one of

which appeared to meet the criteria for the so-called ‘E-cigarette, or Vaping product, use-Associated Lung Injury’, ‘EVALI’.

A safety review by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) concluded that the risk of adverse health effects from vaping products is expected to be much lower than from cigarettes. The review found that exposure to particulate matter and nicotine could be associated with adverse health effects and that the effects of inhaling flavouring ingredients is uncertain. The COT also suggested people who had not smoked tobacco but vaped would likely experience some adverse health effects.

A government consultation in 2019 outlined a new ambition to go smokefree in England by 2030. It also included an ultimatum to industry to make smoked tobacco obsolete by 2030, with smokers quitting or moving to reduced risk nicotine delivery systems, such as vaping products.

The 2017 Tobacco Control Plan for England, which sets out ambitions for 2022, remains in place, although a new Tobacco Control Plan for England is expected to be published in July 2021.

1.19 Implications

The Smokefree 2030 goal, developing a new Tobacco Control Plan and reviewing the TRPR provide an opportunity to review all vaping (and other nicotine and tobacco) regulations to ensure that they are appropriate and help smokers quit, while managing the risk of uptake for never smokers.

As outlined in the Smokefree Action Coalition’s ‘Roadmap to a Smokefree 2030’, becoming smokefree by 2030 will require much greater resources and the Coalition proposed legislating to require tobacco manufacturers finance a ‘Smokefree 2030 Fund’.

The next Tobacco Control Plan for England provides an opportunity to set intermediate targets for smoking in different disadvantaged groups.

The lack of a medicinally licensed product needs also to be urgently reviewed.

Research is needed on the areas of concern outlined in the COT review.

2. Methods

As with previous PHE reports (3 to 6), this report used several data sources to assess vaping among adults and young people in England.

2.1 Survey data used

The present report used the following surveys for information on vaping and smoking among young people: the ASH Smoke-free Great Britain Youth survey (ASH-Y) and the International Tobacco Control Policy Evaluation Project Youth Tobacco and Vaping Survey (ITC Youth). The methods, sampling strategies and sample size of these surveys are described in Table 3 and data reported in Chapter 3.

The surveys used for information on vaping among adults were the Smoking Toolkit Study (STS), ASH Smoke-free Great Britain Adult Survey (ASH-A), the Opinions and Lifestyle Survey (OPN) and the Internet Cohort Great Britain survey (ICGB). The Annual Population Survey (APS) (17) was used to estimate smoking prevalence. These surveys are described in Table 4 and data reported in Chapter 4.

Data collection for the STS was interrupted in 2020 due to the COVID-19 pandemic with no data collection in March, and from April onwards, data were collected via telephone rather than household surveys. Diagnostic analyses have suggested it is reasonable to compare data from before and after the lockdown, despite the change in data collection method (35).

Changes from April onwards included that data on ethnicity were not collected until September. Additionally, all data were collected only from people aged 18 and over rather than 16 and over. This was to keep data comparable with other data collected by telephone and because most of the sample are contacted via mobile and a mobile phone contract requires the holder to be at least 18 years old. To ensure data consistency across time, we decided to exclude the participants aged 16 or 17 who had been surveyed in January to February 2020 (n=36). In previous years' reports we have used STS data from people aged 16 and over. In this report, where we present data over time, we have re-analysed all years' data, excluding people aged 16 and 17. This means there may be small differences in numbers reported for the same year between the present report and previous reports.

Table 3: Surveys used, young people

Survey name and acronym	Commissioned and conducted by	Geographic coverage, sample	Age	Representativeness	Design or mode
ASH-Y Smoke-free Great Britain Youth survey	ASH and YouGov Plc	Annual GB[1] survey of ~2,500 young people. Survey in 2020 conducted between 11 and 31 March GB 2020 n = 2,505, England n = 2,168, recruited from a YouGov Plc UK panel of more than 800,000 members	11 to 18 years	Figures weighted to be representative of GB children	Online, repeated, cross-sectional survey
ITC Youth[2] International Tobacco Control Policy Evaluation Project Youth Tobacco and Vaping survey	School of Public Health and Health Systems, University of Waterloo and the Nielsen Consumer Insights Global Panel	Survey covering the US, Canada and England, England sample of ~4,500 young people Survey in 2019 conducted between August and September 2019, England 20192 n = 3,493	16 to 19 years	Data are weighted to be representative of demographic characteristics (age by gender by region), calibrated to Wave 1 sample for student status and school grades, and to past 30-day smoking trend (in Canada and the US only)	Online, repeated, primarily cross-sectional survey with follow-up in subsequent waves for a limited number of participants (excluded from this analysis). Data collection is carried out using non-probability sampling

[1] Just those participants from England were used in the analyses presented in this report.
[2] The ITC survey also collects data from a small number of participants who were involved in previous years – we have excluded these given possible biases introduced from being involved in prior surveys

Table 4: Surveys used, adults

Survey name and acronym	Commissioned and conducted by	Geographic coverage, sample and date of most recent survey	Age	Representativeness	Design/Mode
APS Annual Population Survey	The Office for National Statistics (ONS)	UK (1) survey of ~122,000 households and ~220,000 respondents collected January to December 2019 in 4 waves, England 2019 n = 146,897	16+ years	Systematic sampling ensures representativeness at a regional level. Weighting is used to reflect official UK population data	Annual Household survey conducted face-to-face, by telephone or through computer assisted interviews. The APS does not collect data on vaping, but provides reliable estimates of smoking prevalence
STS Smoking Toolkit Study	University College London and Ipsos MORI	England survey of ~1,700 people per month, England 2020 (to October) n = 15,847 (15,811 aged 18+)	18+ years[2]	The sample is weighted to match the demographic characteristics of census data for England	From April 2020: Computer-assisted telephone interviewing Previously: Household survey consisting of face-to-face interviews
ASH-A ASH Smoke-free Great Britain Adult Survey	Action on Smoking and Health (ASH) and YouGov Plc	Annual GB[1] survey, 2020 conducted between February and April GB 2020 n = 12,809, England n = 10,749. Recruited from a YouGov Plc UK panel of more than 800,000 members	18+ years	The data are weighted to be representative of GB adults	Online, repeated, cross-sectional survey

Survey name and acronym	Commissioned and conducted by	Geographic coverage, sample and date of most recent survey	Age	Representativeness	Design/Mode
OPN Opinions and Lifestyle Survey	The Office for National Statistics (ONS)	GB[1] survey of 1,100 households per month over 8 months of the year England 2019 n = 6,511	16+ years	Sampling is stratified and data are weighted to be representative of the GB population	Household, face-to-face, repeated, cross-sectional survey
ICGB Internet cohort Great Britain survey	King's College London and Ipsos MORI	GB[1], people with a history of smoking and/or vaping, aged 18+, England 2019 n = 3,279	18+ years	Recruited from a panel using quotas for age, gender and region	Online, longitudinal survey

[1] Just those participants from England were used in the analyses presented in this report.
[2] The STS survey recruited people aged 16+ until February in 2020. Due to COVID-19 restrictions, no data were collected in March. From April, the STS has only collected data from people aged 18 and we have excluded previous respondents aged 16 and 17 for consistency.

2.2 Systematic literature review

To identify the available evidence on vaping for smoking cessation and reduction, we conducted a systematic review of the available, peer-reviewed literature. The full methods used to compile this review are described in Chapter 5. We conducted the systematic review following PRISMA guidelines and pre-registered the protocol on PROSPERO (CRD42021228676).

2.3 Other data sources

NHS Digital stop smoking service data

PHE monitors the delivery of stop smoking services in England. Data are collected from local authorities by NHS Digital (formerly the HSCIC), an internal NHS information technology provider. The data include information on the number of patients setting a quit date; the number who successfully quit and key measures of the service including intervention type, intervention setting, and type of pharmacotherapy received.

Since 2014, Stop Smoking Services have been asked to record if a vaping product was used in a quit attempt. A successful quitter is defined as a person who reports they have not smoked in the past 2 weeks, when assessed 4 weeks after their designated quit date. Clients who self-report as having quit at the 4-week follow up are required to have their carbon monoxide (CO) levels monitored as a validation of their quit attempt; self-reported quit rates and CO validated rates are reported separately by NHS Digital.

NHS Digital does not provide information on statistical difference and we do not have access to the raw data to provide more detailed information. We report data from April 2019 to March 2020.

MHRA Yellow Card scheme

The Yellow Card reporting scheme, run by the MHRA, is the system for recording suspected adverse reactions to medicines and medical devices in the UK. On 20 May 2016, the Yellow Card scheme launched an online reporting form tailored to collecting cases of suspected adverse reactions and physical safety concerns associated with vaping products.

The Yellow Card scheme was established in 1964 and is an important way in which the MHRA collects information to monitor the safety of medicines in the UK; medicines safety information from other UK and international data sources supplements data collected by the Yellow Card scheme. Any suspected adverse drug reaction to a medicine can be reported by a health professional, or member of the public and manufacturers have a legal obligation to report reactions. Inclusion of a report in the Yellow Card scheme database does not necessarily mean that the reactions reported

were caused by a medicine or a vaping product, only that the person reporting the event had a suspicion it may have, or it had a close temporal relationship to the administration of the medicine or vaping product.

The MHRA provided us with anonymised details for spontaneous suspected adverse reaction reports for vaping products. We report spontaneous adverse drug reactions for the period from 20 May 2016 to 5 January 2021.

3. Vaping among young people

3.1 Objective

This chapter summarises survey data on vaping among young people in England. The focus is on vaping, with smoking data also presented where comparisons are appropriate and illustrative. As well as reporting on vaping prevalence overall, this chapter summarises vaping by socio-demographic characteristics. It also covers reasons for use, product preferences, sources of vaping products, addiction and harm perceptions. The chapter briefly presents prevalence of use of heated tobacco, nicotine pouches and smokeless tobacco.

3.2 Surveys

There are fewer available data on young people compared with previous years for the following reasons:

1. The largest survey used in our 2020 report (3) was the Smoking, Drinking and Drugs (SDD) survey - this survey runs every 2 years and therefore there were no new SDD data available for the present report.
2. COVID-19 disrupted some data collection. After February 2020, the STS survey (usually 16+ years) stopped collecting data from people under the age of 18 (see Chapter 2) (36)
3. The Health Survey for England runs every 2 years and was due to be published in 2020; however, fieldwork was suspended due to COVID-19 and so data are not available for this report (37).

ASH-Y surveys (covering 11 to 18 year olds) have been used in our previous reports. These surveys are conducted online and the latest one was completed in March 2020, so these data are reported here. ASH-Y is a large survey designed to be nationally representative.

To supplement this, we also include data from the International Tobacco Control Policy Evaluation Project (ITC) Youth Tobacco and Vaping survey which is also conducted online. The ITC is a large survey of 16 to 19 year olds that is weighted to ensure that the sample matches national benchmarks for age, gender and region. The ITC youth survey has been running annually since 2017 and here we report data collected between August and September 2019. However, for continuity and to align with our data on young people in previous reports which focused on 18 year olds and under, we predominantly report ASH-Y data in this chapter, showing ITC youth survey data for key questions or where the questions were not available in ASH-Y. We also report ASH-Y data from 2015 to 2020 for trends where available. Both the ASH-Y and ITC surveys are described in Chapter 2 (Table 3).

3.3 Smoking and vaping prevalence among young people in England

Table 5 presents the latest available data on smoking and vaping among young people from the ASH-Y and ITC surveys. Current smoking prevalence (people who smoked sometimes but less than weekly, as well as those who smoked more than once a week) in 2020 was 6.7% for 11 to 18 year olds (ASH-Y), with 80.9% having never tried smoking. This estimate of current smoking compares with previous ASH-Y estimates of 6.3% for 2019 and 6.1% for 2018. In the ITC survey, 6.2% of 16 to 19 year olds currently smoked (people who had smoked more than 100 cigarettes in their life and who had smoked in the past 30 days) in 2019, with 62.0% saying they had never smoked.

Current vaping prevalence (people who vaped at least monthly) as reported in the ASH-Y survey was 4.8% in 2020, the same estimate as in 2019, preceded by 3.5% in 2018. The proportion of young people who had never vaped in 2020 was 82.8%. The ITC survey in 2019 estimated current vaping (people who had vaped more than 10 days in their life and who had vaped in the past 30 days) among 16 to 19 year olds to be 7.7% and any past 30-day vaping to be 12.6%, which is higher than the ASH-Y estimate of current vaping, with the proportion who had never vaped being 63.9%.

The differences between the 2 surveys are likely attributable to the different age ranges covered by each survey as well as the differing definitions of smoking and vaping across the 2 surveys (see footnotes Table 5). For example, ASH-Y includes people aged 11 to 18 years old, whereas the ITC survey includes people aged 16 to 19 years old. It is therefore to be expected that the ITC survey will produce higher estimates of current vaping prevalence and contains a higher proportion of current vapers who vaped daily than the ASH-Y survey. Indeed, around 25.6% of current vapers in the ITC survey vaped daily compared with around 21.4% of current vapers in the ASH-Y survey.

Table 5: Current smoking and vaping prevalence among young people in 2 national surveys, England (ASH-Y 2015 to 2020 and ITC 2019; weighted data)

Survey	ASH-Y 2015 England	ASH-Y 2016 England	ASH-Y 2017 England	ASH-Y 2018 England	ASH-Y 2019 England	ASH-Y 2020 England	ITC 2019 England
Age	11 to 18	11 to 18	11 to 18	11 to 18	11 to 18	11 to 18	16 to 19
Smoking status %							
Never tried	77.1	80.3	76.9	78.6	79.7	80.9	62.0
Tried only[1]	11.7	9.7	10.7	10.2	9.0	8.3	31.0
Former	3.0	3.3	3.6	3.5	3.4	3.0	0.8
Current	7.1	5.2	7.8	6.1	6.3	6.7	6.2
Vaping status %							
Never tried	93.9	87.8	83.2	82.8	83.6	82.8	63.9
Tried only[1]	4.7	9.3	10.9	12.3	9.4	10.0	23.8
Former			1.7	0.8	0.9	1.8	4.6
Current	1.2	2.5	3.5	3.5	4.8	4.8	7.7
Past 30-day							12.6
Unweighted sample size	1,926	1,999	2,260	2,011	2,173	2,168	3,493

Notes

ASH-Y: Never smokers were people who had never tried cigarettes. Tried only smokers were people who had only ever tried smoking cigarettes once. Former smokers were people who used to smoke sometimes but who never smoked now. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week. Never vapers were people who had never tried vaping as

well as those who had never heard of e-cigarettes. Tried only vapers were people who had only tried vaping once or twice. Former vapers were people who used vaping products in the past but who no longer do. Current vapers were people who vaped at least monthly.
ITC: Never smokers were people who had never tried cigarettes. Tried only smokers (referred to as 'Experimental smokers' in the ITC survey) were people who had tried cigarettes, but who had not smoked more than 100 cigarettes in their life. Former smokers were people who had smoked more than 100 cigarettes in their life, but who had not smoked in the past 30 days. Current smokers were people who had smoked more than 100 cigarettes in their life and who had smoked in the past 30 days. Never vapers were people who had never tried vaping. Tried only vapers were people who had tried vaping, but who had not vaped for more than 10 days in their life. Former vapers were people who had vaped more than 10 days in their life, but who had not vaped in the past 30 days. Current vapers were people who had vaped more than 10 days in their life and who had vaped in the past 30 days. Past 30-day vapers were people who had vaped at least once in the past 30 days.
[1] ITC denotes 'tried only' as 'experimental' smokers

Table 6 contains data for smoking prevalence by socio-demographic characteristics using the ASH-Y data. As expected, the proportion of young people who smoked appears to increase with age, for example 2.7% of 11 to 15 year olds smoked compared with 15.6% of 18 year olds. This latter estimate for 18 year olds is slightly lower than the equivalent estimates in 2019 (16.5%) and 2018 (16.1%). Similarly, the proportion of young people who had never tried smoking appears to decline with age. There were few variations according to gender and region. The estimate for smoking prevalence by social grade was 7.1% for people from social grades A, B and C1 (ABC1) and 5.7% for people from social grades C2, D and E (C2DE). Box 1 shows the definition of these social grades which are derived from the main income earner in the household.

Table 6: Smoking prevalence among young people by age, gender, region and social grade; England 2020 (ASH-Y, weighted data)

	Never tried % (n)	Tried only % (n)	Former smoker % (n)	Current smoker % (n)
Total	80.9 (1,683)	8.3 (206)	3.0 (78)	6.7 (176)
Age				
11 to 15	90.2 (1,001)	5.0 (60)	1.3 (15)	2.7 (33)
16 to 17	68.7 (419)	13.0 (81)	5.5 (36)	11.7 (77)
18	60.8 (263)	15.1 (65)	6.2 (27)	15.6 (66)
Gender				
Female	81.5 (825)	7.8 (98)	3.1 (41)	7.1 (95)
Male	80.5 (858)	8.8 (108)	2.9 (37)	6.3 (81)
Region				
North	79.4 (445)	10.0 (69)	3.3 (22)	6.5 (48)
Midlands	83.4 (330)	7.8 (35)	2.4 (13)	5.3 (26)
South	80.9 (908)	7.7 (102)	3.1 (43)	7.3 (102)
Social Grade				
ABC1	80.4 (1,185)	8.7 (153)	3.0 (55)	7.1 (133)
C2DE	82.2 (498)	7.6 (53)	3.1 (23)	5.7 (43)

Notes

Unweighted base = 2,168. Never smokers were people who had never tried cigarettes. Tried only smokers were people who had only ever tried smoking cigarettes once. Former smokers were people who used to smoke sometimes but who never smoked now. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week. 1% of participants (n=25) did not want to say what their smoking status was, therefor row percentages might not total 100

Box 1. Social grade classifications derived from the National Readership Survey

Social Grade	Description
A	High managerial, administrative or professional
B	Intermediate managerial, administrative or professional
C1	Supervisory, clerical and junior managerial, administrative or professional
C2	Skilled manual workers
D	Semi and unskilled manual workers
E	State pensioners, casual or lowest grade workers, unemployed with state benefits only

Table 7 shows the estimates of vaping prevalence by socio-demographic characteristics and similarly indicates increased vaping prevalence with age, with 2.4% of 11 to 15 year olds currently vaping compared with 8.7% of 18 year olds. As with smoking, the proportion of young people who had never vaped seems to decline with age from 91.5% of 11 to 15 year olds to 66.2% of 18 year olds. Vaping prevalence among males was 5.3% compared with 4.2% among females. The data indicate that, as with smoking prevalence, vaping prevalence may be higher among social grades ABC1 (5.3%) than among C2DE (3.5%).

Table 7: Vaping status among young people by age, gender, region, social grade and smoking status; England 2020 (ASH-Y, weighted data)

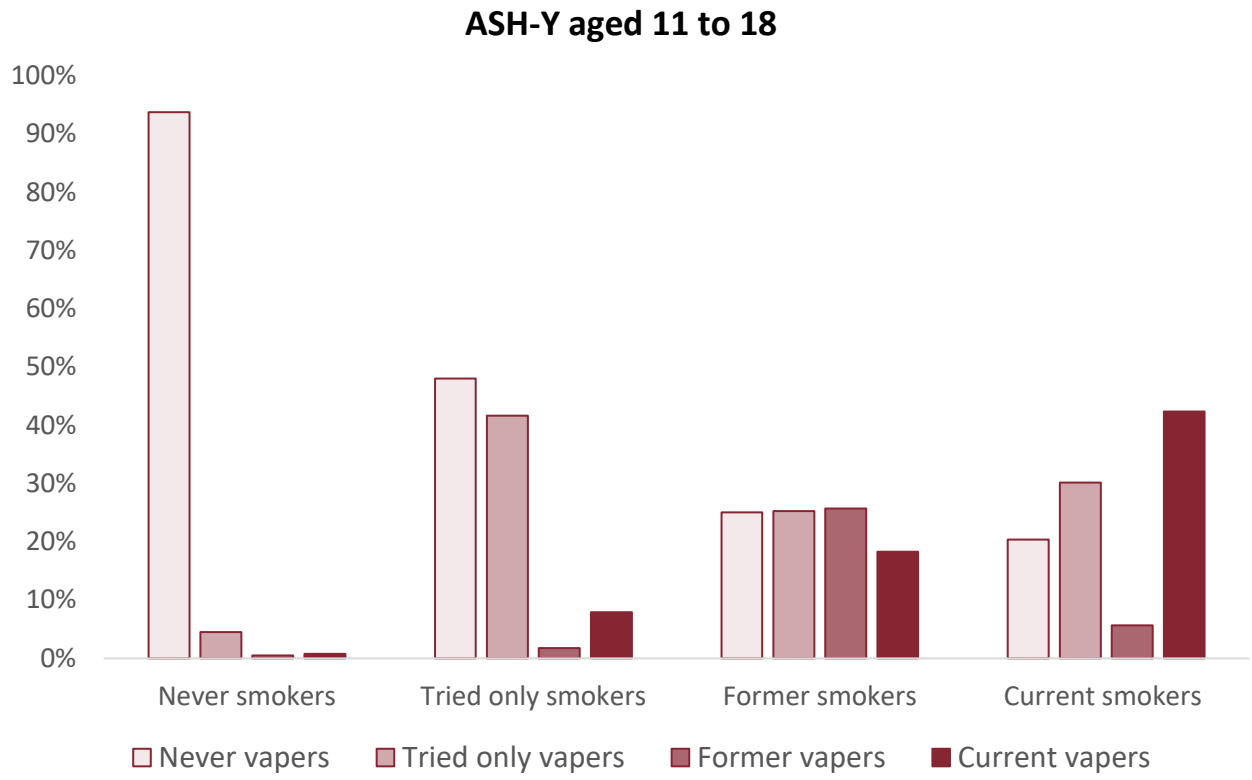
	Never tried % (n)	Tried only % (n)	Former vaper % (n)	Current vaper % (n)
Total	82.8 (1,731)	10.0 (261)	1.8 (44)	4.8 (117)
Age				
11 to 15	91.5 (1,017)	4.5 (55)	0.6 (8)	2.4 (28)
16 to 17	69.6 (428)	17.2 (111)	4.2 (25)	8.4 (52)
18	66.2 (286)	22.3 (95)	2.5 (11)	8.7 (37)
Gender				
Female	84.2 (863)	8.9 (119)	1.8 (24)	4.2 (51)
Male	81.4 (868)	11.1 (142)	1.8 (20)	5.3 (66)
Region				
North	80.9 (454)	10.8 (79)	2.0 (15)	5.3 (37)
Midlands	84.2 (331)	9.0 (47)	1.4 (6)	5.0 (23)
South	83.2 (946)	10.0 (135)	1.8 (23)	4.4 (57)
Social Grade				
ABC1	82.6 (1,228)	10.2 (187)	1.6 (28)	5.3 (92)
C2DE	83.2 (503)	9.7 (74)	2.2 (16)	3.5 (25)
Smoking Status				
Never smoked	93.8 (1,561)	4.5 (91)	0.5 (9)	0.8 (14)
Tried only	48.1 (99)	41.7 (88)	1.8 (3)	7.9 (15)
Former smoker	25.1 (19)	25.3 (19)	25.8 (21)	18.3 (16)
Current smoker	20.4 (34)	30.2 (60)	5.7 (10)	42.4 (70)

Notes

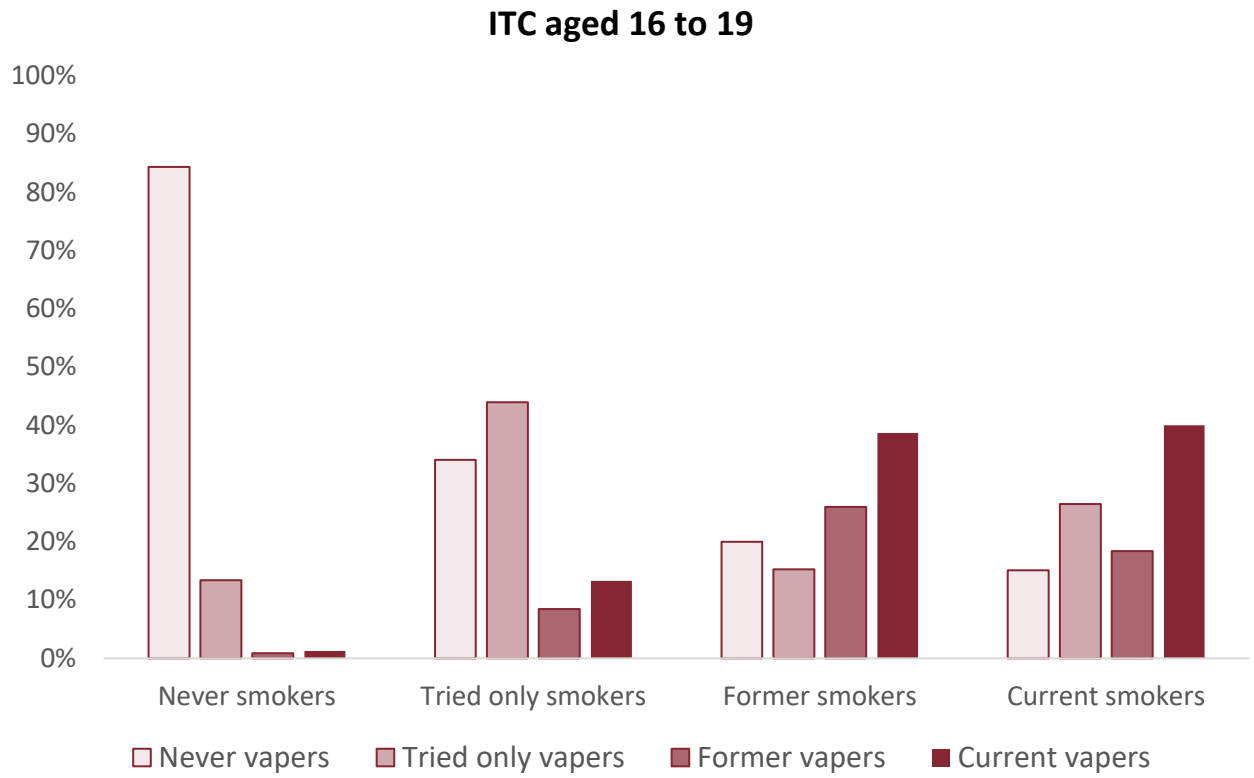
Unweighted base = 2,168. Never vapers were people who had never tried vaping. Tried only vapers were people who had only tried vaping once or twice. Former vapers were people who used vaping products in the past but who no longer do. Current vapers were people who vaped at least monthly. Never smokers were people who had never tried cigarettes. Tried only smokers were people who had only ever tried smoking cigarettes once. Former smokers were people who used to smoke sometimes but who never smoked now. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week.

Most young people who had never smoked had also never vaped (Table 7 and Figure 1). ASH-Y data indicate that 93.8% of 11 to 18 year olds who had never smoked had also never vaped, and just 0.8% of never smokers were current vapers. An estimated 42.4% of current smokers, and 18.3% of former smokers currently vaped.
The proportion of current smokers who were current vapers was similar in the ITC data (40.0%). The ITC data indicate that 84.4% of 16 to 19 year olds who had never smoked had also never vaped, and a very low proportion of never smokers reported currently vaping (1.3%). In both surveys, a high proportion of people who had tried (or experimented with) vaping had also tried smoking.

Figure 1: Vaping status by smoking status among young people; England (ASH-Y 2020 and ITC 2019, weighted data)



Notes
Unweighted base = 2,168. Never smokers were people who had never tried cigarettes. Tried only smokers were people who had only ever tried smoking cigarettes once. Former smokers were people who used to smoke sometimes but who never smoked now. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week. Never vapers were people who had never tried vaping. Tried vaping were people who had only tried vaping once or twice. Former vapers were people who used vaping products in the past but who no longer do. Current vapers were people who vaped at least monthly.



Notes

Unweighted base = 3,485. Never smokers were people who had never tried cigarettes. Tried only smokers (referred to as 'Experimental smokers' in the ITC survey) were people who had tried cigarettes, but who had not smoked more than 100 cigarettes in their life. Former smokers were people who had smoked more than 100 cigarettes in their life, but who had not smoked in the past 30 days. Current smokers were people who had smoked more than 100 cigarettes in their life and who had smoked in the past 30 days. Never vapers were people who had never tried vaping. Tried only vapers were people who had tried vaping, but who had not vaped for more than 10 days in their life. Former vapers were people who had vaped more than 10 days in their life, but who had not vaped in the past 30 days. Current vapers were people who had vaped more than 10 days in their life and who had vaped in the past 30 days.

3.4 Reasons for vaping

The ASH-Y and ITC surveys asked participants about reasons for vaping, but different groups of participants were asked these questions. The ASH-Y survey asked all participants who had ever vaped, whereas the ITC survey asked participants who had vaped in the past 30 days. The ITC survey also differed from the ASH-Y survey because participants could choose multiple reasons for vaping, whereas the ASH-Y survey reported participants' single, main, reason for vaping.

The most common reasons for vaping reported by young people were either to 'give it a try' (ASH-Y survey – 50.1%) or 'for fun/I like it' (ITC survey – 44.6%) with 'liking the flavours' the second most popular reason in both surveys (ASH-Y - 13.8%, ITC - 41.1%).

For ASH-Y, the next most common reasons were 'other people use them, so I join in' (12.0%) and to 'use them instead of smoking' (7.2%); all other reasons were selected by less than 5% of participants. In the ITC survey, 41.2% of people who vaped in the past

30 days selected at least one reason related to reducing harm (for example ‘vaping may be less harmful to people around me than smoking’ or ‘to cut down the number of cigarettes I smoke’). Reasons related to smoking cessation (for example ‘I use them instead of smoking’ or ‘I am trying to quit smoking’) were selected by 11.9% of ASH-Y participants, and in the ITC survey 20.4% selected at least one reason related to quitting smoking, perhaps reflecting the older age range (16 to 19) and the option to choose multiple reasons for vaping in the ITC survey.

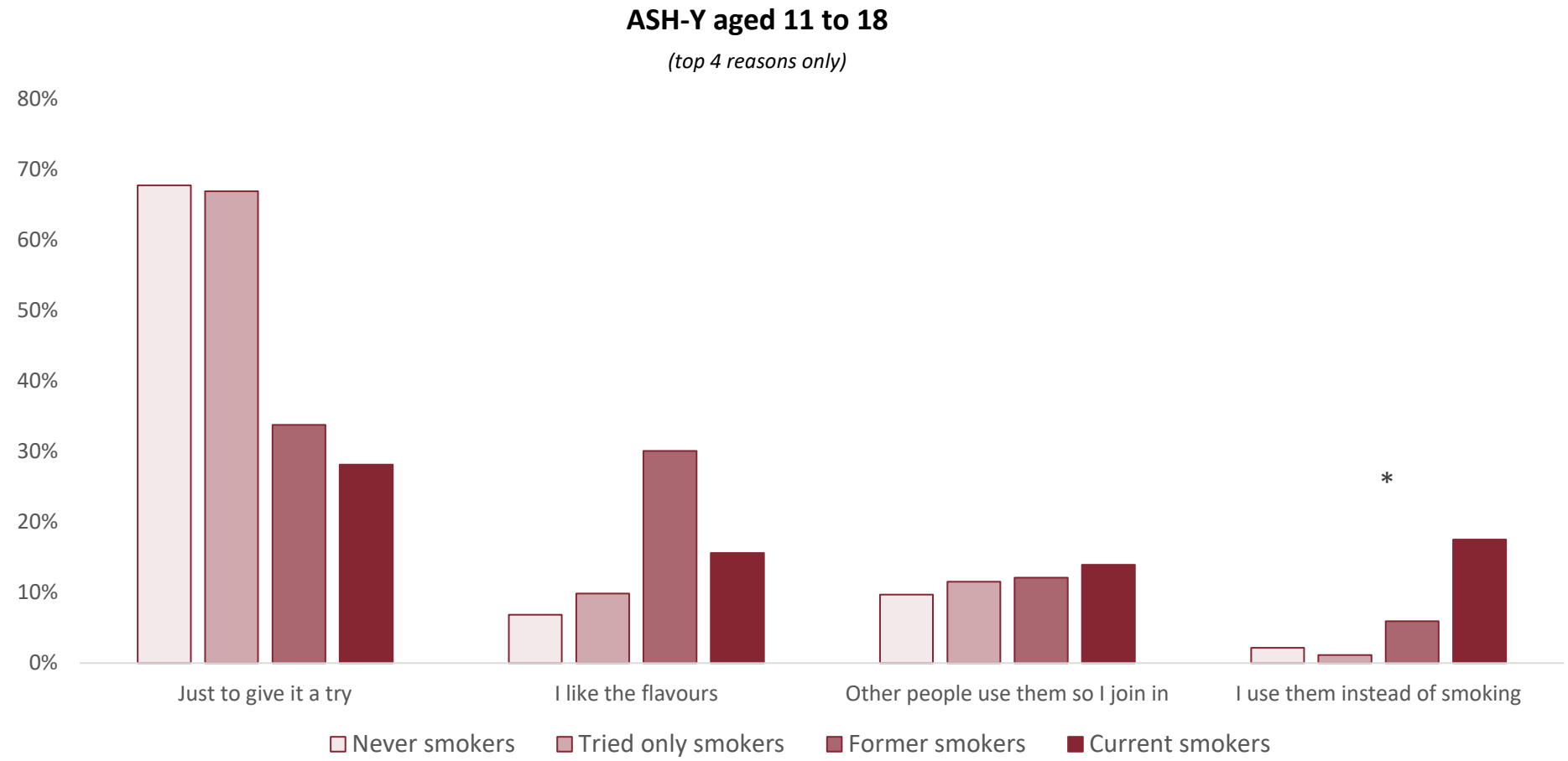
The reasons for vaping differed according to smoking status (Figure 2). ASH-Y data indicate that high proportions of never smokers (67.8%) and those who had tried smoking only (66.9%) had vaped just to ‘give it a try’. This latter figure suggests that there may be a group of young people who experiment with both smoking and vaping but do not become regular users, although this cannot be tested with cross-sectional data. Whereas 28.2% of current smokers also vaped to ‘give it a try’, the next most common reason by current smokers for vaping was as an alternative to smoking (17.5% compared with 5.9% of former, 1.1% of tried only and 2.2% of never smokers).

The ITC data show that high proportions of former and current smokers vaped for smoking reduction or cessation reasons, including to cut down on or reduce the number of cigarettes they smoke (Figure 2). Among current smokers, 37.2% vaped to cut down on the number of cigarettes they used and 32.1% to help them quit.

That some current smokers vaped to cut down on smoking, rather than to quit completely is of concern, with dual users continuing to be exposed to high levels of harm from smoking. On the other hand, smokers’ experience of vaping might facilitate further changes towards quitting smoking. Nevertheless, it is perhaps encouraging that some young people have vaped to try to quit smoking, suggesting that the health benefits from smoking cessation are being heard by some people in these age groups.

Among former smokers, 50.9% vaped because it might be less harmful to people around them than smoking and 45.2% to help them maintain abstinence from cigarettes. The most common reason for vaping reported by 64.0% of former smokers in the ITC survey was because vaping may be less harmful for them than smoking.

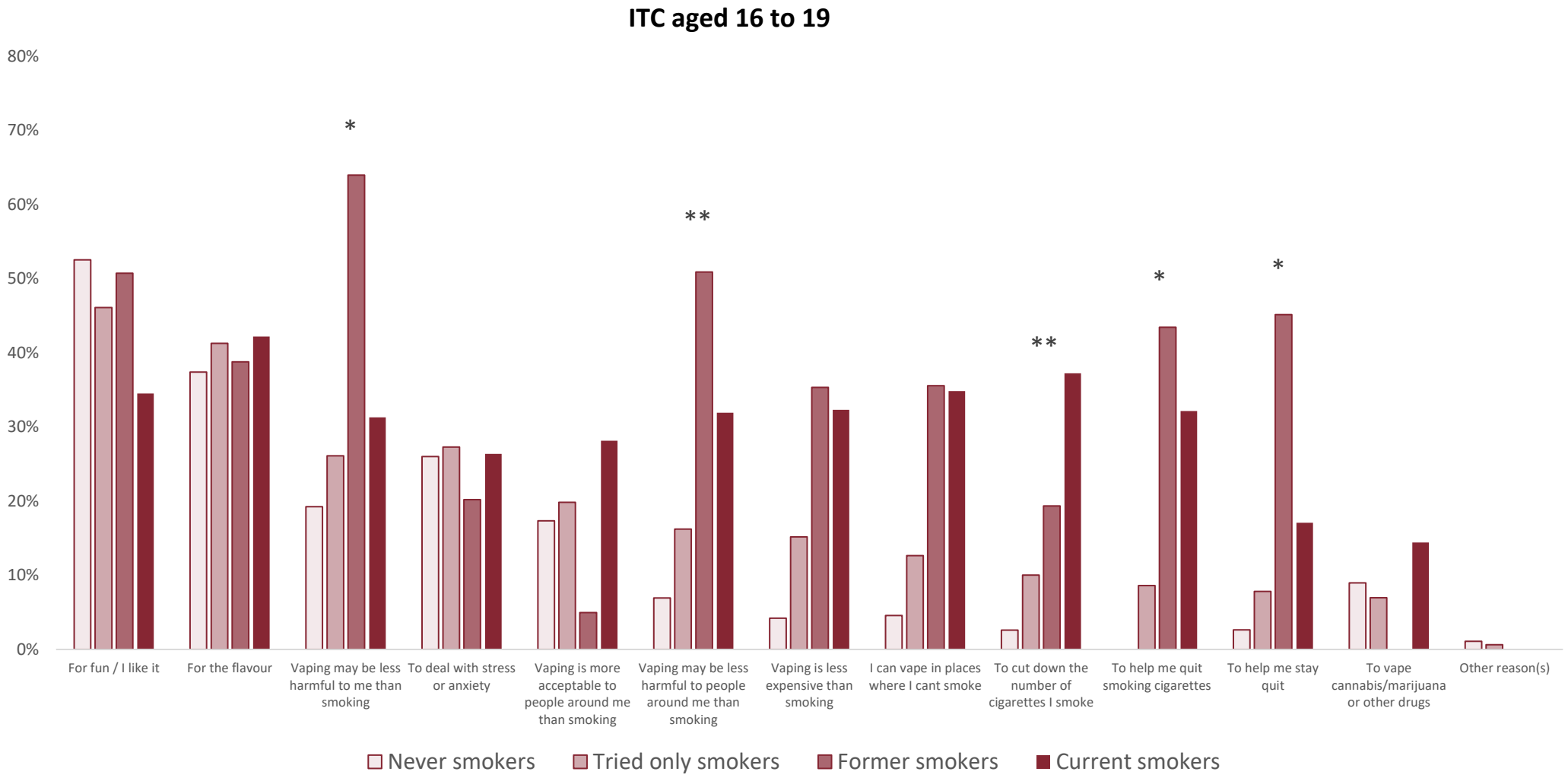
Figure 2: Reasons for vaping by smoking status among young people who have ever vaped (ASH-Y) and who vaped in the past 30 days (ITC); England (ASH-Y 2020 and ITC 2019, weighted data)



Notes

Unweighted base = 422. Participants could choose a single, main reason for vaping. People who have ever vaped comprised current, former and tried only vapers. Never smokers were people who had never tried cigarettes. Tried only smokers were people who had only ever tried smoking cigarettes once. Former smokers were people who used to smoke sometimes but who never smoked now. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week.

* denotes reasons related to smoking cessation



Notes

Unweighted base = 472. Participants could choose multiple reasons for vaping. Never smokers were people who had never tried cigarettes. Tried only smokers (referred to as 'Experimental smokers' in the ITC survey) were people who had tried cigarettes, but who had not smoked more than 100 cigarettes in their life. Former smokers were people who had smoked more than 100 cigarettes in their life, but who had not smoked in the past 30 days. Current smokers were people who had smoked more than 100 cigarettes in their life and who had smoked in the past 30 days.

* denotes reasons related to smoking cessation

** denotes reasons related to harm reduction

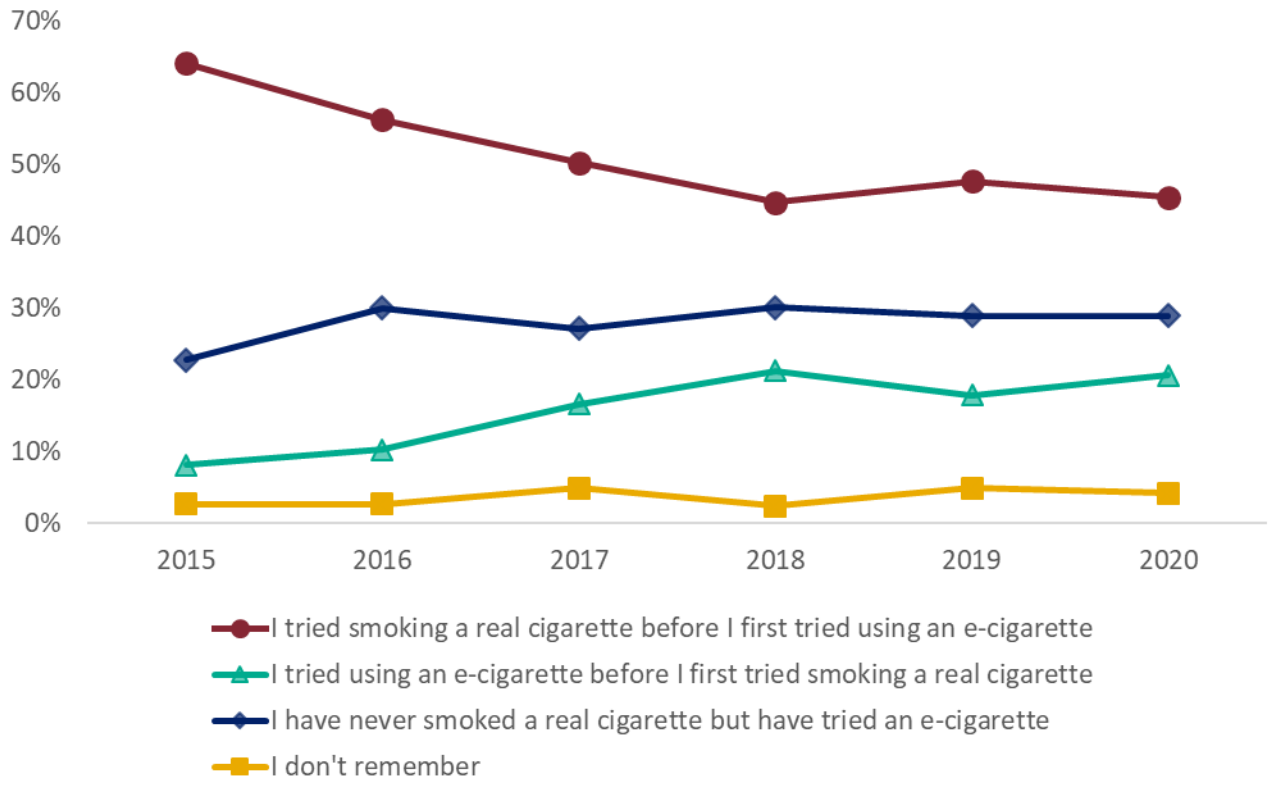
3.5 Order of first use

The ASH-Y survey participants reported the order in which they first tried cigarettes or vaping products from 2015, enabling changes to be tracked over time. The ITC survey participants reported order of first use across a range of tobacco products not limited to vaping products. To be consistent with our previous reports, the ASH-Y data were used for this section. To note, data presented here are cross-sectional and cannot provide evidence for causal relationships.

Among young people who had ever vaped, the order in which they first used cigarettes and vaping products appears to have changed in the past 6 years (Figure 3). From 2015 until 2018, decreasing proportions of young people had tried smoking before vaping. This appears to have remained steady at around 45% since 2018, while remaining the most common order of use. Similarly, while there was an increase in the proportion of young people who vaped before smoking, the proportion appears to have stabilised at around 20% since 2018. Trying vaping but never having smoked has remained at just under 30% since 2016. The order of first use of vaping and smoking by socio-demographic characteristics is presented in Table 8.

It appears that, among the older age group, smoking before vaping was more common as selected by 41.3% of 11 to 15 year olds and 53.0% of 18 year olds. For social grade, 23.9% of people in groups ABC1 vaped before they smoked compared with 11.8% in groups C2DE; however, 36.4% of those in C2DE groups reported that they had ever vaped but never smoked, compared with 26.0% of young people from ABC1 groups. There was otherwise little variation between socio-demographic characteristics.

Figure 3: Order of first use of cigarettes and vaping products among young people aged 11 to 18 who have ever vaped; England, 2015 to 2020 (ASH-Y, weighted data)



Notes

Unweighted bases: 2015=268; 2016=273; 2017=374; 2018=365; 2019=335; 2020=422. People who have ever vaped comprised current, former and tried only vapers.

Table 8: Order of first use of cigarettes and vaping products among young people who have ever vaped by age, gender, region and social grade, England 2020 (ASH-Y weighted data)

	Tried smoking before vaping % (n)	Tried vaping before smoking % (n)	Never smoked, but have vaped % (n)
Total	45.4 (195)	20.6 (87)	28.9 (117)
Age			
11 to 15	41.3 (38)	20.1 (17)	33.0 (31)
16 to 17	43.3 (81)	21.5 (42)	31.4 (57)
18	53.0 (76)	19.8 (28)	20.5 (29)
Gender			
Female	51.0 (101)	16.7 (32)	27.1 (51)
Male	41.1 (94)	23.6 (55)	30.2 (66)
Region			
North	43.3 (59)	21.3 (28)	30.6 (38)
Midlands	46.8 (35)	17.7 (13)	30.6 (24)
South	46.2 (101)	21.2 (46)	27.3 (55)
Social Grade			
ABC1	44.8 (140)	23.9 (74)	26.0 (76)
C2DE	47.2 (55)	11.8 (13)	36.4 (41)

Notes

Unweighted base = 422. People who have ever vaped comprised current, former and tried only vapers. 4.1% (n=19) said they did not remember which product they tried first, therefore percentages might not total 100

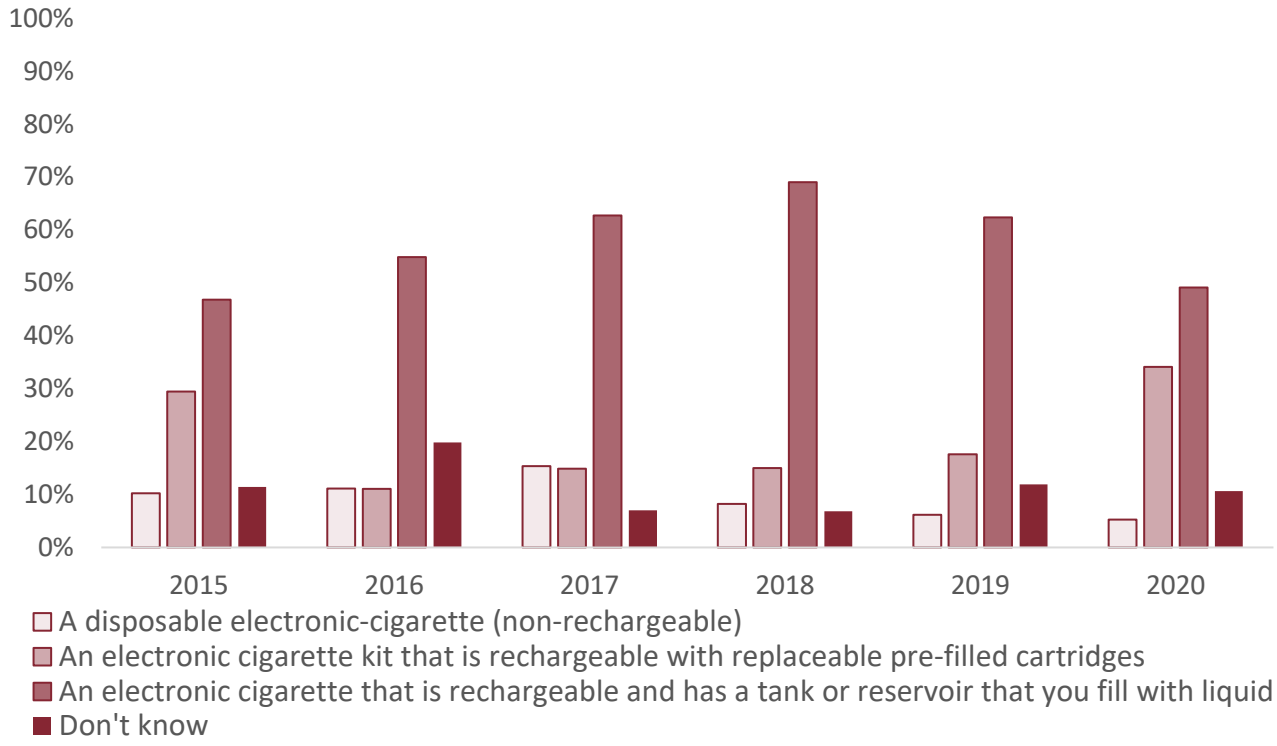
3.6 Vaping products

Rechargeable models that have a tank that you fill with liquid (tank models) were the most popular vaping product type among ASH-Y survey participants, with just under half of 11 to 18 year olds (49.1%) who currently vaped using this type of product. The second most common product type was rechargeable products that used cartridges (34.2%). Disposable vaping products were used by 5.3% of current vapers and 10.6% did not know which product type they used.

The popularity of tank models appears to have increased between 2015 and 2018 (Figure 4) but subsequently declined between 2018 and 2020. This could be because of the increasing popularity of cartridge models between 2018 (15.0%) and 2020 (34.2%). It is likely that this is driven by the arrival on the market of pod models, which are not recorded separately in the ASH-Y survey, however brands are reported and give us an indication of patterns of use.

In 2020, the ASH-Y survey indicated that the most popular brands were JUUL (a cartridge model, 21.8%), Smok (cartridge and tank models, 18.3%) and Vype (a cartridge model, 13.2%), although 43.0% of participants did not know which brand they used.

Figure 4: Type of vaping product used by young people aged 11 to 18 who currently vape, England 2015 to 2020 (ASH-Y, weighted data)



Notes

Unweighted bases; 2015 = 52; 2016 = 57; 2017 = 82; 2018 = 77; 2019 = 106; 2020 = 117. Current vapers were people who vaped at least monthly.

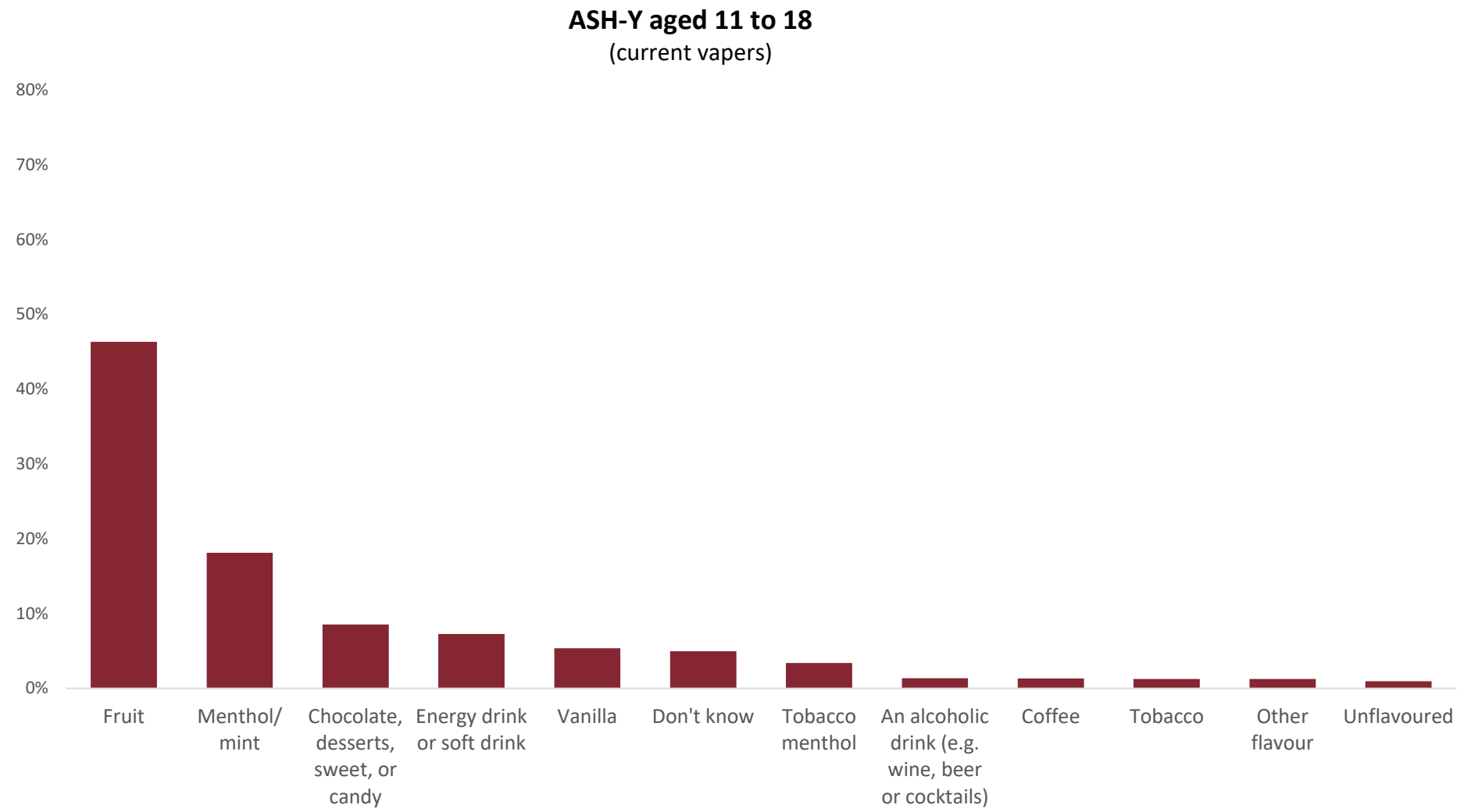
3.7 Flavours

The ASH-Y surveyed the flavour preferences of young people who currently vaped, while the ITC collected data on the flavours used most often among young people who vaped in the past 30 days. The ASH-Y data estimated that fruit flavoured vaping products were used by 46.3% of 11 to 18 year olds who vaped (Figure 5) followed by menthol or mint (18.1%) and chocolate, desserts, sweet or candy flavours (8.5%).

The ITC data reports similar flavours that were most often used among 16 to 19 year olds who vaped in the last 30 days, with 67.7% using fruit flavours, 18.3% using menthol or mint flavours and 13.5% using chocolate, desserts, sweet or candy flavours. The ITC survey also indicates that 10.3% used tobacco flavours (1.2% in ASH-Y). All other flavours, across both surveys, were used by less than 10% of those included participants.

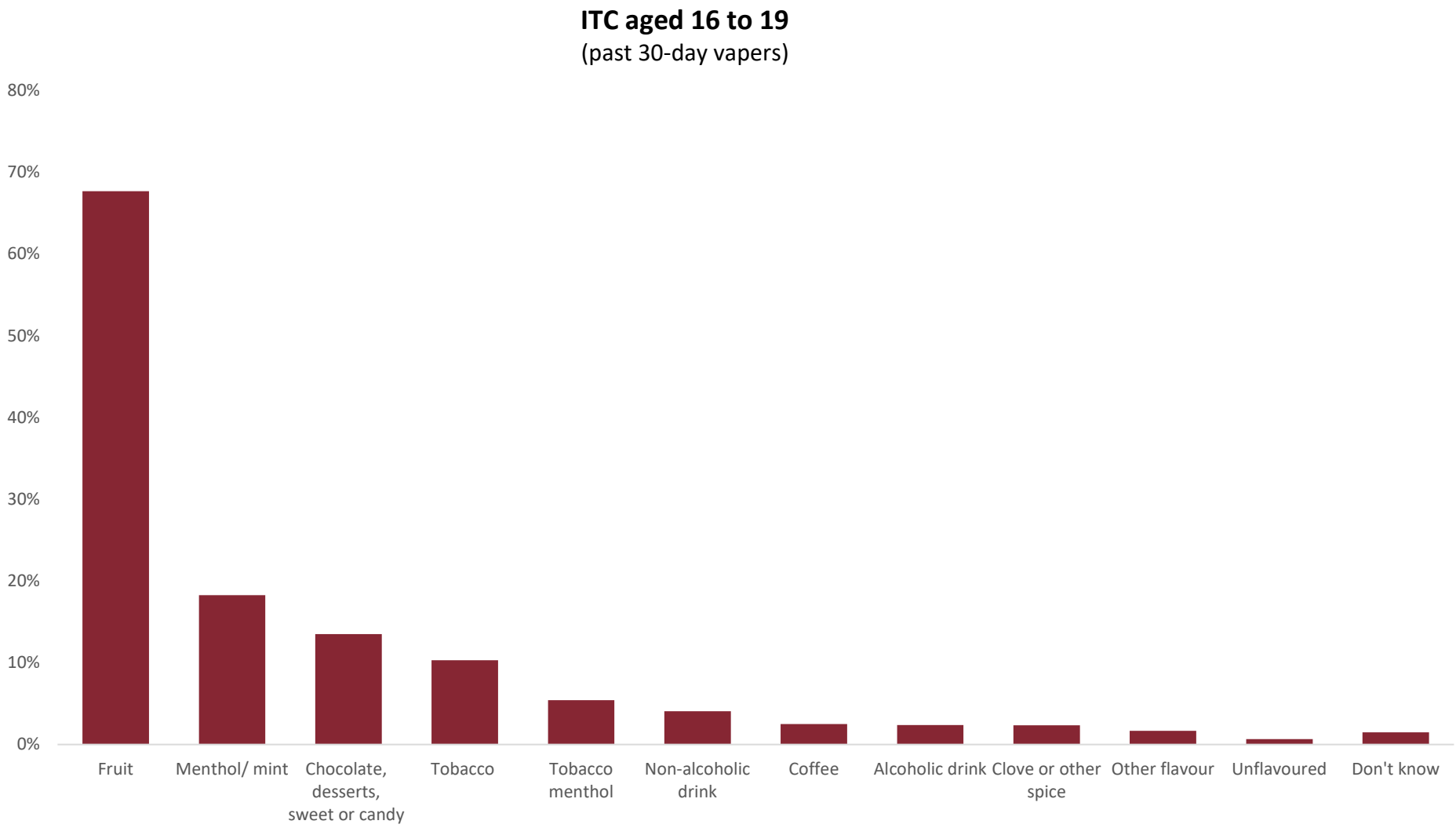
The breakdown of flavour preferences by socio-demographic characteristics in Table 9 uses ITC data only, because of the higher number of participants (n=468) that were asked about flavours compared with ASH-Y (n=117). There were, however, few variations between groups and the numbers remain too small to draw conclusions.

Figure 5: Vaping flavour preference among young people who currently vape (ASH-Y) and among young people who vaped in the past 30 days (ITC), England (ASH-Y 2020 and ITC 2019, weighted data)



Notes

Unweighted base = 117. Current vapers were people who vaped at least monthly.



Notes:
Unweighted base = 468.

Table 9: Usual vaping flavour among young people who vaped in the past 30 days, England 2019 (ITC, weighted data)

	Fruit % (n)	Menthol or mint % (n)	Candy or chocolate % (n)	Tobacco % (n)
Total	67.7 (316)	18.3 (82)	13.5 (64)	10.3 (51)
Age				
16	60.8 (45)	27.1 (18)	13.7 (9)	12.2 (9)
17	63.1 (69)	16.6 (17)	17.1 (16)	11.5 (13)
18	75.0 (129)	13.3 (27)	12.4 (26)	7.5 (15)
19	66.6 (73)	22.5 (20)	9.9 (13)	12.6 (14)
Gender				
Female	69.2 (201)	16.3 (51)	13.0 (38)	7.7 (27)
Male	66.3 (115)	20.0 (31)	14.0 (26)	12.6 (24)
Region				
North	65.1 (85)	18.1 (22)	11.9 (18)	5.1 (8)
Midlands	69.7 (60)	21.8 (19)	11.2 (11)	8.3 (8)
South	68.3 (171)	17.1 (41)	15.1 (35)	13.7 (35)
Ethnicity				
White	65.3 (240)	21.1 (74)	13.0 (50)	10.7 (42)
Black and Minority Ethnic groups	76.9 (72)	8.3 (8)	14.7 (12)	9.4 (9)
Smoking status				
Never smoked	79.4 (51)	7.1 (6)	7.3 (6)	5.5 (2)
Tried only	67.3 (184)	19.6 (47)	17.9 (47)	10.7 (32)
Former smoker	87.0 (11)	19.7 (3)	6.2 (1)	0.0 (0)
Current smoker	59.2 (68)	21.8 (26)	6.8 (9)	13.5 (17)

Notes

Unweighted base = 468. Never smokers were people who had never tried cigarettes. Tried only smokers (referred to as 'Experimental smokers' in the ITC survey) were people who had tried cigarettes, but who had not smoked more than 100 cigarettes in their life. Former smokers were people who had smoked more than 100 cigarettes in their life, but who had not smoked in the past 30 days. Current smokers were people who had smoked more than 100 cigarettes in their life and who had smoked in the past 30 days.

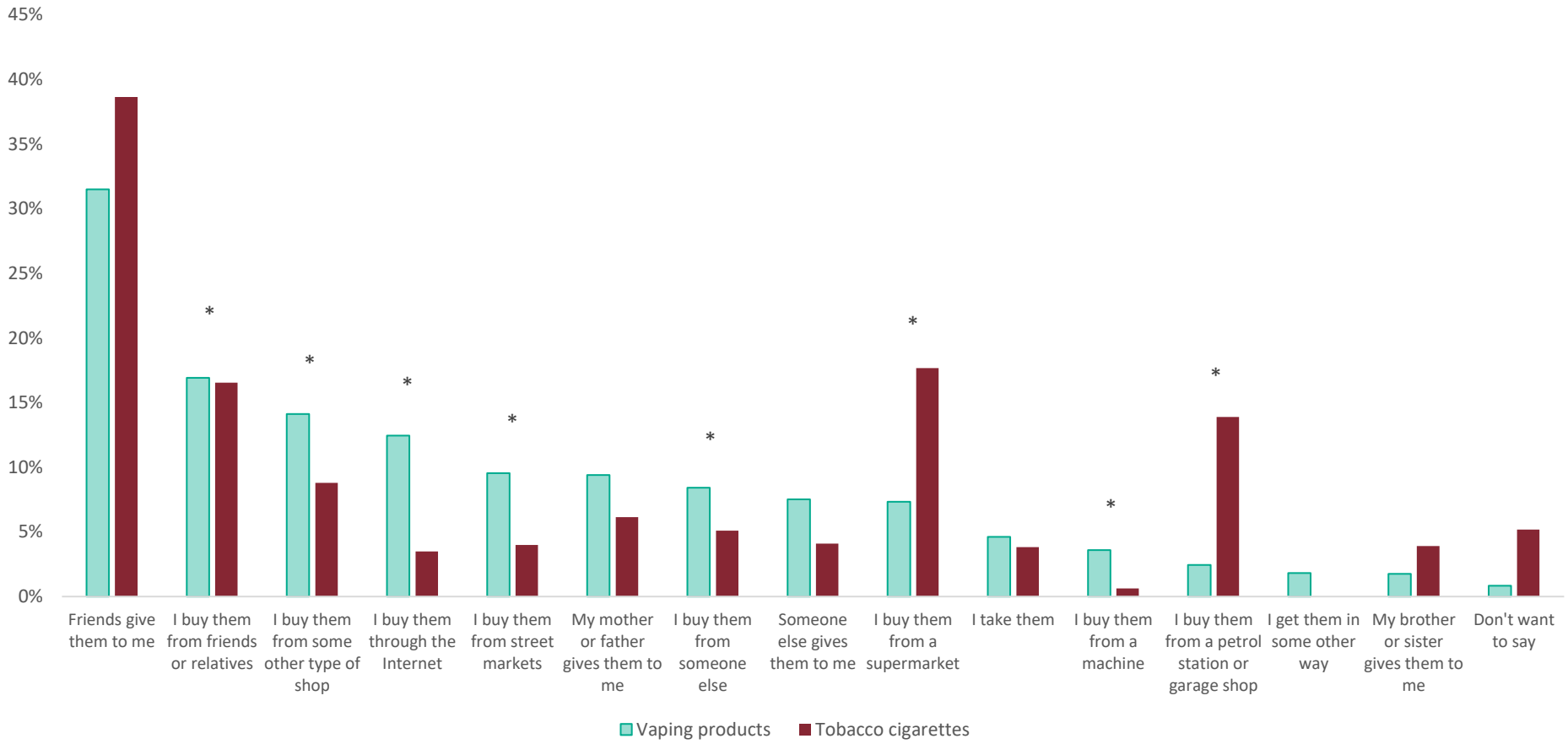
3.8 Source and place of purchase

It is illegal in the UK to sell tobacco or vaping products to under-18s , and for adults to buy tobacco and vaping products on behalf of someone under the age of 18, so in this section we include only ASH-Y participants aged 11 to 17 (Figure 6).

All participants who vaped at least monthly could provide one or more answers regarding where they get their vaping products from. Similarly, all current smokers could provide one or more answers regarding where they get their tobacco cigarettes from.

Three-quarters (74.8%) bought their vaping products, albeit from a variety of places (marked with an * in Figure 6) with 31.5% reporting that ‘friends give them to me’. Around one in 6 (16.9%) said they purchased (rather than were given) vaping products from their friends, with other popular sources for purchasing vaping products being shops (14.1%), the internet (12.4%) and street markets (9.6%). Just under one in 10 (9.4%) said that their parents gave vaping products to them. Among current smokers, many reported that friends give cigarettes to them (38.7%), and 70.1% bought their cigarettes at least sometimes. Compared with vaping products, cigarettes were more often bought from a supermarket (17.7%) or from a petrol station or a garage shop (13.9%).

Figure 6: Sources of vaping products and tobacco cigarettes used by current vapers and current smokers aged 11 to 17, England 2020 (ASH-Y, weighted data)



Notes

Unweighted bases; current vapers = 80, current smokers = 110. Participants could choose multiple response options. Current vapers were people who vaped at least monthly. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week. Sources denoting that vaping products or tobacco cigarettes have been bought by (rather than given to) young people are marked with an *

3.9 Nicotine

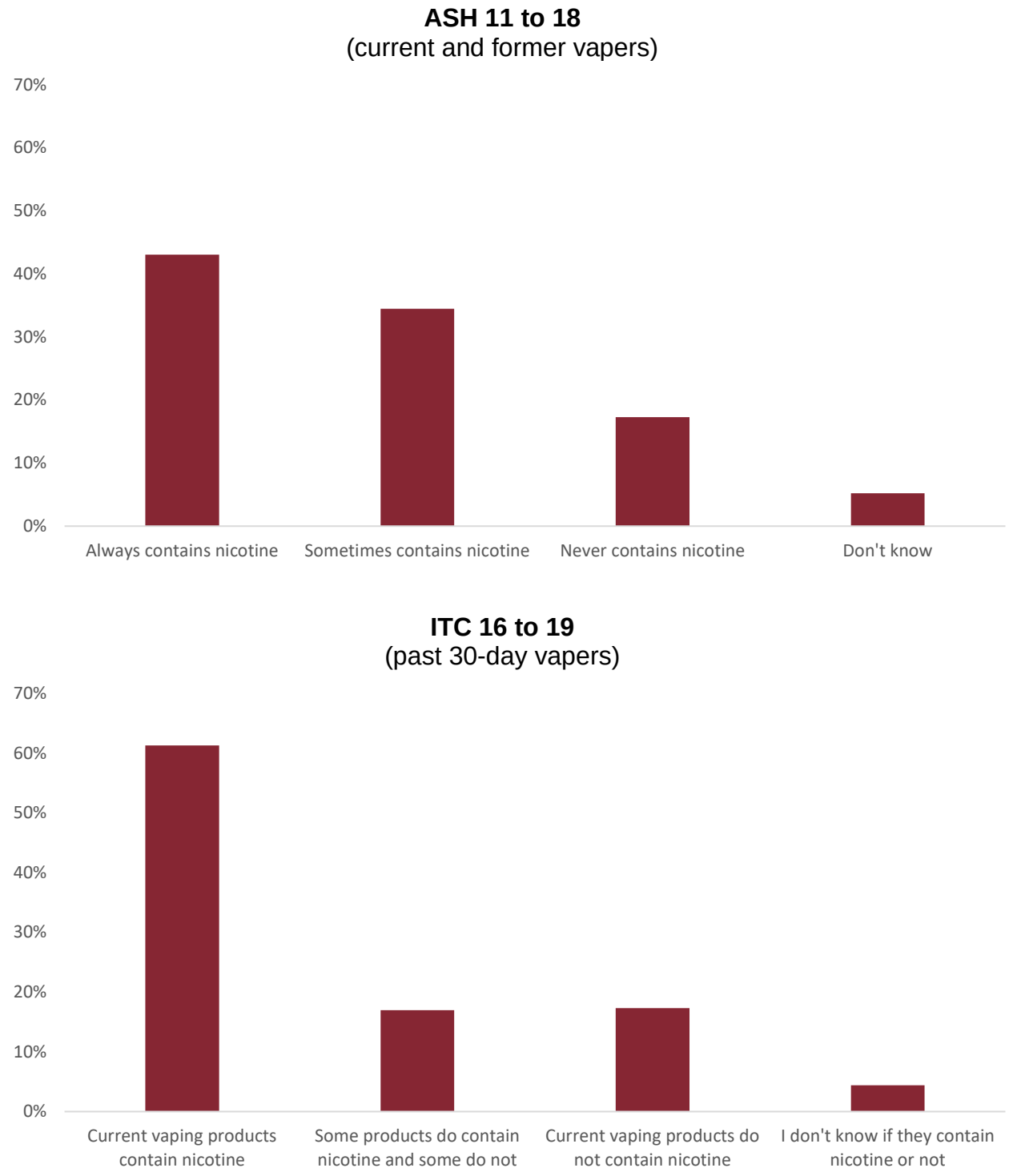
In the ASH-Y survey, 43.0% of current and former vapers aged 11 to 18 reported they used vaping products that always contained nicotine, 34.5% said their products sometimes contained nicotine, 17.3% said their products never contained nicotine and 5.2% said they did not know (Figure 7).

In the ITC survey, 61.3% of people aged 16 to 19 who had vaped in the past 30 days and had ever used vaping products with nicotine said their current products always contained nicotine, 17.0% said their products sometimes contained nicotine, 17.3% said their current product did not contain nicotine and the remaining 4.4% did not know (Figure 7). Similar proportions of vapers in both surveys reported their vaping products did not contain nicotine. The proportion of vapers who had used nicotine containing vaping products was larger in the ITC survey, perhaps a result of the different participants included for these measures – the ITC survey participants could have been more confident about nicotine in their products as they were older and only those who had vaped in the past 30 days were asked this question.

Using ITC data, when those who had vaped in the past 30 days were asked about the nicotine strength used, 1.7% said that they used vaping products which contained no nicotine, 54.0% used less than 2% (20 mg/mL) and 24.6% used 2% strength (20 mg/mL) or stronger. Strengths over 2% (20 mg/mL) are illegal to sell in the UK; however, we are unable to discern which participants used 2% strength and which used over 2% strength. Nevertheless, 6.6% of participants reported they had used 4% (40 mg/mL) or stronger vaping liquids – this warrants further attention as vaping liquids of this strength are illegal to sell in the UK. Nearly one in 5 (19.6%) past 30-day vapers did not know the nicotine strength of the liquid they used (Figure 8).

The ITC survey data indicated that over half (56.6%) of young people who vaped in the past 30 days currently used nicotine salts, 30.6% said they did not currently use nicotine salts and 19.6% did not know (Figure 9). Participants in the ASH-Y survey were not asked about nicotine salts.

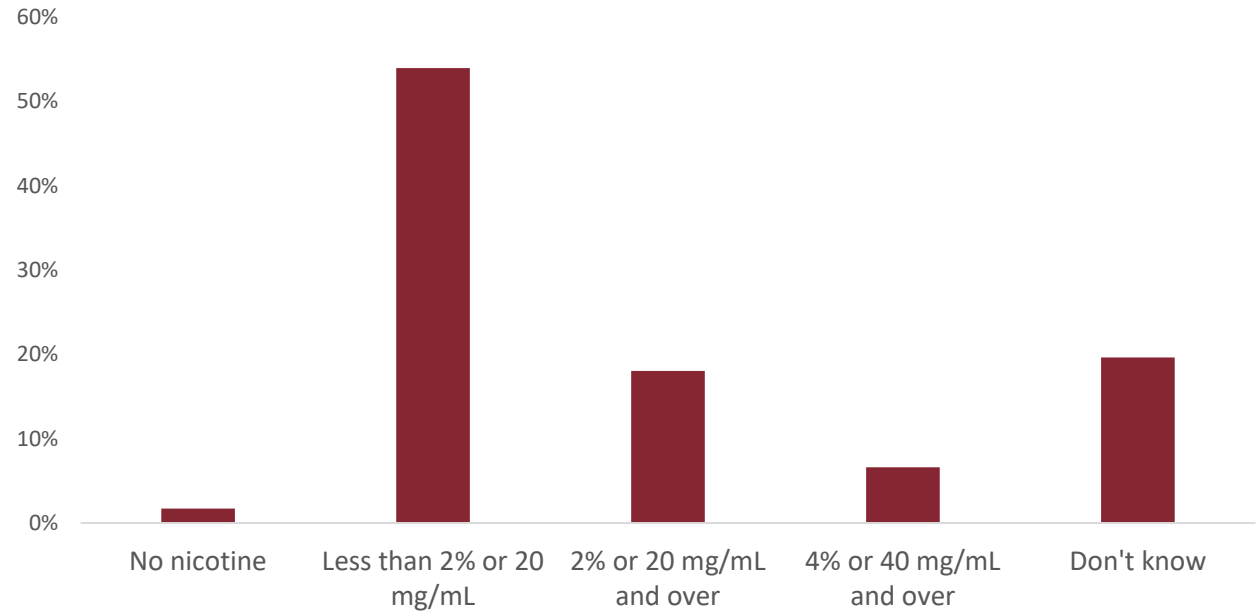
Figure 7: Use of nicotine vaping products among young people who are current and former vapers (ASH) and who have vaped in the past 30 days and had used vaping products with nicotine (ITC), England (ASH-Y 2020 and ITC 2019)



Notes

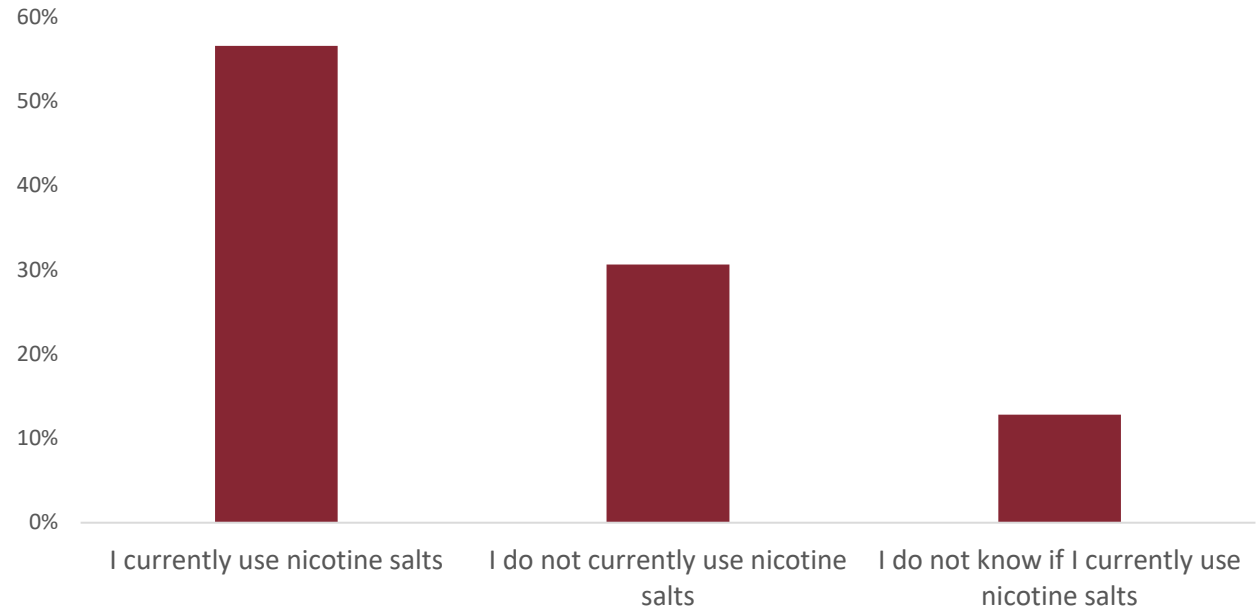
ASH-Y: Unweighted base = 161. Current vapers were people who vaped at least monthly. Former vapers were people who used vaping products in the past but who no longer do.
ITC: Unweighted base = 289.

Figure 8: Strength of nicotine in vaping liquids among young people who have vaped in the past 30 days and had used vaping products with nicotine , England 2019 (ITC, weighted data)



Notes
Unweighted base = 227.

Figure 9: Use of nicotine salts among young people who have vaped in the past 30 days and had used vaping products with nicotine, England 2019 (ITC, weighted data)



Notes
Unweighted base = 95.

3.10 Perceived addiction

The ITC survey asked several questions relating to addiction to vaping that were not included in the ASH-Y survey. More than half (51.3%) of the whole ITC sample of 16 to 19 year olds thought that vaping products were slightly or somewhat addictive, and a third (32.7%) thought that vaping products were very or extremely addictive. Only 5.6% thought that vaping was not at all addictive, with 10.2% not knowing.

This pattern of responses was similar across different socio-demographic characteristics (Table 10). These responses varied across smoking and vaping status, with 38.7% of current and 53.8% of former smokers rating vaping products as not at all or slightly addictive compared with 20.2% of never smokers.

Conversely, 37.8% of never smokers thought that vaping was very or extremely addictive compared with 21.0% of current smokers. A small proportion of people who had never vaped thought that vaping was not at all addictive (3.0%) compared with over 10.7% of current and 12.9% of former vapers. Furthermore, 17.1% of current vapers thought that vaping was very or extremely addictive compared with 39.0% of never vapers.

The ITC survey also asked participants who had vaped in the past 30 days, the extent to which they consider themselves addicted to vaping (Table 11). More than a third (38.5%) said that they felt a little or very addicted; however, over half (58.2%) said that they were not at all addicted to vaping (Table 11).

Table 10: Perceptions of the addictiveness of vaping among young people aged 16 to 19 by age, gender, region, ethnicity, smoking status and vaping status, England 2019 (ITC, weighted data)

	Not at all addictive % (n)	Slightly addictive % (n)	Somewhat addictive % (n)	Very addictive % (n)	Extremely addictive % (n)	Don't know % (n)
Total	5.6 (212)	20.4 (719)	30.9 (1,065)	22.4 (774)	10.3 (346)	10.2 (373)
Age						
16	5.7 (35)	18.7 (113)	30.3 (167)	23.3 (131)	9.2 (57)	12.6 (81)
17	5.7 (53)	20.0 (183)	29.3 (273)	24.8 (226)	10.5 (96)	9.7 (98)
18	5.1 (83)	21.2 (301)	31.3 (439)	22.4 (330)	10.8 (140)	8.8 (127)
19	6.6 (41)	21.1 (122)	33.9 (186)	15.9 (87)	10.1 (53)	12.1 (67)
Gender						
Female	4.8 (121)	19.1 (452)	29.7 (676)	26.2 (553)	10.6 (230)	9.5 (225)
Male	6.4 (91)	21.5 (267)	32.0 (389)	18.7 (221)	10.1 (116)	10.9 (148)
Region						
North	6.4 (64)	18.3 (178)	31.5 (287)	22.5 (216)	11.9 (104)	9.4 (89)
Midlands	6.6 (49)	20.2 (157)	30.8 (239)	18.6 (147)	10.3 (80)	13.2 (108)
South	4.8 (99)	21.6 (384)	30.6 (539)	23.7 (411)	9.5 (162)	9.5 (176)
Ethnicity						
White	5.3 (151)	19.4 (528)	32.1 (824)	23.0 (594)	10.2 (255)	9.9 (266)
Black and Minority Ethnic groups	6.5 (55)	23.8 (184)	27.3 (230)	20.7 (171)	10.6 (83)	10.9 (96)

	Not at all addictive % (n)	Slightly addictive % (n)	Somewhat addictive % (n)	Very addictive % (n)	Extremely addictive % (n)	Don't know % (n)
Smoking status						
Never smoked	3.4 (74)	16.8 (358)	30.3 (628)	25.3 (522)	12.5 (253)	11.6 (260)
Tried only	8.3 (97)	25.8 (284)	33.6 (357)	17.8 (203)	7.1 (79)	7.1 (79)
Former smoker	15.6 (4)	38.2 (8)	11.0 (4)	17.8 (8)	10.5 (2)	6.9 (2)
Current smoker	13.0 (36)	25.7 (66)	27.7 (76)	16.4 (39)	4.6 (12)	12.6 (30)
Vaping status						
Never vapers	3.0 (66)	15.6 (344)	29.5 (621)	26.1 (554)	12.9 (271)	12.8 (288)
Tried only	9.6 (87)	25,6 (227)	34.7 (300)	17.1 (157)	6.5 (53)	6.2 (61)
Former vapers	12.9 (25)	33.7 (52)	28.6 (55)	15.4 (28)	3.3 (13)	6.1 (12)
Current vapers	10.7 (34)	35.7 (96)	32.4 (89)	12.3 (35)	4.8 (13)	4.1 (12)

Notes

Unweighted base = 3,493 Never smokers were people who had never tried cigarettes. Tried only smokers (referred to as 'Experimental smokers' in the ITC survey) were people who had tried cigarettes, but who had not smoked more than 100 cigarettes in their life. Former smokers were people who had smoked more than 100 cigarettes in their life, but who had not smoked in the past 30 days. Current smokers were people who had smoked more than 100 cigarettes in their life and who had smoked in the past 30 days. Never vapers were people who had never tried vaping. Tried only vapers were people who had tried vaping, but who had not vaped for more than 10 days in their life. Former vapers were people who had vaped more than 10 days in their life, but who had not vaped in the past 30 days. Current vapers were people who had vaped more than 10 days in their life and who had vaped in the past 30 days.

0.2% (n=4) refused, so percentages might not total 100.

Table 11: Self-reported level of addiction to vaping among young people aged 16 to 19 who vaped in the past 30 days by age, gender, region, ethnicity, smoking status and vaping status, England 2019 (ITC, weighted data)

	Not at all % (n)	Yes, a little or very addicted % (n)
Total	58.2 (292)	38.5 (181)
Age		
16	52.0 (41)	44.5 (32)
17	69.3 (84)	28.9 (29)
18	58.6 (115)	37.4 (67)
19	46.0 (52)	49.8 (53)
Gender		
Female	69.6 (203)	28.5 (96)
Male	48.0 (89)	47.4 (85)
Region		
North	60.9 (85)	33.2 (48)
Midlands	60.5 (59)	36.9 (32)
South	56.0 (148)	41.9 (101)
Ethnicity		
White	57.0 (225)	39.0 (144)
Black and Minority Ethnic groups	62.8 (64)	36.4 (35)
Smoking status		
Never smoked	80.3 (55)	18.5 (13)
Tried only	58.0 (164)	39.5 (108)
Former smoker	53.9 (7)	46.1 (7)
Current smoker	45.9 (65)	47.7 (53)
Vaping status		
Tried only	73.4 (139)	23.4 (51)
Current vapers	48.2 (142)	48.3 (127)

Notes

Unweighted base = 488. Never smokers were people who had never tried cigarettes. Tried only smokers (referred to as 'Experimental smokers' in the ITC survey) were people who had tried cigarettes, but who had not smoked more than 100 cigarettes in their life. Former smokers were people who had smoked

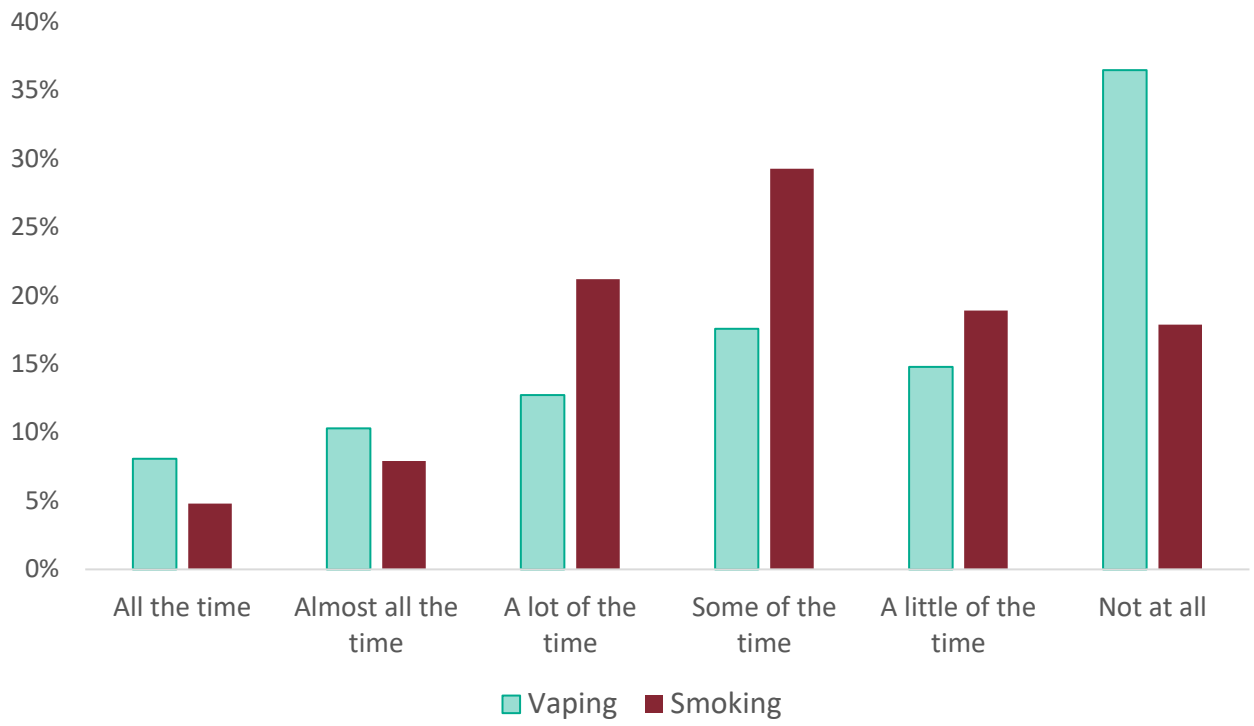
more than 100 cigarettes in their life, but who had not smoked in the past 30 days. Current smokers were people who had smoked more than 100 cigarettes in their life and who had smoked in the past 30 days. Current vapers were people who had vaped more than 10 days in their life and who had vaped in the past 30 days. People who have only tried vaping were people who had tried vaping, but who had not vaped for more than 10 days in their life.
3.3% (n=15) said they did not know or did not answer, therefore percentages might not total 100.

3.11 Urges to vape

Another indicator of addiction is the strength and frequency of urges to vape. The ASH-Y survey collected data on both measures (Figure 10). Over a third of young people who currently vaped (36.5%) said they did not feel any urges to vape at all, with a further 32.4% saying they felt urges to vape a little or some of the time. A further 23.0% said they felt urges a lot or almost all the time, with 8.1% saying they experienced urges to vape all the time. A similar pattern can be seen with the strength of urges to vape (Figure 11), with 39.5% experiencing no urges and smaller proportions reporting strong (11.0%), very strong (10.1%), and extremely strong (3.5%) urges to vape.

Strength of urges also varied according to vaping frequency, with two-thirds of those who vaped monthly (67.1%) reporting experiencing no urges to vape compared with just 11.8% of those who vaped daily. We have included the strength and frequency of urges to smoke for comparison. The data here include dual users, a group which was not differentiated from exclusive smokers or vapers because of too few cases, so it is hard to draw conclusions.

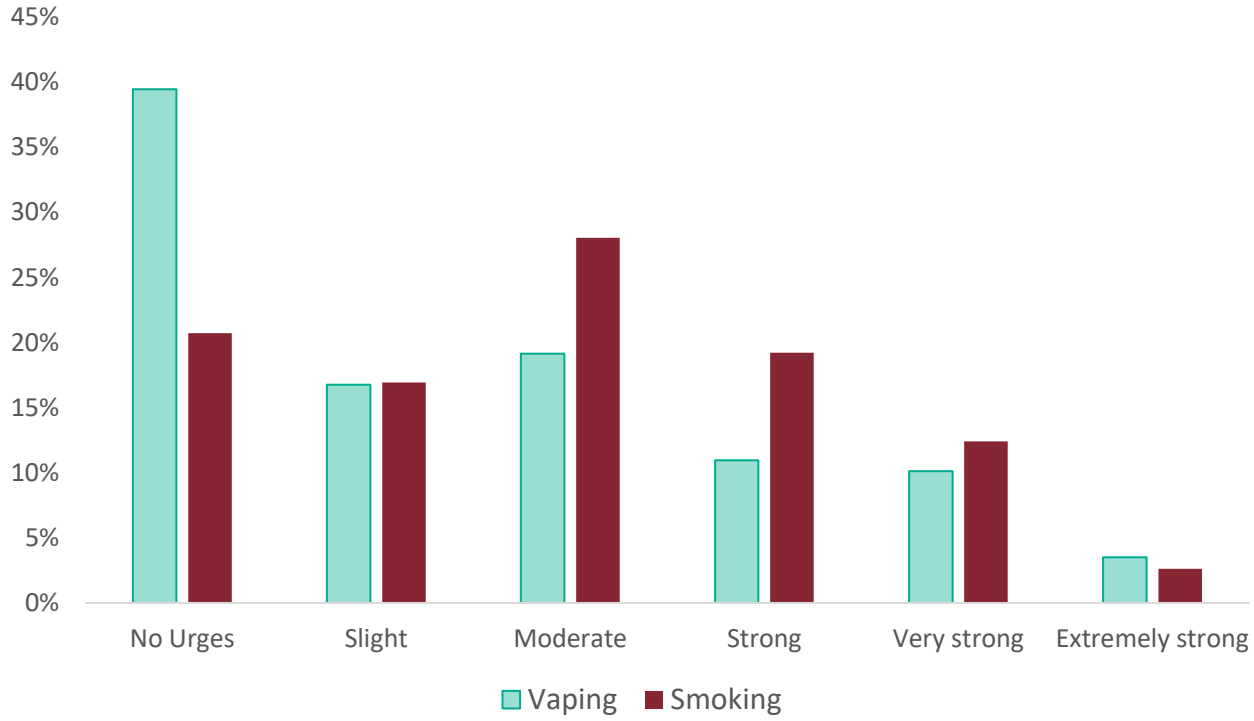
Figure 10: Frequency of urges to vape among current vapers and frequency of urges to smoke among current smokers. Young people aged 11 to 18, England 2020 (ASH-Y, weighted data)



Notes

Unweighted bases Vaping=117; smoking=176. Current vapers were people who vaped at least monthly. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week.

Figure 11: Strength of urges to vape among current vapers and strength of urges to smoke among current smokers. Young people aged 11 to 18, England 2020 (ASH-Y, weighted data)



Notes

Unweighted bases Vaping=117; smoking=176. Current vapers were people who vaped at least monthly. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week.

3.12 Harm perceptions

Among all 11 to 18 year olds (ASH-Y), 43.3% said they thought that vaping products were less harmful than smoking. Around a third (35.3%) thought that the harms from vaping and smoking were about the same, with 5.0% thinking that vaping was more harmful than smoking. Many young people, however, remained uncertain, with 16.3% of 11 to 18 year olds saying they did not know which was more harmful. There were few differences by socio-demographic characteristics (Table 12).

ASH-Y data suggest that young people's perceptions of the relative harms from vaping and smoking have changed since 2015 (Figure 12) with the proportion who thought that vaping was less harmful than smoking declining from 66.7% in 2015 to 43.3% in 2020. At the same time the proportion of young people who thought that the harms were the same increased from 21.2% to 35.3%. The proportion of young people who thought that vaping was more harmful than smoking has been low throughout.

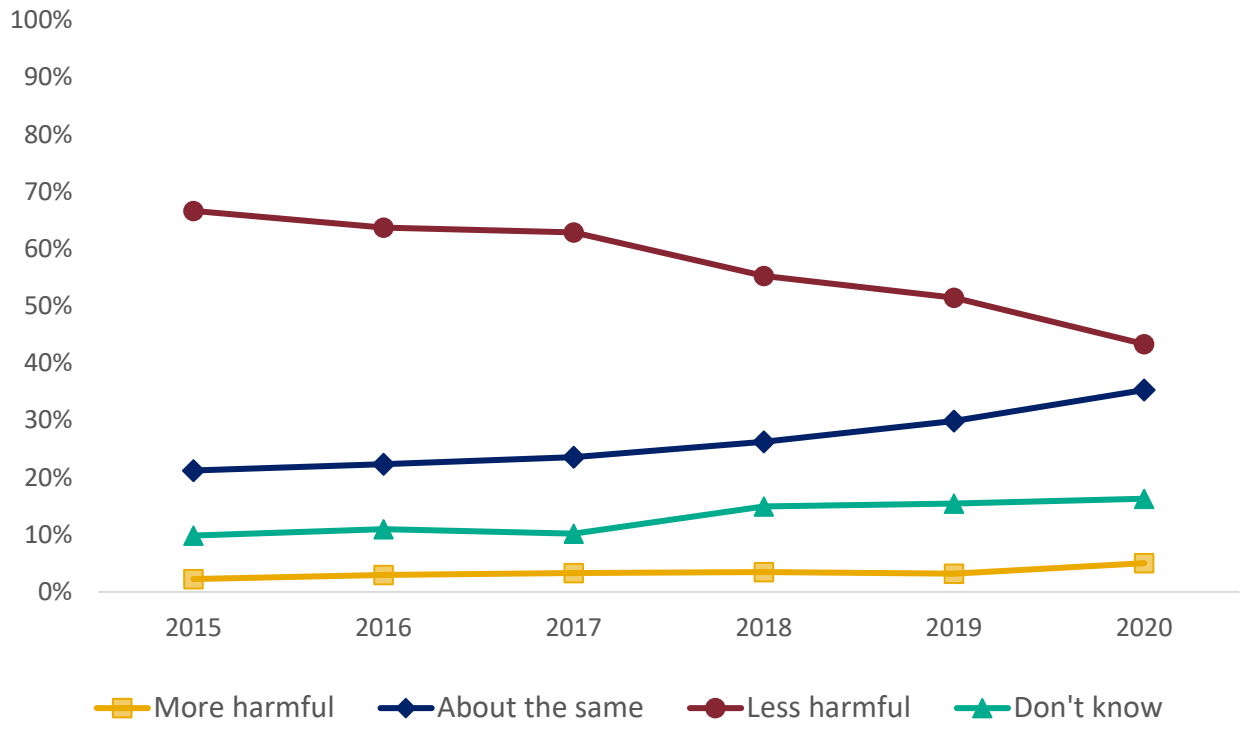
Table 12: Perceptions of the relative harms of vaping and smoking among young people, by age, gender, region, social grade and smoking status, England 2020 (ASH-Y, weighted data)

	More harmful % (n)	About the same % (n)	Less harmful % (n)	Don't know % (n)
Total	5.0 (100)	35.3 (721)	43.3 (911)	16.3 (299)
Age				
11 to 15	5.0 (51)	34.3 (359)	39.6 (428)	21.0 (213)
16 to 17	4.9 (28)	37.6 (219)	49.0 (283)	8.5 (51)
18	5.3 (21)	35.9 (143)	50.2 (200)	8.6 (35)
Gender				
Female	5.5 (56)	38.8 (399)	40.3 (416)	15.4 (137)
Male	4.6 (44)	32.1 (322)	46.3 (495)	17.1 (162)
Region				
North	5.6 (32)	32.5 (189)	47.2 (266)	14.8 (77)
Midlands	4.6 (15)	34.6 (134)	41.5 (168)	19.3 (62)
South	4.9 (53)	37.1 (398)	42.0 (477)	16.0 (160)
Social Grade				
ABC1	4.9 (69)	36.8 (528)	44.0 (668)	14.2 (184)
C2DE	5.3 (31)	31.6 (193)	41.7 (243)	21.3 (115)

	More harmful % (n)	About the same % (n)	Less harmful % (n)	Don't know % (n)
Smoking status				
Never smoked	4.7 (74)	35.5 (568)	41.6 (675)	18.2 (262)
Tried only	6.4 (12)	34.1 (68)	52.0 (106)	7.5 (15)
Former smoker	9.2 (5)	30.4 (20)	50.4 (40)	10.1 (8)
Current smoker	4.4 7(2)	37.7 (60)	51.0 (86)	6.9 (12)

Notes
Unweighted base = 2,031. Never smokers were people who had never tried cigarettes. Tried only smokers were people who had only ever tried smoking cigarettes once. Former smokers were people who used to smoke sometimes but who never smoked now. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week

Figure 12: Perceptions of the relative harms of vaping compared with smoking among young people, by year, England, 2015 to 2020 (ASH-Y weighted data)



Notes
Unweighted bases; 2015=1,797; 2016=1,859; 2017=2,077; 2018=1,878; 2019=2,057; 2020=2,031

3.13 Other nicotine products

Most participants in the ASH-Y survey (86.9%) had not heard of heated tobacco (also known as heat-not-burn) products (Table 13); with 7.3% having heard of, but not tried such products. This was consistent across socio-demographic characteristics. Just 0.5% of young people said that they had tried, and still used, heated tobacco products but this referred only to 10 participants so caution is needed with this statistic (Table 13). When viewed by vaping status, 28.7% of current vapers had heard of heated tobacco products compared with 4.7% of people who had never vaped. When broken down by smoking status, a similar pattern can be seen, with 26.5% of current smokers having heard of heated tobacco products compared with 5.4% of people who had never smoked (Table 13).

The ITC survey asked about ever use and past 30-day use of different tobacco and nicotine products (Figure 13). Among young people aged 16 to 19 in England, 16.7% reported having ever used a waterpipe, 8.4% had ever used little cigars or cigarillos and 7.4% had ever used cigars. A very small proportion have ever used smokeless tobacco products (4.1%) or nicotine pouches (2.6%). Nearly two-thirds (64.6%) of those who had ever used a waterpipe had used it in the past 30 days, and just over half (51.5%) of those who had ever used nicotine pouches had used these products in the past 30 days. The high proportion of recent nicotine pouches might be related to the novelty of nicotine pouches, making ever users more likely to have used them in the past month.

Table 13: Awareness and use of heated tobacco products among young people aged 11 to 18 by age, gender, region, social grade and smoking status; England 2020 (ASH-Y, weighted data)

	Never heard of % (n)	Heard of but not tried % (n)	Tried but do not use them anymore* % (n)	Tried and still use them* % (n)	Don't know % (n)
Total	86.9 (1,868)	7.3 (170)	0.8 (18)	0.5 (10)	4.5 (102)
Age					
11 to 15	89.4 (997)	5.6 (64)			4.1 (46)
16 to 17	84.1 (523)	8.8 (52)			4.6 (31)
18	80.6 (348)	12.8 (54)			5.9 (25)
Gender					
Female	89.6 (949)	5.5 (65)			4.1 (42)
Male	84.4 (919)	9.0 (105)			4.8 (60)
Region					
North	88.8 (517)	5.9 (40)			4.3 (27)
Midlands	85.3 (346)	7.4 (32)			4.7 (21)
South	86.5 (1,005)	8.0 (98)			4.5 (54)
Social Grade					
ABC1	86.8 (1,332)	8.0 (128)			4.1 (66)
C2DE	87.3 (536)	5.7 (42)			5.4 (36)

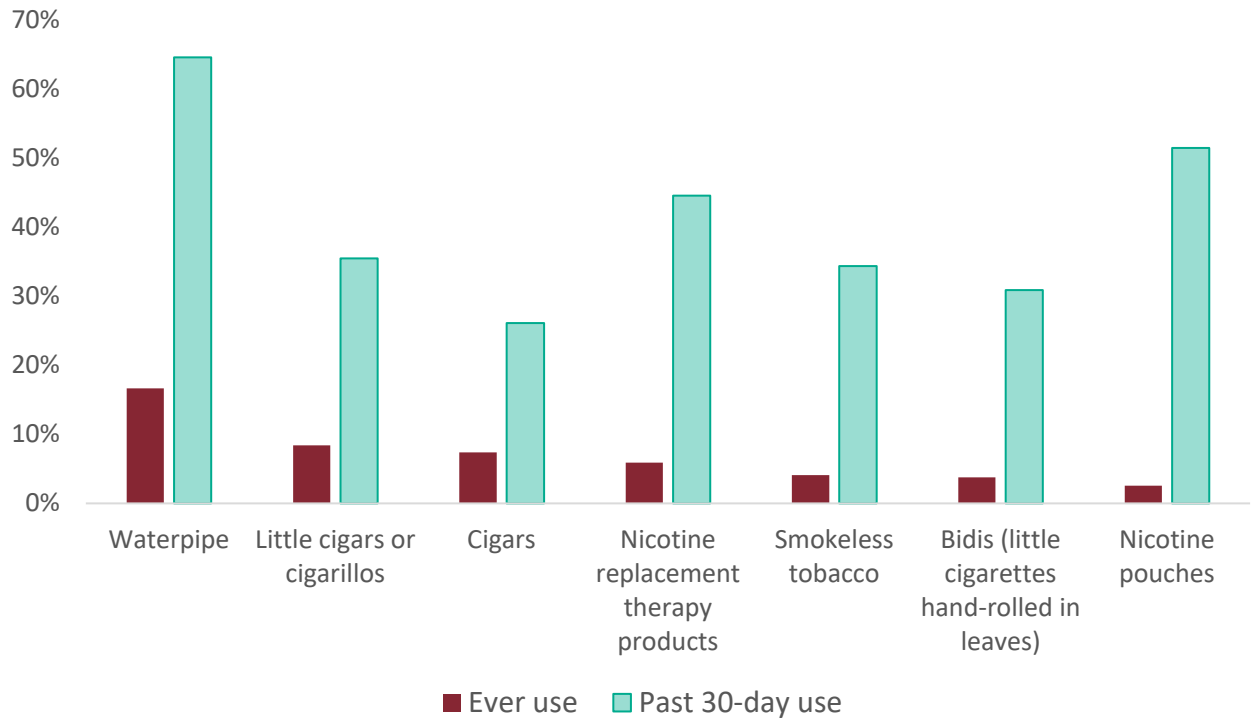
	Never heard of % (n)	Heard of but not tried % (n)	Tried but do not use them anymore* % (n)	Tried and still use them* % (n)	Don't know % (n)
Smoking status					
Never smoked	90.9 (1,523)	5.4 (98)			3.3 (56)
Tried only	82.7 (173)	8.7 (17)			5.3 (10)
Former smoker	79.6 (61)	13.6 (11)			4.1 (4)
Current smoker	54.9 (103)	26.5 (42)			10.4 (18)
Vaping status					
Never vaped	90.2 (1,551)	5.3 (100)			3.6 (65)
Tried only	78.7 (206)	12.9 (32)			6.7 (9)
Former vaper	76.4 (34)	12.8 (5)			6.2 (3)
Current vaper	55.5 (69)	28.7 (32)			8.5 (19)

Notes

The survey used the term heat-not-burn, Unweighted base = 2,168. Never smokers were people who had never tried cigarettes. Tried only smokers were people who had only ever tried smoking cigarettes once. Former smokers were people who used to smoke sometimes but who never smoked now. Current smokers were people who smoked sometimes but less than weekly, as well as those who smoked more than once a week. Never vapers were people who had never tried vaping. Tried only vapers were people who had only tried vaping once or twice. Former vapers were people who used vaping products in the past but who no longer do. Current vapers were people who vaped at least monthly.

*Columns with fewer than 50 participants have not been broken down by socio-demographic characteristics as they do not represent a wide enough cross-section of the target population to be considered statistically reliable.

Figure 13: Ever use and past 30-day use of different tobacco and nicotine products among young people aged 16 to 19; England, 2019 (ITC, weighted data)



Notes

Unweighted base for ever use = 3,493. Past 30-day use estimated among people who had ever used these products.

3.14 Summary of findings

Data reported in this chapter were collected in September 2019 (the International Tobacco Control, ITC, Youth survey) and in March 2020 (the ASH-Youth survey). So, conclusions in this chapter do not take into account the potential impact of COVID-19 on vaping and smoking among youth.

ASH-Youth survey data of 11 to 18 year olds indicated a plateauing of vaping over the last few years with current (at least monthly) vaping prevalence being 4.8% in March 2020, the same as in March 2019.

Current smoking prevalence (including those who smoked sometimes or more than once a week) among 11 to 18 year olds in March 2020 was 6.7% (compared with 6.3% in March 2019) and has changed little since 2015 when it was 7.1%.

The ITC survey of 16 to 19 year olds in England in 2019 reported current vaping prevalence at 7.7% (defined as vaping on more than 10 days in their lifetime and having vaped in the past 30 days) and smoking prevalence at 6.2% (defined as smoking more than 100 cigarettes in their life and having smoked in the past 30 days). Vaping prevalence in this survey was higher than in the ASH-Youth survey but smoking prevalence was similar.

Based on the socioeconomic status of 11 to 18 year olds, the estimates for smoking and vaping prevalence were higher among more advantaged groups in social grades A, B and C1 (7.1% for smoking, 5.3% for vaping) than for more disadvantaged groups in social grades C2, D and E (5.7% for smoking, 3.5% for vaping).

Most young people who had never smoked had also never vaped. Between 0.8% and 1.3% of young people who had never smoked were current vapers.

Most current vapers were either former or current smokers.

The main reasons for vaping were to "give it a try", "for fun/I like it" and "liking the flavours".

Of the 11 to 18 year olds who vaped, 11.9% reported doing so to quit smoking.

More 11 to 18 year olds who had tried vaping had smoked first (45.4%), 20.6% said they had vaped before they smoked and 28.9% said they had tried a vaping product and never tried smoking.

Tank models were the most popular model, used by 49.1% of 11 to 18 year olds who currently vaped. The use of models which use prefilled cartridges has increased from 17.6% in 2019 to 34.2% in 2020; this may be due to the advent of pod models.

Fruit flavours were the most popular among past 30-day vapers followed by "menthol/mint", then "chocolate, dessert, sweet or candy" flavours.

Three-quarters of current vapers aged 11 to 17 bought their vaping products despite sales to under-18s and proxy purchases being illegal.

Under half (43.0%) of 11 to 18 year olds who were current and former vapers reported always using vaping products that contained nicotine and 17.3% reported always using nicotine free products. Three out of 5 (61.3%) 16 to 19 year olds who had vaped in the past 30 days used nicotine in their current product and 17.3% said their product did not contain nicotine.

The most common nicotine strength used by 16 to 19 year olds who had vaped in the past 30 days was under 20 mg/mL (54.0%). One-fifth (19.6%) of participants did not know the strength of their vaping liquid, 18.0% used a strength of 20 mg/mL or over, and 6.6% used 40 mg/mL or over.

Over half (56.6%) of 16 to 19 year olds who vaped in the past 30 days currently used nicotine salts, 30.6% did not use nicotine salts and 12.8% were unsure.

Over half (58.2%) of 16 to 19 year olds who had vaped in the past 30 days did not feel addicted to vaping but 38.5% said they felt a little or very addicted.

Just under a fifth (18.4%) of current vapers aged 11 to 18 reported experiencing urges to vape almost all the time or all the time.

The proportion of 11 to 18 year olds who thought that vaping was less harmful than smoking had declined to 43.3% in 2020 from 66.7% in 2015.

Current use of heated tobacco products was rare among 11 to 18 year olds (0.5%). Among 16 to 19 year olds, 2.6% reported ever using nicotine pouches (half of those used them in the last month) and 4.1% reported ever using smokeless tobacco (a third of those used them in the last month).

3.15 Implications

Vaping and smoking prevalence among young people in England both appear to have stayed the same in recent years and should continue to be closely monitored.

Enforcement of age of sale regulations for vaping (and smoking) needs to be improved.

Misperceptions of the relative harms of smoking and vaping should be addressed.

More research is needed on the apparent differences in the prevalence of smoking and vaping in different socioeconomic groups among young people (higher in more advantaged groups) and adults (higher in more disadvantaged groups).

More research is needed on the addictiveness of different types and strengths of nicotine vaping products among young people and the extent to which they are using illegal products.

4. Vaping among adults

4.1 Objective

This chapter summarises the latest available survey data on vaping among adults in England. The focus is on vaping, with equivalent data on smoking reported where a comparison between vaping and smoking is appropriate and illustrative. This chapter reports vaping prevalence overall and by smoking status, as well as reasons for vaping, details on vaping behaviour, urges to vape, perceived addiction to vaping and harm perceptions of vaping compared with smoking. Where data are available, we present these data broken down by age, gender, region, social grade and ethnicity. We also briefly report prevalence of selected other products.

4.2 Surveys

The chapter uses survey data from APS, STS, ASH-A, OPN, and ICGB as described in Chapter 2. The APS is the largest survey available (age 18+; sample size 146,897 from 2019); however, it only reports smoking prevalence and does not cover vaping. Of the surveys that do report vaping status, the STS (age 18+; sample size January to October 2020 = 15,811) has the lowest risk of bias due to its size and the representative nature of its sampling strategy (36). Therefore, where available, STS data will be used. The ASH-A survey (age 18+; sample size for England = 9,329) is the second largest available data source and will be presented alongside the STS data. Where data or relevant measures are not available in the STS or ASH-A data, we will use OPN (age 16+; sample size for England 2019 = 6,511) and the ICGB (age 18+; sample size for England 2019 = 3,279) in that order of preference. The ICGB will be used to explore vaping urges and the comparative addiction of vaping and smoking, issues not covered by the other surveys.

Comparisons between this year's and last year's data will be presented where illustrative. For the STS, data from 2010 to 2020 will be used so that changes over a decade can be tracked. Many variables of interest have been added to the STS more recently than 2010; where this is the case, the available data will be presented. The ASH-A survey has run every year since 2012, therefore data from 2012 to 2020 will be used to report change over time.

Data collection for many surveys was affected by the COVID-19 pandemic in 2020. In particular, the STS stopped collecting data from people aged 16 and 17 after February as described in Chapter 2. When using the STS, we will therefore only use data from people aged 18 and over and will apply this age cut-off to all STS data used in this report, from 2010 to 2020 (so data may look different to that presented in our previous reports).

It is also important to note the disruptive effect that the COVID-19 pandemic had on health-related behaviours in 2020. At the time of writing there was a second wave of COVID-19 infections in England, and the overall impact on health behaviours was not yet known.

One analysis of STS data between April and May 2020 reported that among 49 past-year smokers who had recently made a quit attempt, 6 (12%) said this had been triggered because of the COVID-19 outbreak, and that of 170 current vapers, around one in 10 vapers (n=19) had tried to quit vaping because of COVID-19 (38). A second STS analysis compared data from before (April 2019 to February 2020) versus after (April 2020) the national COVID-19 lockdown. It concluded that the lockdown was not associated with a significant change in smoking prevalence but was associated with increases in attempts to quit smoking and successful cessation among past-year smokers.

Among smokers who tried to quit, there was no significant change in use of evidence-based support but use of remote support increased (35). A report from ASH suggested that, between April and June 2020, half of those who quit smoking said that the pandemic had influenced their decision to quit (39, 40). It is also likely that vaping behaviour was influenced by vaping shops having been closed in England during the first lockdown from late March to early July 2020, whereas the availability of smoking products remained relatively unchanged (41, 42).

Another STS study of 2791 UK adults recruited in April to June 2020 reported that among current vapers (n=397), 9.7% (95% CI 6.8-12.6%) reported vaping less than usual since COVID-19, 42.0% (37.2-46.9%) reported vaping more, and 48.3% (43.4-53.2%) reported no change. Of current vapers, 32.2% (95% CI 27.5-36.8%) were motivated to quit vaping since COVID-19, partly motivated by COVID-19, and 17.4%, (9.7-26.3%) of recent ex-vapers quit vaping due to COVID-19 (43).

The overall effect of COVID-19 on smoking and vaping behaviours in England continues to be the subject of research; however, it is likely that smoking and vaping, along with many other health-related behaviours, have been influenced by the COVID-19 pandemic.

4.3 Smoking and vaping prevalence among adults in England

Smoking prevalence

The APS which is used by the government to monitor smoking prevalence estimated that in 2019, 13.9% of adults were current smokers; other survey estimates for smoking ranged from 13.8% to 16.0% (Table 14). The different dates and modes of data collection, sample sizes, age ranges and definitions of current smoking may explain the differences between these estimates. Using the latest population data from the ONS (17) and the prevalence from the different surveys, we can estimate that there were between 6.1 and 7.1 million smokers aged 18+ in England in 2020[1] (2).

Estimates of smoking prevalence in 3 of the annual surveys (APS, ASH-A and OPN) were lower in the most recent data than they were in the previous year. APS was 14.4% in 2018 and 13.9% in 2019; ASH-A was 14.7% in 2019 and 13.8% in 2020; OPN was 16.3% in 2018 and 15.5% in 2019. The STS estimate, however, was 16.0% in 2019 as well as in 2020 (January to October). This estimate for 2019 differs from the estimate of smoking prevalence from the STS in our previous report (3) due to the different age cut-off we have used this year as described in Chapter 2.

Smoking prevalence, as estimated using all 4 national surveys, has steadily declined over time. Declines over the past 10 years from 3 national surveys (STS, ASH-A, OPN), from between 19.6% and 22.0% in 2010 are shown in Figure 14.

[1] The Office for National Statistics uses a different approach; to obtain their estimate of 5.7 million adult smokers in England in 2019, they summed the weighted value for everyone recorded as smoker in their survey. However, applying the most recent prevalence to the most recent estimate of the population in England is a prudent approach (Horton, PHE, personal communication 8 Jan 2021) and allows for replication across the surveys used in this report.

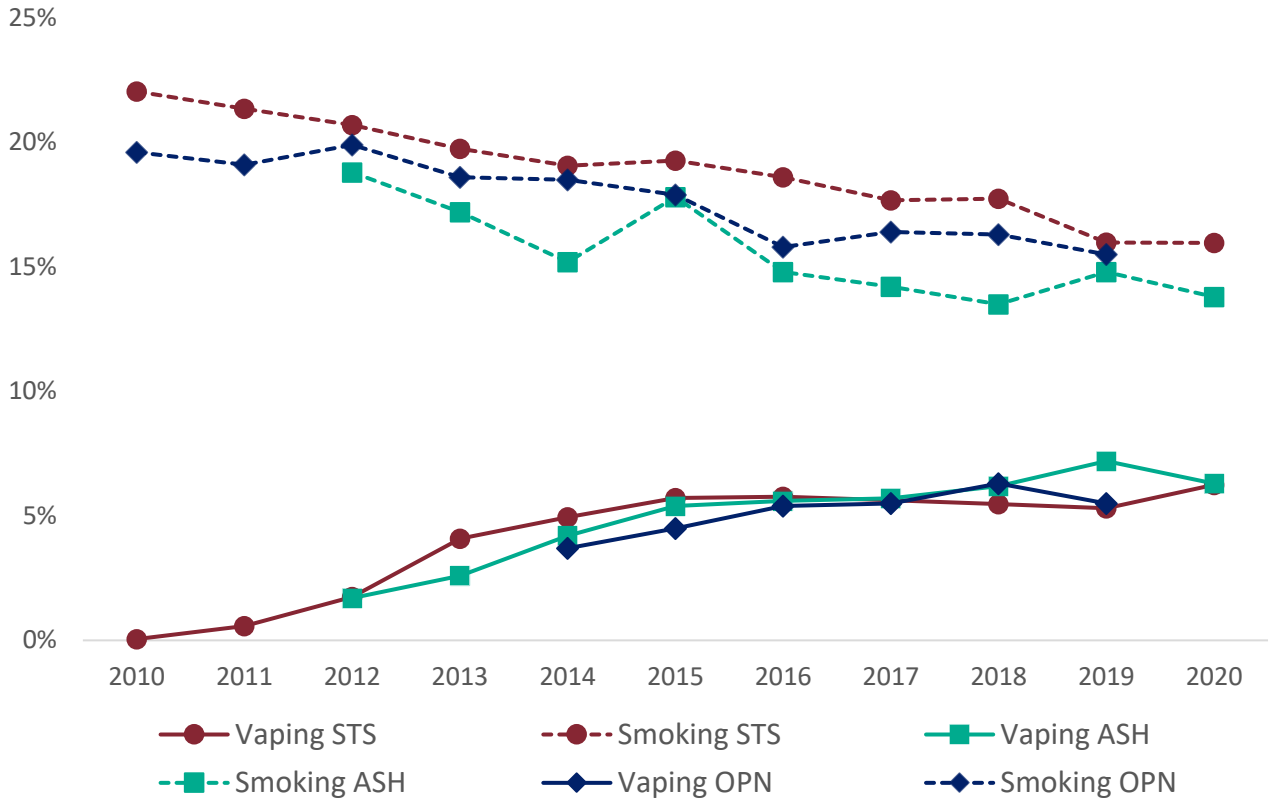
Table 14: Current smoking, ever tried and current vaping (%) among adults in 4 national surveys, England 2019-2020 (APS, OPN, STS, ASH-A; weighted data)

	APS 2019 Age 18+	OPN 2019 Age 16+	STS 2020 Age 18+	ASH-A 2020 Age 18+
Current smoking	13.9%	15.5%	16.0%	13.8%
Ever tried vaping		19.4%		18.3%
Current vaping		5.5%	6.2%	6.3%
Unweighted bases	146,897	6,511	Smoking 15,747 Vaping 15,811	9,329

Notes

APS: Current smoking was defined as people who had tried cigarettes and that said they still smoked ‘nowadays’.
OPN: Current smoking was defined as people who had tried cigarettes and that said they still smoked ‘nowadays’.
Current vaping was defined as people who answered “yes, I currently use one” to a question about whether they had ever used e-cigarettes. Ever tried vaping was defined as current and former vapers as well as those who had tried vaping but who did not continue.
STS: Current smoking included people who said that they smoked daily or that they smoked, but less than daily. Current vaping included people who ‘currently vaped for any reason’. STS data available from January to October 2020. The unweighted bases for vaping and smoking differ because of missing data among small numbers of participants.
ASH-A: Current smoking included people who smoked daily as well as those who smoked, but not daily. Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped. Ever tried included people who had tried vaping and those who continued to vape.

Figure 14: Current smoking and vaping prevalence among adults in 3 national surveys, England 2010 to 2020 (weighted data)



Notes

STS (18+): Unweighted bases smoking: 2010=24,268; 2011=21,299; 2012=20,832; 2013=21,658; 2014=19,733; 2015=19,642; 2016=20,063; 2017=20,036; 2018=20,402; 2019=20,380; 2020=15,747. Unweighted bases vaping: 2010=24,294; 2011=21,315; 2012=13,897; 2013=18,311; 2014=19,798; 2015=19,650; 2016=20,066; 2017=20,051; 2018=20,421; 2019=20,385; 2020=15,811
Current smokers included people who said that they smoked daily or that they smoked, but less than daily. Current vapers included people who 'currently vaped for any reason'. STS data available from January to October 2020, all previous years use the full year's data.
ASH-A (18+): Unweighted bases for both smoking and vaping: 2012=10,742; 2013=10,022; 2014=10,112; 2015=10,017; 2016=10,058; 2017=10,488; 2018=10,578; 2019=10,208; 2020=9,329. Current smoking included people who smoked daily as well as those who smoked, but not daily. Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped.
OPN (16+): Unweighted base Smoking: 2014=9,320 2015=8,139; 2016=7,713; 2017=7,122; 2018=9,620; 2019=6,511; Vaping: 2014=4,285; 2015=6,940; 2016=6,679 2017=6,079; 2018=6,619; 2019=6,509;Current smoking was defined as people who had tried cigarettes and that said they still smoked "nowadays". Current vaping is people who answered "yes, I currently use one" to a question about whether they had ever used e-cigarettes.

In the STS data, just under a quarter of 25 to 34 year olds (24.3%) and 18 to 24 year olds (24.1%) were current smokers compared with, for example, 7.8% of people aged over 65 (Table 15).

In the ASH-A survey, current smoking appeared to be lowest among people aged 18 to 24 (10.8%) and aged 55 and over (10.6%) compared with the age groups ranging from 25 to 55. It is unclear why the estimates for young adults differ so markedly.

The modes of data collection differ (STS telephone and ASH-A online), ASH-A was collected before the COVID-19 pandemic reached England while STS was collected throughout 2020, and there are differences in the composition of the unweighted samples; for example, the STS sample had a lower proportion of 18 to 24 year olds in social grades AB, in London and the South-East than the ASH-A sample. However, further research into this discrepancy is needed.

Estimates of smoking prevalence were higher for men than for women with 17.3% (STS) and 14.7% (ASH-A) of men currently smoking compared with 14.6% and 12.9% of women respectively. The surveys showed small variations across regions. Social grade in both surveys used the classifications from the National Readership Survey (44) (Table 16). The STS reported smoking prevalence to be 10.8% for people from A, B and C1 groups (ABC1) compared with 22.2% for people from C2, D and E groups (C2DE), with a gradient in the same direction in the ASH-A data (10.7% ABC1 and 17.1% C2DE).

In the STS, estimates of smoking prevalence were 16.0% for people from white ethnic groups, and 13.1% for people from black and minority ethnic groups. ASH-A data reported smoking prevalence of 13.2% for people from white ethnic groups and 18.2% for people from black and minority ethnic groups. In this case, differences may partly be due to STS having to suspend collection of ethnicity data for several months, resulting in smaller numbers with higher susceptibility to random variation.

Table 15: Smoking and vaping prevalence among adults by age, gender, region, social grade and ethnicity, England 2020 (STS and ASH-A, weighted data)

	STS	STS		ASH-A	ASH-A
	Current smoker % (n)	**Current vaper % (n)**		**Current smoker % (n)**	**Current vaper % (n)**
Total	16.0 (2,267)	6.2 (911)		13.8 (1,213)	6.3% (564)
Age			**Age**		
18 to 24	24.1 (361)	8.2 (131)	18 to 24	10.8 (69)	4.0 (25)
25 to 34	24.3 (487)	9.5 (202)	25 to 34	16.0 (171)	6.5 (71)
35 to 44	18.3 (355)	8.1 (164)	35 to 44	18.3 (247)	9.1 (123)
45 to 54	14.0 (350)	6.8 (174)	45 to 54	17.3 (246)	9.4 (135)
55 to 64	12.9 (351)	5.1 (148)	55+	10.6 (480)	4.5 (210)
65+	7.8 (362)	2.0 (92)			
Gender					
Male	17.3 (1,136)	7.2 (467)		14.7 (591)	7.2 (298)
Female	14.6 (1,121)	5.3 (429)		12.9 (622)	5.5 (266)
Region					
North	16.8 (655)	7.7 (305)		13.5 (391)	7.5 (216)
Midlands	15.5 (406)	5.7 (150)		14.5 (229)	6.6 (102)
South	15.7 (1,206)	5.7 (456)		13.6 (593)	5.5 (246)

	STS	STS		ASH-A	ASH-A
	Current smoker % (n)	**Current vaper % (n)**		**Current smoker % (n)**	**Current vaper % (n)**
Social Grade					
ABC1	10.8 (1,018)	5.1 (437)		10.7 (544)	5.1 (260)
C2DE	22.2 (1,189)	7.6 (408)		17.1 (669)	7.6 (304)
Ethnicity					
White	16.0 (958)	6.5 (396)		13.2 (1,037)	6.3 (498)
Black and Minority Ethnic groups	13.1 (102)	3.7 (28)		18.2 (142)	7.0 (56)

Notes

STS (18+): Unweighted bases for smoking by age, gender and region = 15,747; social grade = 15,294; ethnicity = 7,329. Unweighted bases for vaping by age, gender and region = 15,811; social grade = 15,343; ethnicity = 7,352. Sixteen people defined their gender in another way. Current smoker included people who said that they smoked daily or that they smoked, but less than daily. Current vaper included people who 'currently vaped for any reason'. STS data available from January to October 2020

ASH-A (18+): Unweighted base for age, gender, region and social grade = 9,329; ethnicity = 9,025. Current smoker included people who smoked daily as well as those who smoked, but not daily. Current vaper included people who had tried vaping and who still vaped, excluding those who no longer vaped. 5 participants selected 'preferred not to say' when asked about their ethnicity

Table 16: Social grade classifications derived from the National Readership Survey (44)

Social Grade	Description
A	Higher managerial, administrative or professional
B	Intermediate managerial, administrative or professional
C1	Supervisory, clerical and junior managerial, administrative or professional
C2	Skilled manual workers
D	Semi and unskilled manual workers
E	State pensioners, casual or lowest grade workers, unemployed with state benefits only

Vaping prevalence

Estimates of current vaping prevalence among adults ranged from 5.5% to 6.3% (Figure 14). The survey with the largest sample (STS) estimated that vaping prevalence was 6.2%. Using the 2 2020 estimates of current vaping prevalence and the most recent population data (45) we can estimate that there were 2.7 to 2.8 million vapers aged 18+ in England.

Vaping prevalence increased between 2010 and 2015 but has fluctuated since then (Figure 14). The STS data suggest that there was an uptick in vaping between 2019 (5.3%) and 2020 (6.2%). This is not explained by the 2020 data only covering January to October – as for January to October 2019, prevalence would be 5.2%. It is possible that this difference between STS and other survey results might be partially explained by STS data collection having continued through the COVID-19 pandemic; whereas data collection for ASH-A had finished by March 2020 and for OPN was completed in 2019. Both ASH-A and OPN estimates of vaping prevalence were lower than in previous years: ASH-A estimated vaping prevalence to be 7.2% in 2019 and 6.3% in 2020, and OPN estimated vaping prevalence to be 6.3% in 2018 and 5.5% in 2019.

The STS reports 8.2% and the ASH-A 4.0% vaping prevalence in young adults which is likely to reflect the discrepancies between the surveys in smoking prevalence for this age group (Table 15). Vaping prevalence among men (7.2% for both STS and ASH-A) appeared to be higher than among women (5.3% and 5.5% respectively). The STS survey estimated that 10.7% of people who identify their gender ‘in another way’ vaped; however, this referred to 6 (out of 57) participants, so population inferences cannot be drawn from this estimate. Both STS and ASH-A surveys estimated vaping prevalence to be high in the north of England (7.7% and 7.5% respectively) compared with the Midlands (5.7% and 6.6%) and the south (5.7% and 5.5%), and among C2DE social grades (7.6% and 7.6%) compared with ABC1 (5.1% and 5.1%). In terms of ethnicity,

vaping prevalence in the STS was 6.5% for people from white ethnic groups (3.7% for black and minority ethnic groups), whereas in the ASH-A survey data it was 7.0% for people from black and minority ethnic groups and 6.3% for people from white ethnic groups. Partly because collection of STS data on ethnicity had to be suspended for several months during 2020, the numbers for estimates relating to ethnicity are small so caution should be used when drawing conclusions from the data.

Smoking prevalence was higher than vaping prevalence across all age, gender, region social grade and ethnicity groups (Table 15).

4.4 Vaping by smoking status

Between 15.8% (OPN, 2019) and 20.1% (STS, 2020) of current smokers vaped (Table 17) estimates that are higher than the previous years' estimates (14.4% - OPN, 2019, 16+; 18.5% - STS, 2019, 18+). Vaping prevalence among former smokers was between 10.9% (ASH-A) and 11.3% (OPN). Vaping prevalence among never smokers remains low and was under 1% across surveys.

Table 17: Current vaping prevalence by smoking status among adults in 3 national surveys, England 2019 and 2020 (weighted data)

	STS 2020 Age 18+	**ASH-A 2020 Age 18+**	**OPN 2019 Age 16+**
Never smokers	0.6%	0.3%	0.2%
Former smokers	11.0%	10.9%	11.3%
Current smokers	20.1%	17.5%	15.8%
Unweighted bases	15,747	9,329	6,508

Notes
STS (18+): Current vaping included people who 'currently vaped for any reason'. Never smokers included people who had never regularly smoked for a year or more. Former smokers included those who had stopped smoking completely but who had smoked for a year or more in the past. Current smokers included people who said that they smoked daily or that they smoked, but less than daily. STS data available from January to October 2020.
ASH-A (18+): Current vaping included people who had tried vaping who still vaped, excluding those who no longer vaped. Never smokers included people who responded to a question about smoking with 'I have never smoked'. Former smokers included those who said that they used to smoke, but who had "given up now". Current smokers included people who smoked daily as well as those who smoked, but not daily.
OPN (16+): Current vaping was people who answered "yes, I currently use one" to a question about whether they had ever used e-cigarettes. Never smokers included people who said that they do not currently smoke and that they have never smoked cigarettes regularly. Former smokers included people who said that they had smoked cigarettes regularly but who did not currently smoke. Current smoking was defined as people who had tried cigarettes and that said they still smoked "nowadays".

There were few consistent patterns of vaping prevalence across current and former smokers by age groups and the numbers of never smoking vapers were too small to draw any conclusions (Table 18). Rates of vaping among current smokers in the STS data were similar for women and for men; however, in the ASH-A data vaping among current smokers was 15.7% for women and 19.1% for men. Vaping among current smokers was similar across social grades. For ethnicity, the numbers involved were too small to draw any conclusions.

Table 18: Current vaping prevalence (%) by smoking status among adults by age, gender region social grade and ethnicity, England 2020 (STS and ASH-A weighted data)

	STS	STS	STS		ASH-A	ASH-A	ASH-A
	Never regularly smoked % (n)	Former smokers % (n)	Current smokers % (n)		Never smokers % (n)	Former smokers % (n)	Current smokers % (n)
Total	0.6 (63)	11.0 (405)	20.1 (443)		0.3 (12)	10.9 (346)	17.5 (206)
Age				**Age**			
18 to 24	1.9 (22)	20.2 (32)	21.1 (77)	18 to 24	0.6 (3)	10.8 (7)	22.9 (15)
25 to 34	0.4 (5)	23.9 (90)	21.6 (107)	25 to 34	0.5 (2)	16.1 (39)	17.8 (30)
35 to 44	0.3 (4)	20.6 (97)	18.9 (63)	35 to 44	0.6 (4)	17.1 (71)	20.0 (48)
45 to 54	0.6 (12)	11.9 (82)	24.5 (80)	45 to 54	0.3 (2)	18.5 (87)	19.2 (46)
55 to 64	0.5 (9)	8.9 (71)	18.4 (68)	55+	0.1 (1)	6.8 (142)	13.9 (67)
65+	0.4 (11)	2.2 (33)	12.8 (48)				
Gender							
Male	0.8 (36)	12.3 (222)	20.4 (218)		0.5 (7)	11.5 (182)	19.1 (109)
Female	0.5 (26)	9.5 (180)	19.7 (223)		0.2 (5)	10.3 (164)	15.7 (97)
Region							
North	0.7 (18)	14.1 (146)	22.3 (141)		0.4 (4)	14.4 (145)	17.2 (67)
Midlands	0.4 (6)	9.8 (72)	18.5 (72)		0.3 (2)	10.4 (56)	20.6 (44)
South	0.7 (39)	9.8 (187)	19.4 (230)		0.3 (6)	9.3 (145)	16.4 (95)

	STS	STS	STS		ASH-A	ASH-A	ASH-A
	Never regularly smoked % (n)	**Former smokers % (n)**	**Current smokers % (n)**		**Never smokers % (n)**	**Former smokers % (n)**	**Current smokers % (n)**
Social Grade							
ABC1	0.7 (42)	10.6 (240)	18.8 (191)		0.1 (3)	9.6 (162)	18.0 (95)
C2DE	0.5 (16)	11.7 (158)	20.4 (234)		0.6 (9)	12.2 (184)	17.1 (111)
Ethnicity							
White	0.7 (31)	11.3 (170)	21.0 (195)		0.3 (9)	10.7 (316)	17.0 (173)
Black and Minority Ethnic groups	0.3 (1)	8.4 (6)	21.4 (21)		0.8 (3)	3.7 (23)	4.2 (30)

Notes

STS (18+): Unweighted base for age, gender and region = 15,747; social grade = 15,294; ethnicity = 7,329. Six people defined their gender in another way. Current vaper included people who 'currently vaped for any reason'. Never regularly smoked included people who had never smoked for longer than 1 year. Former smokers included those who had stopped smoking completely but who had smoked for a year or more in the past. Current smokers included people who said that they smoked daily or that they smoked, but less than daily. STS data available from January to October 2020.

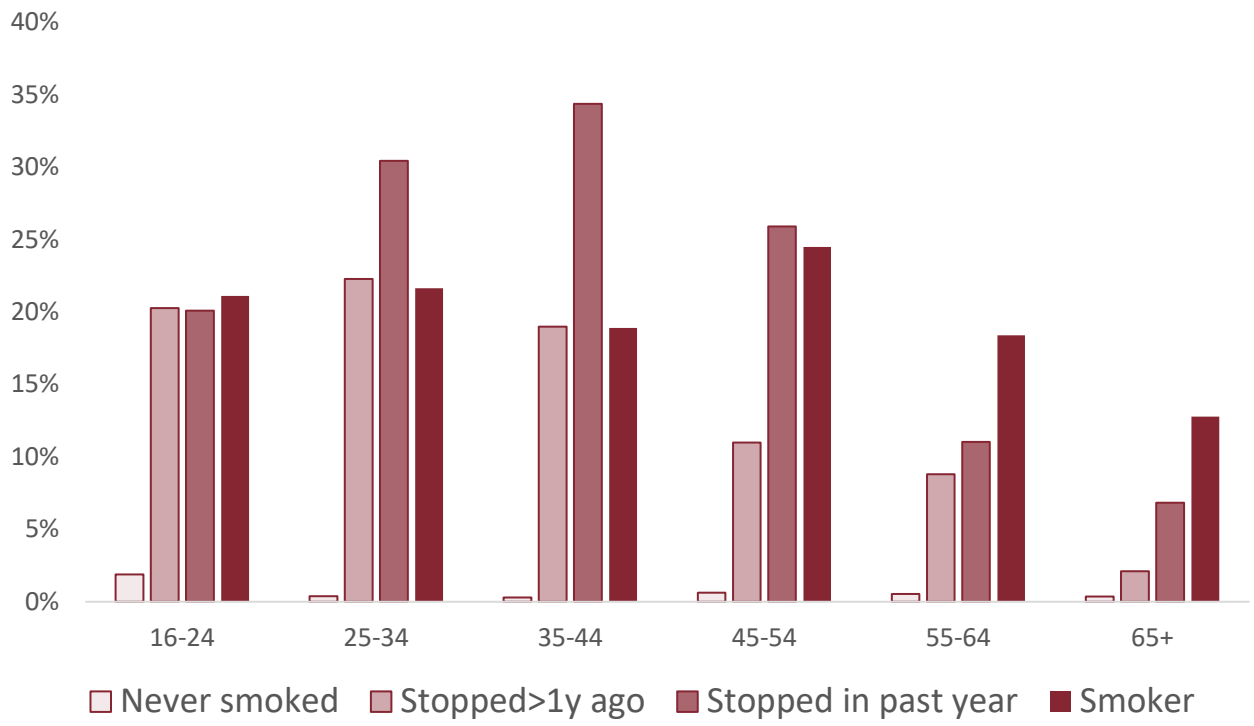
ASH-A (18+): Unweighted base for age, gender, region, social grade = 9,329; ethnicity = 9,025

Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped. Never smokers included people who responded to a question about smoking with 'I have never smoked'. Former smokers included those who said that they used to smoke, but who had "given up now". Current smokers included people who smoked daily as well as those who smoked, but not daily. 5 participants selected 'prefer not to say' when asked about their ethnicity.

The STS survey differentiated between long-term former smokers (who had quit for longer than 1 year), and short-term former smokers (who had stopped smoking in the past year), with vaping prevalence at 9.8% among long-term former smokers and 24.2% among short-term former smokers. Figure 15 illustrates the differences between these groups, with vaping prevalence estimates for long-term former smokers higher in those aged less than 45 years and among recent former smokers aged 25 to 54 years.

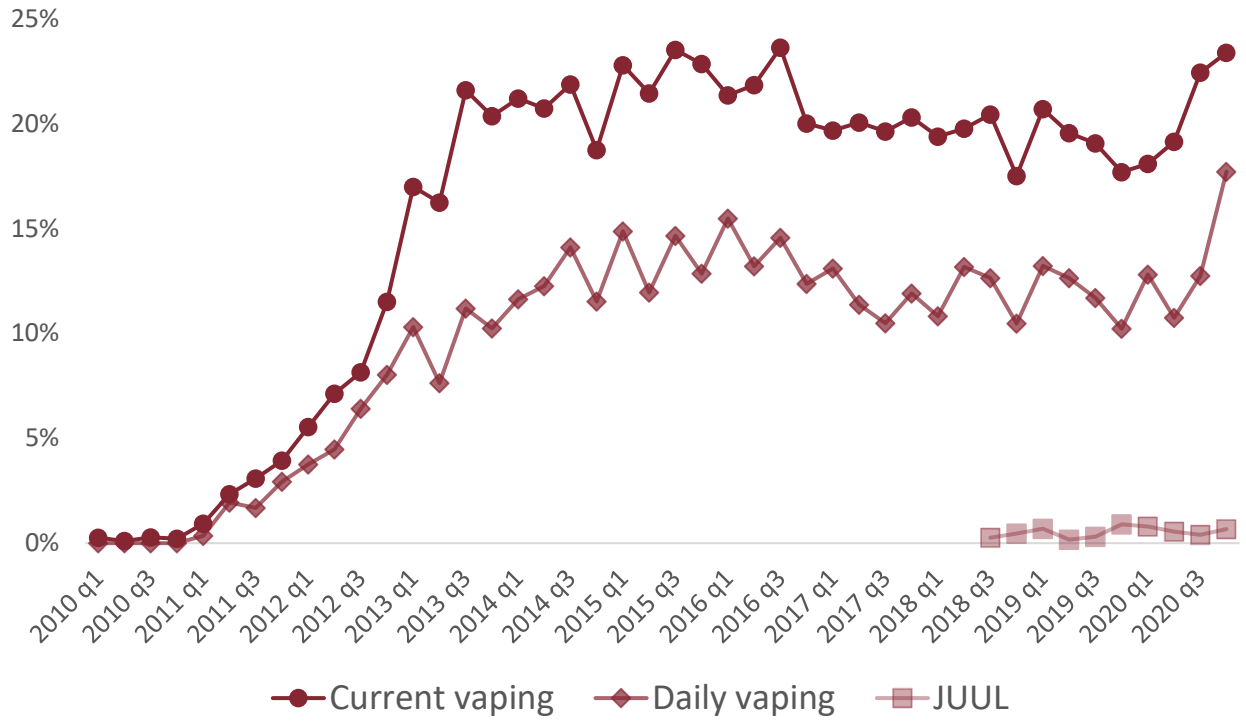
Figure 16 illustrates changes in current and daily vaping prevalence among past-year smokers (combining current smokers with short-term former smokers) between 2010 and 2020 (STS – aged 18+ for all years). It suggests a slight, but steady, decline in current vaping among past-year smokers since 2015 to 2016, although there was a substantive increase in the third quarter of 2020. This uptick is possibly due to fluctuations present throughout the data but could also signify an increase in past-year smokers vaping during the COVID-19 pandemic. While current vaping among past-year smokers has ranged between 17% and 24% since 2013, the proportion of past-year smokers who vaped every day ranged between 10% and 18%. JUUL use by past-year smokers has remained under 1%.

Figure 15: Current vaping prevalence by smoking status and by age, England 2020 (STS, weighted data)



Notes
Age 18+; Unweighted base = 15,747. Current vaping included people who 'currently vaped for any reason'. Never smoked included people who had never smoked for longer than 1 year. Former smokers included those who had stopped smoking completely but who had smoked for a year or more in the past; and here was split between those who quit smoking over, and under 1 year ago. Current smokers included people who said that they smoked daily or that they smoked, but less than daily. STS data available from January to October 2020.

Figure 16: Vaping prevalence and use of JUUL among smokers and recent (less than one year) former smokers, England 2011 to 2020 (STS, weighted data)

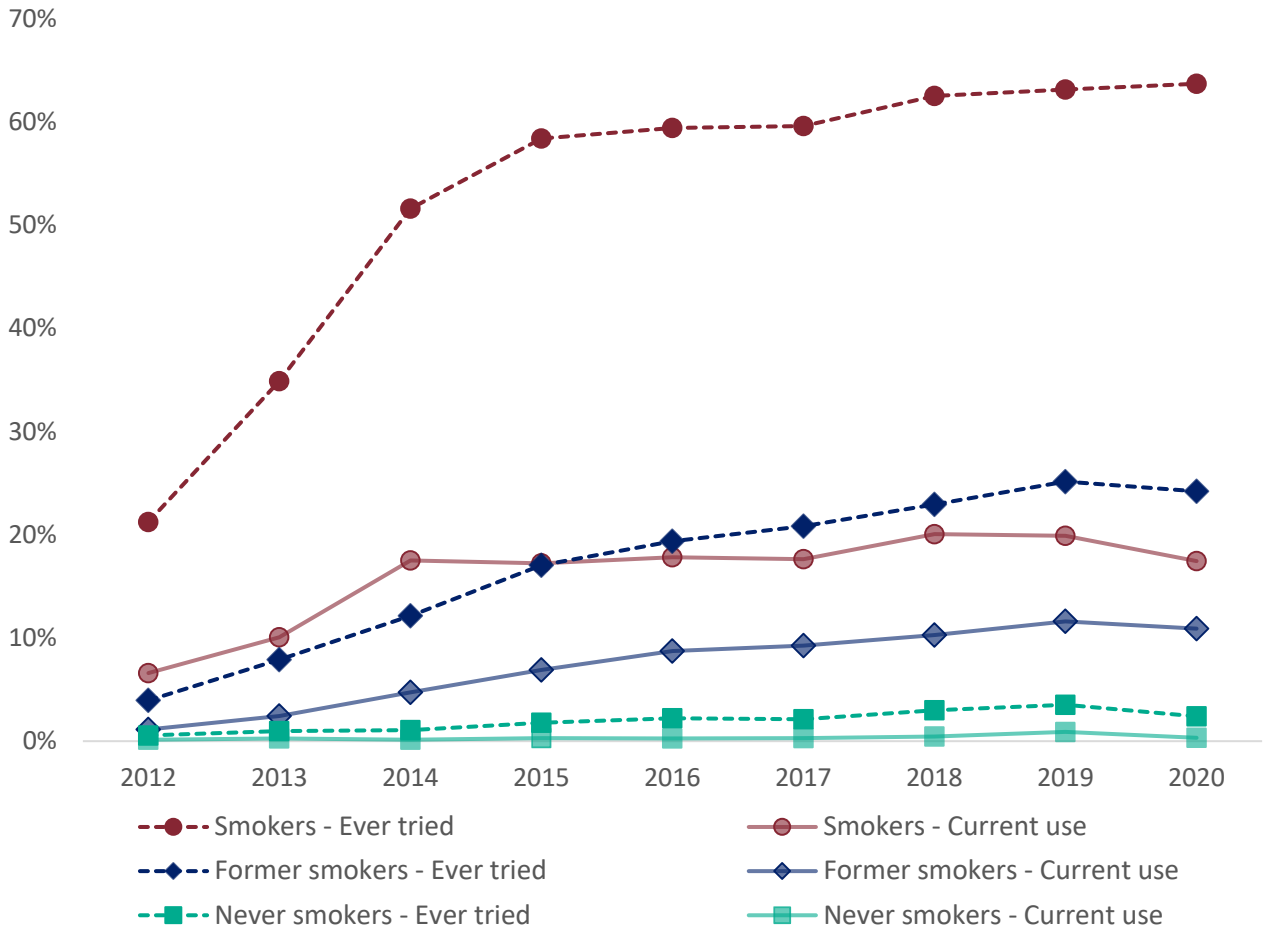


Notes

Age 18+; Unweighted bases vaping: 2010=6,005; 2011=5,110; 2012=3.204; 2013=3,556; 2014=3,711; 2015=3,621; 2016=3,407; 2017=3,225; 2018=3,311; 2019=2,994; 2020 (to October) =2,244. Unweighted bases JUUL: 2010=6,005; 2011=5,191; 2012=5,063; 2013=4,760; 2014=4,203; 2015=4,147; 2016=3,922; 2017=3,651; 2018=3,755; 2019=3,408; 2020 (to October) =2,558. Smokers included people who smoked daily as well as those who smoked, but not daily. Recent former smokers included those who had stopped smoking completely, who had previously smoked for a year or more and who quit smoking under 1 year ago. Current smokers included people who said that they smoked daily or that they smoked, but less than daily. Current vaping included people who 'currently vaped for any reason'. Daily vaping included people who reported currently using a vaping product and who reporting using nicotine every day. JUUL use included current use of JUUL for any reason. 2020 data available from January to October. The full year's data was used for all other years.

The proportions of smokers who have ever tried, or who currently use, vaping products have remained relatively stable since 2014 (ASH-A, Figure 17). However, trial and use of vaping products by former smokers steadily increased between 2012 and 2019 before plateauing. There was a small decline in current vaping prevalence among all groups in the past year. The ASH-A data were collected in early 2020 and therefore vaping prevalence might have been influenced by concerns about the 'EVALI' outbreak in the US that were widely publicised in late 2019 and early 2020 (27). These data were collected prior to the upward trend for current vaping that appears to have been observed since the third quarter (starting in July) of the STS, 2020.

Figure 17: Ever tried and current use of vaping products among adults by smoking status, England 2012 to 2020 (ASH-A, weighted data)



Notes

Age 18+; Unweighted bases: 2012=10,742; 2013=10,022; 2014=10,112; 2015=10,017; 2016=10,058; 2017=10,488; 2018=10,578; 2019=10,208; 2020=9,329. Never smoked included people who responded to a question about smoking with 'I have never smoked'. Former smokers included those who said that they used to smoke, but who had "given up now". Current smokers included people who smoked daily as well as those who smoked, but not daily. Ever tried vaping included people who had tried vaping and those who continued to vape. Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped.

4.5 Use of selected other products

The STS asks people who currently smoke or stopped smoking within the past year if they use heated tobacco products. Prevalence of heated tobacco product use in this group has remained below 0.5%. The ASH-A survey also contained data on heated tobacco products, tobacco products that are chewed or sucked and nicotine pouches (Table 19).

Since 2017, prevalence of heated tobacco products has remained under 1% and shows no evidence of increase over time. Use of tobacco products that are chewed or sucked has been recorded since 2019 and has remained at just over 1% since then. Use of nicotine pouches was a new item in the 2020 survey with an estimated 0.5% people using these products.

Table 19: Use of heated tobacco products, nicotine or tobacco pouches and chewing tobacco by year, England 2017 to 2020 (STS and ASH-A, weighted data)

Year	STS	ASH-A	ASH-A	ASH-A
	Heated tobacco products[1]	Heated tobacco products	Tobacco products that are chewed or sucked	Nicotine pouches
2017	0.1%	0.6%	Not asked	Not asked
2018	0.4%	0.4%	Not asked	Not asked
2019	0.2%	0.6%	1.2%	Not asked
2020	0.3%	0.3%	1.2%	0.5%

Notes
Age 18+.
STS: Unweighted bases 2017=3,645; 2018=3,742; 2019=3,398; 2020 (to October) =2,551. Heated tobacco products included current use of heated tobacco products for any reason. 2020 data available from January to October.
ASH-A: Unweighted bases 2017=5,224; 2018=10,578; 2019=10,208; 2020=9,329. Heated tobacco products included people who have tried them and still use them. Chewing and sucking tobacco included people who use them once a week more. Data for chewing and sucking tobacco are only available from 2019. Nicotine pouches included people who tried them and still use them. Data for nicotine pouches are only available from 2020.
[1] Among smokers and recent (less than one year) former smokers

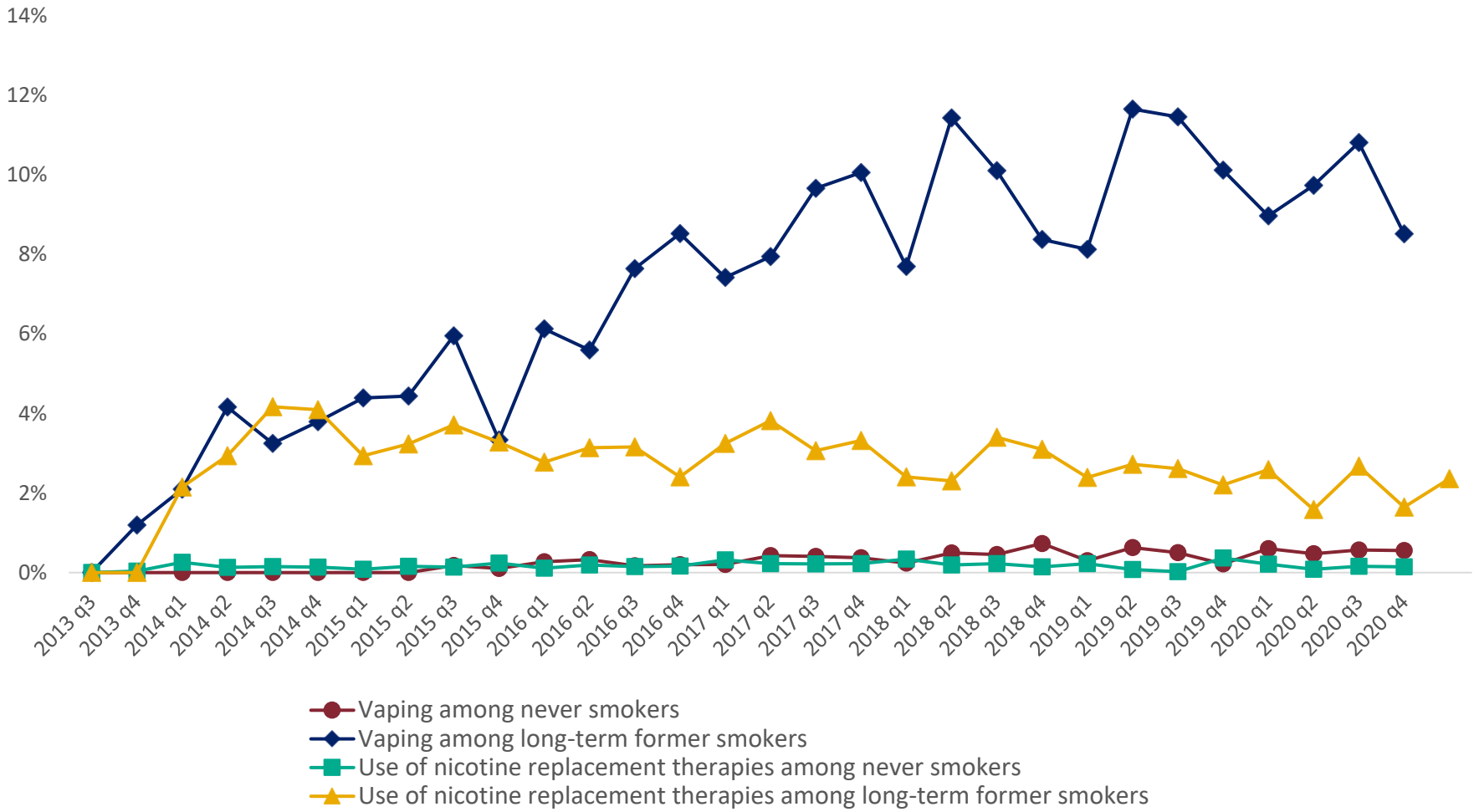
4.6 Nicotine product use by former and never smokers

Continued use of nicotine products (including vaping and NRT products) by long-term (more than 1 year) former smokers indicates whether or not people who quit smoking either continue to use nicotine products or initiate them once they have successfully quit smoking. NRT use by long-term former smokers has approximately halved in the past 7 years from around 4% in 2013 to around 2% in 2020 (Figure 18).

This contrasts with the increase in vaping among long-term former smokers from a similar starting point of 4% in 2013 to around 10% in 2020. Use of both NRT and vaping products among never smokers remains under 1%. Use of NRT and vaping products by never and long-term former smokers by age, gender, region, SES and ethnicity is reported in Table 20.

Among long-term ex-smokers, vaping appeared to be more common in younger age groups, and possibly more common in the North of England. However, the numbers of never smokers who vape or use NRT are too small to draw any conclusions.

Figure 18: Use of vaping products and nicotine replacement therapy by never smokers and long-term (more than one year) former smokers, England 2014 to 2020 (STS, weighted data)



Notes

Age 18+; Unweighted bases: 2013=14,364; 2014=15,495; 2015=15,495; 2016=15,642; 2017=16,385; 2018=15,574; 2019=16,972; 2020 (to October) = 13,189. Current vaper included people who 'currently vaped for any reason'. Use of nicotine replacement therapy (NRT) included people who were currently using NRT. 2020 data available from January to October. The full year's data was used for all other years.

Table 20: Vaping and NRT prevalence by never smokers and long-term (more than 1 year) former smokers by and age, gender, region, social grade and ethnicity, England 2020 (STS, weighted data)

	Vaping among never smokers % (n)	Vaping among long-term former smokers % (n)	NRT by never smokers[1] % (n)	NRT by long-term former smokers % (n)
Total	0.6 (63)	9.8 (331)	0.1 (15)	2.1 (86)
Age				
18 to 24	1.9 (22)	20.3 (18)		1.5 (1)
25 to 34	0.4 (5)	22.3 (65)		2.5 (8)
35 to 44	0.3 (4)	19.0 (80)		2.3 (9)
45 to 54	0.6 (12)	11.0 (72)		1.6 (15)
55 to 64	0.5 (9)	8.8 (67)		2.5 (20)
65+	0.4 (11)	2.1 (29)		1.8 (32)
Gender				
Male	0.8 (36)	10.9 (179)		2.5 (52)
Female	0.5 (26)	8.6 (150)		1.6 (34)
Region				
North	0.7 (18)	12.4 (119)		2.2 (22)
Midlands	0.4 (6)	8.9 (58)		2.2 (16)
South	0.7 (39)	8.8 (154)		2.0 (48)
Social Grade				
ABC1	0.7 (42)	9.5 (197)		1.7 (42)
C2DE	0.5 (16)	10.5 (128)		2.5 (40)
Ethnicity				
White	0.7 (31)	9.9 (137)		2.1 (41)
Black and Minority Ethnic groups	0.3 (1)	7.1 (5)		0.0 (0)

Notes

Age 18+; Unweighted bases for never smokers: for age, gender and region = 9,377; social grade = 9,096; ethnicity = 4,543

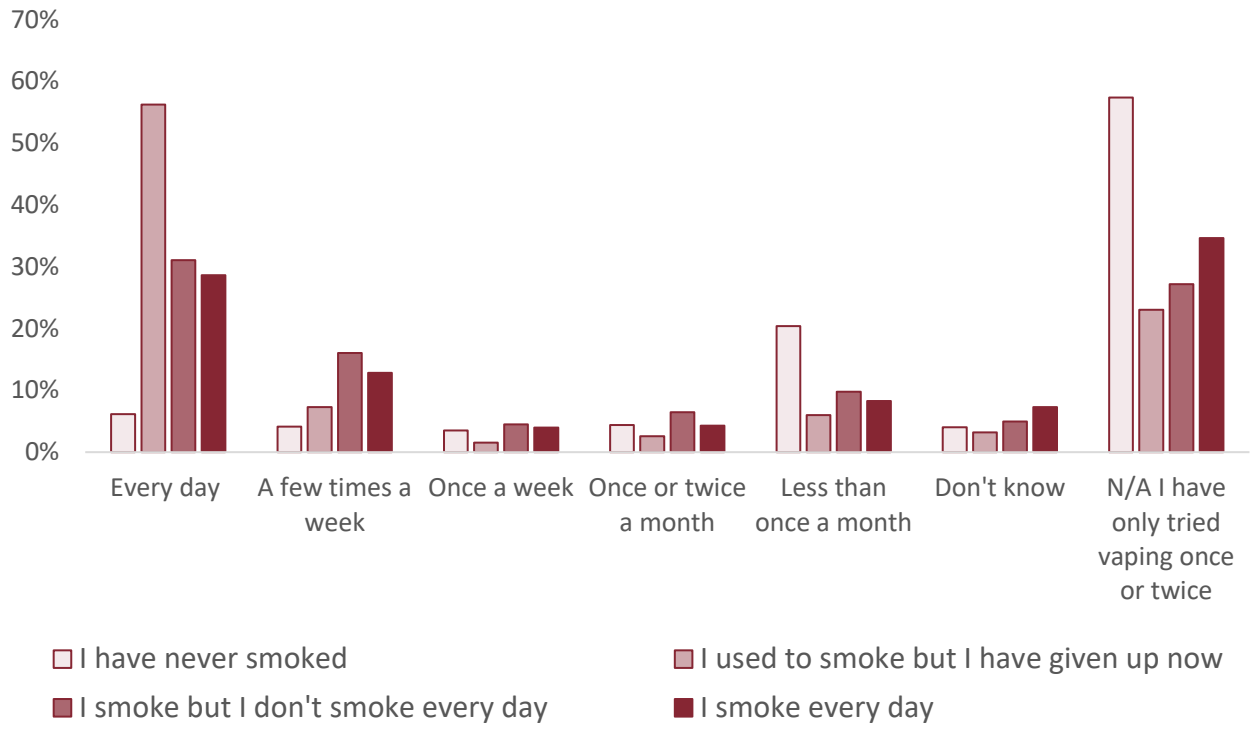
Unweighted bases for long-term former smokers: for age, gender and region = 3,812; social grade = 3,709; ethnicity = 1,621. Three people defined their gender in another way. Current vaper included people

who ‘currently vaped for any reason’. Use of nicotine replacement therapy (NRT) included people who were currently using NRT. Never smokers included people who had never smoked for longer than 1 year. Long-term former smokers included those who had stopped smoking completely over 1 year go, but who had smoked for a year or more in the past. STS data available from January to October 2020.
[1] Columns with fewer than 50 participants have not been broken down by socio-demographic characteristics as they do not represent a wide enough cross-section of the target population to be considered statistically reliable.

4.7 Vaping frequency by smoking status

The ASH-A survey recorded how often people vaped (Figure 19). Among people who vaped, those who had never smoked appeared to vape less frequently than those who were current or former smokers. Over half of never smokers who vaped had only tried vaping once or twice and over a fifth vaped less than once per month. Just 6% of never smokers who vaped, did so daily. Of all groups who had ever vaped, never smokers appear to be the most likely to have tried, but to have not continued, vaping. More than 50% of former smokers who vaped, did so every day compared with around 30% of daily and non-daily smokers who vaped. This is potentially because vaping is the sole source of nicotine for former smokers whereas smokers who vape consume nicotine from both smoking and vaping.

Figure 19: Vaping frequency by smoking status among adults who have ever tried vaping products, England 2020 (ASH-A, weighted data)



Notes

Age 18+. Unweighted base = 1,636. Current smoking was split between people who smoked daily and people who smoked, but not every day. Never smoked included people who responded to a question about smoking with ‘I have never smoked’.

4.8 Smoking status of vapers

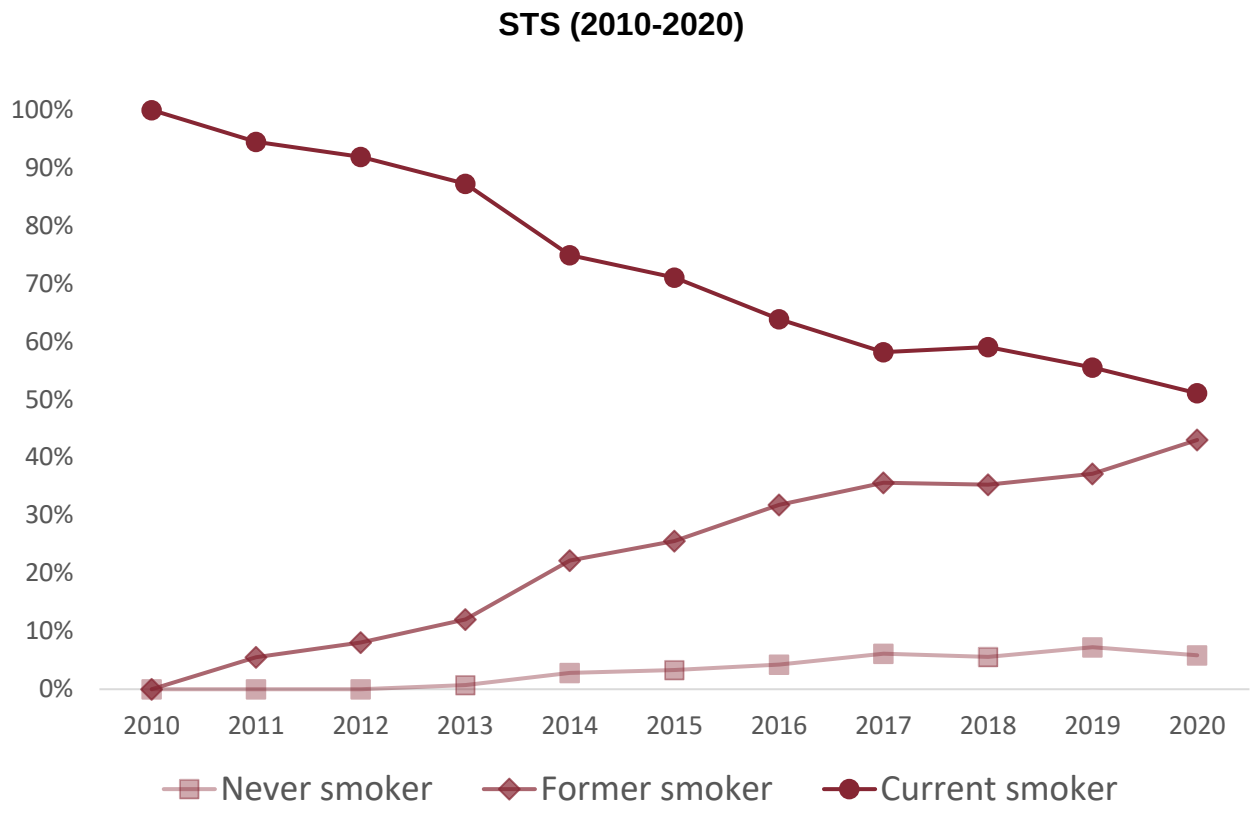
Previous figures in this chapter focused on the vaping status of current, former and never smokers. By contrast, Figure 20 shows the smoking status of current vapers in the STS and ASH-A surveys. Since 2010 (STS) and 2012 (ASH-A), current vapers have increasingly comprised former smokers with decreasing proportions of current smokers. This decline in the proportion of vapers who currently smoke indicates that 'dual use' is diminishing among vapers, a positive indication for reducing the risks associated with smoking.

Both STS and ASH-A show a past-year decline in the proportion of vapers who have never smoked. The definition of a former smoker in the STS survey required people to have smoked regularly for a year or more before stopping, whereas the ASH-A survey did not specify any duration needed for smoking before stopping, accounting for the lower proportion of former smokers in the STS survey compared with the ASH-A survey.

The smoking status of current vapers is presented by age, region, gender, social grade and ethnicity in Table 21. Using the STS data, the highest proportions of vapers who never smoked were seen in the 18 to 24 (15.2%) and 65+ (10.2%) age ranges. The 18 to 24 age group also appeared to have the highest proportion of vapers who were current smokers (61.8%). Six percent of men and 5.5% of women who vaped were never smokers. There was some regional variation, with 7.0% of vapers from the South being never smokers, 5.1% from the North and 4.2% from the Midlands. People from social grades ABC1 who vaped seemed to be less likely to also currently smoke (40.2%) compared with vapers from groups C2DE (59.2%). Around three-quarters (75.9%) of people from black and minority ethnic groups who vaped also smoked, compared with just over half (51.6%) of those from white ethnic groups.

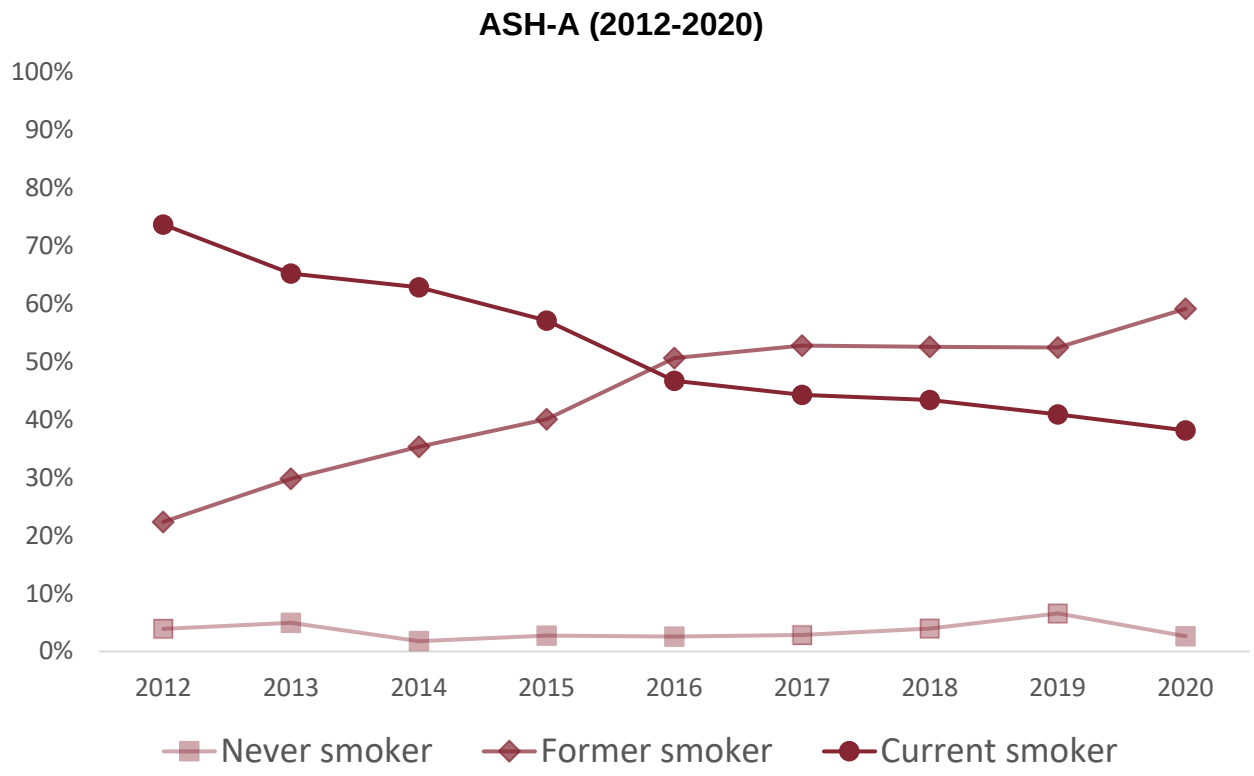
These patterns were not consistently reflected in the ASH-A data, perhaps reflecting the different definitions of smoking and vaping used by both surveys. Across all age groups, more vapers were former smokers than current smokers, apart from in the 18 to 24 age group where 61.6% of vapers were current smokers and 25.8% were former smokers. The smoking status of vapers was broadly similar by gender and social grade. The highest estimate of smoking among vapers was seen in the Midlands (45.1%) compared with 31.3% in the North. Again, higher estimates of smoking among vapers from black and minority ethnic groups were seen (53.6%) compared with people from white ethnic groups (35.8%). There were too few vapers who were never smokers to look at subgroups.

Figure 20: Smoking status of current vapers over time, England (STS and ASH-A, weighted data)



Notes

Age 18+. Unweighted bases: 2010=10; 2011=116; 2012=231; 2013=747; 2014=962; 2015=1,077; 2016=1,088; 2017=1,056; 2018=1,071; 2019=1,053; 2020 (to October) =911. Current vaper included people who 'currently vaped for any reason'. Never smoker included people who had never regularly smoked for a year or more. Former smokers included those who had stopped smoking completely but who had smoked for a year or more in the past. Current smokers included people who said that they smoked daily or that they smoked, but less than daily. Never regularly smoked included people who had never smoked for longer than 1 year. 2020 data available from January to October. The full year's data was used for all other years.



Notes

Age 18+. Unweighted bases: 2012=180; 2013=270; 2014=407; 2015=508; 2016=545; 2017=542; 2018=620; 2019=699; 2020=564. Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped. Never smoked included people who responded to a question about smoking with 'I have never smoked'. Former smokers included those who said that they used to smoke, but who had "given up now". Current smoking included people who smoked daily as well as those who smoked, but not daily.

Table 21: Smoking status of current vapers by age, gender, region, social grade and ethnicity, England 2020 (STS and ASH-A, weighted data)

	STS	STS	STS		ASH-A	ASH-A	ASH-A
	Never smoker % (n)	Former Smoker % (n)	Current smoker % (n)		Never smoker * % (n)	Former Smoker % (n)	Current smoker % (n)
Total	5.9 (63)	43.0 (405)	51.1 (443)		2.7 (12)	59.2 (346)	38.2 (206)
Age				**Age**			
18 to 24	15.2 (22)	23.0 (32)	61.8 (77)	18 to 24		25.8 (7)	61.6 (15)
25 to 34	2.3 (5)	42.4 (90)	55.3 (107)	25 to 34		51.4 (39)	44.0 (30)
35 to 44	2.2 (4)	55.6 (97)	42.3 (63)	35 to 44		56.5 (71)	40.2 (48)
45 to 54	5.7 (12)	43.7 (82)	50.6 (80)	45 to 54		62.9 (87)	35.4 (46)
55 to 64	6.2 (9)	47.8 (71)	46.0 (68)	55+		66.7 (142)	32.8 (67)
65+	10.2 11()	40.2 (33)	49.6 (48)				
Gender							
Male	6.0 (36)	44.7 (222)	49.3 (218)			57.9 (182)	39.0 (109)
Female	5.5 (26)	40.8 (280)	53.7 (223)			60.7 (164)	37.2 (97)
Region							
North	5.1 (18)	46.2 (146)	48.7 (141)			66.2 (145)	31.3 (67)
Midlands	4.2 (6)	45.7 (72)	50.1 (72)			52.9 (56)	45.1 (44)
South	7.0 (39)	39.8 (187)	53.1 (230)			56.9 (145)	40.1 (95)

	STS	STS	STS		ASH-A	ASH-A	ASH-A
	Never smoker % (n)	**Former Smoker % (n)**	**Current smoker % (n)**		**Never smoker * % (n)**	**Former Smoker % (n)**	**Current smoker % (n)**
Social Grade							
ABC1	8.4 (41)	51.4 (240)	40.2 (190)			61.2 (162)	37.8 (95)
C2DE	3.0 (15)	37.8 (156)	59.2 (232)			57.7 (184)	38.5 (111)
Ethnicity							
White	6.2 (31)	42.3 (167)	51.6 (192)			62.2 (316)	35.8 (173)
Black and Minority Ethnic groups	5.5 (1)	18.5 (6)	75.9 (21)			39.6 (23)	53.6 (30)

Notes

STS (18+): Unweighted base for age, gender and region = 911; social grade = 874; ethnicity = 418. Six people defined their gender in another way. Current vaper included people who 'currently vaped for any reason'. Current smoker included people who said that they smoked daily or that they smoked, but less than daily. Former smokers included those who had stopped smoking completely but who had smoked for a year or more in the past. Never smokers included people who had never regularly smoked for a year or more. STS data available from January to October 2020.

ASH-A (18+): Unweighted base for age, gender, region, social grade = 564; ethnicity = 554. Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped. Never smoked included people who responded to a question about smoking with 'I have never smoked'. Former smokers included those who said that they used to smoke, but who had "given up now". Current smoking included people who smoked daily as well as those who smoked, but not daily.

*Columns with fewer than 50 participants have not been broken down by socio-demographic characteristics as they do not represent a wide enough cross-section of the target population to be considered statistically reliable.

4.9 Vaping, smoking and socio-economic status

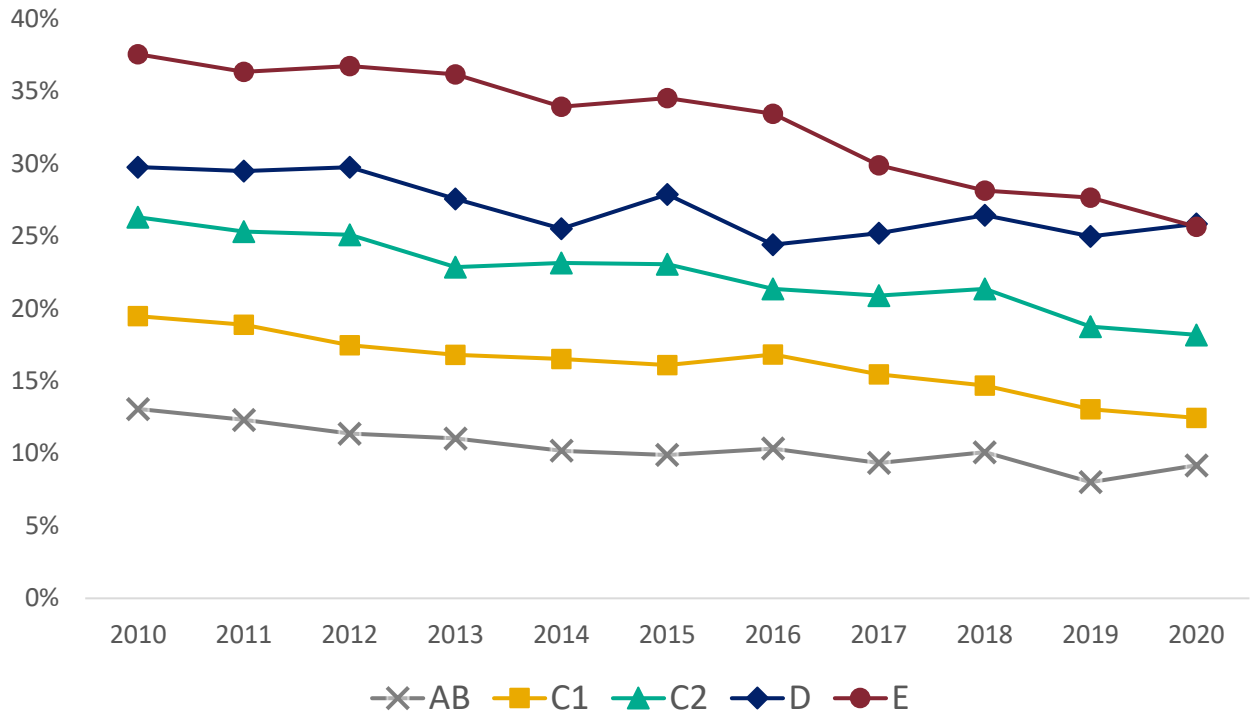
Overall, smoking prevalence has declined since 2010, however, among people classified as ‘semi and unskilled manual workers’ (group D), smoking has remained relatively steady and possibly increased in recent years (STS - Figure 21). There may also have been a past-year increase in smoking prevalence among people classified as ‘high or intermediate managerial, administrative or professional’ (group AB). Both groups require careful monitoring.

Large differences in estimates of smoking prevalence between the SES groups remain, despite those differences narrowing a little in recent years. In 2020, smoking prevalence ranged from 9.2% in group AB to 25.9% in group D (25.7% in group E), illustrating the social inequalities of harms caused by smoking in England.

Vaping prevalence also varied between SES groups (Figure 22), ranging from 4.6% in group AB to 8.2% in group D, with the past-year uptick in vaping observed in the STS across all SES grades. The large fluctuations seen for groups D and E in Figure 22 can be attributed to the relatively small absolute numbers of vapers in these groups.
When viewing past-year smokers only (Figure 23), the uptick in vaping among all adults across SES groups between 2019 and 2020 appears to have been restricted to SES groups C2, D and E.

A recent study by Kock and colleagues using STS data (46) identified that, between 2014 and 2019 vaping prevalence increased across all SES groups but was higher among people from lower SES groups. They also found no differences in initiating vaping among recent or long-term former smokers between SES groups. The authors highlighted the importance of understanding whether higher levels of vaping product use among people from lower SES groups might be protective of relapse to smoking, or whether they might expose people in those groups to increased risk and therefore worsen inequalities.

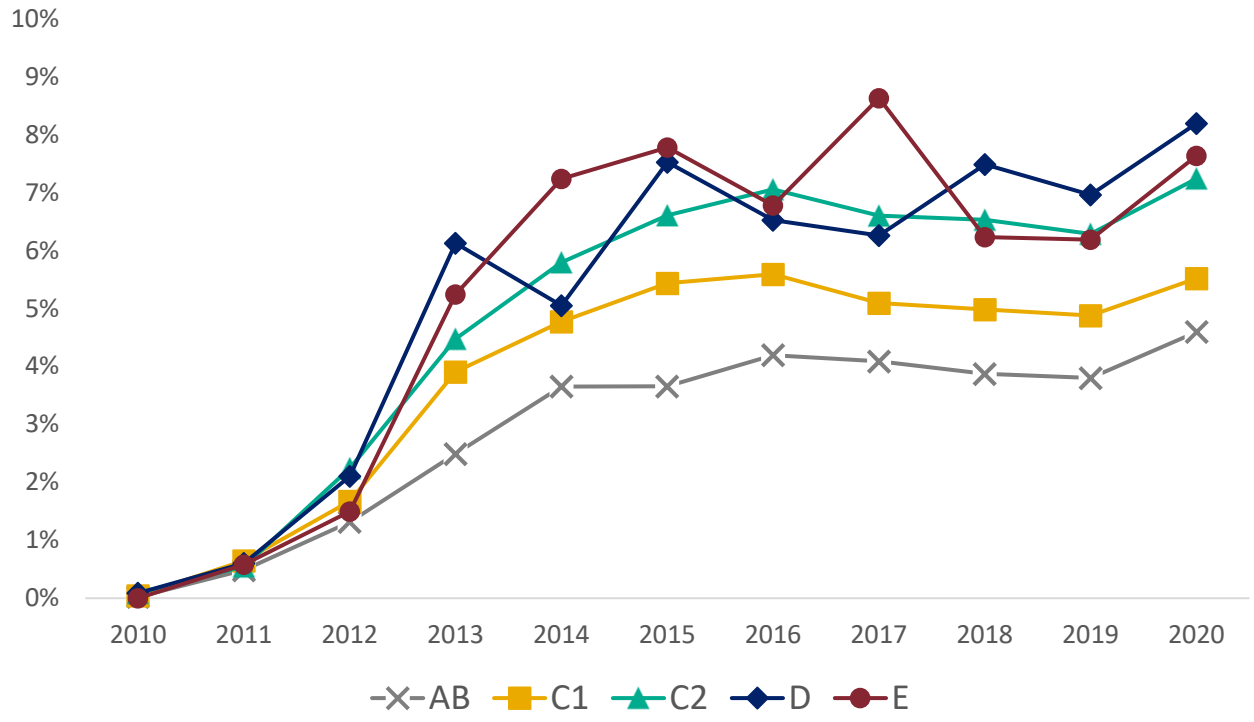
Figure 21: Smoking prevalence by socio-economic status among all adults, England 2010 to 2020 (STS, weighted data)



Notes

Age 18+. Unweighted bases: 2010=24,268; 2011=21,299; 2012=20,832; 2013=21,658; 2014=19,773; 2015=19,642; 2016=20,063; 2017=20,036; 2018=20,402; 2019=20,380; 2020 (to October) =15,294. Smoking prevalence included current smokers who smoked daily or smoked, but less than daily. Social grade definitions (44): A = High managerial, administrative or professional; B = Intermediate managerial, administrative or professional; C1 = Supervisory, clerical and junior managerial, administrative or professional; C2 = Skilled manual workers; D = Semi and unskilled manual workers; E = State pensioners, casual or lowest grade workers, unemployed with state benefits only. 2020 data available from January to October. The full year's data was used for all other years.

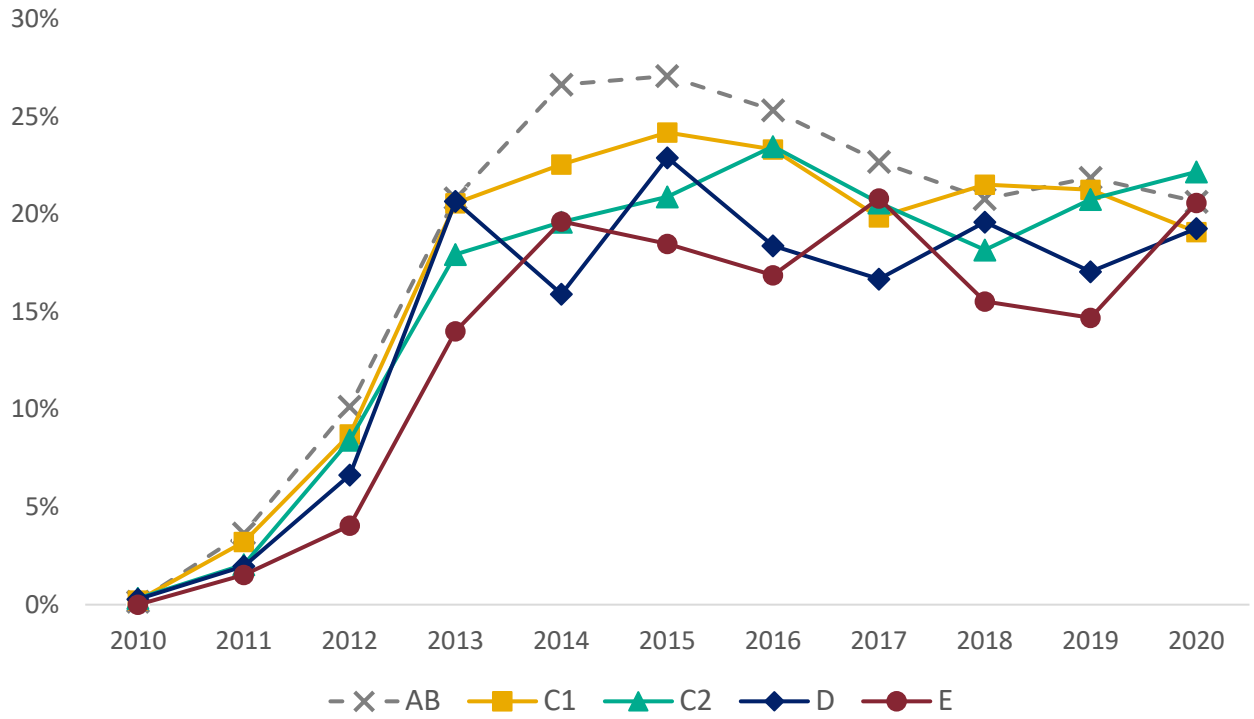
Figure 22: Vaping prevalence by socio-economic status among all adults, England 2010 to 2020 (STS, weighted data)



Notes

Age 18+. Unweighted bases: 2010=24,294; 2011=21,315; 2012=13,897; 2013=18,311; 2014=19,798; 2015=19,650; 2016=20,066; 2017=20,051; 2018=20,421; 2019=20,385; 2020 (to October) =15,343. Vaping prevalence included current vapers who 'currently vaped for any reason'. Social grade definitions (44): A = High managerial, administrative or professional; B = Intermediate managerial, administrative or professional; C1 = Supervisory, clerical and junior managerial, administrative or professional; C2 = Skilled manual workers; D = Semi and unskilled manual workers; E = State pensioners, casual or lowest grade workers, unemployed with state benefits only. 2020 data available from January to October. The full year's data was used for all other years.

Figure 23: Vaping prevalence by socio-economic status among current smokers and recent (less than one year) former smokers, England 2010 to 2020 (STS, weighted data)



Notes

Age 18+. Unweighted bases: 2010=6,005; 2011=5,191; 2012=3,360; 2013=3,936; 2014=4,203; 2015=4,147; 2016=3,922; 2017=3,651; 2018=3,755; 2019=3,408; 2020 (to October) =2,489. Smokers included people who smoked daily as well as those who smoked, but not daily. Recent former smokers included those who had stopped smoking completely, who had previously smoked for a year or more and who quit smoking under 1 year ago. Vaping prevalence included current vapers who 'currently vaped for any reason'. Social grade definitions (44): A = High managerial, administrative or professional; B = Intermediate managerial, administrative or professional; C1 = Supervisory, clerical and junior managerial, administrative or professional; C2 = Skilled manual workers; D = Semi and unskilled manual workers; E = State pensioners, casual or lowest grade workers, unemployed with state benefits only. 2020 data available from January to October. The full year's data was used for all other years.

4.10 Duration of use

Since 2018, the ASH-A survey has asked participants about the length of time they have vaped. The proportion of current vapers who had vaped for one month or less was 16.1% in 2018 compared with 13.4% in 2020 (ASH-A – Table 22). The proportion of vapers who had vaped for more than 3 years was 14.5% in 2018 and 23.0% in 2020.

This changing profile of vaping duration could be explained by a steady accumulation of long-term vapers which is supported by a comparison of current and past vapers. Among current vapers in 2020, 39.2% have vaped more than 3 years, a proportion that appears to have increased year on year, while a declining minority have vaped for one year or less (24.9% in 2018 versus 14.1% in 2020). Vapers who have stopped vaping are likely to have done so after a shorter period of use; 59.9% of past vapers in 2020 had vaped for 6 months or less (65.8% in 2018, 66.2% in 2019) and 6% had stopped after having vaped for more than 3 years.

Further research on this issue would help explore whether long-term vapers have stopped smoking and whether they are reducing their health risks by preventing relapse to smoking or whether, by continuing to vape, they continue to expose themselves to risks that could be avoided had they managed to quit all nicotine product use.

Table 22: Duration of vaping among past and current vapers, England 2018 to 2020 (ASH-A, weighted data)

Duration	2018 (%)			2019 (%)			2020 (%)		
	Past vapers	Current vapers	Total	Past vapers	Current vapers	Total	Past vapers	Current vapers	Total
1 month or less	28.5	5.5	16.1	31.6	5.1	17.5	24.7	2.6	13.4
1 to 3 months	22.7	9.2	15.4	22.7	9.7	15.8	18.5	4.8	11.5
3 to 6 months	14.6	10.2	12.2	11.9	7.4	9.5	16.7	6.7	11.6
6 months to 1 year	13.7	13.0	13.3	10.9	11.3	11.1	16.5	10.9	13.6
1 to 2 years	9.7	19.9	15.2	8.5	17.5	13.3	9.3	17.1	13.3
2 to 3 years	2.9	17.9	11.0	4.2	18.4	11.7	5.3	16.9	11.2
More than 3 years	3.8	23.7	14.5	4.4	29.3	17.6	6.0	39.2	23.0
Don’t know	4.0	0.6	2.2	5.7	1.4	3.4	3.1	1.7	2.4

Notes

Age 18+. Unweighted bases: 2018=1,114; 2019=1,257; 2020=1,066. Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped. Past vaping included people who had tried e-cigarettes but did not use them (anymore) and excluded those who said they had only tried e-cigarettes once or twice.

4.11 Reasons for vaping

Both ASH-A and OPN surveys asked participants for the single main reason why they ever and currently vaped.

In the ASH-A data, the 3 most popular reasons for vaping were all related to tobacco cessation or reduction and were selected by between 10% and 30% of people who had tried vaping (Table 23). All other reasons were selected by less than 10% of participants. The most popular reason for vaping in the OPN survey was as an aid to quit smoking (52.8%). All other reasons to vape were selected by less than 12% of participants (Figure 24). Those other reasons related to harm perceptions, enjoyment, cost, flavours, ability to vape indoors, peer influence and novelty. A large proportion (40.7%) of former smokers vaped to help them give up smoking entirely (ASH-A, Table 23). This indicates that many former smokers continued to use vaping products to prevent relapse. Half of never smokers selected ‘other’ reasons, however, the small numbers of never smokers (n=12) compared with former smokers (n=346), and current smokers (n=206) prevent reliable estimates being drawn.

Table 23: Main reason for vaping, England 2020 (ASH-A, weighted data)

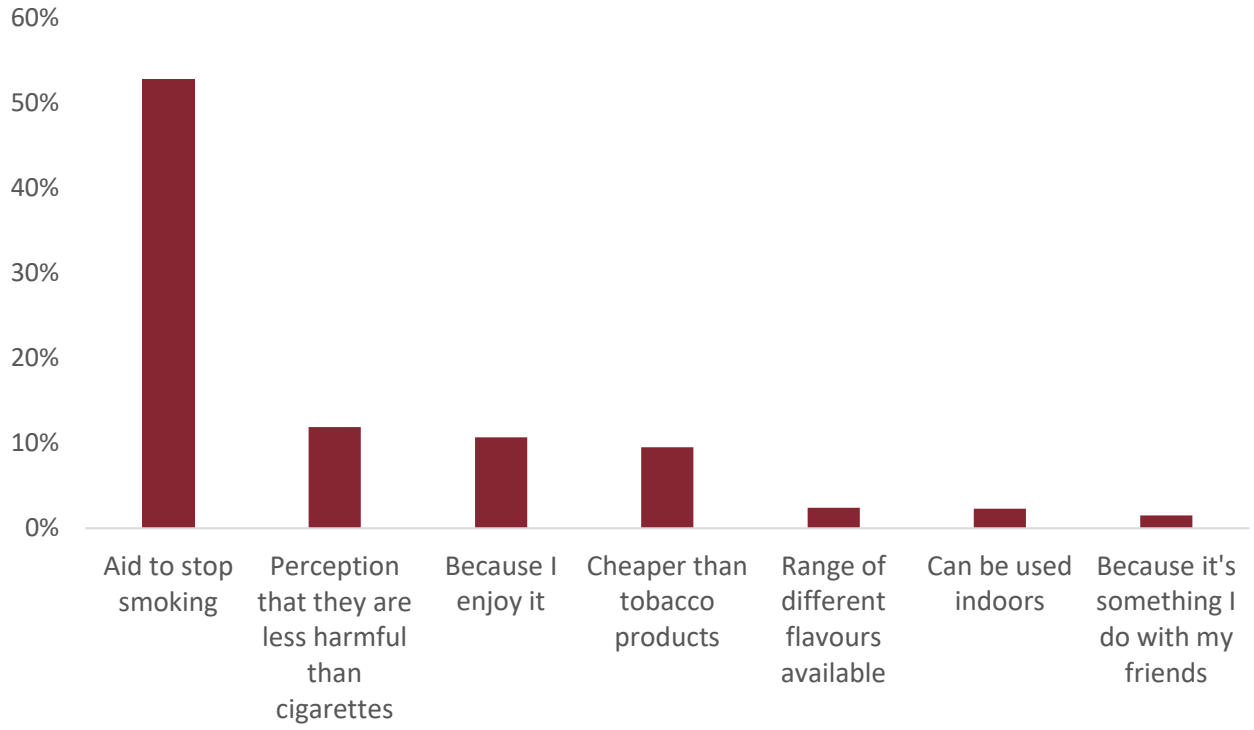
Reason	Tried vaping	Current vaper, former smoker	Current vaper, current smoker
To help me stop smoking tobacco entirely *	29.7%	40.7%	14.2%
I want an aid to help me keep off tobacco *	19.4%	23.8%	13.5%
To help me reduce the amount of tobacco I smoke, but not stop completely *	11.2%	3.8%	23.5%
To save money compared with smoking tobacco	9.1%	9.0%	9.9%
Because I enjoy the experience	8.0%	8.6%	6.5%
Because I feel I am addicted to smoking tobacco and cannot stop using it even though I want to *	6.1%	6.5%	6.0%
I need something to help deal with situations where I cannot smoke (for example workplaces, bars or restaurants)	3.5%	0.3%	8.6%
Just to give it a try	3.4%	1.4%	6.1%
It was suggested or recommended by a friend	3.0%	1.1%	6.1%
To avoid putting those around me at risk due to second-hand tobacco smoke	2.0%	1.4%	3.0%
It was advised by a health professional *	1.7%	1.8%	1.2%
Other	2.8%	1.7%	1.3%

Notes

Age 18+. Unweighted base = 564. People who have tried vaping included those who had tried vaping and who still vaped, as well as those who no longer vaped. Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped. Former smokers included those who said that they used to smoke, but who had “given up now”. Current smoking included people who smoked daily as well as those who smoked, but not daily. The reasons given by never smokers are not shown because number (n=12) does not represent a wide enough cross-section of the target population to be considered statistically reliable.

* indicates reasons to vape that are related to smoking cessation or reduction.

Figure 24: Main reason for vaping among current vapers, England 2019 (OPN, weighted data)



Notes

Age 18+. Unweighted base = 221. Current vapers were those who answered “Yes I currently use one” to a question about whether they had vaped.

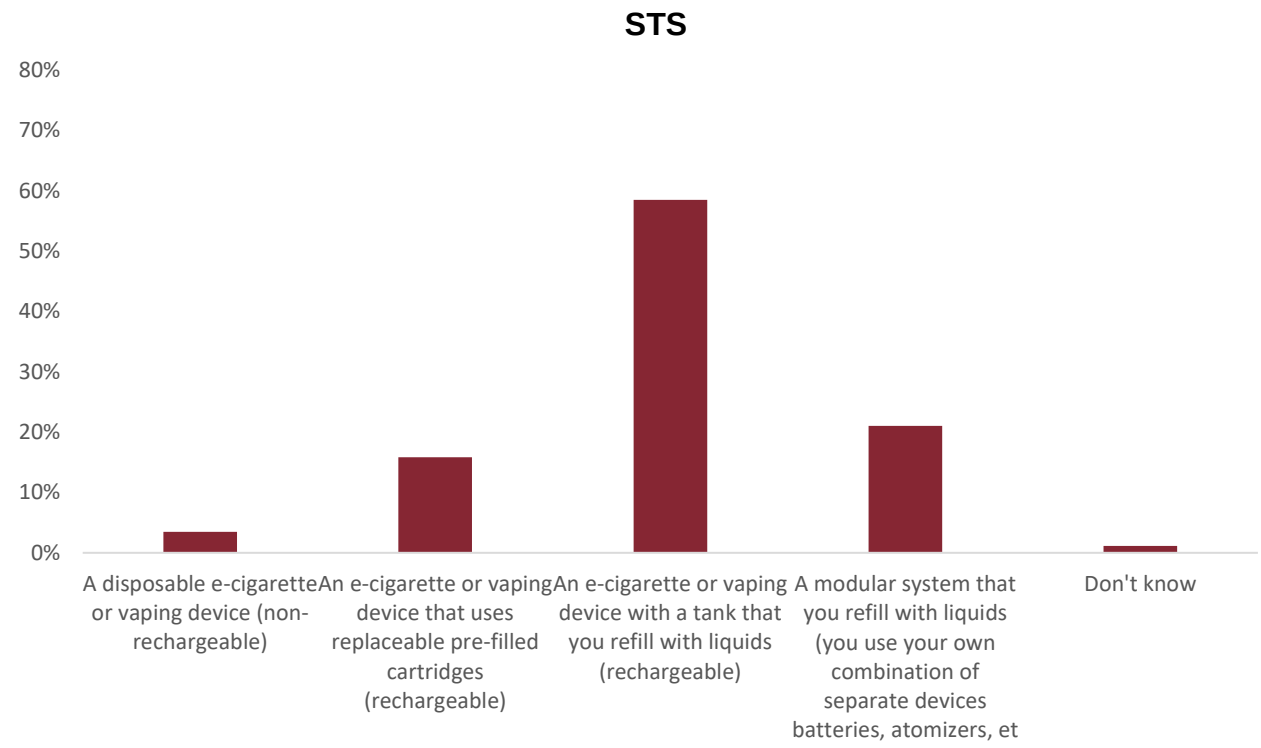
There was some variation by socio-demographics. When broken down by age (data not shown), reasons for vaping that were related to smoking cessation constituted the most common reason across all ages, although appeared to be less common among people aged 18 to 24 (55.4%) than older age groups, for example, 73.5% of people aged 55 and over reported vaping to reduce, replace or stay off tobacco.

4.12 Vaping products

Rechargeable models with tanks designed to be refilled by the user (tank models) were the most popular type of vaping product (STS, Figure 25) with an estimated 58.5% of current vapers using this type of device. Modular models (which are tank models where users use their own combination of device parts) were used by 21.0% of vapers, cartridge models by 15.8% and disposable models by 3.5%. This order of preference was also reflected in the ASH-A data (Figure 25). When viewed over time (Figure 26), vaping product preferences have remained relatively stable since 2016. However, there appears to have been a small change in the past year away from modular devices and towards tank devices.

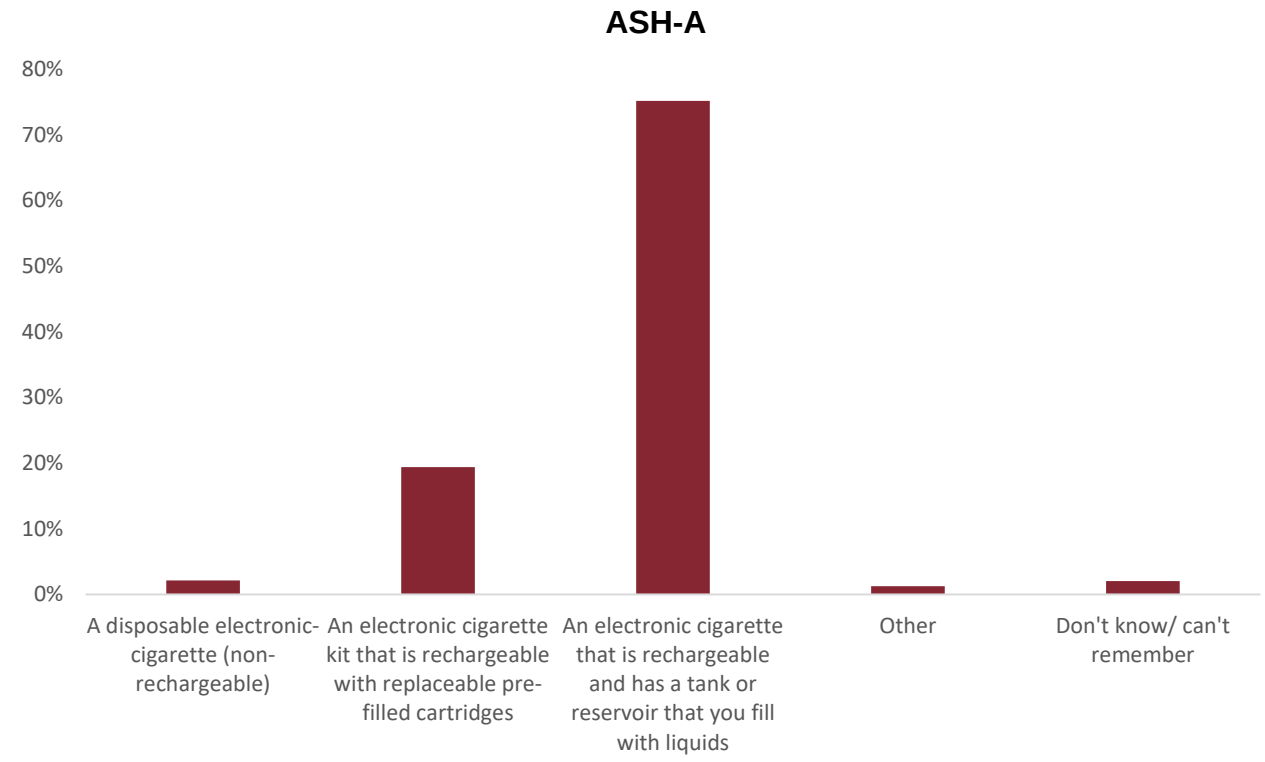
Table 24 shows the vaping product preferences across socio-demographic characteristics, with the biggest differences seen in the popularity of cartridge models. Cartridge vaping devices were particularly popular among people in the STS survey aged 65 and over (32.5%) but this age difference was not apparent in the ASH-A survey where cartridges appeared to be more commonly used in the younger age groups. A more detailed exploration of the raw data indicated that the STS survey result was partly driven by data from a single month in a specific local authority area and therefore likely represents a localised effect (Tattan-Birch, UCL, personal communication 8 Jan 2021). In the STS survey, tank models were the most popular regardless of smoking status and cartridge models appeared to be somewhat more popular among current smokers (19.3%) compared with former (12.3%) and never (10.0%) smokers.

Figure 25: Type of vaping product used by current vapers, England 2020 (STS and ASH-A, weighted data)



Notes

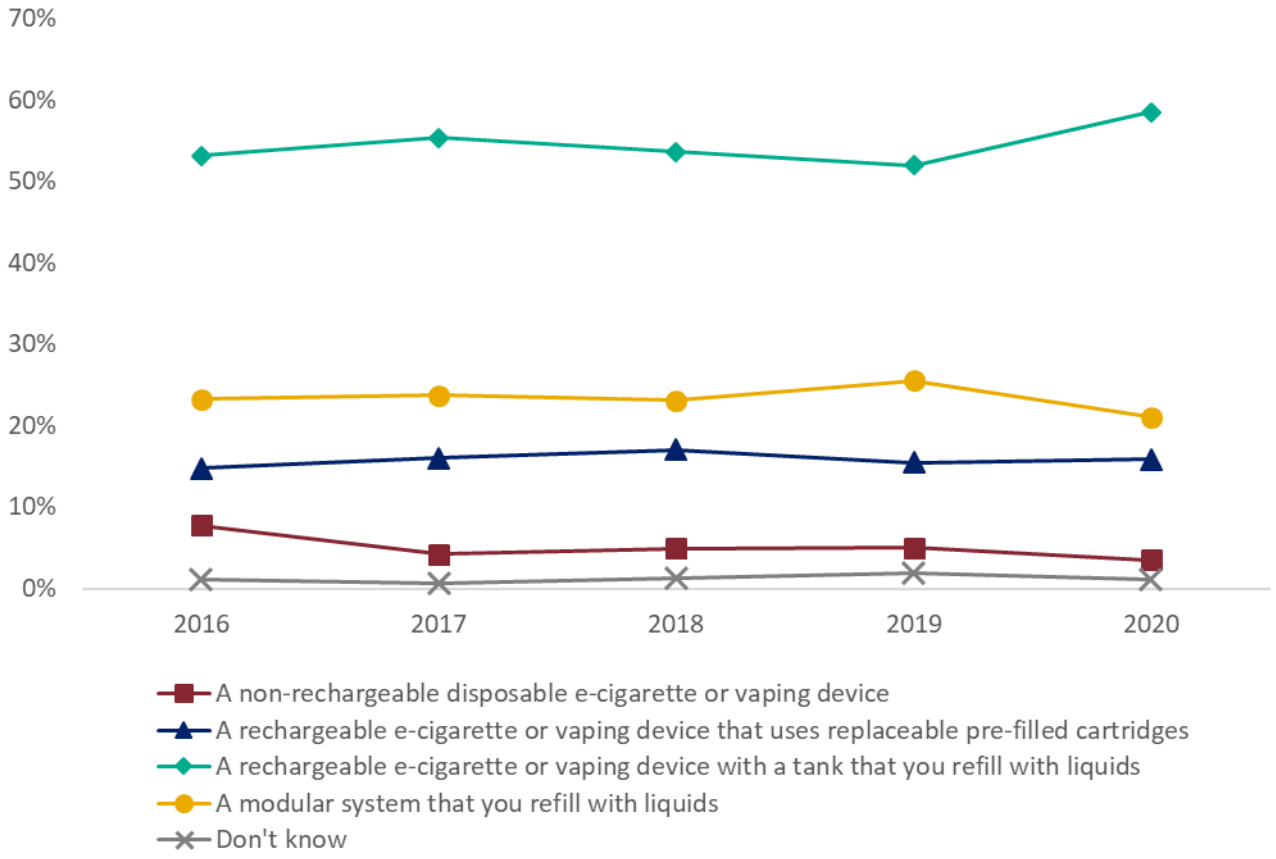
Age 18+. Unweighted base = 804. Current vaper included people who 'currently vaped for any reason'.



Notes

Age 18+. Unweighted base (2020 to October) =804. Current vapers included people who had tried vaping and who still vaped.

Figure 26: Type of vaping product used by current vapers, England 2016 to 2020 (STS, weighted data)



Notes

Age 18+. Unweighted bases: 2016=490; 2017=1,044; 2018=1,040; 2019=980; 2020 (to October) =804. Current vapers included people who 'currently vaped for any reason. 2020 data available from January to October. The full year's data was used for all other years.

Table 24: Type of vaping products used by current vapers by age, gender, region social grade and ethnicity, England 2020 (STS and ASH-A, weighted percentage and unweighted n)

	STS	STS	STS	STS		ASH-A	ASH-A	ASH-A	ASH-A
	Disposable * % (n)	**Cartridge % (n)**	**Tank % (n)**	**Modular % (n)**		**Disposable * % (n)**	**Cartridge % (n)**	**Tank % (n)**	**Other * % (n)**
Total	3.5 (28)	15.8 (137)	58.5 (460)	21.0 (169)		2.1 (10)	19.4 (104)	75.2 (422)	1.2 (6)
Age					**Age**				
18 to 24		16.7 (18)	53.8 (59)	26.0 (28)	18 to 24		24.9 (5)	53.5 (12)	
25 to 34		14.9 (29)	60.1 (108)	19.7 (35)	25 to 34		28.5 (19)	65.8 (44)	
35 to 44		11.2 (17)	62.0 (92)	22.1 (33)	35 to 44		16.9 (22)	72.7 (88)	
45 to 54		14.7 (26)	60.5 (96)	21.3 (36)	45 to 54		17.7 (23)	78.3 (106)	
55 to 64		17.4 (25)	59.6 (74)	17.3 (22)	55+		18.0 (35)	81.3 (172)	
65+		32.5 (22)	43.4 (31)	19.0 (15)					
Gender									
Male		12.6 (53)	59.8 (247)	23.1 (99)			18.6 (54)	76.2 (224)	
Female		19.3 (81)	57.2 (212)	18.7 (70)			20.3 (50)	74.0 (198)	
Region									
North		14.9 (45)	60.3 (166)	20.6 (61)			11.9 (25)	83.0 (176)	
Midlands		13.9 (20)	65.3 (76)	17.4 (22)			23.7 (22)	76.3 (78)	
South		17.2 (72)	54.8 (218)	22.6 (86)			22.8 (57)	69.1 (168)	

	STS	STS	STS	STS		ASH-A	ASH-A	ASH-A	ASH-A
	Disposable * % (n)	**Cartridge % (n)**	**Tank % (n)**	**Modular % (n)**		**Disposable * % (n)**	**Cartridge % (n)**	**Tank % (n)**	**Other * % (n)**
Social Grade									
ABC1		16.8 (72)	57.2 (239)	21.6 (86)			18.7 (47)	74.4 (193)	
C2DE		14.8 (60)	60.2 (206)	20.8 (78)			20.0 (57)	75.8 (229)	
Ethnicity									
White		14.3 (59)	56.8 (196)	23.0 (80)			19.2 (92)	76.7 (380)	
Black and Minority Ethnic groups		18.8 (6)	56.8 (12)	17.4 (3)			20.3 (10)	64.2 (34)	
Smoking status									
Never smoker		10.0 (3)	66.0 (27)	21.2 (10)			46.6 (4)	44.2 (4)	
Former smoker		12.3 (46)	62.0 (228)	22.8 (82)			14.6 (50)	83.4 (288)	
Current smoker		19.3 (88)	55.0 (205)	19.6 (77)			25.7 (50)	63.5 (130)	

Notes

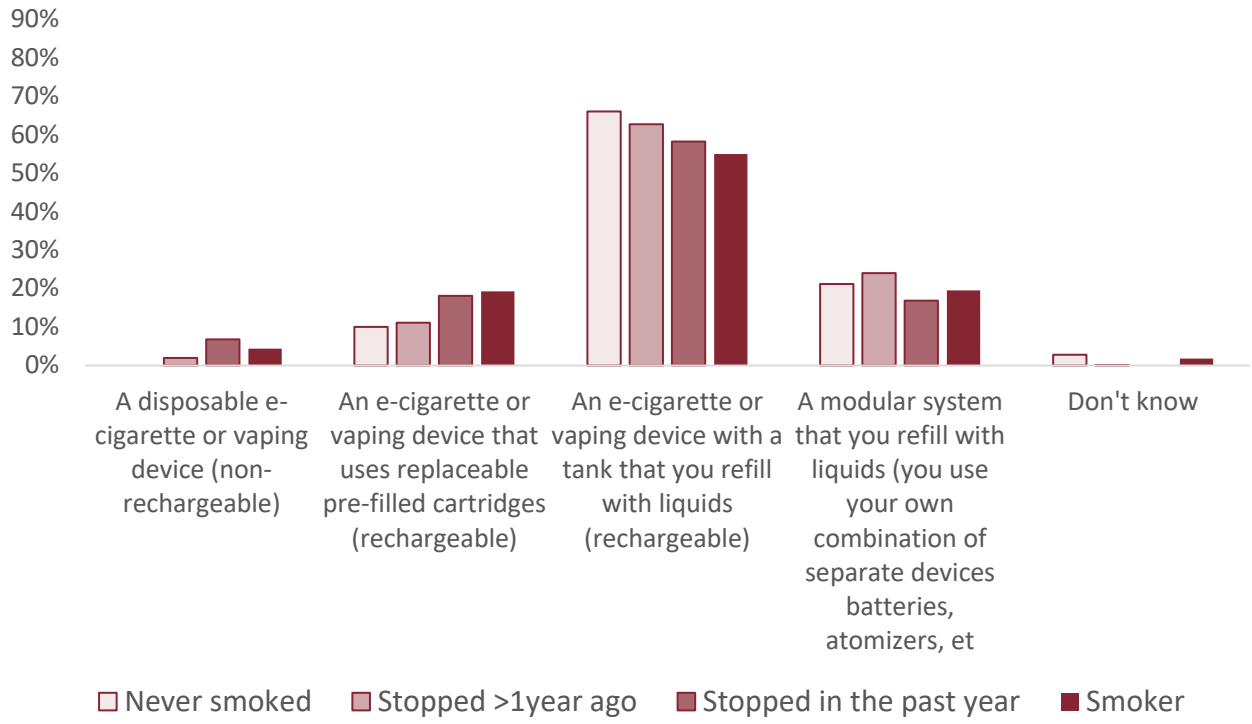
STS (18+): Unweighted base for age, gender and region = 804; social grade = 775; ethnicity = 377. Four people defined their gender in another way. Current vaper included people who ‘currently vaped for any reason’. STS data available from January to October 2020. 7 participants said that they did not know which type of vaping device they used

ASH-A (18+): Unweighted base for age, gender, region and social grade = 552; ethnicity = 542. Current and former vapers included people who had tried vaping and who still vaped, as well as those who no longer vaped. 10 participants said that they did not know which type of vaping device they used. *Columns with fewer than 50 participants have not been broken down by socio-demographic characteristics as they do not represent a wide enough cross-section of the target population to be considered statistically reliable.

The STS survey had the largest sample of participant responses about the vaping products that participants used (Figure 27). There were few differences among never smokers, short-term former, long-term former and current smokers in their choice of vaping products (Figure 27).

The ASH-A survey questioned vapers about which brand of vaping device they used. Vype, Logic and JUUL vaping products all appeared to be more popular in 2020 than in 2019 (Figure 28). Vype was the most popular, with 30.5% of vapers using their products. All other brands declined in popularity over the same time period. The numbers included in this figure for both years are low (n=151 and n=104, respectively) and so should be treated with caution.

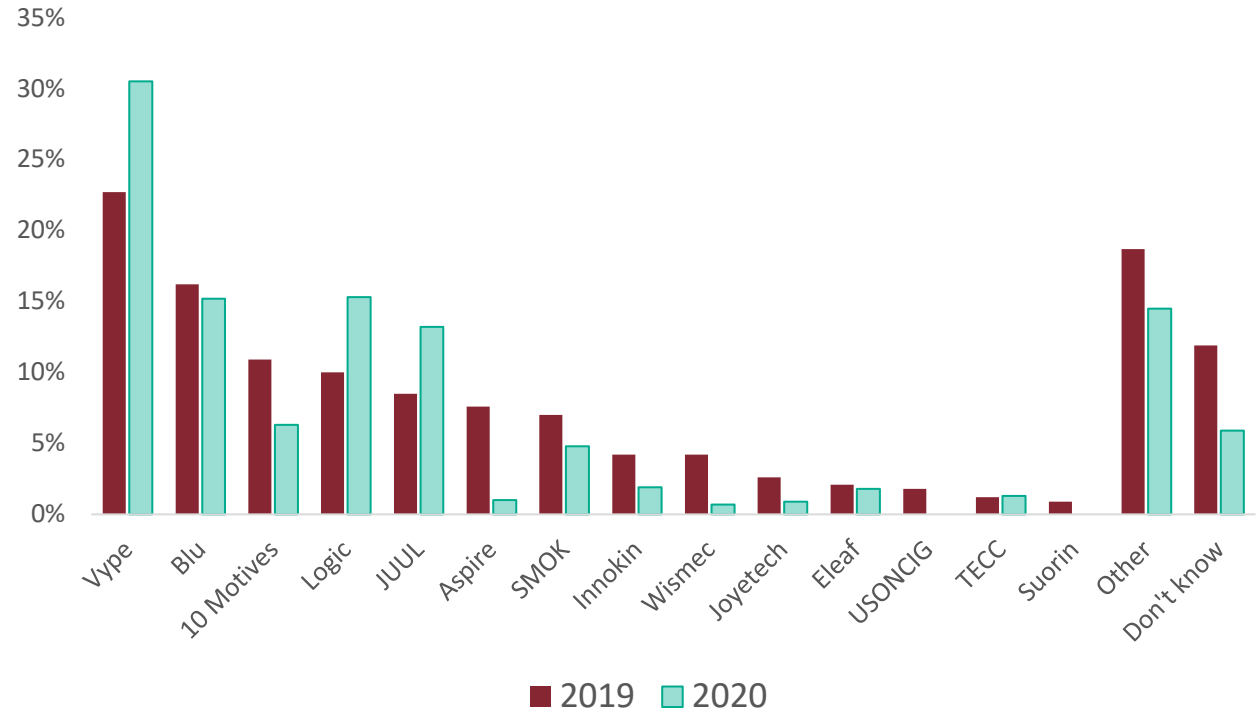
Figure 27: Type of vaping product by smoking status among current vapers, England 2020 (STS, weighted data)



Notes

Age 18+. Unweighted base = 804. Current vaper included people who ‘currently vaped for any reason’. Never smoker included people who had never smoked for longer than 1 year. Former smokers (who stopped over or under 1 year ago) included those who had stopped smoking completely but who had smoked for a year or more in the past. Current smoker included people who said that they smoked daily or that they smoked, but less than daily. STS data available from January to October 2020.

Figure 28: Brand of vaping product used by current vapers by year, England 2019 to 2020 (ASH-A, weighted data)



Notes
Age 18+. Unweighted bases = 2019=151; 2020=104. Current vapers included people who had tried vaping and who still vaped, excluding those who no longer vaped.

Short-fill products

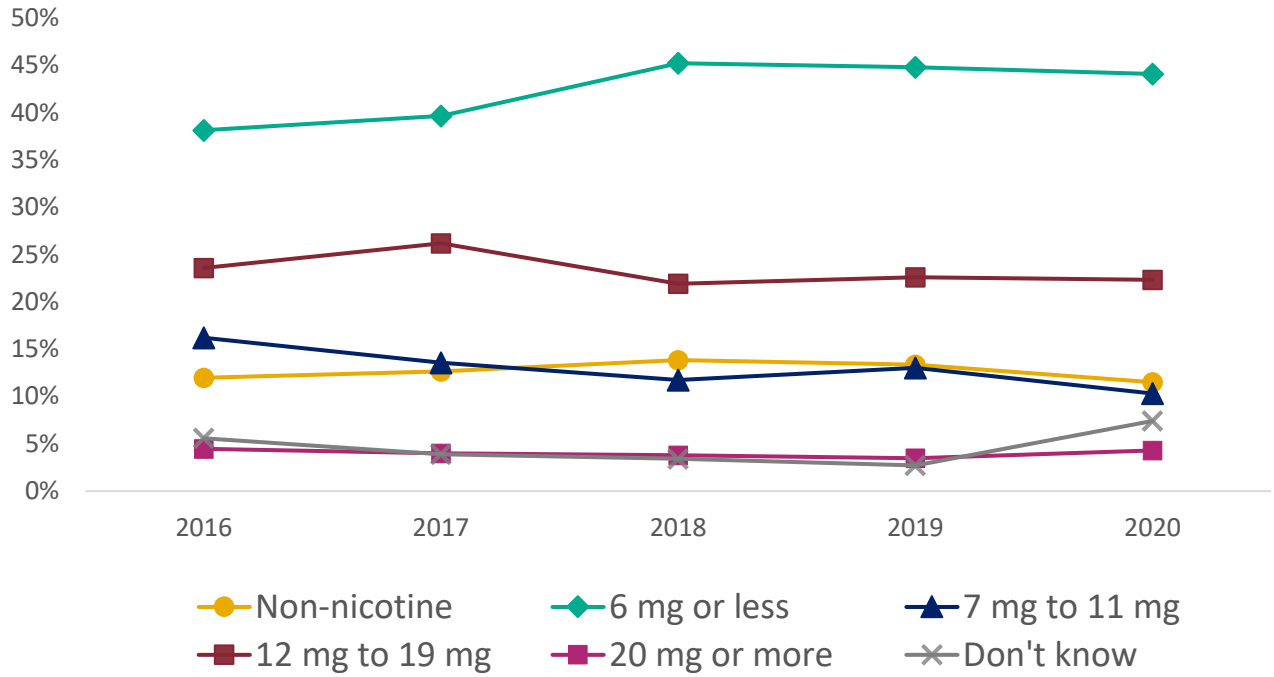
Short-fill vaping products are larger (more than 10 mL) bottles of flavoured, nicotine-free vaping liquids that are deliberately made to leave space for nicotine liquid that is sold separately. Because the short-fill liquids do not contain nicotine they are not subject to the EU TPD and TRPR regulations so can be sold in sizes that would otherwise be prohibited. In the ICGB survey, just over a third of current vapers (35.4%) had heard of short-fill products and 16.1% of current vapers said they currently used them.

Nicotine

Since 2016, the most popular strength of vaping liquid has been 6mg/mL – 38.2% in 2016 and 44.1% in 2020. In 2020, 79.1% used nicotine products below 20 mg/mL (STS – Figure 29). Vaping liquids stronger than 20 mg/mL are not allowed on the market in the EU and the UK. We are unable to discern how many of the 4.3% vapers using 20 mg/mL and stronger were using 20 mg/mL liquids which are legally permitted, and liquids stronger than this, which are not. In the past year, the proportion of vapers who did not know the nicotine strength of their e-liquids appears to have increased from 2.7% in 2019 to 7.4% in 2020.

Non-nicotine liquids were used by about 1 in 10 vapers across different age groups. An estimated 13.5% of women used non-nicotine vaping liquids compared with 10.1% of men (STS – Table 25). Non-nicotine liquids were used by 14.0% of vapers from the Midlands, 12.2% of those from the south and 9.6% of vapers from the north. Twice as many vapers from SES groups C2DE (14.8%) were estimated to use non-nicotine liquids compared with vapers from groups ABC1 (7.4%), a difference that could have important implications for the effectiveness of using vaping products for smoking cessation. Differences in nicotine strength by ethnicity cannot be meaningfully interpreted due to the low numbers available. There were few notable differences in nicotine strength preferences by smoking status (Table 25).

Figure 29: Nicotine strength by year among current vapers, England 2016 to 2020 (STS, weighted data)



Notes

Age 18+. Unweighted bases: 2016=490; 2017=1,044; 2018=1,040; 2019=980; 2020 (to October) =804. Current vapers included people who 'currently vaped for any reason'. 2020 data available from January to October. The full year's data was used for all other years

Table 25: Nicotine strength used by current vapers by age, gender, region, social grade and ethnicity, England 2020 (STS, weighted data)

	Non-nicotine % (n)	6 mg or less % (n)	7 mg to 11 mg % (n)	12 mg to 19 mg % (n)	20 mg or more * % (n)	Don't know % (n)
Total	11.5 (88)	44.1 (350)	10.3 (81)	22.3 (185)	4.3 (31)	7.4 (69)
Age						
18 to 24	11.3 (14)	44.2 (47)	7.3 (8)	18.4 (16)		10.2 (12)
25 to 34	13.9 (23)	47.5 (88)	11.3 (21)	19.5 (36)		4.4 (10)
35 to 44	10.6 (13)	48.8 (75)	10.9 (16)	20.8 (32)		4.8 (8)
45 to 54	8.2 (13)	47.2 (78)	7.9 (12)	25.4 (42)		7.4 (12)
55 to 64	13.1 (16)	33.9 (44)	13.9 (17)	25.7 (33)		9.4 (13)
65+	12.0 (9)	25.1 (18)	11.8 (7)	31.8 (23)		18.2 (14)
Gender						
Male	10.1 (37)	47.3 (198)	9.6 (40)	21.4 (94)		6.4 (30)
Female	13.5 (51)	40.5 (152)	11.0 (40)	23.5 (90)		8.6 (38)
Region						
North	9.6 (26)	45.3 (126)	11.7 (31)	23.0 (69)		6.5 (20)
Midlands	14.0 (17)	39.4 (48)	14.8 (17)	24.4 (30)		5.9 (9)
South	12.1 (45)	44.8 (176)	7.7 (33)	21.1 (86)		8.6 (40)

	Non-nicotine % (n)	6 mg or less % (n)	7 mg to 11 mg % (n)	12 mg to 19 mg % (n)	20 mg or more * % (n)	Don't know % (n)
Social Grade						
ABC1	7.4 (35)	50.9 (202)	11.4 (44)	21.6 (95)		5.6 (26)
C2DE	14.8 (50)	39.0 (137)	9.8 (36)	23.2 (85)		8.0 (35)
Ethnicity						
White	12.0 (40)	43.3 (149)	11.5 (39)	22.2 (83)		7.1 (29)
Black and Minority Ethnic groups	27.4 (6)	27.3 (8)	25.6 (5)	16.4 (4)		0.0 (0)
Smoking status						
Never smoker	17.2 (7)	46.1 (19)	2.6 (1)	24.3 (9)		4.3 (3)
Former smoker	10.3 (37)	48.7 (174)	10.4 (35)	24.3 (95)		2.9 (13)
Current smoker	12.1 (44)	40.1 (157)	10.9 (45)	20.5 (81)		11.5 (53)

Notes

Age 18+. Unweighted base for age, gender and region = 804; Social grade = 657; Ethnicity = 246. Two people defined their gender in another way. Current vapers included people who 'currently vaped for any reason'. STS data available from January to October 2020.

*Columns with fewer than 50 participants have not been broken down by socio-demographic characteristics as they do not represent a wide enough cross-section of the target population to be considered statistically reliable

The ASH-A data suggest that just over half (51.0%) of all current vapers had reduced the strength of their nicotine liquid since they started to vape (Table 26), with 39.4% having stayed on the same nicotine strength. This is very similar to the previous year when 51.7% had stayed the same and 38.1% had decreased their nicotine strength in the ASH-A (3). Just 1.1% of current vapers went from using no nicotine to using nicotine liquids. An estimated 8.3% of vapers reported having increased the strength of their vaping liquids since starting to vape (2019: 9.7%).

Table 26: Change in nicotine strength since started to vape among current vapers, England 2020 (ASH-A, weighted data)

	% (n)
Increased from no nicotine	1.1% (5)
Increased strength	8.3% (32)
Stayed the same	39.4% (171)
Decreased strength	51.0% (221)
Decreased to no nicotine	0.0% (0)
Always no nicotine	0.2% (1)

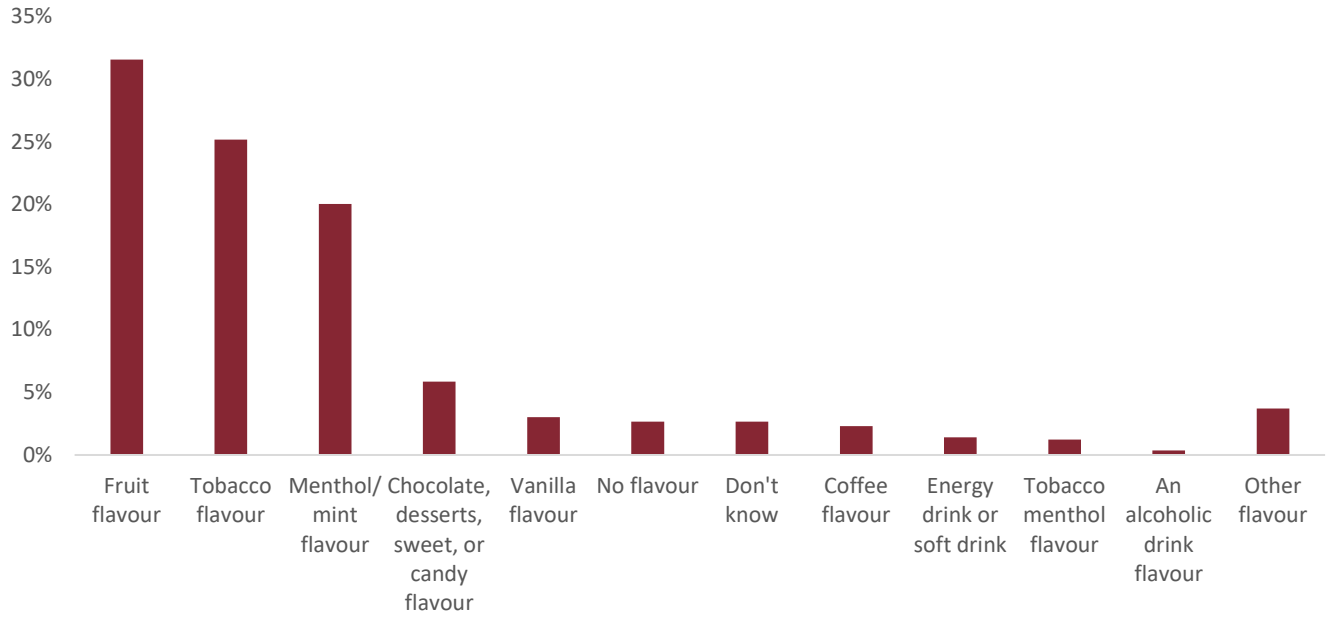
Notes
Age 18+. Unweighted base = 430; Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped.

4.13 Flavours

The STS survey did not record vaping product flavour preference or use. Of the remaining surveys, ASH-A has the largest sample size for flavour preferences and is therefore used here (Figure 30). Fruit flavours were used by 31.6% of vapers, tobacco flavours by 25.2% and menthol/mint flavours by 20.0%. All other flavours were used by less than 10% of current vapers, a pattern that aligns with our previous report (3).

When broken down by socio-demographics (Table 27), tobacco flavours seemed to be preferred by older vapers, with 40.5% of vapers aged over 55 selecting this type of e-liquid. There were few discernible differences according to gender and region. People from SES groups C2DE appeared to have a greater preference for tobacco flavours (26.5%) compared with people from groups ABC1 (19.2%). As with previous tables, the number of participants from black or minority ethnicities was too small to produce any reliable estimates of flavour preferences according to ethnicity.

Figure 30: Flavour preferences among adults who currently vape, England 2020 (ASH-A, weighted data)



Notes

Age 18+. Unweighted base = 564. Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped.

Table 27: Flavour preferences among adults who currently vape, England 2020 (ASH-A, weighted percentage, unweighted n)

	Fruit flavour % (n)	Tobacco flavour % (n)	Menthol/ mint flavour % (n)
Total	32.8 (178)	23.4 (142)	19.3 (113)
Age			
18 to 24	35.6 (9)	13.0 (3)	10.6 (3)
25 to 34	44.2 (32)	7.3 (5)	15.5 (13)
35 to 44	32.9 (41)	12.8 (17)	25.1 (30)
45 to 54	35.5 (45)	22.6 (30)	18.1 (27)
55+	25.4 (51)	40.5 (87)	19.0 (40)
Gender			
Male	33.3 (95)	22.0 (70)	16.6 (53)
Female	32.2 (83)	25.2 (72)	22.6 (60)
Region			
North	35.7 (70)	24.6 (61)	18.8 (43)
Midlands	36.8 (35)	20.9 (23)	12.4 (14)
South	27.2 (52)	21.6 (43)	25.7 (48)
Social Grade			
ABC1	31.5 (77)	19.2 (57)	23.3 (62)
C2DE	33.8 (101)	26.5 (85)	16.4 (85)
Ethnicity			
White	32.1 (154)	25.2 (133)	20.4 (103)
Black and Minority Ethnic groups	35.3 (19)	14.2 (8)	11.3 (7)
Smoking status			
Never smoker	7.2 (1)	0.0 (0)	12.2 (2)
Former smoker	33.4 (108)	24.4 (93)	23.1 (79)
Current smoker	33.7 (69)	23.5 (49)	14.0 (32)

Notes

Age 18+. Unweighted base for age, gender, region and social grade = 564; ethnicity = 554. Current vaping included people who had tried vaping and who still vaped, excluding those who no longer vaped.

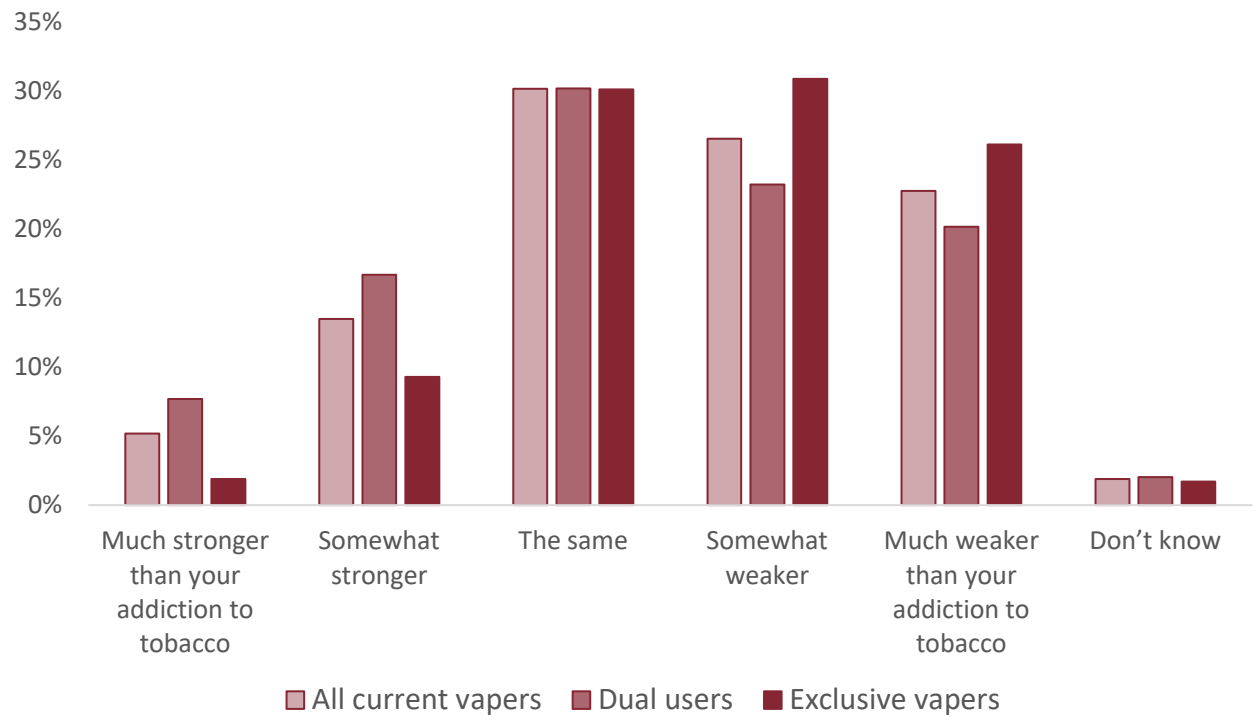
4.14 Perceived addiction

None of the population-level surveys asked about perceived addictiveness or perceived addiction to vaping. Thus, we use the ICGB here, a survey of adults with a history of smoking and/or vaping.

The ICGB survey recorded whether current vapers (who did or did not also smoke) thought that they were equally, more, or less addicted to vaping than smoking (Figure 31). Overall, a greater proportion of vapers thought that they were less addicted to vaping than smoking (49.3%), than thought they were more addicted to vaping than smoking (18.7%). However, around 30% of all vapers thought that their addiction was similar. There were moderate differences according to smoking status, a greater proportion of vapers who also smoked thought they were more addicted to vaping than to smoking compared with exclusive vapers.

Perceptions of relative addiction varied according to the vaping product used (Figure 32). Overall, just over 45% of people who used a disposable vaping product thought that they were more addicted to vaping than smoking, compared with 27.4% of those using cartridge systems, 11.2% of those using tank models and 10.1% of those using modular models. This pattern was reversed for the perception of being less addicted to vaping than smoking. The numbers for some of these groups are small however (for example n=109 for those using disposable vaping devices) and so caution should be used when drawing conclusions.

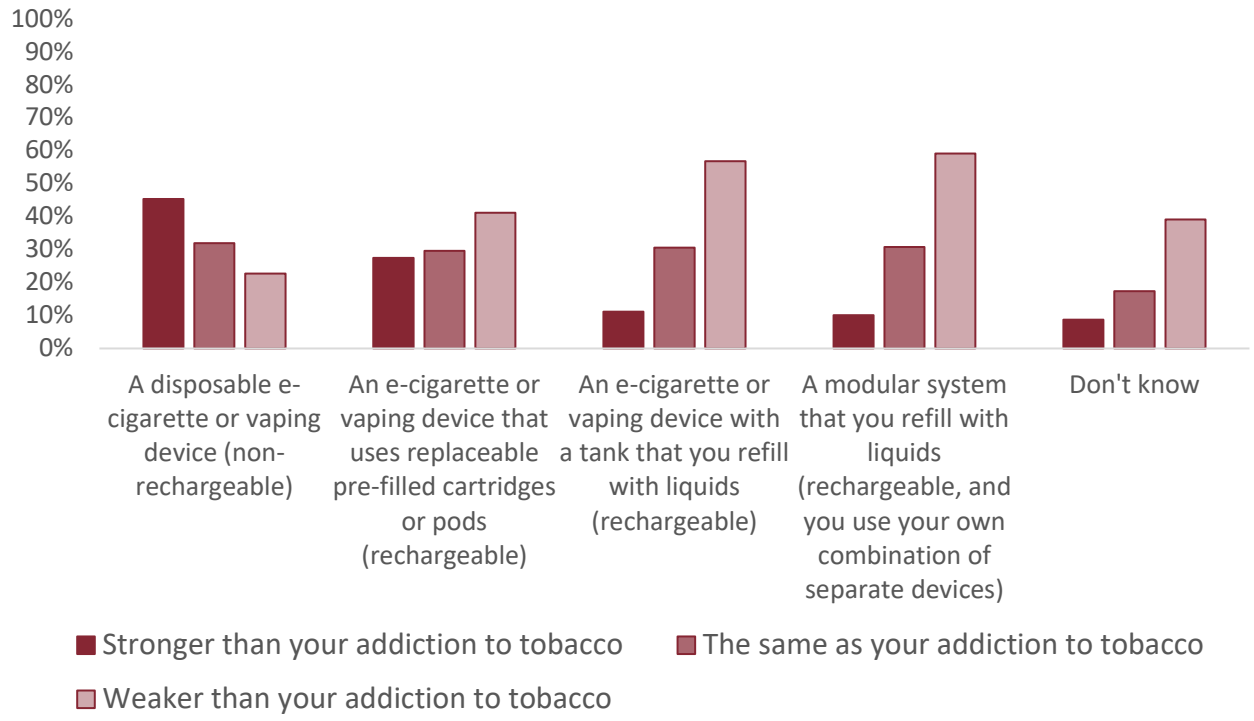
Figure 31: Current vapers' perceptions of the relative strength of vaping addiction compared with smoking addiction, England 2019 (ICGB)



Notes

Age 18+. Unweighted bases: All current vapers = 1,429; dual users = 809; exclusive vapers = 638. Current vaping included people who currently vape every day and those who currently vape, but not every day. Dual users included current vapers who also currently smoked tobacco cigarettes (including hand-rolled) daily and who currently smoke tobacco cigarettes, but not every day. Exclusive vapers included current vapers who were not current smokers.

Figure 32: Current vapers' perceptions of the relative strength of vaping addiction compared with smoking addiction by vaping product type, England 2019 (ICGB)



Notes

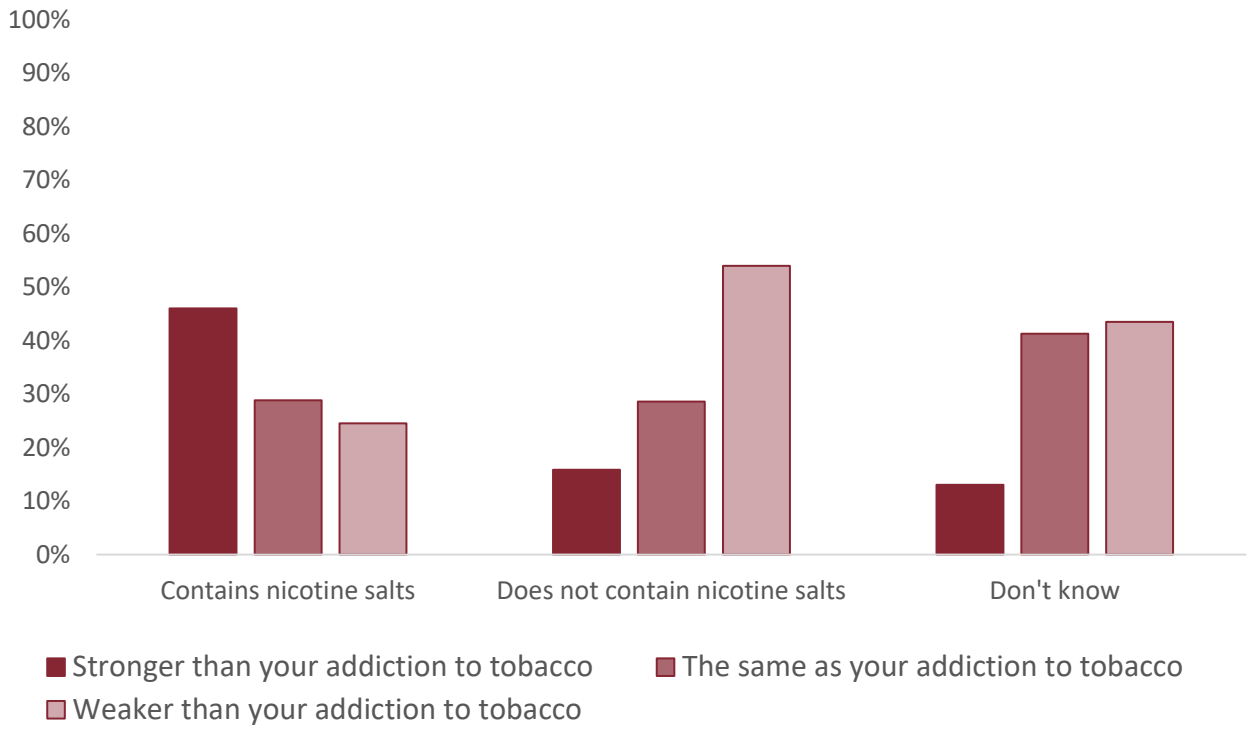
Age 18+. Unweighted base = 1,217. Current vapers included people who currently vape every day and those who currently vape, but not every day.

The ICGB data reported that, among current vapers, 40.1% reported that they currently used nicotine salts. Nearly half of vapers who used nicotine salts perceived themselves to be more addicted to vaping than smoking (46.0%) compared with 15.9% of those who did not use nicotine salts (Figure 33). Among users of the 4 most popular flavour types, perceived relative addiction showed similar patterns (Figure 34). There were however some variations by flavours with 46.5% of people who used a combined tobacco and menthol flavour thinking they were more addicted to vaping than smoking compared with 9.4% of those using no flavour. The latter groups were much smaller (n=38 for no flavour and n=156 for tobacco and menthol versus n=602 for fruit flavours), so more susceptible to random variation.

These findings indicate that perceived relative addiction can be associated with characteristics of the behaviour and the products used. An explanation for the perceived stronger addiction among users of disposable devices may be that these are generally less effective at nicotine delivery and the perceived addiction may be linked to the more frequent behaviour required to obtain sufficient nicotine. However, nicotine salt users also reported strong relative addiction and nicotine salts are generally more effective at nicotine delivery, so this explanation would not be in line with this finding. It is also possible that users using different devices or using nicotine salts have different reference points due to differences in smoking history. There is a need to examine

these associations further, taking into account aspects of the behaviour such as frequency of use and different properties of the products used to assess which ones drive any association. Associations between perceived addiction and changes in vaping and smoking behaviour also warrant investigation. Further research could also explore vapers' definition of 'addiction' when asked to compare their addiction to vaping and smoking.

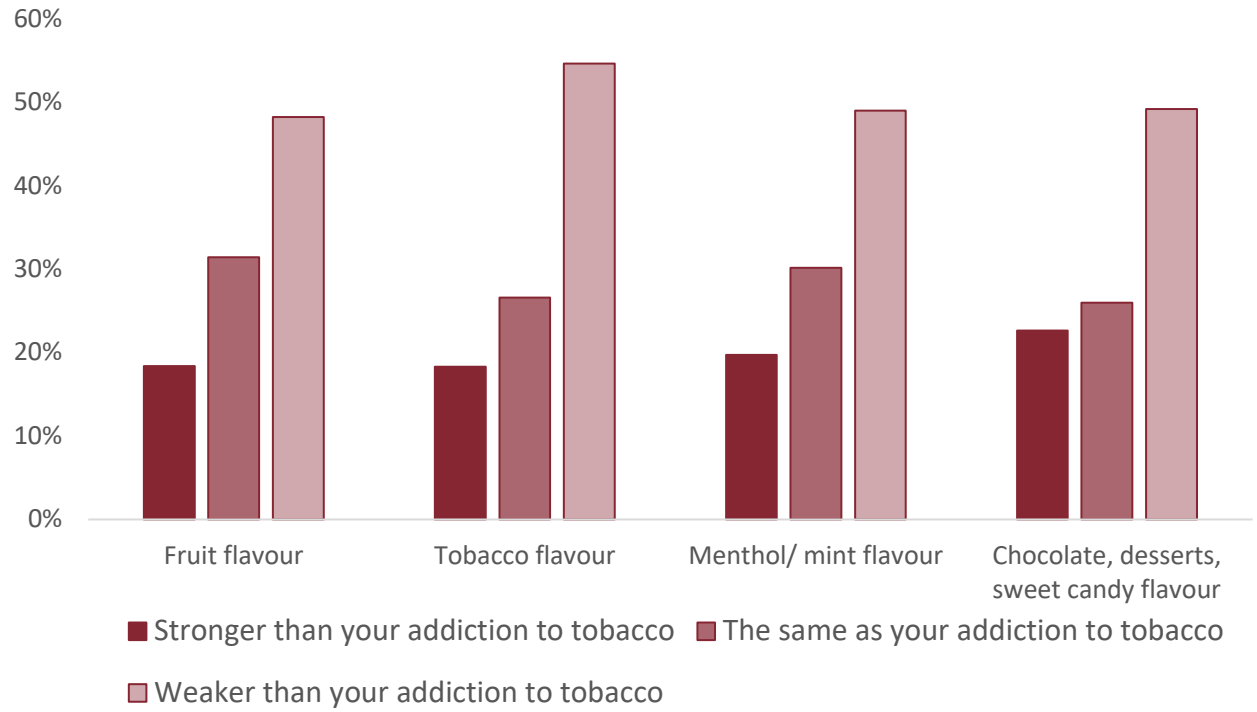
Figure 33: Current vapers' perceptions of the relative strength of vaping addiction compared with smoking addiction by use of nicotine salts, England 2019 (ICGB)



Notes

Age 18+. Unweighted base = 398. Current vaping included people who currently vape every day and those who currently vape, but not every day.

Figure 34: Current vapers' perceptions of the relative strength of vaping addiction compared with smoking addiction by flavour type, England 2019 (ICGB)

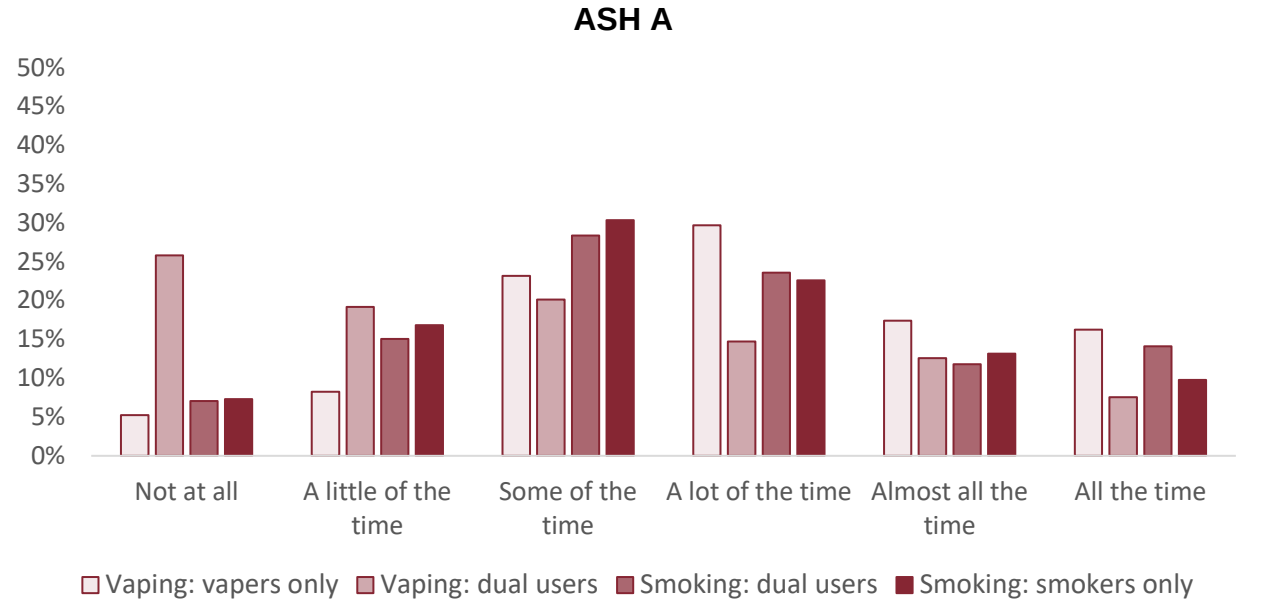


Notes
Age 18+. Unweighted base = 1,233. Current vaping included people who currently vape every day and those who currently vape, but not every day.

4.15 Urges to vape

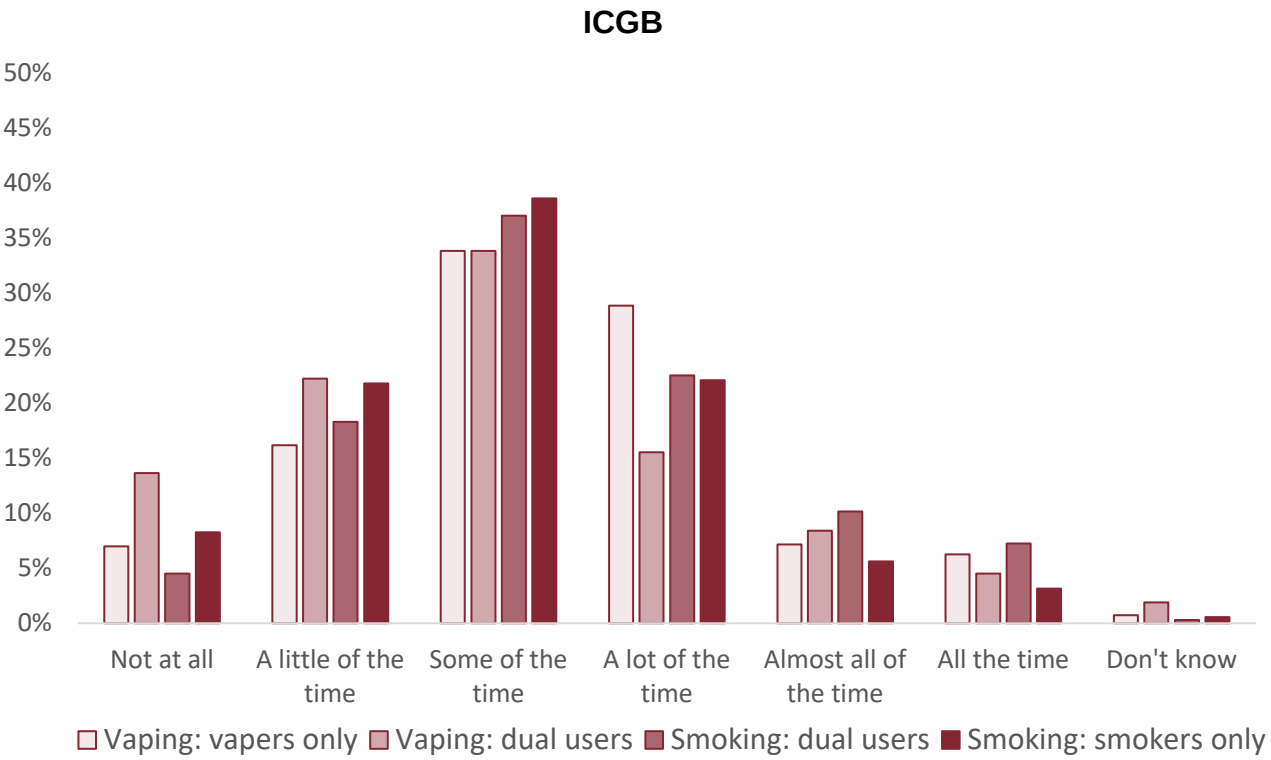
Another measure of addiction is the strength and frequency of urges. ASH-A and ICGB both assessed urges to vape (for respondents who vaped only or vaped and smoked) and urges to smoke (for those who smoked only or vaped and smoked) (Figure 35 and Figure 36). Overall, urges to smoke and to vape appear to be relatively similar across these different groups, except for dual users who appear less likely to experience any urges to vape and those vaping only possibly experiencing moderate urges rather than stronger urges.

Figure 35: Frequency of urges to vape among current vapers and dual users, and frequency of urges to smoke among dual users and current smokers, England 2020 (ASH-A, weighted data, and ICGB, unweighted data)



Notes

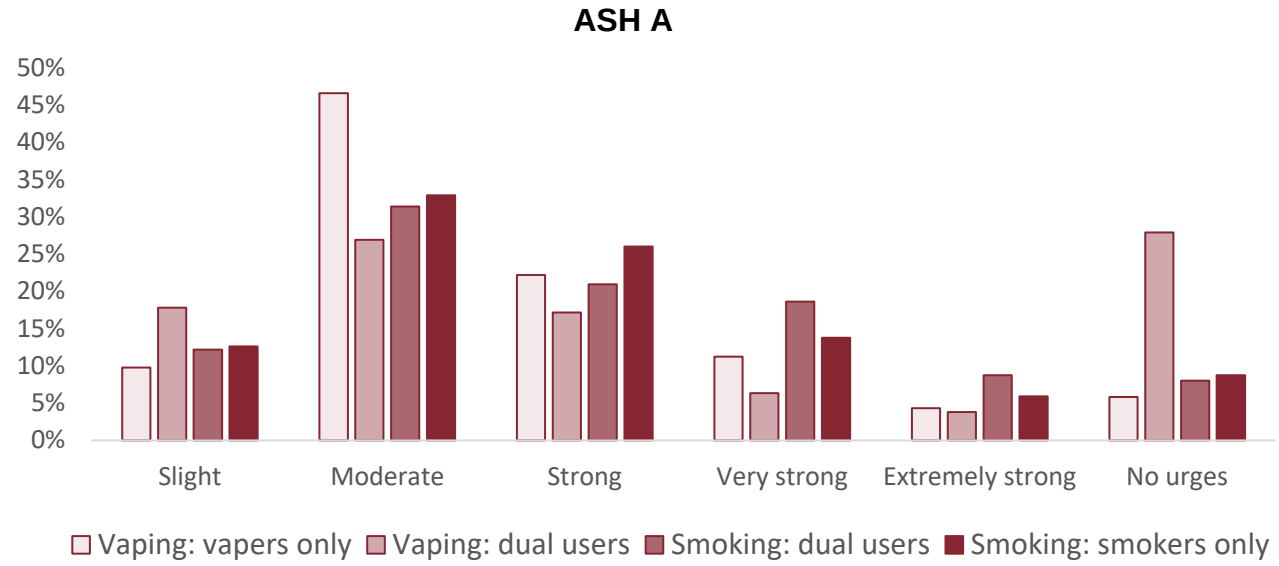
Age 18+. Unweighted bases: Vaping = 564; Smoking 1,213. Current vapers included people who had tried vaping and who still vaped. Dual users included people who had tried vaping and who still vaped but also smoked daily or not daily. Current smoking included people who smoked daily as well as those who smoked, but not daily and included people who also vaped.



Notes

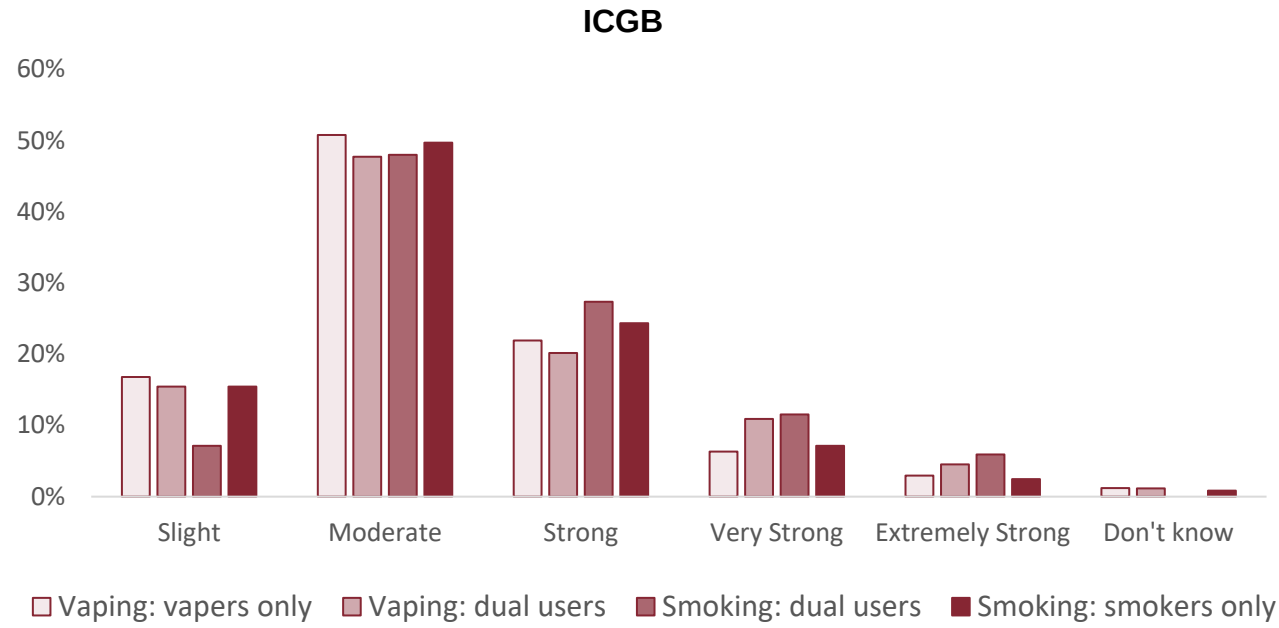
Age 18+. Unweighted bases: Vaping = 1,233; Smoking = 2,094. Current vaping included people who currently vape every day and those who currently vape, but not every day. Dual users included people who currently vape daily or non-daily and smoke cigarettes daily or non-daily. Current smokers included daily and non-daily cigarette smokers.

Figure 36: Strength of urges to vape among current vapers and dual users, and strength of urges to smoke among dual users and current smokers, England 2020 (ASH-A, weighted data, and ICGB, unweighted data)



Notes

Age 18+. Unweighted bases: Vaping = 564; Smoking = 1,213. Current vapers included people who had tried vaping and who still vaped. Dual users included people who had tried vaping and who still vaped but also smoked daily or not daily. Current smoking included people who smoked daily as well as those who smoked, but not daily and included people who also vaped.



Notes

Age 18+. Unweighted bases: Vaping = 1,101; Smoking = 1,947. Current vaping included people who currently vape every day and those who currently vape, but not every day. Dual users included people who currently vape daily or non-daily and smoke cigarettes daily or non-daily. Current smokers included daily and non-daily cigarette smokers.

4.16 Harm perceptions

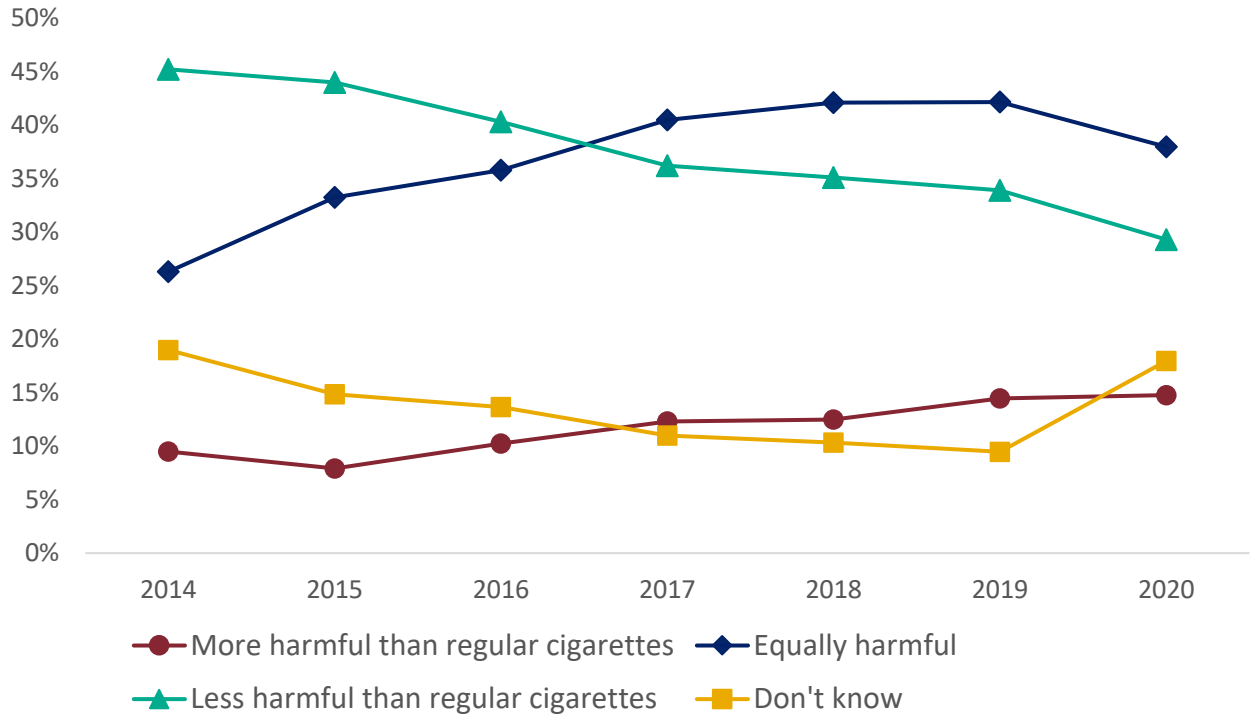
Perceptions about the relative harms of vaping among smokers are increasingly out of line with the evidence (STS – Figure 37). The proportion of smokers who thought that vaping was more harmful than smoking was 9.5% in 2014 and 14.8% in 2020. Similarly, the proportion of smokers who thought that vaping and smoking were equally harmful went up from 26.3% in 2014 to 42.2% in 2019 but appears to have dipped to 38.0% in 2020. Over the same time period, estimates of the proportion of smokers who believe that vaping is less harmful than smoking fell from 45.2% to 29.3%.

The decline in those believing vaping to be less or equally harmful between 2019 and 2020 matched an increase in the proportion of smokers who did not know whether smoking or vaping was more harmful (18.0% in 2020). This change in perceptions is likely to have been influenced by the 'EVALI' outbreak in the US in late 2019 and, to some extent, the COVID-19 pandemic and discussions about any associations between vaping and risk of infection and serious outcomes of infection (47).

A greater emphasis needs to be placed on how to best communicate evidence of relative harm to smokers so that they can consider all the options available to them to quit smoking.

The proportion of smokers who did not know whether vaping or smoking was more harmful appeared to increase with age and was 9.7% for 18 to 24 year olds compared with 35.2% for people aged 65 and over. The proportion who thought that vaping and smoking were equally harmful seemed to decline with age, going from 46.4% of 18 to 24 year olds to 29.2% of smokers aged 65 and over. There was some indication that smokers from lower social grades may be more likely to have misperceptions of the relative harm. There were few other differences across socio-demographic characteristics (Table 28).

Figure 37: Harm perceptions about vaping among current smokers, England 2014 to 2020 (STS, weighted data)



Notes

Age 18+. Unweighted bases: 2014=663; 2015=1,223; 2016=3,664; 2017=3,379; 2018=3,523; 2019=3,220; 2020= (to October) =2,267. Current smokers included people who said that they smoked daily or that they smoked, but less than daily. 2020 data available from January to October. The full year's data was used for all other years.

Table 28: Harm perceptions about vaping among current smokers by age, gender, region, social grade and ethnicity, England 2020 (STS, weighted percentage, unweighted n)

	More harmful than regular cigarettes % (n)	Equally harmful % (n)	Less harmful than regular cigarettes % (n)	Don't know % (n)
Total	14.8 (320)	38.0 (828)	29.3 (681)	18.0 (129)
Age				
18 to 24	13.1 (48)	46.4 (164)	30.8 (114)	9.7 (35)
25 to 34	18.9 (88)	40.0 (196)	27.7 (138)	13.5 (65)
35 to 44	17.0 (54)	36.8 (134)	27.7 (103)	18.4 (64)
45 to 54	12.0 (46)	37.3 (121)	33.3 (118)	17.4 (65)
55 to 64	10.9 (41)	33.0 (109)	33.5 (122)	22.7 (79)
65+	12.1 (43)	29.2 (104)	23.6 (86)	35.2 (129)
Gender				
Male	14.2 (153)	33.7 (362)	33.5 (396)	18.7 (225)
Female	15.6 (167)	43.0 (464)	24.6 (283)	16.8 (207)
Region				
North	16.7 (105)	35.8 (224)	29.4 (199)	18.1 (127)
Midlands	13.3 (52)	37.9 (149)	29.5 (122)	19.4 (83)
South	14.2 (163)	39.2 (455)	29.2 (360)	17.3 (228)
Social Grade				
ABC1	10.3 (107)	32.9 (324)	38.1 (385)	18.6 (202)
C2DE	17.4 (203)	41.2 (486)	24.1 (278)	17.3 (222)
Ethnicity				
White	14.6 (138)	41.1 (370)	29.2 (288)	15.1 (162)
Black and Minority Ethnic groups	23.1 (21)	41.5 (47)	17.0 (18)	18.5 (16)

Notes

Age 18+. Unweighted base for age, gender, region = 2,267; Social grade = 2,207; Ethnicity = 1,065. Ten people defined their gender in another way. Current smokers included people who said that they smoked daily or that they smoked, but less than daily. STS data available from January to October 2020.

4.17 Summary of findings

Data reported in this chapter come from 4 different surveys. Most data were from the Smoking Toolkit Study (STS), collected between January and October 2020, and the ASH-Adult (ASH-Adult) survey, collected in February and March 2020. Other data were collected in 2019.

Smoking prevalence among adults in England continues to fall and was between 13.8% and 16.0% depending on the survey, equating to about 6 to 7 million smokers.

There was some variation in smoking prevalence by socio-demographics such as a higher prevalence among adults from more disadvantaged groups. There was also variation between surveys, most notably for smoking prevalence in young adults (24.1% in STS compared with 10.8% in ASH-Adult for 18 to 24 year olds).

Vaping prevalence was lower than smoking prevalence across all groups and continues to be around 6% (between 5.5% and 6.3%), equating to about 2.7 million adult vapers in England.

There was some variation in vaping prevalence by socio-demographic groups and smoking status. Using 2020 STS data, 7.2% of men, 7.7% of people in the north of England and 7.6% of people from social grades C2, D and E vaped. Vaping prevalence was between 17.5% and 20.1% among current smokers, around 11% among former smokers and between 0.3% and 0.6% among never smokers. Around 10% of long-term former smokers (quit for longer than 1 year) vaped compared with 24% of short-term former smokers (quit for less than one year).

The proportion of vapers who also smoke has declined since 2012, from 74% to 38% in the ASH-Adult and from 92% to 51% in the STS survey. The discrepancy is likely due to different definitions of smoking status.

Among adults who had ever vaped, over half (57.4%) of never smokers had tried it once or twice and 6.1% were vaping daily. More than half (56.3%) of former smokers and around 30% of daily and non-daily smokers vaped daily (ASH-A).

Among long-term former smokers, a decreasing proportion used NRT, and an increasing proportion used vaping products, between 2013 and 2020 (STS).

ASH-Adult data suggest an increase in the proportion of current vapers who have vaped for more than 3 years (23.7% in 2018, 29.3% in 2019, 39.2% in 2020), while the proportion of new current vapers who have vaped for less than one month in 2020 was 2.6% (5.5% in 2018, 5.1% in 2019). People who had vaped in the past mostly stopped after 6 months of use or less (59.9% in 2020).

The most common reasons for vaping reported in the ASH-Adult survey were to quit (29.7%), stay off (19.4%) or reduce (11.2%) smoking tobacco. In the OPN 2019 survey, 52.8% of current vapers reported vaping to quit smoking.

In both STS and ASH-Adult, tank models remained the most popular type of vaping device, used by 58.9% of vapers. Modular models were used by 21.0% of vapers in STS, ASH-Adult does not provide this option. Cartridge models were used by 15.8% (STS) and 19.4% (ASH-Adult) of vapers.

Strengths above those allowed by regulations (more than 20 mg/mL) were used by less than 5% of vapers. Use of non-nicotine liquids may be more common among vapers from social grades C2, D and E (STS).

Just over half of vapers (51.0%) reported having reduced the strength of the nicotine liquid they use since starting to vape. Just 1.1% of people who started on non-nicotine liquids moved to vaping nicotine (ASH-Adult).

Fruit (31.6%), tobacco (25.2%) and "menthol/mint" (20.0%) were the most popular flavours among vapers (ASH-Adult).

In the ICGB survey of adults with a history of smoking and/or vaping, vapers tended to think they were less addicted to vaping than smoking. However, a perception of being more addicted to vaping than smoking may be more common among dual users and those using disposable devices or nicotine salts.

Perceptions of the harm caused by vaping compared with smoking are increasingly out of line with the evidence, with just 29% of current smokers believing that vaping is less harmful than smoking, 38% believing vaping to be as harmful as smoking, 18% not knowing whether vaping or smoking is more harmful and 15% of smokers believing vaping to be more harmful than smoking. Misperceptions may be more pronounced among smokers from social grades C2, D and E (STS).

Use of heated tobacco products by adults in England was estimated at 0.3% and use of nicotine pouches at 0.5% in 2020 (ASH-Adult).

4.18 Implications

The proportion of long-term vapers is increasing over time and further research into this group is needed.

As recommended in previous reports in this series and as per existing National Institute for Health and Care Excellence (NICE) guidance, all smokers should be supported to stop smoking completely, including dual users who smoke and vape.

A greater emphasis needs to be placed on how best to communicate evidence of relative harm to smokers so that they can consider all the options available to them to quit smoking completely.

Vaping is more common among more disadvantaged adult groups in society. This mirrors smoking prevalence, and research should continue to explore the impact this has on health inequalities.

Further research should be carried out on addiction among vapers of different types of vaping products, nicotine types and flavours used.

5. The effect of vaping on smoking cessation and reduction

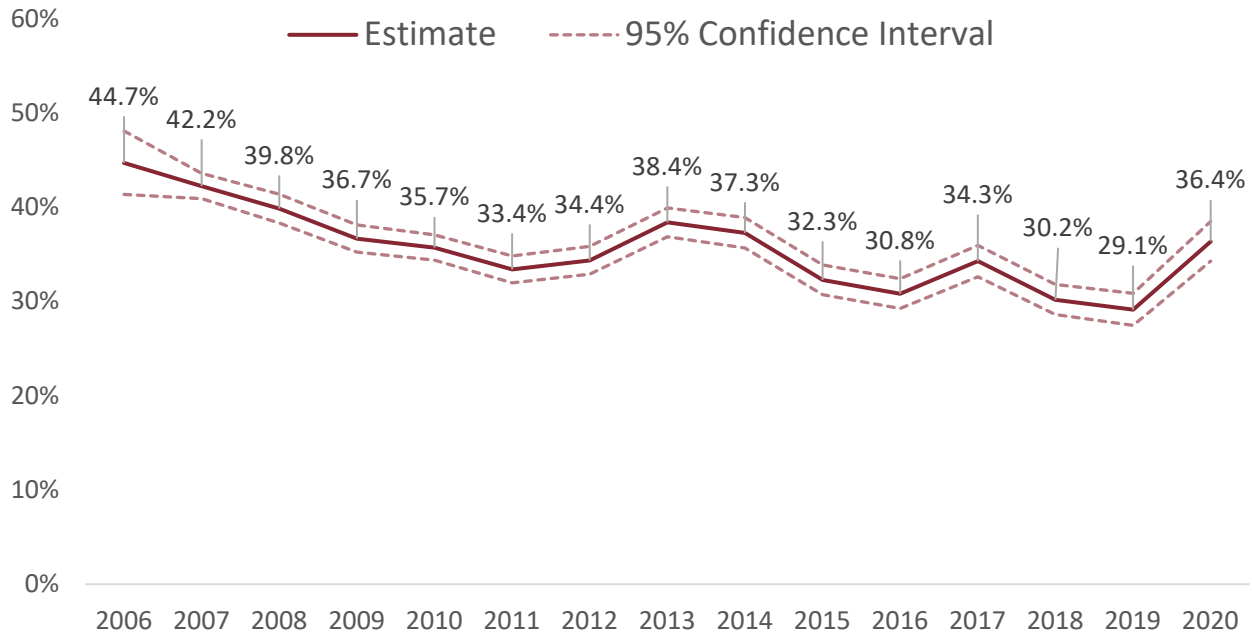
5.1 Introduction

The objective of this chapter is to provide an overview of available data about the effect of using vaping products on smoking cessation and reduction in England. First, we provide some context about smoking cessation and vaping in relation to stopping smoking in England, using data from the Smoking Toolkit Study (STS) (a repeated monthly cross-sectional nationally representative survey of adults in England (36)). We then provide an update of the use of vaping products in English stop smoking services and smoking cessation outcomes. Finally, we present a systematic review of systematic reviews, randomised controlled trials and non-randomised studies that have assessed the effect of vaping on smoking cessation or reduction, published since our 2018 report (5).

5.2 Smoking cessation rates in England

Using data from the STS, Figure 38 and Figure 39 include the proportion of people between January 2007 and October 2020 who tried to quit and were successful. Those trying to quit are defined as past year smokers who made at least one serious attempt to stop smoking in the previous 12 months. The STS defines a serious attempt as meaning ‘you decided that you would try to make sure you never smoked again’. Those who were successful are people who report still not smoking after a quit attempt made at some point within the past 12 months. The proportion of people who reported trying to quit smoking declined annually between 2007 and 2011 and has been variable for the past several years. For January to October 2020, an estimated 36.4% of adults had tried to stop smoking in the previous 12 months, compared with 29.3% in 2019 (Figure 38). Quit success rates for those who reported they had tried to stop smoking in the previous year have varied over time; the highest (22.3%) was in January to October 2020, compared with 14.3% in 2019 (Figure 39). The increase in quit attempts and quit success may have been prompted by the COVID-19 pandemic. As mentioned in Chapter 4, Jackson et al. (35) analysed aggregated STS data collected before (April 2019 to February 2020) and after the first national lockdown (April 2020). It concluded that the national lockdown was associated with an increase in attempts to quit smoking and successful cessation among past year smokers, with the highest proportions for attempts and cessation seen among younger smokers (aged 34 years or less).

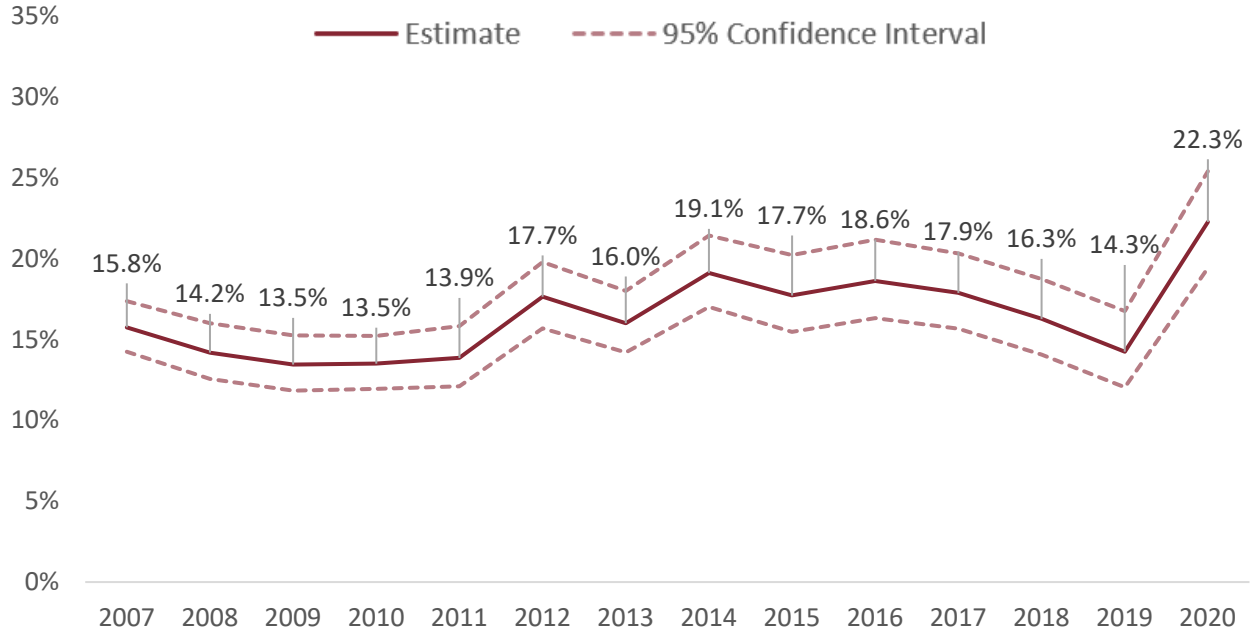
Figure 38: Proportion of people who tried to stop smoking in the past year: England (STS, weighted data)



Notes

Unweighted bases 2007=6,114; 2008=4,735; 2009=5,069; 2010=5,995; 2011=5,190; 2012=5,063; 2013=4,549; 2014=4,021; 2015=4,047; 2016=3,831; 2017=3,515; 2018=3,630; 2019=3,308; 2020=2,467.
Base: adults (age 18+) who smoked in the past year.
Percentages in the graph refer to the estimate.

Figure 39: Success rate for those who tried to stop smoking in the past year: England (STS, weighted data)



Notes

Unweighted bases: 2007=2,565; 2008=1,860; 2009=1,839; 2010=2,101; 2011=1,698; 2012=1,708; 2013=1,728; 2014=1,483; 2015=1,283; 2016=1,139; 2017=1,201; 2018=1,08; 2019=5,973. Base: adults (age 18+) who smoked in the past year and who tried to stop in the preceding 12 months.
Percentages in the graph refer to the estimate.

5.3 Use of vaping products for smoking cessation in England (population level data)

As reported in our previous reports (3 to 6), among STS participants vaping products have been the most popular aid used in a quit attempt since 2013, though their popularity has declined since a peak in 2016. In 2020, 27.2% of adults (aged 18+) reported they used a vaping product in their most recent quit attempt, compared with 15.5% who reported they used NRT bought over the counter from a shop (OTC) or on prescription (2.7%), 4.4% who reported they used varenicline and 1.4% who used behavioural support, with or without medication (Figure 40).

Contribution of the use of vaping products to smoking cessation in England

In our 2018 report (5) we included evidence, based on STS data between 2006 and 2015, that an increase in vaping product use in England had been positively associated with the success rates of quit attempts after adjustment for a range of confounding variables (48). Beard et al. updated their estimates of how changes in the prevalence of the use of vaping products were associated with changes in smoking cessation and daily cigarette consumption in England (49). Data were based on 50,498 past-year smokers between 2006 and 2017. In a time series analysis (49), they assessed the association between current use of vaping products and use of vaping products during a quit attempt with overall quit rate, quit success rate and average cigarette consumption. Statistical adjustments were made for factors that may have confounded the associations, such as population level policies. Beard et al. found that as use of vaping products in quit attempts went up from 2011 onwards, so did the success rate of quitting. When the increase in use of vaping products plateaued around 2015, so did the increase in quit success. Beard et al. estimated that every 1 percentage point increase in use of vaping products in quit attempts resulted in a 0.060% (95% CI = 0.043– 0.078, $P < 0.001$) increase in quit success rate, other things being equal. This led them to estimate that in 2017 over 50,000 smokers had stopped who would otherwise have carried on smoking.

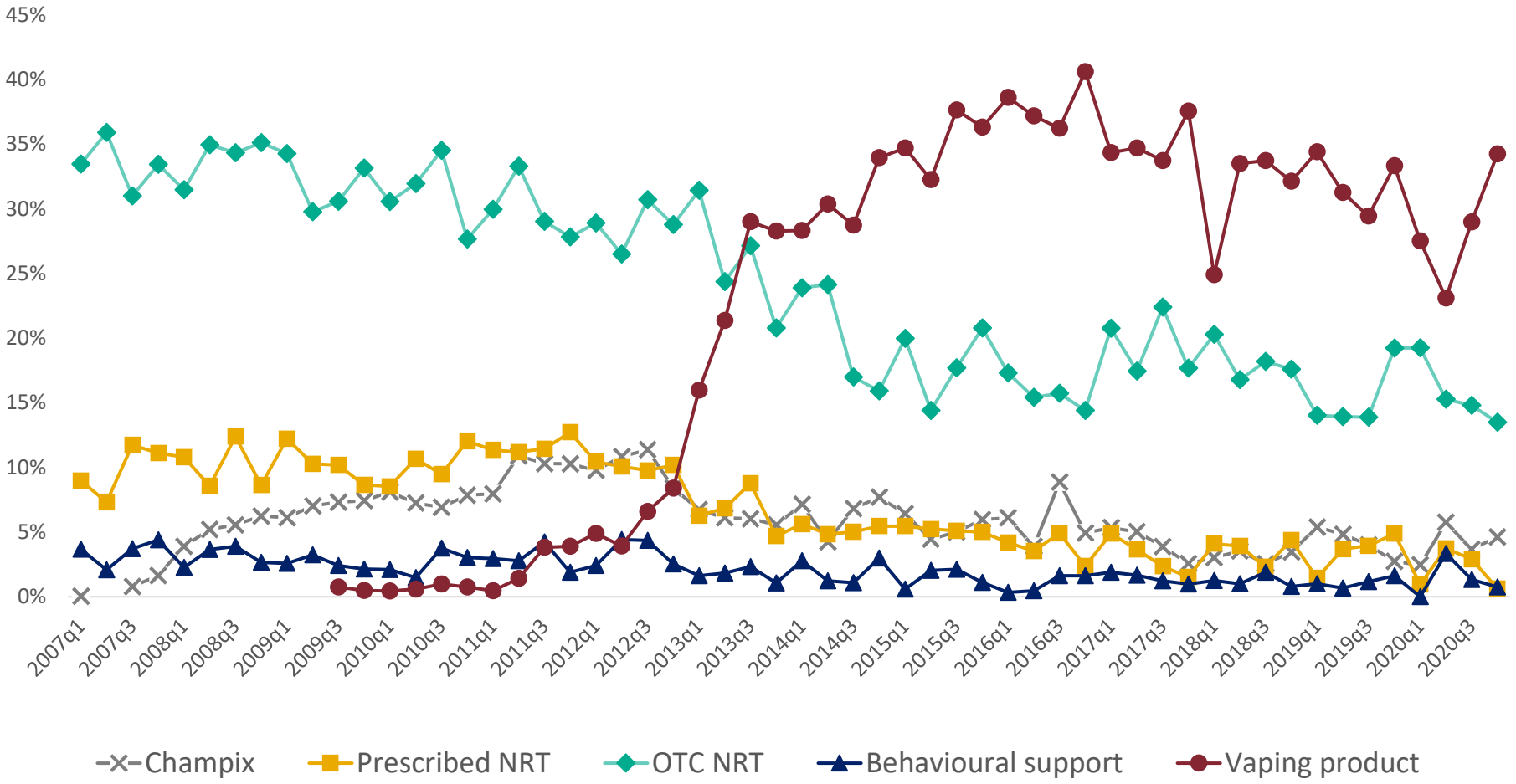
In a further study using data from STS participants, Beard et al. (50) used population-level time series data to estimate the success rate of quit attempts among 54,847 past-year smokers in England between 2007 and 2018 and quantified associations between the success of quit attempts and factors that have varied across the period at a population level and are known or hypothesised to influence quit attempts, including prevalence of vaping product use during a quit attempt. A positive association was found for quit success when a vaping product was used during a quit attempt. For every 1% increase in the mean point prevalence of vaping product use, the mean point prevalence of successful quit attempts increased by 0.106% (95%CI = 0.011– 0.201, $P = 0.029$). A positive association was also found for prescription medication (NRT, varenicline and bupropion combined). For every 1% increase in the mean point

prevalence of the use of prescription medication during a quit attempt, the mean point prevalence of successful quit attempts increased by 0.143% (95% CI = 0.009–0.279, P = 0.038). Also, the licensing of NRT for harm reduction was associated with a 0.641% (95%CI) = 0.073–1.209, P = 0.027) increase in the mean point prevalence of the success rate of quit attempts. Expenditure on tobacco control mass media campaigns was also positively associated with quit success; for every 1% increase in the mean expenditure, the mean point prevalence of successful quit attempts increased by 0.046% (95% CI = 0.001–0.092, P = 0.046).

In this and other studies, data were inconclusive about the association between prevalence of use of vaping products and quit attempts or whether use of vaping products was associated with a reduction in cigarette intake among people who smoked (50-52).

Also of relevance since our 2018 report (5), Jackson et al. (2019) (53) estimated the effectiveness of smoking cessation aids, including vaping products, using a correlational design; data from 18,929 STS participants collected between 2006 and 2018 who had smoked and had made at least one quit attempt within the previous 12 months were used. A total of 10,581 respondents (55.9%) had used one or more smoking cessation aids during their most recent quit attempt. The majority had used NRT bought over the counter (27.5%), followed by vaping products (12.7%), prescription NRT (8.5%), varenicline (5.5%) and face-to-face behavioural support (4.6%). Other cessation aids (websites, telephone support, self-help materials, hypnotherapy) had been used by less than 2% of participants. Self-reported abstinence rates were highest among users of vaping products (21.2%), followed by varenicline (20.4%) and websites (18.6%). After adjustment for covariates and use of other cessation aids, users of vaping products (OR=1.95, 95%CI:1.69-2.24) and varenicline (OR=1.82, 95%CI:1.51-2.21) had significantly higher odds of reporting abstinence than those who did not report use of these cessation aids. Use of prescription NRT was associated with increased abstinence in older (45 years or older) (OR=1.58, 95%CI: 1.25-2.00) but not younger adults (less than 45 years) (OR=1.09, 95%CI:0.85-1.42). While success rates were similar for use of vaping products and varenicline, vaping was much more common (12.7%) among people trying to quit smoking than varenicline (5.5%) and thus helped more people quit smoking.

Figure 40: Proportion of smokers trying to stop by support used in most recent quit attempt: England (STS, weighted data)



Notes

n=16,462 for vaping products, 22,272 for all others. Adults aged 18+ who smoke and tried to stop or who stopped in the past year. OTC NRT = Nicotine replacement therapy over the counter; Prescribed NRT = Nicotine Replacement Therapy on prescription; Champix = Varenicline.

Summary

Similar to findings in our 2018 report (5), in England, according to STS data, vaping products remain the most common aid used in a quit attempt and are positively associated with successfully quitting. Other tobacco control measures, such as extending the licence of NRT to aid tobacco harm reduction and the use of varenicline when used as part of a quit attempt are also positively associated with smoking cessation, underscoring the importance of ensuring people who want to give up smoking have a choice of cessation aids available to them. However, as vaping is more popular than licensed medication, the impact of vaping products at a population level may be greater than that of licensed aids.

5.4 Use of vaping products in stop smoking services in England

Introduction

As discussed in our previous reports, there has been a reduction in the availability and use of stop smoking services in England over recent years. Between July and September 2019, ASH (2020) reported findings from their fifth annual survey of tobacco leads in English local authorities with responsibility for public health (54). These surveys have tracked key indicators of the state of stop smoking services and wider tobacco control functions across local government settings.

Their most recent survey included responses from 127 out of 151 local authorities; 69% of surveyed local authorities reported they offered a specialist stop smoking service, though only 59% offered a service to all people who smoke in their locality. A fifth of local authorities (20%) offered an integrated lifestyle service with no specialist service, 9% only offered support in primary care and 2% only offered telephone support. About two-thirds of local authority stop smoking services (65%) offered people a full 12-week course of dual NRT, a further 21% offered part of a course of dual NRT (less than 12 weeks); the remainder offered either single NRT only (8%) or no NRT (6%). A full 12-week course of varenicline was offered by 87% of local authority stop smoking services, with 8% offering part of a course (less than 12 weeks) and 5% not offering varenicline. Eleven percent of local authority stop smoking services offered vaping products to some or all people making a quit attempt.

This context is important to interpret the data below, which focuses on the use of a vaping product as part of a supported quit attempt in stop smoking services.

English stop smoking services

Stop smoking services offer behavioural support in addition to licensed medication (NRT, varenicline, bupropion). Vaping products, alone or in combination with licensed medication, concurrently or consecutively are also used. A small number of stop smoking services offer vaping products (see above) as part of the provision of support. In other services where these are not directly provided, some people making a quit attempt use their own vaping product (alone or alongside licensed medication).

Data are collected by NHS Digital from local authority commissioned services every 3 months about: the number of quit attempts made (people can make several quit attempts in one year and therefore be counted more than once); the number of quit attempts which led to successful quits at 4 weeks (self-reported and carbon-monoxide (CO) verified); and key measures of the service including intervention type, intervention setting and type of pharmacotherapy received. A person is counted as a 'self-reported 4-week quitter' if they are assessed (face to face or by telephone) 4 weeks after the designated quit date and declare that they have not smoked a single puff on a cigarette in the past 2 weeks. A person is counted as a CO-verified 4-week quitter if they are a self-reported 4-week quitter and their expired-air CO is assessed 4 weeks after their designated quit date (-3 or +14 days) and found to be less than 10ppm. People who have set a quit date and are lost to follow up are counted as non-quitters.

Although some stop smoking services are commissioned to provide extended behavioural support beyond 4 weeks post-quit date, NHS Digital only requires the submission of data regarding quit attempt outcomes after 4 weeks. Four-week CO-verified quit rates represent a reliable and valid indicator of smoking cessation which can be used to predict long-term abstinence rates and provides a good balance between accuracy and practicability (55). The comparative quit rates with different types of support have also been found to be stable over longer follow ups (56).

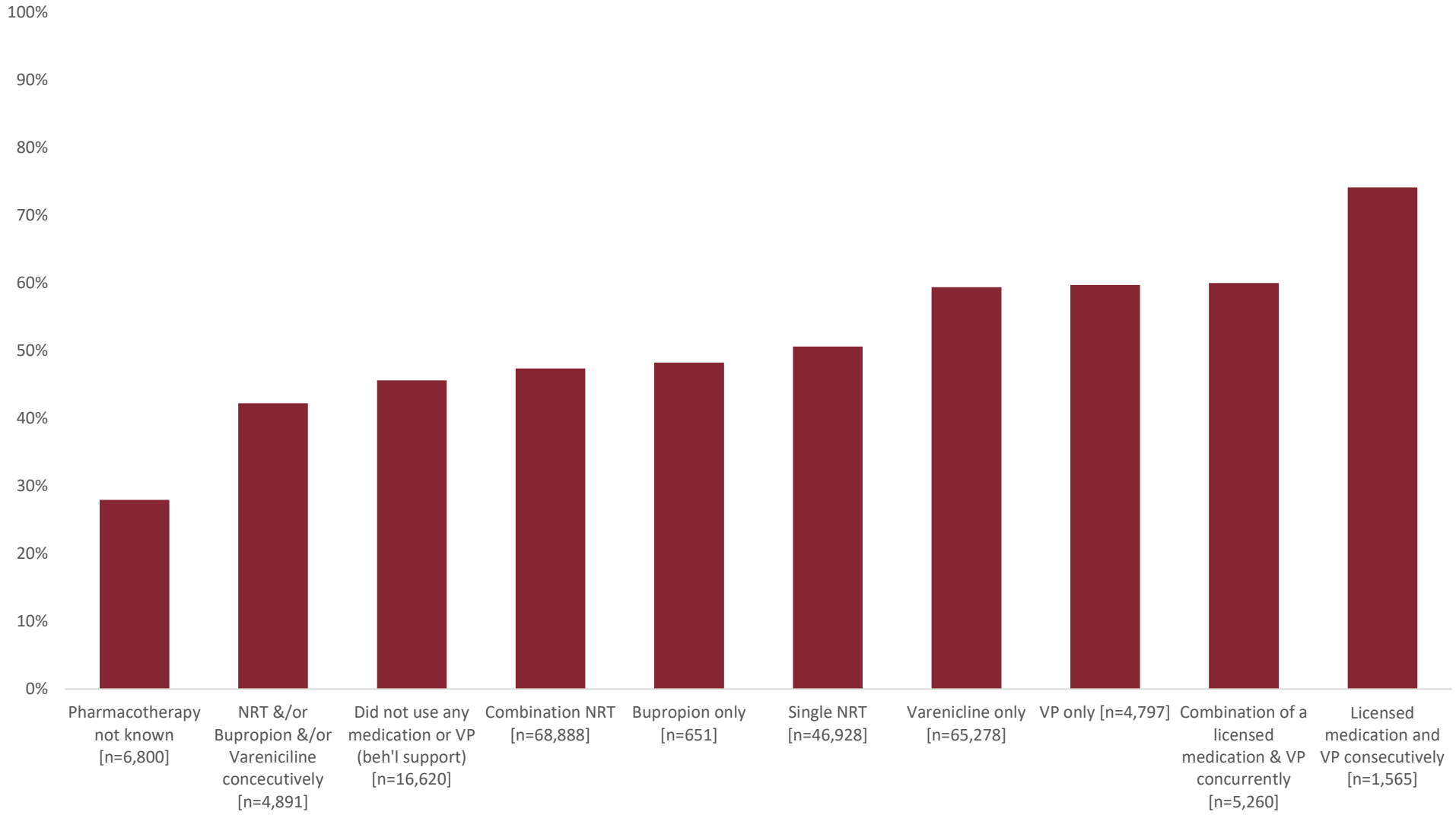
Since 2011, the number of quit attempts made with stop smoking services and the number of self-reported quitters have declined annually (though self-reported quit rates have remained relatively stable). Between April 2019 and March 2020, 221,678 quit dates were set with a stop smoking service and 114,153 (51%) self-reported that they had successfully quit at 4-week follow up. More women (120, 996, 54.6%) than men (100, 682, 45.3%) set a quit date. Men had higher quit rates than women (53% and 50% respectively). The majority (87%) of those setting a quit date were of white ethnicity. The next most represented ethnicity was Asian or Asian British (9%), followed by Black or Black British (4%) and mixed ethnicity (4%). The self-reported quit rate varied, from 48% for mixed ethnicity to 55% for people of Asian or Asian British heritage. The largest number of quit attempts were made by people who were classified as being from 'routine and manual occupational groups' (60,058, 27.1%) of whom 54% successfully quit.

Use of vaping products in quit attempts supported by stop smoking services

NHS Digital provide numbers and proportions of quit attempts and quit success by each type of pharmacotherapy offered and where a vaping product was used in the quit attempt. However, they do not provide additional information that may influence quit success (for example, level of tobacco dependence, age, socio-economic status according to type of pharmacotherapy offered), therefore these data only allow for a crude comparison between and within stop smoking services. This report presents data from 1 April 2019 to 31 March 2020 (the most recent data provided by NHS Digital at the time of writing the report). Previous reports provide information about use of vaping products in quit attempts from April 2014 onwards (3 to 6).

The number of quit attempts with each type of support and the quit rates between April 2019 and March 2020 are presented in Figure 41. Combination NRT remains the most popular type of pharmacotherapy used in a quit attempt (31.1%) and single NRT is the second most popular (21.1%). A vaping product was used in 5.2% of quit attempts either alone, concurrently or consecutively in combination with licensed medication. Similar to previous years, the highest quit rates were observed when the quit attempt involved the use of a licensed medicine and a vaping product consecutively (74.1%), though only 0.7% of the total quit attempts involved a vaping product and licensed medicine consecutively. Quit rates with a vaping product and licensed medication concurrently (60.0%), a vaping product alone (59.7%) and varenicline alone (59.4%) were similar.

Figure 41: Self-reported 4-week successful quits by pharmacotherapy type, including number of quit attempts (April 2019 to March 2020, NHS Digital)



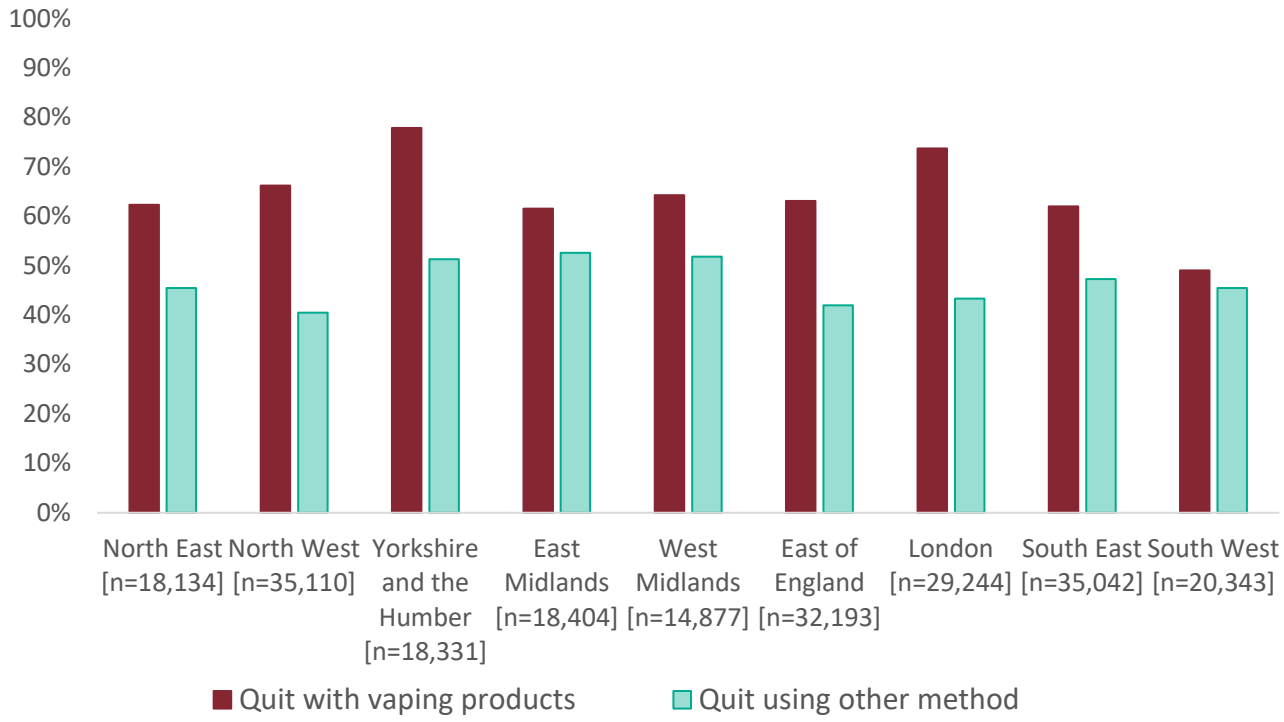
Vaping in quit attempts in stop smoking services by region

Vaping as part of a quit attempt continues to vary by region, from 2.4% in Yorkshire and the Humber to 16% in the East Midlands (16%) (Table 29). In every region, quit rates involving the use of a vaping product were higher than any other method used. These ranged from 49% in the South West to 78% in Yorkshire and the Humber (Figure 42).

Table 29: Proportion of quit attempts involving a vaping product (NHS Digital)

Region	%
North East	3.4
North West	3.0
Yorkshire and the Humber	2.4
East Midlands	16.0
West Midlands	2.6
East of England	7.2
London	5.4
South East	5.0
South West	2.7

Figure 42: Self-reported 4-week successful quits using a vaping product compared with other methods by region (April 2019 to March 2020) (NHS Digital)



Notes
Other methods include, single NRT, combination NRT, varenicline, bupropion, behavioural support only and pharmacotherapy unknown.

Limitations of the data

It is possible that the people using a vaping product alone or in combination with licensed stop smoking medicines may differ in their demographic, clinical and smoking characteristics, from people making a quit attempt with licensed medication only or those who only opt for behavioural support. People who attend stop smoking services are self-selected and since 2014, the reporting of activity by commissioned stop smoking services to NHS Digital has been voluntary. Although the vast majority of services continue to report their activity to NHS Digital, it is possible that those who do not may be more (or less) effective in supporting smokers to quit with the use of vaping products. Also, there have been challenges with submitting data to NHS Digital this year; 12 local authorities that run stop smoking services did not submit data for one or more quarters of April 2019 to March 2020.

Notwithstanding the limitations of the data, people who are treated by a stop smoking service with behavioural support and use a vaping product with or without additional licensed medication, have at least comparable short-term quit success compared with people who used licensed medication only. However, the proportion who use vaping products as part of a supported quit attempt remains very small. This is in contrast to findings from the STS (Figure 40) that suggest vaping products remain the most popular

stop smoking aid in people who reported making a quit attempt in the previous year. The most likely reasons for these differences are that the vast majority of people who use a vaping product to help them stop smoking, do not actively seek support from stop smoking services. Also, as mentioned above, only a small proportion of stop smoking services offer a vaping product (approximately 11%) (54). As suggested in our previous reports, stop smoking services may not be actively reaching out to or have the resources to support people who are using, or may want to use a vaping product as part of a quit attempt.

Summary

Between April 2019 and March 2020, in stop smoking services in England, a vaping product was used in 5.2% of quit attempts, either alone, concurrently or consecutively in combination with licensed medication. Consistent with findings of our previous reports, the highest quit rates were observed when the quit attempt involved the use of a licensed medicine and a vaping product consecutively (74.1%). Quit rates with a vaping product and licensed medication concurrently (60.0%), a vaping product alone (59.7%) and varenicline alone (59.4%) were similar. Few stop smoking services offer vaping products to support a quit attempt. A consistent approach to the use of vaping products should be pursued by all stop smoking services. Further research into the barriers and enablers to using vaping products as part of a supported quit attempt is needed.

5.5 Systematic review of systematic reviews, randomised controlled trials and non-randomised intervention studies: the effect of vaping for smoking cessation or reduction

In our 2018 report (5) we included an overview of systematic reviews that assessed the use of vaping products for smoking cessation or reduction. We identified 14 systematic reviews of randomised and observational studies, 7 of which included a meta-analysis, with variable effect estimates. We identified that the variations were related to the types of studies, participants, outcomes and length of follow up included in each meta-analysis. In this report, we have updated the overview of systematic reviews and also include randomised and non-randomised intervention studies of the effect of the use of a vaping product on smoking cessation or reduction, published since our 2018 report.

Methods

Protocol registration

The protocol of the review was registered on PROSPERO (CRD42021228676).

Eligibility criteria

Types of studies

We included systematic reviews of studies using any design and any length of follow up, that evaluated the effect of the use of vaping products on smoking cessation or reduction, with or without a meta-analysis. We also included RCTs and non-randomised intervention studies. Although they can provide important information about how vaping may influence smoking cessation, observational studies (for example cross sectional and longitudinal) and qualitative studies are not included in this report. While planning our review, we were aware that the Cochrane Tobacco Addiction Group were updating their 2016 review on the effect of e-cigarettes for smoking cessation and developing a living systematic review, with a planned publication date around the time of our final search date (57). We therefore planned a priori to include findings on cessation outcomes from the Cochrane review and compare meta-analyses of each systematic review identified in our search. We also included RCTs and non-randomised intervention studies, that were identified within our search parameters, but were either not included in identified systematic reviews (because they were published after the end search date of a systematic review), or if included, did not contribute to cessation outcomes (which occurred in the case of the Cochrane review, which only includes studies that follow up participants for 6 months or longer).

Types of participants
People over the age of 18 who were defined as current smokers at the start of the study, either motivated or unmotivated to quit were included. We excluded studies that recruited exclusive vapers at the start of the study.

Types of interventions
We have previously described that there are several ways vaping can contribute to smoking cessation (5). For this review, we only include studies where participants (people who were current smokers) were offered a vaping product and had changes in their smoking behaviours assessed at follow up. Any interventions that included the use of a vaping product, with or without nicotine intended for smoking cessation, reduction or cigarette substitution were eligible. We excluded studies that focused on the use of vaping products to prevent relapse to smoking.

Types of control or comparisons
Comparators included use of vaping products with and without nicotine, licensed medication, behavioural or psychological support, and no intervention or comparator.

Types of outcomes
Smoking cessation: outcomes were either self-reported and/or carbon monoxide (CO) verified. Abstinence could either be reported as point prevalence, prolonged or continuous abstinence at the longest follow up. Smoking reduction: defined by the primary review authors, including the number and percentage of smokers that achieved 50% or higher reduction in cigarettes per day (CPD), or change in CPD, relative to baseline, either self-reported or CO-validated, also measured at the longest follow up were included. We also report other outcomes assessed in each study, for example adverse effects, but only briefly summarise these in the appendices as these outcomes will be a main focus of a PHE commissioned report due to be published in early 2022 (58).

Search strategy, information sources and study selection
The search strategy was adapted from those used in our previous reports to include smoking cessation and reduction terms (Appendix 1). Embase, PsycINFO, Medline, PubMed and CINAHL databases were searched on 14 September 2020 for studies published since 19 August 2017 (the date of our final search in the 2018 report). Search terms were adapted for each database to align with differences in keyword terms and syntax requirements. The full search terms used for each database are included in Appendix 1.

The searches were performed after pilot testing against a sample of known relevant papers, independently chosen by 2 reviewers. These were cross checked to test whether they were identified by the output from the search strategy. Authors of registered protocols of systematic reviews of vaping products or e-cigarettes for smoking cessation, registered with PROSPERO with an expected completion data within our

search parameters, were contacted by reviewers to identify any further studies that were in press. A list of the registered protocols can be found in Appendix 2. The outputs of the search were merged and de-duplicated using Endnote and imported to Covidence (59) a systematic review management software. Titles and abstracts and later full texts were independently screened by 2 reviewers.

Data collection process and data items

Data were extracted and collated independently by 2 reviewers. Any discrepancies were resolved between the 2 reviewers and a third consulted if unresolved. For systematic reviews, a summary of characteristics for each study included author, year of publication, country, funder, databases and dates searched, participants, interventions, comparators, outcomes, studies included, method of synthesis, risk of bias and certainty of evidence tools used. The summary of findings covered aspects such as the follow-up period, effects estimate (if a meta-analysis was conducted), quality assessment and main findings.

For RCTs and non-randomised intervention studies, we included details of authors, year of publication, country, funder, data collection period, setting, study design as specified by the authors, recruitment strategy, demographics of the sample, outcome measures used, vaping product details, vaping product supply and additional support given. The summary of findings included smoking characteristics at baseline, cessation outcomes, reduction outcomes, quality assessment and risk of bias analysis. Additional outcomes reported within each study, for example adverse effects are included in Appendix 3 and Appendix 4.

Quality and risk of bias assessment

The quality of the included systematic reviews was assessed using the AMSTAR 2 tool (A MeaSurement Tool to Assess systematic Reviews) (60). The tool supports the critical appraisal of systematic reviews that include both randomised and non-randomised studies of a specific healthcare intervention, taking into consideration a range of possible biases resulting from the methodological limitations of non-randomised studies and their effect on overall evidence quality. AMSTAR 2 comprises 16 items and does not yield an overall score but rather a categorical classification of the overall quality (high, moderate, low and critically low), by assessing aspects including protocol registration, literature search, exclusion criteria, risk of bias and meta-analytical approach.

We also used the Methodological Index for Non-Randomised Studies (MINORS), initially conceptualised as a tool to assess the quality of non-randomised studies in surgical settings, it is now widely used for other types of interventions (61). The validated version of MINORS comprises 8 methodological items applicable to all non-randomised studies, with 4 additional items for comparative studies, and has good reliability. Each item is rated as 0= not reported; 1= reported but inadequate; 2= reported and adequate.

The risk of bias assessment of included systematic reviews was based on the information provided by the authors of each review, as recommended in the Cochrane handbook (62). We also used ROBINS-I tool (Risk Of Bias in Non-randomised Studies of Interventions), a domain-based instrument for risk of bias assessment based on the Cochrane Risk of Bias tool (63) and recommended for systematic reviews including non-randomised studies. It considers 7 potential sources of bias (bias due to confounding, selection of participants into the study, classification of interventions, deviations from intended interventions, missing data, measurement of outcomes, selection of the reported result) at different stages of an intervention (pre-intervention, at intervention, post-intervention) and provides an overall risk of bias judgement (low, moderate, serious or critical risk of bias) for each study.

Data synthesis

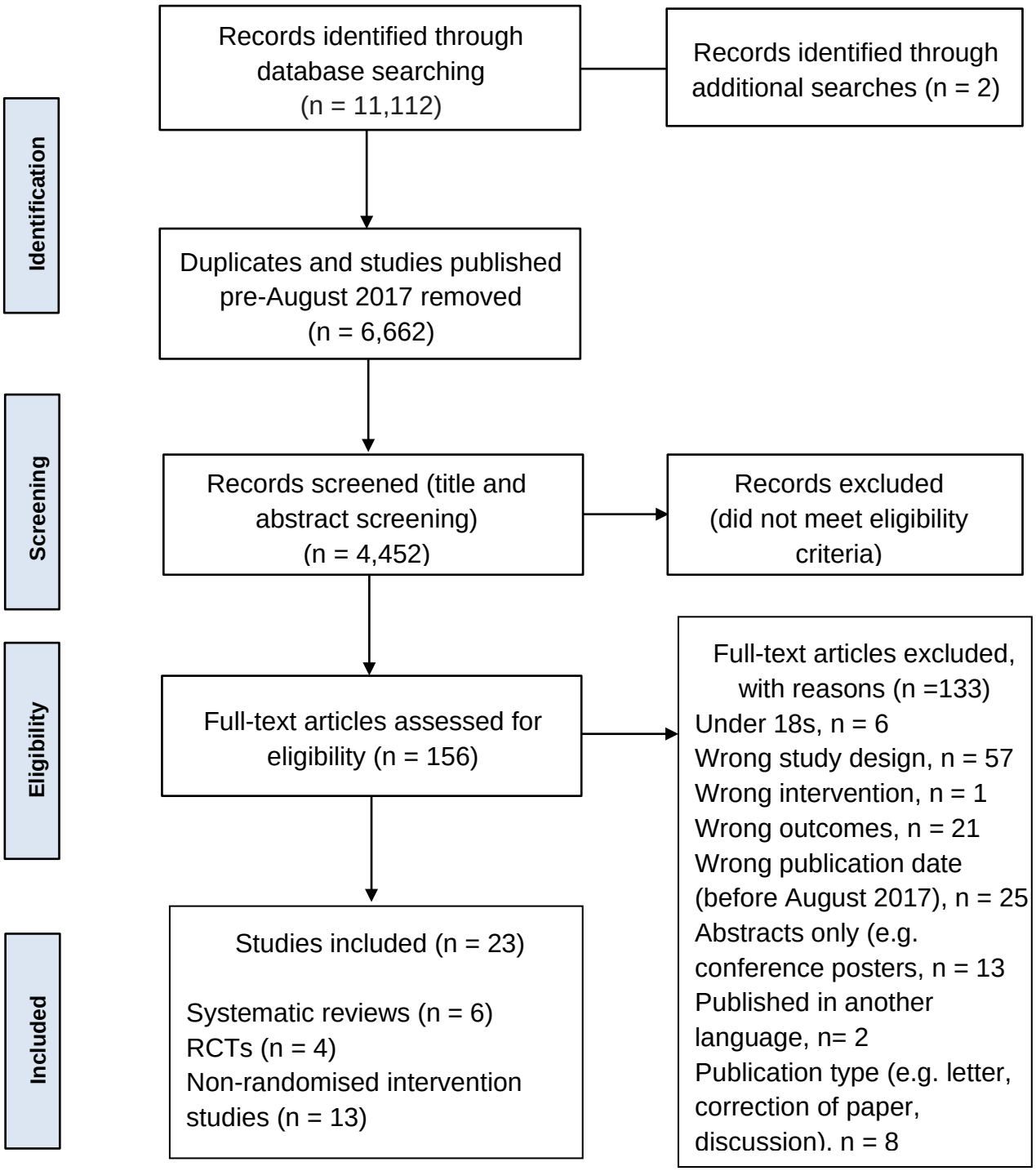
The findings from the systematic reviews, RCTs and non-randomised studies are narratively described.

Results

Study selection

The database searches identified 4,450 records after duplicates were removed and 2 further studies were identified by the authors. Independent screening by 2 reviewers identified 156 studies for full text screening, of which 23 studies were eligible for inclusion in the review; these included 6 systematic reviews (57, 64-68); 4 RCTs (69-72) and 13 non-randomised intervention studies (73-85) (Figure 43).

Figure 43: PRISMA flow chart



Study characteristics

Systematic reviews

We identified 6 systematic reviews published since our 2018 review (5) that met the inclusion criteria; 4 included a meta-analysis (57, 64 to 66) and 2 were narrative only reviews (67, 68) (see Table 30 and Table 31). Hartmann- Boyce et al. (57) included RCTs and non- randomised intervention studies and the reviews by Grabovac et al. (64) and The Joanna Briggs Institute (JBI) (65) included RCTs only. The others (67, 68) were broader reviews and included other designs, for example surveys and qualitative studies. Pooled participant sizes within each review ranged from 1,217 (67) to 35,665 (66). Hartmann-Boyce et al. (57) was the only review to include only studies that followed up participants for 6 months or longer, others allowed for shorter durations of follow up. Gentry et al. (67) reviewed studies that included participants from groups with high smoking rates, such as those with a mental health or substance use disorder, whereas the others included studies with participants from the wider general population as well as high risk smokers. Vaping products containing nicotine were compared with vaping products without nicotine, NRT, varenicline, behavioural support or usual care. Hartmann-Boyce et al. (57); Grabovac et al. (64) and JBI (65) used the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) to assess the quality of the evidence. GRADE has 4 levels of evidence, also referred to as certainty in evidence or quality of evidence. Ratings can be very low, low, moderate or high based on risk of bias, imprecision, indirectness and publication bias. Overall, across all reviews, 15 RCTs, 11 non-randomised intervention studies, 5 longitudinal and 5 cross sectional studies contributed to cessation data (see Appendix 5).

Table 30: Study characteristics of systematic reviews including meta-analysis

Authors and funding	Databases and dates searched	Participants	1) Interventions 2) Comparators	Outcomes and length of follow up (FU)	No and type of studies included in each review and method of synthesis	Tools used to assess 1) risk of bias 2) quality/ certainty of evidence	AMSTAR
Hartmann-Boyce et al. (2020) (57) Funding: Returning Carer's Fund / National Institute of Health Research / Tobacco Advisory Group Cancer Research UK Project Grant	Cochrane Tobacco Addiction Group Specialized Register; Cochrane Central Register of Controlled Trials (CENTRAL); MEDLINE (OVID SP), Embase (OVID SP), PsycINFO (OVID SP). Clinical trials registries: ClinicalTrials.gov, WHO International	n=12,430 Currently smoking cigarettes at enrolment into the studies, motivated or unmotivated to quit.	1) Any type of VP or intervention intended to promote VP use for smoking cessation, or complete substitution for cigarette use. VPs may or may not contain nicotine 2) Non-nicotine VP; alternative cessation aids (NRT or no intervention); standard smoking cessation treatment	Primary outcomes Smoking cessation measured on an intention-to-treat basis, with strictest definition of abstinence. Longest FU, at least 6 months from the start of intervention. Number of participants reporting adverse events or serious adverse events at one week or longer Secondary outcomes:	Overall: n=50 For cessation outcomes n=20 (12 RCTs and 8 uncontrolled studies). The other studies contributed to short term safety outcomes, but also include, but did not contribute to, their cessation outcome data. Method of synthesis: Narrative synthesis with meta-analysis:	1) Cochrane Risk of Bias Tool 2) Grading of Recommendations, Assessment, Development and Evaluations (GRADE)	High

Authors and funding	Databases and dates searched	Participants	1) Interventions 2) Comparators	Outcomes and length of follow up (FU)	No and type of studies included in each review and method of synthesis	Tools used to assess 1) risk of bias 2) quality/ certainty of evidence	AMSTAR
	Clinical Trials Registry Platform. Dates searched: up to 20/1/2020.		(behavioural or pharmacological or both)	changes in health effects (for example blood pressure, biomarkers) at one week or longer.	fixed-effect Mantel-Haenszel model (RR, 95% CI)		
Grabovac et al. (2020) (64) Funding: Health Insurance Group of Styria	Dates searched: 01/01/2014 to 27/06/2020	n=8,512 Female: 49.7% Mean age: 28-62.8 years. Motivated or unmotivated to quit	1)VP. 2) Non- nicotine VP; 'established smoking cessation therapy'	Smoking cessation at study, CO validated or self-reported via validated tools (for example the FTND)	Overall n=12 RCTs Method of synthesis: a random-effects model; weighted by inverse variance weights.	1 and 2) GRADE	Moderate

Authors and funding	Databases and dates searched	Participants	1) Interventions 2) Comparators	Outcomes and length of follow up (FU)	No and type of studies included in each review and method of synthesis	Tools used to assess 1) risk of bias 2) quality/ certainty of evidence	AMSTAR
The Joanna Briggs Institute (2019) (65) Funding: Royal Australian College of General Practitioners.	OVID Medline and CENTRAL (The search strategy used by Hartmann-Boyce et al. 2016 was reproduced) 1/1/2016-21/1/2019	n=10,086 "Smokers (all); more dependent smokers" Motivated or unmotivated to quit	1) VP 2) Non-nicotine VP; no intervention; NRT; any pharmaco-therapy	Smoking cessation; ideally biochemically validated. Reduction in smoking; CPD reduced by 50% Adverse events. Longest FU (any length).	Overall: n=13 (RCTs: n=12; RCT protocol and conference abstract: n=1) Method of synthesis: Meta-analysis: event rates, relative effect (95% CI), anticipated absolute effects.	1) Cochrane Risk of Bias Tool 2) GRADE	High
Liu et al. (2018) (66) Funding: not reported	PubMed, EMBASE, Web of Science, Google scholar, the Chinese Medical Citation Index, CENTRAL.	n = 35,665 (n=1,092 for cessation and reduction studies). Participants with a 'consumption	1) VP 2) Unclear	Smoking cessation: "Single point prevalence to sustained abstinence (multiple point prevalence with self-report of no slips or relapses):	Overall: n=14 RCTs: 3 Observational studies: 7 Surveys: 4 Meta-analysis: Random and fixed effects models	1) Funnel plot analysis for publication bias and CONSORT 2) Newcastle-Ottawa Scale for cross-	Low

Authors and funding	Databases and dates searched	Participants	1) Interventions 2) Comparators	Outcomes and length of follow up (FU)	No and type of studies included in each review and method of synthesis	Tools used to assess 1) risk of bias 2) quality/ certainty of evidence	AMSTAR
	1/2003 to 7/2017	history' of smoking and VPs. Motivated or unmotivated to quit		Reduction in smoking: more than 50% CPD reduction to one year follow up; CO levels; adverse events. Adverse events. 1-year FU	(no pooled estimate)	sectional and prevalence studies.	

Table 31: Study characteristics of systematic reviews without meta-analysis

Authors and funding	Databases and dates searched	Participants	1) Interventions 2) Comparators	Outcomes and length of follow up (FU)	No and type of studies included in each review and method of synthesis	Tools used to assess 1) risk of bias 2) quality/ certainty of evidence	AMSTAR
Gentry et al. (2019) (67) Funding: University of East Anglia, England. No additional funding reported	MEDLINE, EMBASE, PsycINFO, CINAHL, ASSIA, ProQuest Dissertations and Theses, Open Grey. 2004 to 3/2017	n = 1,217 Participants and carers of any age, country/setting in vulnerable conditions such as experiencing mental illness, substance misuse, homelessness or within the criminal justice system Motivated or unmotivated to quit	1) VP. 2) Another type of nicotine or non-nicotine VP; smoking cessation intervention (for example NRT, behavioural support); no or delayed intervention	Primary outcomes: Smoking cessation at longest follow-up, by any measure, self-report and expired-CO. Serious/non-serious adverse events. Perceived barriers and facilitators to VP use. Secondary outcomes: Smoking reduction: self-reported/CO validated at longest follow up. Retention in treatment.	Overall: n= 9 Quantitative: n=5 Secondary analysis of RCT: 1; Uncontrolled before and after studies: n=3; observational cohort study: n=1 Method of synthesis: Narrative synthesis Qualitative: (n=4): Focus groups: n=3; Qualitative analysis of online postings: n=1	1) Cochrane Risk of Bias Tool. 2) Effective Public Health Practice Project criteria. 2) Critical Appraisal Skills Programme checklist	Moderate

Authors and funding	Databases and dates searched	Participants	1) Interventions 2) Comparators	Outcomes and length of follow up (FU)	No and type of studies included in each review and method of synthesis	Tools used to assess 1) risk of bias 2) quality/ certainty of evidence	AMSTAR
				Health economic outcomes Longest FU (any length).	Method of synthesis: Thematic analysis Data relationships mapped into COM-B model.		
Maglia et al. (2018) (68) Funding: University Catania, Italy. Hunter College at the City University of New York, USA.	PubMed, PsycINFO and Scopus 2009 to 30/72017	Overall participant size not reported; n=8,337 for cessation studies Dual users of CCs and VPs (daily use of at least one and at least weekly use of the other Motivated or unmotivated to quit	1) VP 2) Unclear	Smoking cessation: self-reported/CO validated, PP or continuous abstinence. Smoking reduction: reduction in CPD; Health risks. FU period ranged from 4 weeks to 1 year across studies	Overall: n= 76 For cessation/reduction outcomes; n=7 (Cross-sectional survey: n=2; Longitudinal survey: 2; Observational Prospective Trial: n=2; Retrospective Chart Review: n=1)	1, 2) Not reported.	Critically low

Authors and funding	Databases and dates searched	Participants	1) Interventions 2) Comparators	Outcomes and length of follow up (FU)	No and type of studies included in each review and method of synthesis	Tools used to assess 1) risk of bias 2) quality/ certainty of evidence	AMSTAR
					Method of synthesis: Narrative.		

Notes

VP: vaping product; CC: combustible cigarette; CO: expired carbon monoxide, in parts per million; COM-B: Capability, Opportunity, Motivation model of behaviour; CPD: cigarettes per day; FTND: Fagerstrom Test for Nicotine Dependence. PP: point prevalence abstinence; RCT: randomised controlled trial. AMSTAR: A MeaSurement Tool to Assess systematic Reviews

Additional randomised controlled trials

No additional RCTs were identified from a UK setting and 4 were identified from outside the UK. One RCT by Bonevski et al. (69) was published after the final search dates of the 6 systematic reviews, but within our search parameters. We also identified 3 RCTs (70 to 72) that were also included in the review by Hartmann-Boyce et al. (57) for the purpose of providing data on the short-term adverse health effects of vaping, but did not contribute to their cessation outcomes because participants were followed up for less than 6 months. The study by Bonevski et al. (69) was conducted among people discharged from a residential substance use disorder service in Australia. The 3 other studies were conducted in research settings in the USA. Sample sizes ranged from 50-264. Average ages ranged from 41 to 49 years and 32% to 60% were female. Two studies included participants who intended to quit smoking. Length of follow up ranged from 1 week to 3 months (Table 32).

Table 32: Study characteristics of randomised controlled trials (non-UK)

Authors	Country, data collection period and setting	Study design	Participants	Funding or COI
Bonevski et al. (2020) (69)	Australia Data collection period not specified Residential withdrawal service	Pragmatic, open-label, single-centre, two-arm randomized controlled trial with an active control	Participants: n = 100 Mean age: 40.9 (SD 10.4) Female: 32% (n = 32) Intended to quit smoking	VicHealth Innovation Research Grant
Hatsukami et al. (2019) (70)	USA November 2014 to December 2018	Randomized clinical trial	Participants: n = 264 Median age: 47 Female: 49.2% (n = 130) Interested in reducing exposure to harmful tobacco smoke.	National Center for Advancing Translational Science of the National Institutes of Health and National Institute of Drug Abuse.
Smith et al. (2020) (72)	USA Data collection period not specified	Double-blind randomised controlled trial	Participants: n = 30 Mean age: 43.7 (SD 12.4) Female: 30% (n = 9) no requirement that participants be interested in switching to vaping products or quitting smoking	National Cancer Institute; National Institute on Drug Abuse.
Veldheer et al. (2019) (71)	USA October 2015 to May 2017	Four-arm, parallel-group randomised controlled trial	Participants: n = 263 Mean age: 47 (SD 11.3) Female: 60% (n = 158) Intended to quit smoking.	National Institutes of Health and US Food and Drug Administration; National Center for Advancing Translational Sciences.

Additional non-randomised intervention studies

We identified 13 studies published since our 2018 (5) review, 4 of which were conducted in the UK and 9 outside the UK (Table 33). One of these (81) was included in the review by Hartmann-Boyce et al. (57), but only contributed to their safety results and not cessation results.

UK studies:

Three studies, 2 of which were conducted in English community stop smoking services and pharmacy services (73, 74) and one in a community mental health setting (75) were included. A fourth was conducted in a research setting in Scotland (76) (Table 33). Sample sizes ranged from 50 to 1022. Average ages ranged from 36 to 45 years and 24 to 44% of participants were female. Three studies included participants who intended to quit smoking (73, 74, 76). Length of follow up assessments varied as did the starting point of the timing of assessment (for example target quit day for those attending a stop smoking service or from the day the vaping product was supplied). The longest follow up was 90 days after the start of the supply (76). Two studies included CO verified quit rates for participants (74, 75) and 2 were self-reported (73, 76).

Non-UK studies:

Nine studies, 6 of which were conducted in the USA (79 to 82, 84, 85), 2 in New Zealand (77, 83) and one in Italy (78) were included (Table 33). Sample sizes ranged from 11 to 593. Two studies took place in settings caring for people living with HIV/AIDS (79, 85) and one for veterans with mental health or substance use disorders (84). The rest were conducted in research settings. Average ages ranged from 37 to 57 years and 7% to 61% were female. Three studies included participants who intended to quit smoking (77, 78, 80). Similar to the UK studies, length of follow up assessments varied as did the starting point of the timing of assessment (for example target quit day or from the day the vaping product was supplied.) The longest follow up was 52 weeks (78). Six studies (78 to 84) included CO verified quit rates for all participants and 2 (77, 85) were self-reported.

Table 33: Study characteristics of non-randomised intervention studies

Authors	Country, data collection period and setting	Study design[1]	Participants	Funding or COI
UK				
Coffey et al. (2020) (73)	England January - March 2018 Community Stop Smoking Services and pharmacy services in North West England	Secondary data analysis (single group)	n = 1022 Mean age: 44.7 Female: not collected Intended to quit smoking	Greater Manchester Health and Social Care. VP purchased from a British Vape Trading Association registered provider
Cox et al. (2019) (74)	England 2017-2018. Stop Smoking Service in a community pharmacy, Hertfordshire	Prospective cohort study with a between subject design. (3 groups: VP; NRT; VP+NRT)	n = 115 Mean age: 46.4 (SD 13.6) Female: 64% (n = 74) Intended to quit smoking	No funding received; VP donated by Evapo Ltd
Hickling et al. (2019) (75)	England September 2014 and November 2016. Community Mental Health Centres in South London	Pre-post pilot study (single group)	n = 50 Mean age: 39 (SD 10.7) Female: 24% (n = 12) People receiving treatment for severe mental illness Not intending to quit smoking	Maudsley Charity, NIHR Biomedical Research Centre, South London and Maudsley Foundation Trust and King's College London
McKeganey et al. (2018) (76)	Scotland Data collection period not specified	Exploratory trial (single group)	n = 72 Mean age: 35.7 (SD 11.4) Female: 36.1% (n = 26) Willing to try VP as a method of quitting smoking	Fontem Ventures (VP manufacturer linked to Imperial Tobacco). Funding obtained through uninvited request from lead author to Fontem Ventures

Authors	Country, data collection period and setting	Study design[1]	Participants	Funding or COI
Non-UK				
Blank et al. (2019) (77)	New Zealand February to June 2017	Mixed-methods feasibility study (single group)	Participants: n = 11 Mean age: 44.1 (SD 15) Female: 45.5% (n = 5) Intended to quit smoking	Health Research Council of New Zealand
Caponnetto et al. (2019) (78)	Italy January 2015 and December 2016. Smoking Cessation Centre	Observational longitudinal study (4 groups)	Participants: n = 593 Mean age: 47.5 (SD 12.1) Female: 41.1% (n = 244) Intended to quit smoking	Authors report no funding received. Majority of authors are part of the Center of Excellence for the acceleration of Harm Reduction (COEHAR), which is supported by a grant from the Foundation for a Smoke-free World, which have received tobacco industry funding
Cioe et al. (2020) (79)	USA July and December 2018 Two HIV clinics in northeast USA	Pilot study (single group)	Participants: n = 20 (results based on 19 pts) Mean age: 52.7 (SD 9.3) Female: 30% (n = 6) People who were HIV-positive (in treatment), not intending to quit in the short term	Authors supported by funding from Brown University; Providence/ Boston Center for AIDS Research; National Institute on Drug Abuse; Food and Drug Administration

Authors	Country, data collection period and setting	Study design[1]	Participants	Funding or COI
Martner and D'alleryl (2019) (80)	USA Data collection period not stated.	Non-concurrent multiple baseline across participants study. (2 groups: VP; P and CM)	Participants n = 12 Mean age: 37.5 (SD 13.5) Female: 58.3% (n = 7) Intended to quit smoking	Part funded through Crowdsourced funding enabled by Experiment.com
Pulvers et al (2018) (81)	USA	Observational pilot stud (single group)	Participants n = 40 Mean age:30.1 (SD 8.8) Female:27.5% (n=11) Being willing to switch from smoking to vaping	University of Minnesota and California State University San Marcos
Rohsenow et al. (2018) (82)	USA Data collection period not stated	Single group pilot pre-post study (single group)	Participants n = 18 Mean age: 45.1 (SD 7.8) Female: 61% (n = 11) Not intending to quit	Authors funded by Research Excellence Award from Brown University's Center for Alcohol and Addiction Studies; National Institute on Drug Abuse (NIDA)
Truman (2018) (83)	New Zealand Data collected July 2013 to April 2014 and May 2014 to February 2016 Hospital setting proving medically supported alcohol withdrawal and detoxification	Feasibility/ acceptability study 2 groups: NRT; VP (with the option of NRT)	Participants n = 62 Mean age (median): 45 (range = 24 to 54) Female: 42% (n = 27) People either undergoing medically supported alcohol withdrawal or hospital detoxification. Intention to quit unclear.	Reducing Tobacco Related Harm Research Partnership: Health Research Council of New Zealand and the Ministry of Health of New Zealand

Authors	Country, data collection period and setting	Study design[1]	Participants	Funding or COI
Valentine et al. (2018) (84) DeVito et al. (2019) (86)	USA Data collection period not specified. Mental health clinic for military veterans	Uncontrolled longitudinal study (Valentine) (single group) Secondary analysis of Valentine's participants (DeVito)	Participants n = 43 Age: 56.9 (SD 8) Female: 7% (n = 3) People receiving treatment for a mental health and/ or substance use disorder. Not intending to quit smoking	New England Mental Illness Research, Education and Clinical Center, US Department of Veteran's Affairs; NIH and FDA Center for Tobacco Products.
Yingst et al. (2019) (85)	USA Data collection period not specified. Penn State Health HIV Comprehensive Care Program	Cross-over study; participants used 2 VP in a random order during 2 use periods separated by 7 days	Participants n = 17 Age: 49.1 (SD 8.8) Female: 41.2% (n = 7) People living with HIV/AIDS Not intending to quit smoking	National Institute on Drug Abuse; Center for Tobacco Products of the U.S. Food and Drug Administration; Penn State Cancer Institute.

Notes
VP: vaping product; SD: standard deviation; NRT: nicotine replacement therapy; CM: contingency management.
[1] Defined by authors

Systematic reviews

Quality assessment and risk of bias: systematic reviews

The AMSTAR2 ratings of the quality of the systematic reviews are included in Table 30 and Table 31 and more details are given in Appendix 6. Two reviews were rated high quality (57, 65), 2 moderate (64, 67), one low (66) and one critically low (68). The primary review authors risk of bias ratings for studies included in their respective reviews (where reported) are summarised in Appendix 7a.

Effect of interventions: systematic reviews

Hartmann-Boyce et al., Grabovac et al. and JBI (57, 64, 65) all provided effect estimates for vaping products containing nicotine compared with:

- vaping products without nicotine
- behavioural or no support
- licensed NRT

Vaping products included in each RCT varied from:

- disposable 'cigalikes'
- reusable, rechargeable kits designed with replaceable cartridges
- a reusable, rechargeable kit designed to be refilled with liquid by the user

However, many are now outdated and in 2 trials, the vaping device had to be changed mid-trial as they were no longer available to purchase. Nicotine strengths ranged from 0mg/mL to 45mg/mL. No RCT included nicotine salts. Flavours were mostly limited to tobacco flavour. (See Appendix 8 for a summary of vaping products used in each RCT).

Vaping products containing nicotine compared with vaping products without nicotine

Six RCTs were included across the 3 reviews (Table 34). Hartmann-Boyce et al. (57) pooled results from 3 RCTs (87-89) and found that people randomised to receive a vaping product containing nicotine had higher quit rates than those randomised to receive a vaping product without nicotine. Confidence intervals indicated that potential effects could extend to include no benefit over vaping products without nicotine, but the effect size increased, and the confidence interval no longer included no difference, when one study with a high risk of bias was removed (89) (Table 34). Grabovac et al. (64) pooled results from 5 RCTs (87 to 91) and found higher quit rates in people randomised to vaping products containing nicotine than to those without nicotine. Both Hartmann-Boyce et al. and Grabovac et al. (57, 64) reported they were moderately certain of this evidence (based on their GRADE assessment). JBI (65) pooled results from 4 RCTs (87, 88, 91, 92); the effect estimate favoured vaping products containing nicotine but the confidence intervals included no difference. They rated the certainty of this evidence as very low. After JBI excluded a study by Felicione et al. (92), that included people

receiving treatment for opiate use disorder, the effect size increased and a significant difference was found in favour of vaping products containing nicotine.

Vaping products containing nicotine compared with behavioural support only/no support
Six RCTs were included across the 3 reviews (Table 35). Hartmann-Boyce et al. (57) pooled results from 4 studies (89, 93 to 95) and found that people randomised to vaping products containing nicotine had significantly higher quit rates than people who received behavioural support only or no support, but the certainty of the evidence was rated as very low (Table 35).

Grabovac et al. (64) pooled results from 2 RCTs (89, 94), whereas JBI (65) pooled results from 2 different RCTs (96, 97). In these trials, people randomised to receive a vaping product containing nicotine had higher quit rates than those randomised to receive behavioural or no support. However, wide confidence intervals indicated that potential effects could extend to include no benefit from vaping products containing nicotine over behavioural support or no support. Certainty of evidence was rated as low by JBI et al. (65), Grabovac et al. (64) combined behavioural support or no support and NRT studies in their GRADE rating, so did not produce a separate GRADE rating for the behavioural support only/no support comparison studies.

Vaping products containing nicotine compared with NRT
The same 3 RCTs (87, 98, 99) were included in each of the 3 reviews with similar effect estimates (Table 36); these showed that people randomised to vaping products containing nicotine had significantly higher quit rates than those randomised to NRT. There is a small discrepancy across the 3 reviews in the event rates for one of the RCTs (99) due to JBI reporting outcomes at 8-week follow up (CO validated) and Hartmann-Boyce et al. (57) and Grabovac et al. (64) reporting outcomes at the longest follow up (24-weeks and self-reported). Hartmann-Boyce et al. (57) rated the certainty of evidence as moderate and JBI (65) rated it as low. Grabovac et al. (64) combined NRT and behavioural support/no support in their GRADE rating, so did not produce a separate GRADE rating for the NRT comparison studies (Table 36).

Table 34: Vaping product containing nicotine vs vaping product without nicotine (1)

	Hartmann-Boyce 2020 (57)			**Grabovac 2020** (64)			**The Joanna Briggs Institute** (65)		
		Quit rate: nicotine VP	**Quit rate: non-nicotine VP**		**Quit rate: nicotine VP**	**Quit rate non-nicotine VP**		**Quit rate: nicotine VP**	**Quit rate: non - nicotine VP**
Studies meta analysed	Bullen 2013 Caponnetto 2013[a] Lucchiari 2020	21/289 22/200 13/70	3/73 4/100 11/70	Bullen 2013 Caponnetto 2013[a] Lucchiari 2020 Baldassarri 2018 Tseng 2016[b]	21/289 13/100 13/70 4/20 2/50	3/73 4/100 11/70 2/20 1/49	Bullen 2013 Caponnetto 2013[a] Felicione 2019 Tseng 2016[b]	21/289 22/200 0/14 2/50	17/29 4/100 2/11 1/50
Total events		56/559 43/489b	18/243 7/173b		53/529	21/312		45/553 45/539	10/234 8/223
% quit		10% 8.8%[c]	7.4% 4%[c]		10%	6.7%		8.1% 8.3%[d]	4.3% 3.6%[d]
Effect estimate RR (95%CI)	1.71 (1.00 – 2.92) (P=0.05) 2.27 (1.04 – 4.95) (P=0.04)[c]			1.71 (1.02 – 2.84)			1.84 (0.94 – 3.62) (P=0.08) 2.26 (1.08 – 4.73) (P=0.03)[d]		
Length of follow up (FU)	6 months or more (up to 52 weeks)			Longest FU (3 to 52 weeks)			Longest FU (3 to 52 weeks)		

Notes

[a] The discrepancy between the quit numbers for the nicotine VP participants in the Caponnetto study appear to be due to the Hartmann-Boyce and JBI reviews combining participants from 2 nicotine VP groups (7.2mg/mL VP for 12 weeks and 7.2mg/mL VP for 6 weeks), whereas the Grabovac review only included 1 nicotine VP group (7.2mg/mL VP for 12 weeks).

[b] The discrepancy in the denominators in the Tseng study appear to be due to the Grabovac review only including the number of participants assessed at baseline (n=49) whereas the JBI review included all recruited participants (n=50).

[c] After removing Lucchiari (RR not included in Hartmann-Boyce, but data accessible online).

[d] After removing Felicione (pts were people in treatment for opiate use).

Table 35: Vaping product containing nicotine vs behavioural support only/no support (BS/NS) (2)

	Hartmann-Boyce (2020) (57)			**Grabovac (2020)** (64)			**Joanna Briggs Institute (2019)** (65)		
		Quit rate: nicotine VP	**Quit rate: BS/NS**		**Quit rate: nicotine VP**	**Quit rate: BS**		**Quit rate: nicotine VP**	**Quit rate: NS**
Studies meta analysed	ISRCTN14140672[e] Halpern 2018 Holliday 2019 Lucchiari 2020	3/48 4/1199 6/40 13/70	0/32 0/813 2/40 7/70	Halpern 2018 Lucchiari 2020	4/1199 13/70	0/813 7/70	Adriaens 2014 Carpenter 2017	11/33 4/46	0/17 1/22
Total events		26/1357	9/955		17/1267	7/883		14/79	1/39
% quit		1.9%	0.9%		1.3%	0.8%		17.7%	2.5%
Effect estimate RR (95%CI)	2.50 (1.24 – 5.04) (P=0.01)			2.04 (0.90 – 4.64)			4.93 (0.97 – 25.19) (P=0.05)		
Length of follow up	6 months or more (up to 52 weeks)			Longest follow up (24 to 48 weeks)			Longest FU (8 to 16 weeks)		

Notes

[e] Hartmann-Boyce consider ISRCTN14140672 to be at a high risk of bias as the original planned randomisation was not achieved. Though the study is included in the meta-analysis, this high risk is taken into account in the certainty judgements for the relative comparisons. Removal of this study from this meta-analysis changes the event rates to VP: 23/1309 vs BS/NS: 9/923 (1.7% vs 1%) and the RR and 95% CI to 2.36 (1.14-4.86)

Table 36: Vaping product containing nicotine vs NRT (3)

	Hartmann-Boyce (2020) (57)			**Grabovac (2020)** (64)			**Joanna Briggs Institute (2019)** (65)		
		Quit rate: nicotine VP	**Quit rate: NRT**		**Quit rate: nicotine VP**	**Quit rate: NRT**		**Quit rate: nicotine VP**	**Quit rate: NRT**
Studies meta analysed	Bullen 2013 Hajek 2019 Lee 2018[f]	21/289 79/438 5/20	17/295 44/446 1/10	Bullen 2013 Hajek 2019 Lee 2018[f]	21/289 79/438 5/20	17/295 44/446 1/10	Bullen 2013 Hajek 2019 Lee 2018[f]	21/289 79/438 3/20	17/295 44/446 0/10
Total events		105/747	62/751		105/747	62/751		103/747	61/751
% quit		14.1%	8.3%		14.1%	8.3%		13.8%	8.1%
Effect estimate RR (95%CI)	1.69 (1.25 – 2.27) (P=0.0005)			1.69 (1.25 – 2.27)			1.69 (1.26 – 2.28)		
Length of follow up	6 months or more (up to 52 weeks)			Longest FU (24 to 52 weeks)			Longest FU (8 to 52 weeks)		

Notes

[f] The discrepancy between the quit numbers for Lee (2018) appear to be because JBI reported outcomes at 8-week follow up (CO validated) and Hartmann-Boyce and Grabovac reviews reported outcomes at 24-week follow up (self-reported)

Other comparisons

Hartmann-Boyce (57) and JBI (65) meta-analysed 2 RCTs (90, 100) and found that vaping products containing nicotine + NRT compared with vaping products without nicotine + NRT were more effective for helping people quit smoking (Table 37). Certainty of evidence was reported as low in the JBI (65) review and not reported by Hartmann-Boyce et al.(57).

Table 37: Vaping products containing nicotine + NRT vs vaping products without nicotine + NRT

	Hartmann-Boyce 2020 (57)			Joanna Briggs Institute 2019 (65)		
		Quit rate: nicotine VP + NRT	Quit rate: non-nicotine VP + NRT		Quit rate: nicotine VP + NRT	Quit rate: non-nicotine VP + NRT
Studies meta analysed	Baldassarri 2018 Walker 2020	4/20 35/500	2/20 20/499	Baldassarri 2018 Walker 2020	4/20 35/500	2/20 20/499
Total events		39/520	22/519		39/520	22/519
% quit		7.5%	4.2%		7.5%	4.2%
Effect estimate RR (95% CI)	1.77 (1.07 – 2.94) (P=0.03)			1.77 (1.07 – 2.94) (P=0.03)		
Length of follow up	6 months or more (up to 26 weeks)			Longest FU 24 to 26 weeks		

Hartmann-Boyce et al. (57) and JBI (65) reported quit rates for single RCTs comparing vaping products containing nicotine with varenicline; vaping products containing nicotine + NRT compared with NRT alone; vaping products without nicotine compared with NRT or combined with NRT compared with NRT alone, and vaping products containing nicotine +/or NRT +/or financial incentive vs usual care. No significant differences were found (see Appendix 9).

Hartmann-Boyce et al. (57) also included 8 uncontrolled studies published between 2011 and 2017 that included the provision of vaping products containing nicotine and assessment of abstinence at 6 months or longer (Appendix 5). Quit rates ranged from 14% to 44%. Six studies included vaping products with disposable or replaceable cartridges, one tested a refillable device and one was unspecified (96, 101 to 107). This review also included 3 RCTs, published in 2019 and 2020 that included the provision of

vaping products containing nicotine and assessment of abstinence that followed participants for less than 6 months (70 to 72) (see Table 32 and Table 38).

For the other reviews, Liu et al. (66) performed multiple fixed and random effects analyses for reduction, cessation, CO levels and adverse effects according to a number of factors such as history of cigarette smoking and length of time vaping in studies of different designs (cross sectional, longitudinal and one RCT). Cessation rates across 6 included studies with a total of 1,092 participants ranged from 13.2% to 22.9%; 48.8% to 58.7% reduced cigarette consumption by at least 50% relative to baseline. Maglia et al. (68) included 7 studies, with a total of 8,077 participants who were concurrent smokers and vapers. Smoking cessation rates ranged from 8% to 48% (with variable follow up lengths); 50% to 66% of participants in 2 included studies reduced their smoking by at least half, relative to baseline. Gentry et al. (67) conducted an extensive mixed method review of the effectiveness of vaping products among people with mental illness, substance use disorders and people who experience homelessness. Cessation rates among 133 participants across 4 studies ranged from 4.8% to 14.3% at the longest follow up. (See Appendix 5 for studies included in these reviews and where overlap occurred).

Appendix 3 includes a summary of additional outcomes reported across all reviews. Other outcomes assessed included adverse effects: the most commonly reported adverse effects were throat or mouth irritation, headache, cough, and nausea, which tended to reduce over time with continued vaping. Hartmann-Boyce et al. (57) included several other outcomes such as serious adverse effects, impact on cardiovascular and lung health and toxicant levels and is the most comprehensive overview of safety effects. They reported that overall incidence of serious adverse effects was low with no clear evidence of harm from nicotine vaping products, although confidence intervals were wide and encompassed clinically significant harm and benefit.

Randomised Controlled Trials

Quality and risk of bias in RCTs

The studies are of low to unclear risk of bias and ratings are included in Appendix 7a and Appendix 7b.

Vaping products used in RCTs

Participants were provided with either a rechargeable, prefilled replaceable cartridge kit or reusable, rechargeable kit designed to be refilled with liquid by the user. Nicotine strengths ranged from 0mg/mL to 48mg/mL. One study included a liquid with no added flavour (69), one offered tobacco flavour only (72), and the rest offered 2 or more flavours (70, 71). Supplies of vaping product were given for 1 to 12 weeks (Table 38).

Effect on cessation and reduction

Quit rates are only included in the study by Bonevski et al. (69) (Table 38). There was no significant difference in quit rates between the groups randomised to receive a vaping product or NRT at 6 or 12 week follow up (it is important to note that this was a feasibility study and was not powered to detect a difference between groups). Participants who did not quit significantly reduced their CPD within both groups, but there was no significant difference between groups. For 2 RCTs (71, 72) there was a significant reduction in CPD at 4 weeks follow up for participants who were randomised to groups that received a vaping product with instructions to completely substitute tobacco cigarettes with vaping products compared with other comparators. These RCTs were generally testing the safety of vaping products and were not primarily smoking cessation trials, so the results should be treated with caution. Additional outcomes including acceptability and effect on physical health parameters are included in Appendix 4a and Appendix 4b.

Table 38: Vaping products used and outcomes for randomised controlled trials (non-UK)

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
Bonevski et al. (2020) (69)	Reusable, rechargeable, refilled with liquid. 12mg/mL and 18mg/mL Unflavoured e-liquid.	1) 4-week supply of VP and 1-week initial supply of 21mg nicotine patches 2) Combination NRT (gum, lozenges and inhalators) supply for 12-weeks	Self-reported 7-day PP abstinence: Week 6: VP group 10% (n =5), NRT group 14% (n = 7), p < 0.63 Week 12: VP group 14% (n = 7), NRT group 18% (n = 9), p= 0.68 Self-reported 6-week continuous abstinence: Week 6: VP group 16% (n = 8), NRT group 24% (n = 12), p < 0.39 Week 12: VP group 18% (n = 9), NRT group 20% (n = 10), p < 0.87	CPDs (in non-quitters) VP group: week 6: 4.96 (p < 0.001), week 12: 4.72 (p < 0.001) NRT group: week 6: 5.24 (p < 0.001), week 12; 5.52 (p < 0.001)
Hatsukami et al. (2020) (70)	Reusable, rechargeable, prefilled cartridges: Vuse Solo. Started the trial with Blu (cartridge type) and Fin (prefilled tank) 48mg/mL	8-week supply Randomised to 4 groups i) ad libitum VP use (AD-E) ii) Complete substitution with VP (CS-E) iii) Complete substitution with NRT	No cessation outcomes reported.	Median change in CPDs: p < 0.001 Week 4: AD-E group -2.3 / CS-E group -12.3 / CS-NRT group -9.4 UB group -0.0

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
	Choice of tobacco, mint, menthol and berry flavours.	iv) Continue smoking usual brand of cigs (UB) VP groups given 7 cartridges per week with additional provided if needed. 2/4mg nicotine gum (mint, cinnamon and fruit flavours) or lozenge (mint or cherry flavours)		Week 8: AD-E group -2.7 / CS-E group -12.2 / CS-NRT group -9.6 /UB group -0.7 CO reduction (geometric means ratio): $p < 0.001$ Week 4: AD-E group 0.80 / CS-E group 0.38 / CS-NRT group 0.49 / UB group 0.84. Week 8: AD-E group 0.78 / CS-E group 0.42 / CS-NRT group 0.55 / UB group 0.85
Smith et al. (2020) (72)	Rechargeable, refillable ego-T 1100 mAh battery and disposable cartomizers (510 Smoketech, 1.5 dual coil) 18mg/mL Tobacco flavour. Three PG/ VG ratios	1-week supply (10 cartomizers) with financial incentive at the end of sampling period for attendance and diary completion. Randomised to receive 1 of 3 PG/VG ratios.	No cessation outcomes reported.	Mean CPDs: reduction for all groups ($p < 0.01$) 70/30 PG/VG group: 23% 50/50 PG/VG group: 17% 0/100 PG/VG group: 12% CO reduction: 70/30 group: 20% 50/50 group: 18% 0/100 group: 22%

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
Veldheer et al. (2019) (71)	Rechargeable, refillable (SmokTech cartomizer). 0, 8 or 36 mg/mL. Choice of tobacco or menthol flavour.	3-month supply 1) nicotine VP (3 arms assigned to 0, 8 or 36mg/mL) 2) cigarette substitute (non-nicotine plastic tube that resembles a cigarette)	No cessation outcomes reported.	Past 7-day mean change from baseline in CPDs: $p < 0.05$ 1 month: VP group: -8.2, cig substitute group: -4.8 3 months: VP group: -9, cig substitute group: -6 Unadjusted change from baseline in CO: 1 month: VP group -6, substitute group: -3.5 3 months: VP group: -4, substitute group: -4

Non-randomised intervention studies

Quality and risk of bias of non-randomised intervention studies

The quality of the reporting of the studies was generally good. The overall quality scores using MINORS are in Appendix 10. Most of the non-randomised studies were single group, before and after studies, which are inherently at a high risk of bias (risk of bias ratings are included in Appendix 11). Therefore, caution should be applied when interpreting the outcomes of these studies. However, single group before and after studies are often the first step in testing out novel interventions or with groups of people that traditionally get excluded from RCTs, such as those with mental health disorders. Such studies can provide proof of concept that an intervention has potential and can help guide researchers (and funders) about issues to consider when designing an RCT to evaluate the effect of a smoking cessation intervention.

UK studies

Vaping products used in non-randomised intervention studies

One study offered participants a choice of 3 devices, though these were not specified in the publication and could not be confirmed by the authors (73). In the other 3 studies (74 to 76) participants were offered one type of vaping product (either a disposable (75), a reusable, rechargeable kit designed with replaceable nicotine salt pods (74) or a reusable, rechargeable kit designed to be refilled with liquid by the user (76)) (Table 39). Three of the 4 studies included vaping products that were manufactured independently of the tobacco industry (73 to 75). Two studies offered participants one choice of nicotine strength (18 mg/mL in one case (74) which also appeared to be the only study that used nicotine salt pods and 45 mg/mL in another (75)) and the other 2 studies offered more than one choice (10 mg/mL or 16 mg/mL (73) and 0 mg/mL to 16 mg/mL (76)). One study offered participants tobacco flavour only (75), the others (73, 74, 76) offered 3 or more flavours. Vaping products were supplied from one to 3 months. The vaping product used in the Hickling et al. (75) study is no longer on the market in the UK (the 45mg/mL nicotine strength was chosen before implementation of the TPD (108)). Three studies included the assessment on cessation or reduction with a vaping product only (73, 74, 76), and 2 included participants who had used NRT only or NRT combined with a vaping product as comparison groups (74, 78) (Table 39). Participants in the studies by Coffey et al. (73) and Cox et al. (74) also received behavioural support from a trained stop smoking advisor.

Non-randomised intervention studies: effect on cessation and reduction

Among participants from 3 studies (73, 74, 76), quit rates ranged from 18% to 62% at 4 to 6 weeks after the start of the supply of a vaping product and was 7% at the end of a 6-week supply in the study including people with severe mental illness (75) (Table 39). Longer term quit rates included 37% at 3 month follow up (76) and 2% at 6 month follow up in the mental health study (75). All studies found a reduction in CPD relative to baseline in those who did not completely quit (Table 39). Additional outcomes including acceptability and effect on physical health parameters are included in Appendix 4b.

Non-UK studies

Vaping products used in non-randomised intervention studies

One study offered participants a choice of a cigalike or refillable device (78). In the other 7 studies (77, 79-85), participants were offered one type of vaping product (rechargeable, cigalike prefilled replaceable cartridge types or reusable, rechargeable kit designed to be refilled with liquid by the user). Four studies (79, 80, 82, 83) offered participants one choice of nicotine strength (18mg/mL to 26mg/m/L), 4 studies (78, 81, 84, 85) offered more than one choice (6mg/mL to 36mg/mL) and one asked participants to use their own liquid (77). Vaping products were supplied from one to 12 weeks. One study offered participants tobacco flavour only (85), the others (79-84) offered 2 or more flavours. Vaping products used in 2 studies were discontinued mid study (80, 83). Seven studies tested a vaping product only (77, 79, 81, 82, 84, 85), 2 also included licensed pharmacotherapy with the vaping product (78, 83) and one added contingency management (CM) (80) (Table 39).

Non-randomised intervention studies: effect on cessation and reduction

Short-term quit rates (approx. 1 to 8 weeks) among participants recruited from non-clinical settings ranged from 11% to 34%; among the participants living with HIV/AIDS, rates ranged from 14% to 36% (79, 85) whereas 10% of veterans attending a mental health centre quit smoking (84) (Table 39) Long term quit rates in one study (52 weeks) were 15.5% for participants using a cigalike vaping product and 26.4% for participants using a rechargeable refillable vaping product, though participants who were prescribed varenicline had higher quit rates (47%) (78). All studies that reported cigarettes per day reported some level of reduction, ranging from 20% to 80% relative to baseline, though it was not always clear if these reduction rates included people who had also quit (Table 39). Additional outcomes including acceptability, feasibility of use and adverse effect were consistent with findings from the systematic reviews (Appendix 4b.)

Table 39: Vaping products used and outcomes for non-randomised intervention studies

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
UK studies				
Coffey et al. (2020) (73)	Choice of 3 VP 10 mg/mL and 16 mg/mL Tobacco, menthol and mixed fruit	4 weeks Behavioural support Financial incentive to return for 4-week follow up assessment	CO verified: 4 weeks after quit date: 37.5% (n=383)	In non-quitters, CPD reduced from 19.1 to 8.7 (55.5% reduction)
Cox et al. (2019) (74)	Reusable, rechargeable with replaceable pods (Mylo) 18 mg/mL (nicotine salts). Choice of 9 flavours (for example tobacco, menthol, fruits, desert, liquorice)	6-week supply Choice between VP, NRT or combination of both with standard behavioural support. NRT choice: Gum: (2-6 mg) or Lozenge (1-4 mg) or Inhalator (15 mg) or Spray/mouth spray (1 mg) or Patch (10-25 mg)	Self-reported: 4 to 6 weeks after quit date VP only: 62.2% (n = 23) VP with NRT group: 61.5% (n = 8) NRT only group: 34.8% (n = 22) Mean CO (where available) at 4 to 6 weeks: VP only: reduced from 12.9(SD 5.0) to 1.9 (SD 1.6) VP with NRT group: Reduced from 17.5 (SD 13.6) to 2.4 (SD 2.0)	Not reported

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
			NRT only group: reduced from 13.6 (SD 7.6 to 3.1 (SD 1.7) Odds of quitting with VP compared with NRT only increased by 3.2; odds of quitting with VP + NRT increased by 3.1 (no CIs reported)	
Hickling et al. (2019) (75)	One-time disposable 'cigalike' (NJOY) 45 mg/mL Tobacco	6-weeks supply Participants were encouraged to replace smoking with VP	CO validated: End of 6-week supply: 7% (4/50) Week 10 FU: 5% were non-daily smokers Week 24 FU: 1 completely quit, 1 became a non-daily smoker	In non-quitters, % who achieved 50% or higher reduction in CPD: End of 6-week supply=37% (p<0.001) 10 weeks after baseline=26% (p<0.001) 24 weeks after baseline =25% (p<0.001)
McKeganey et al. (2018) (76)	Reusable, rechargeable, refilled with liquid (Blu Pro) Choice of 0mg- 16 mg/mL depending on flavour.	Up to 90-days supply. Free kit and 3 x 10 mL e-liquid bottles, then reimbursement of £30/month/participant for Blu refills (the cost of 6 refill	Self-reported PP: 30 day FU: 18.5% (n = 12, p < 0.001) 60 days FU: 25.4% (n = 17)	CPD, median (range): (p < 0.001) Baseline: 15 (2-30) 30 days: 3 (1-20) 60 days: 4 (1-25)

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
	Choice of 6 flavours (tobacco, menthol, mint, blueberry, cherry, strawberry)	bottles per month). Training on how to assemble/charge/use VP.	90 days FU: 36.5% (n = 23, p < 0.002)	90 days: 5 (1-20) Number of days smoked; median (range) (p < 0.001) Baseline: 30 (3-30) 30 days: 15 (1-30) 60 days: 10 (1-30) 90 days: 30 (1-30)
Non-UK				
Blank et al. (2019) (77)	Reusable, rechargeable, refilled with liquid, connected to smartphone app to measure device use; participants used own e-liquid. Switched to 'conventional' VP after 12 weeks	Instruction how to assemble VP but not about frequency and intensity of use.	Self-reported 7-day PP at 1 and 8 week FU: 18.2% (n = 2)	Smoking reduction 1 week FU: 66% reduction in CPD in 6 participants.
Caponnetto et al. (2019) (78)	Rechargeable with replaceable cartridges 'Cigalike' Reusable, rechargeable, refilled with liquid (Personal vaporizer)	12-week supply of VP + motivational interviewing (MI) 4 other groups received MI, with either bupropion; bupropion and NRT; NRT only; or varenicline	CO validated 52-week PP: Cigalike + MI: 15.8% (n = 20) Vaporizer + MI: 26.4% (n = 27) BPR + MI: 35.2% (n = 18) BPR + NRT + MI: 30.2% (n = 36)	Overall % who achieved 20% reduction in CPD: 89% (n = 527)

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
	6 mg/mL- 18 mg/mL depending on CPD. Flavours not reported		NRT + MI: 23.4% (n = 19) Varenicline + MI: 46.8% (n = 52)	
Cioe et al. (2020) (79)	Reusable, rechargeable, refilled with liquid (Ce6 eGo-T (3.3 volt, 1100 mAh batteries with 6-10 1.5Ω, dual coil XL) with 510-style. Smoketech cartomizer with 30/70 PG/VG. 18 mg/mL Choice of 3 tobacco flavours, mint and fruit	8-week supply. 2 VPs at 1st visit and weekly e-liquid, sufficient to replace daily CC use. Instruction on how to use VP, including how to puff. At each visit, feedback on outcome changes provided. List of smoking cessation resources and compensation for completed visits were also provided.	CO validated at end of 8-week supply: 36% quit (n=7) Mean CO: Week 8: 6.7 (SD 5.7, p < 0.001) Week 12: 6.7 (SD 3.9, p < 0.001)	Overall mean CPD was reduced by more than 80% from 15.1 (SD = 9.6) at baseline to 1.79 (SD = 2.2) at week 8 (p< .001), and 2.44, (SD, 4.01) (p< .001) at week 12.
Martner and D'alleryl (2019) (80)	Reusable, rechargeable, refilled with liquid (Smokio): with Bluetooth to connect to a smartphone. Reusable, rechargeable, refilled with liquid (Joyetech eMode) EC with data monitoring via myVapors	36-day supply Written info on smoking cessation. Instruction on how to use VP and collect data on an online platform Contingency Management:	CO validated PP at end of 36 days (4ppm or less): VP: 34.4% (n = 4) VP- CM: 30.4% (n = 3)	CO-validated reduction (more than 4ppm): 66.6% (n = 8)

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
	software. Replaced Smokio EC from May 2016. 24 mg/mL Tobacco, menthol	escalating incentives for CO of 4 ppm or less. Participants earned $1.00 for the first negative sample, and the amount increased by $0.05 for each consecutive negative sample		
Pulvers et al. (2018) (81)	Reusable, rechargeable, refilled with liquid kit 2 e-Go C batteries (3.7 volts/650 MaH), 12 mg/mL or 24 mg/mL Choice of 7 flavours: tobacco, mint, fruit, candy, sweets, chocolate, and drink/soda	2 week supply, 4 weeks of support including brief education and training about how to use VP, referral to quit line at week 4	CO validated Week 2: 40% (n =16) Week 4: 15% (n = 6) Mean CO Baseline: 14.28 (12.7) Week 4: 8.93 (8.4) (p<0.001)	Mean CPD Baseline: 8.8 (SD 6.5) Week 4: 4.42 (SD 4.1)
Rohsenow et al. (2018) (82)	Reusable, rechargeable, refilled with liquid (Smoktech cartomizer; dual coil, 1.5 1.8Ω, size XL) and eGo batteries, 3.3V, 1100 mAh, with 1 mL capacity) 18 mg/mL	6-week supply Training on how to use EC, with FU training sessions. Weekly meetings for assessment and problem-solving for VP	CO-validated, 7-day PP (< 6 ppm): Weeks 6, 8, 10: 11% (n = 2) Mean CO: (reduced by 45% from baseline, p < .001) Baseline: 17.3 (SD 6.1)	% who achieved 50% or more reduction in CPD: Week 6: 61% (n = 11) Week 10: 53% (n = 9) Mean CPD: Baseline: 19.6 (SD 8.2) Week 6: 6.7 (SD 7.9, p < 0.0001)

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
	Flavour options included tobacco, menthol, chocolate dessert and mixed fruit flavours.		Week 6: 9.7 (SD 6.9, p < 0.001) Week 10: 11.3 (SD 6.4, p < 0.004)	Week 10: 8.8 (SD 8.3, p < 0.005) Mean FTCD: Baseline: 5.9 (SD 2.0) Week 6: 3.9 (SD 2.8, p < 0.001) Week 10: 3.5 (SD 3.1, p < 0.001)
Truman (2018) (83)	Rechargeable with replaceable cartridges 'Cigalike' Liberro Realis brand). Discontinued during study and replaced with a similar model. 18 mg/mL Menthol, tobacco	Each patient given EC supply during a 1-week ward stay. NRT (patch, gum) also offered	CO validated at end of 1 week: VP group: 27% (n = 6/34). NRT group: 12.5% (n = 3/28)	CPD median (range): VP group: Baseline: (range) 3.5 (0-10) Day 7: 3 (0-6) NRT group: Baseline: 3 (0-19) Day 7: 1 (0-6)
Valentine et al. (2018) (84) DeVito et al. (2019) (86)	Reusable, rechargeable, refilled with liquid (eVic Supreme; C3 triple coil atomizer 1.8 Ω.) with software connection for data monitoring. 12 mL-27 mg/mL	4-week supply Choice of trying different nicotine/flavours combinations.	CO-validated, PP: 4-week FU: 10% (n = 3, p < 0.02). Mean CO: Baseline: 9.2ppm End of 4-week supply: 7 ppm (p < 0.01)	Mean CPD: Baseline: 16.2 End of 4-week supply: 5.9 4-week FU: 9 (p < 0.001)

Authors	Vaping product details (type; brand; nicotine strength; flavours)	Supply and support given	Cessation outcomes (%, (n) quitters)	Reduction outcomes
	E-liquid with 50/50 PV/PG available in menthol and tobacco flavours		4-week FU: 8.5ppm Mean FTND: Baseline: 4.9 4-week FU: 3.5 ($p < 0.003$)	
Yingst et al. (2019) (85)	Rechargeable with replaceable cartridges 'Cigalike' (Blu) 24 mg/mL 70/30 PG/VG. Tobacco flavour Reusable, rechargeable, refilled with liquid (eGO, button-operated device). 36 mg/mL 70/30 PG/VG Tobacco flavour	3-week supply of both types, of VP, with 7-day washout period between. Participants also provided with paper daily dairy to record CPD and smoking behaviour.	Self-reported 5-day PP abstinence at end of 3 weeks 14% (n = 1/17) (eGO) Mean CO: Blu: Baseline: 22.4 ppm (SD 12.8) FU: 18.1 (SD 13.8, $p = 0.07$) eGO: Baseline: 24.1 (SD 12.2) FU: 18.4 (SD 13.8, $p = 0.03$)	Mean CPD: Blu: Baseline: 14.4 (SD 7.4) FU: 7.5 (SD 5.4) – 48% reduction ($p < 0.01$). eGO: Baseline: 16.3 (SD 6.9) FU: 7.3 (SD 6.4) – 55% reduction ($p < 0.01$) No significant differences between cigalike and button-operated device

Summary

Three systematic reviews and meta analyses consistently found that vaping products that contain nicotine are more effective for helping people stop smoking than NRT. This finding is supported by 2 non-randomised studies that included NRT as a comparison group. Quit rates from one recently published RCT to assess the feasibility of providing vaping products to people discharged from a residential substance misuse service, were comparable to those of people provided with NRT.

There were inconsistencies between effect estimates from each of the 3 meta analytical reviews about whether vaping products with nicotine are more effective than those without nicotine or behavioural support, though the effect estimates were strengthened, in favour of vaping products containing nicotine, when studies at high risk of bias were excluded.

Quit rates among the non-randomised studies, most of which were single group before and after studies and therefore inherently biased, ranged from 7 to 36% in participants with a clinical condition (mental illness, substance misuse, HIV/AIDS) and 11 to 62% in non-clinical participants.

5.6 Conclusions

Summary of key findings

From nationally representative survey data (STS)

Using a vaping product remains the most popular aid used in a quit attempt. In 2020, 27.2% of people used a vaping product in a quit attempt in the previous 12 months, compared with 15.5% who used NRT over the counter or on prescription (2.7%) and 4.4% who used varenicline.

Vaping is positively associated with quit success. In 2017 over 50,000 smokers stopped smoking with a vaping product, who would otherwise have carried on smoking.

Prescription medication and the licensing of NRT for harm reduction were also positively associated with successfully quitting smoking. This shows how important it is for people who smoke have access to a wide choice of cessation aids.

The extensive use of vaping products in quit attempts in comparison with licensed medication suggests vaping products may reach more people who smoke and so have more impact than NRT and varenicline.

From English stop smoking services data

Between April 2019 and March 2020, 221,678 quit dates were set with a stop smoking service and 114,153 (51%) of these led to self-reported quits 4 weeks after the quit date.

A vaping product was used in 5.2% of quit attempts. This was either using the vaping product alone, at the same time, or following use of a licensed medication.

Consistent with findings of our previous reports, the highest quit rates (74%) were observed when the quit attempt involved the use of a licensed medicine and a vaping product one after another.

Quit rates were similar with a vaping product and licensed medication at the same time (60.0%), a vaping product alone (59.7%) and varenicline alone (59.4%).

Quit rates involving the use of a vaping product were higher than any other method in every region on England. These ranged from 49% in the South West to 78% in Yorkshire and the Humber.

An ASH survey of tobacco control leads found that only 11% of local authority stop smoking services offered vaping products to some or all people making a quit attempt.

From systematic review data

We synthesised data from 6 systematic reviews, 4 RCTs and 13 additional non-randomised studies published since our 2018 evidence review.

Three systematic reviews and meta-analyses of moderate to high quality included 15 RCTs that evaluated the effect of vaping on smoking cessation or reduction.

The 3 systematic reviews consistently found vaping products containing nicotine were significantly more effective for helping people stop smoking than NRT. This finding was supported by 2 non-randomised studies that reported higher quit rates of people using a vaping product who attended a stop smoking service, compared with those who used NRT.

Findings of meta-analyses of RCTs were inconclusive about whether vaping products with nicotine are more effective than those without nicotine or behavioural support. However, when studies of high risk of bias were excluded the pooled results of RCTs suggested that nicotine containing vaping products were more effective.

Quit rates among participants in the non-randomised studies ranged from 7 to 36% in participants with a clinical condition (mental illness, substance misuse, HIV/AIDS) and from 11% to 62% in people recruited from non-clinical settings. It is important to note that most of these non-randomised studies were single group before and after studies and so were inherently biased.

Many of the vaping products used in the RCTs included in the systematic reviews are now outdated and used low nicotine strength. In most studies, tobacco flavour was the most common e-liquid flavour offered and participants were not given the choice of

flavours. No RCT and only one non-randomised intervention study included a vaping product with nicotine salts.

5.7 Implications

Studies continue to show that tens of thousands of smokers stopped as a result of vaping in 2017, similar to estimates in previous years.

Compared to our 2018 report, there is stronger evidence in this year's report that nicotine vaping products are effective for smoking cessation and reduction.

As suggested in our previous reports (5, 6), combining vaping products (the most popular source of support used by people making a quitting in the general population), with stop smoking service support (which is the most effective type of support), should be an option available to all people who want to quit smoking.

Local authorities should continue to fund and provide stop smoking services and all stop smoking services should have a consistent approach to the use of vaping products.

Further research is needed to assess whether smokers who use stop smoking services and vaping products differ from smokers who use the services and other smoking cessation aids.

Further research is needed into the barriers and enablers to using vaping products as part of a supported quit attempt in stop smoking services.

More studies are needed which include newer types of vaping products that have better nicotine delivery.

As we have stated in previous reports, the strict inclusion and exclusion criteria of RCTs mean that they do not apply to many people in real-world clinical settings or people in the general population who smoke or vape. Most RCTs require strict adherence to particular intervention measures (for example, type, dose, duration and frequency) which also does not reflect what happens in real life.

Vaping technology has become more sophisticated and varied, and the people who vape have become more heterogeneous. So, new and flexible ways of conducting observational studies and RCTs are needed to allow for user experimentation (for example trial and error of different types of vaping products, allowing for changes in preferences over time).

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Appendices

Appendix 1: Full search terms for each database

2015 report

(("2014/01/01"(Date - Publication) : "3000"(Date - Publication))) AND (((((((e-cigarette) OR Electronic cigarettes) OR e-cig*) OR electronic cig*) OR ENDS) OR electronic nicotine delivery systems) OR electronic nicotine delivery system) OR ((Nicotine) AND Vap*)).

2018 report

The literature search was based on the search developed and used in the 2015 PHE report. Two terms within the search were updated. The terms “ENDS” and “Vap*” were both combined with the term “nicotine” because of their use in non-nicotine fields.

(("2015/01/01"(Date - Publication): "3000"(Date -Publication))) AND (((((((e-cigarette) OR Electronic cigarettes) OR e-cig*) OR electronic cig*) OR (ENDS AND Nicotine)) OR electronic nicotine delivery systems) OR electronic nicotine delivery system) OR ((Nicotine) AND (Vaping* OR Vape* OR Vaporiz* OR Vaporis* OR Vapouris*)). The term "(2015/01/01"(Date - Publication): "3000"(Date -Publication))” limits the search to all literature published after 1 January 2015 to the day of the search.

2021 report

For Ovid databases

1. ((cut* down or cut-down) OR ((smok* OR tobacco) adj3 (reduc* or quit* or stop* or abstin* or abstain* or cessat*)) OR (taper*) OR (controlled smoking) OR (exp smoking reduction/) OR (smoking reduction))
2. ((smoking cessation) OR (exp smoking cessation/) OR (exp smoking cessation program/) OR ((exp smoking/) AND ((quit* or stop* or ceas* or cessat* or prevent*) adj3 smok*)))
3. (exp Electronic Cigarettes/) OR (e-cig*) OR (electronic cig*) OR (ENDS AND Nicotine) OR (electronic nicotine delivery system*) OR ((Nicotine) AND (Vaping* OR Vape* OR Vapor* OR Vapouris*))
4. (letter or editorial or (conference abstract or conference paper or conference proceeding or "conference review"))
5. 1 OR 2
6. 3 AND 5
7. 6 NOT 4

As one:
((((cut* down or cut-down) OR ((smok* OR tobacco) adj3 (reduc* or quit* or stop* or abstin* or abstain* or cessat*)) OR (taper*) OR (controlled smoking) OR (exp smoking

reduction/) OR (smoking reduction)) OR ((smoking cessation) OR (exp smoking cessation/) OR (exp smoking cessation program/) OR ((exp smoking/) AND ((quit* or stop* or ceas* or cessat* or prevent*) adj3 smok*)))) AND ((exp Electronic Cigarettes/) OR (e-cig*) OR (electronic cig*) OR (ENDS AND Nicotine) OR (electronic nicotine delivery system*) OR ((Nicotine) AND (Vaping* OR Vape* OR Vapor* OR Vapouris*)))) NOT (letter or editorial or (conference abstract or conference paper or conference proceeding or "conference review"))

For Embase

((((cut* down or cut-down) OR ((smok* OR tobacco) adj3 (reduc* or quit* or stop* or abstin* or abstain* or cessat*)) OR (taper*) OR (controlled smoking) OR (exp smoking reduction/) OR (smoking reduction)) OR ((smoking cessation) OR (exp smoking cessation/) OR (exp smoking cessation program/) OR ((exp smoking/) AND ((quit* or stop* or ceas* or cessat* or prevent*) adj3 smok*)))) AND ((exp Electronic Cigarettes/) OR (e-cig*) OR (electronic cig*) OR (ENDS AND Nicotine) OR (electronic nicotine delivery system*) OR ((Nicotine) AND (Vaping* OR Vape* OR Vapor* OR Vapouris*)))) NOT (letter or editorial or (conference abstract or conference paper or conference proceeding or "conference review"))

For PsycINFO

((((cut* down or cut-down) OR ((smok* OR tobacco) adj3 (reduc* or quit* or stop* or abstin* or abstain* or cessat*)) OR (taper*) OR (controlled smoking) OR (exp smoking reduction/) OR (smoking reduction)) OR ((smoking cessation) OR (exp smoking cessation/) OR (smoking cessation program) OR ((exp tobacco smoking/) AND ((quit* or stop* or ceas* or cessat* or prevent*) adj3 smok*)))) AND ((exp Electronic Cigarettes/) OR (e-cig*) OR (electronic cig*) OR (ENDS AND Nicotine) OR (electronic nicotine delivery system*) OR ((Nicotine) AND (Vaping* OR Vape* OR Vapor* OR Vapouris*)))) NOT (letter or editorial or (conference abstract or conference paper or conference proceeding or "conference review"))

For Medline

((((cut* down or cut-down) OR ((smok* OR tobacco) adj3 (reduc* or quit* or stop* or abstin* or abstain* or cessat*)) OR (taper*) OR (controlled smoking) OR (exp smoking reduction/) OR (smoking reduction)) OR ((smoking cessation) OR (exp smoking cessation/) OR (smoking cessation program) OR ((exp smoking/) AND ((quit* or stop* or ceas* or cessat* or prevent*) adj3 smok*)))) AND ((exp Electronic Cigarettes/) OR (e-cig*) OR (electronic cig*) OR (ENDS AND Nicotine) OR (electronic nicotine delivery system*) OR ((Nicotine) AND (Vaping* OR Vape* OR Vapor* OR Vapouris*)))) NOT (letter or editorial or (conference abstract or conference paper or conference proceeding or "conference review"))

For PubMed

1. ((cut* down or cut-down) OR ((smok* OR tobacco) adj3 (reduc* or quit* or stop* or abstin* or abstain* or cessat*)) OR (taper*) OR (controlled smoking) OR ("Smoking Reduction"(Mesh)) OR (smoking reduction))

2. ((smoking cessation) OR ("Smoking Cessation"(Mesh) OR "Smoking Cessation Agents"(Mesh) OR "Tobacco Use Cessation Devices"(Mesh) OR "Smoking Cessation Agents" (Pharmacological Action)) OR (("Smoking"(Mesh)) AND ((quit* or stop* or ceas* or cessat* or prevent*) adj3 smok*)))
3. ("Electronic Nicotine Delivery Systems"(Mesh)) OR (e-cig*) OR (electronic cig*) OR (ENDS AND Nicotine) OR (electronic nicotine delivery system*) OR ((Nicotine) AND (Vaping* OR Vape* OR Vapor* OR Vapouris*))
4. 1 OR 2
5. 3 AND 4

As one:
(“cut* down” or “cut-down” OR ((smok* OR tobacco) adj3 (reduc* or quit* or stop* or abstin* or abstain* or cessat*)) OR taper* OR “controlled smoking” OR "smoking reduction"(Mesh) OR “smoking reduction” OR “smoking cessation” OR "smoking cessation"(Mesh) OR "Tobacco Use Cessation Devices"(Mesh) OR "Smoking Cessation Agents"(Pharmacological Action) OR (Smoking(Mesh) AND (quit* or stop* or ceas* or cessat* or prevent*))) AND ("Electronic Nicotine Delivery Systems"(Mesh) OR e-cig* OR “electronic cig*” OR (ENDS AND Nicotine) OR “electronic nicotine delivery system*” OR (Nicotine AND (Vaping* OR Vape* OR Vaporiz* OR Vaporis* OR Vapouris*)))

For CINAHL (searched using EBSCO host Research Databases interface)

1. ((cut* down or cut-down) OR ((smok* OR tobacco) adj3 (reduc* or quit* or stop* or abstin* or abstain* or cessat*)) OR (taper*) OR (controlled smoking) OR (smoking reduction))
2. ((smoking cessation) OR (MM “Smoking Cessation”) OR (MM Smoking Cessation Programs) OR (“Smoking Cessation Assistance (Iowa NIC)”) OR ((MH smoking+) AND ((quit* or stop* or ceas* or cessat* or prevent*) adj3 smok*)))
3. (exp Electronic Cigarettes/) OR (e-cig*) OR (electronic cig*) OR (ENDS AND Nicotine) OR (electronic nicotine delivery system*) OR ((Nicotine) AND (Vaping* OR Vape* OR Vapor* OR Vapouris*))
4. 1 OR 2
5. 3 AND 4

As one:
(((cut* down or cut-down) OR ((smok* OR tobacco) adj3 (reduc* or quit* or stop* or abstin* or abstain* or cessat*)) OR (taper*) OR (controlled smoking) OR (smoking reduction)) OR ((smoking cessation) OR (MM “Smoking Cessation”) OR (MM Smoking Cessation Programs) OR (“Smoking Cessation Assistance (Iowa NIC)”) OR ((MH smoking+) AND ((quit* or stop* or ceas* or cessat* or prevent*)))) AND ((exp Electronic Cigarettes/) OR (e-cig*) OR (electronic cig*) OR (ENDS AND Nicotine) OR (electronic nicotine delivery system*) OR ((Nicotine) AND (Vaping* OR Vape* OR Vapor* OR Vapouris*)))

Embase, PsycINFO and Medline were each searched individually through Ovid. All searches were conducted on the same day (14/07/2020)

Database	**Number of hits**
Embase	2,876
Medline	2,326
PsycINFO	960
PubMed	3,237
CINHAHL	1,713

Appendix 2: Details of protocols of systematic reviews for smoking cessation registered on PROSPERO

Authors	ID	Title	Outcome of contact
Bandara et al., 2018	CRD42018095807	Electronic cigarettes for tobacco cessation: an overview of systematic reviews	No reply.
Bhadrirajuand Glantz, 2019	CRD42019128465	How does e-cigarette use in adults affect cigarette smoking cessation in real-world and clinical settings? An updated systematic review and meta-analysis.	No reply.
Kim et al., 2018	CRD420181115674	A systematic review investigating associations between e-cigarette use among cigarette smokers and changes in continued cigarette smoking	No reply.
Kleykamp and Kim, 2018	CRD42018078252	Evaluation of the methodological and reporting quality of systematic review examining e-cigarette use	Project interrupted.
Lee, 2016	CRD42016036761	Effectiveness of electronic cigarettes for smoking cessation in clinical research settings: a systematic review and meta-analysis	Project interrupted.
O'Dowd, 2019	CRD42019127882	An adapted systematic review of the effectiveness of electronic nicotine delivery systems (ENDS) for smoking cessation; a review of randomized control trials and prospective cohort studies	No reply.
Spanakis et al., 2020	CRD42020166607	Smoking cessation in severe mental illness: what works – second update	Not published yet.
Stanbrook et al., 2014	CRD42014013967	Efficacy and safety of electronic cigarettes for smoking cessation	Intersected by Cochrane Collaboration and chose not to proceed further.

Appendix 3: Additional reported results from systematic reviews

Authors	Additional reported results
Systematic reviews including a meta-analysis	
Hartmann-Boyce et al. (2020)	Adverse events at 4 weeks to 6 months, assessed by self-report (anticipated absolute effects) Nicotine VP compared to NRT (at 4 to 6 months): NRT 45/100, nicotine VP 44/100; RR 0.98 (95% CI 0.80-1.19) Nicotine VP compared to non-nicotine VP (at 1 to 6 months): Non-nicotine VP 35/100, nicotine VP 35/100; RR 1.00 (95% CI 0.73-1.36) Nicotine VP compared to BS/NS (at 12 weeks to 6 months): BS/NS 60/100, nicotine VP 70/100; RR 1.17 (95% CI 1.04-1.31) Serious adverse events, assessed via self-report and medical records: (anticipated absolute effects) Nicotine VP compared to NRT (at 4 weeks to 1 year): NRT 5/100, nicotine VP 7/100; RR 1.37 (95% CI 0.77-2.41) Nicotine VP compared to non-nicotine VP (at 1 to 6 months): Non-nicotine VP 2/100, nicotine VP 0/100; RR 0.25 (95% CI 0.03-2.19) Nicotine VP compared to BS/NS (at 12 weeks to 6 months): BS/NS 1/100, nicotine VP 1/100; RR 1.33 (95% CI 0.25-6.96) Nicotine VP vs NRT: Data are also included about cardiovascular effects in one study (Hatsukami 2020), lung function (Lee 2018) and toxicant levels (Hatsukami) 2020; lung function (Walele 2018); toxicants (Hatsukami, Walele 2018; Carpenter 2018); Nicotine VP vs non-nicotine: Data are included on heart and lung function in one study (Caponnetto 2013) Nicotine vs BS/NS: Data are included on cardiovascular health (Hatsukami 2020) Comparisons based on nicotine dose: no significant changes in CO, heart rate, blood pressure or lung function.

Authors	Additional reported results
Grabovac et al. (2020)	Differences in willingness to quit smoking: 6 studies indicated motivation to quit or willingness as inclusion criterion; 4 stated that inclusion criteria were not wishing or not intending to quit. Urine cotinine: reported by one included study Saliva cotinine: reported by 3 of the included studies.
The Joanna Briggs Institute (2019)	Adverse events: commonly mild effects such cough, dry or irritated mouth or throat, headache, nausea and insomnia. One study did not report adverse events.
Liu et al. (2018)	Adverse events: most common adverse effects were cough, mouth or throat irritation, anxiety, depressed mood, nausea and insomnia; self-report of adverse events higher ($p < 0.05$) in web-based surveys (74.3%) compared to experimental studies (40.3%); participants vaping more than 3 cartridges per day had higher incidence of adverse events (pooled rate 63.8%); more than 12 months of VP use had a higher rate of adverse events (pooled rate 55.0%).
Systematic reviews without meta-analysis	
Gentry et al. (2019)	Adverse events: no serious adverse events reported; adverse event counts similar between nicotine VP, non-nicotine VP and NRT. Side effects: cough, headache and throat irritation commonly reported. Barriers and facilitators (COM-B): Physical capability: physical access, safe operation and supply maintenance were barriers to VP use; assistance from family/carers and VP design a solution. Psychological capability: VPs considered less harmful than CCs and an alternative for cessation and reduction. Physical opportunity: balancing VP personalisation with affordability was considered important; VP use where smoking was forbidden was a facilitator.

Authors	Additional reported results
	Social opportunity: fear of reversal of de-normalisation of smoking; social acceptability (family, friends, online posters) facilitated VP initiation. Automatic motivation: physical side effects a barrier; visible vapour from VP provided a different experience from NRT. Mixed views on VP appearance and flavour. Reflective motivation: concerns about sustaining/worsening habit a barrier; VPs perceived to have both positive and negative effects on psychiatric symptoms and medication side effects; VPs more desirable than NRT; ability to take charge of nicotine addiction facilitated by ability to choose and personalise device; some considered VPs as an alternative to CCs.
Maglia et al. (2018)	VP appeal and client motivation may provide better treatment compliance compared to pharmacotherapies and NRT (sensorimotor characteristics, socioeconomic factors, convenience and mild side effects). Dual users more likely to use VPs in hedonic situations, to relieve stress or when CCs are not allowed.

Notes:
BS: behavioural support; CC: combustible cigarette; CI: confidence interval; CO: expired carbon monoxide, in parts per million; COM-B: Capability, Opportunity, Motivation model of behaviour NS: no support; NRT: nicotine replacement therapy; RCTs: randomised controlled trials; RR: risk ratio; VP: vaping product.

Appendix 4a: Additional reported results from a randomised controlled trial (non-UK)

Authors	Additional reported results
Bonevski et al. (2020)	Treatment adherence (assuming dropouts were no longer using): NVP group: 64% used the device at week 6, 48% at week 12 NRT group: 40% at week 6, 34% at week 12 Acceptability: “Effective at reducing my cravings”: NRT 61.5% (lozenge), 93.3% (inhalator); NVP: 91.7% “Easy to use”: NRT 91.7% (nicotine gum), 100% (patches, lozenge, inhalator, mouth spray); NVP 91.7% “Enjoyable to use”: NRT 16.7% (nicotine gum), 93.3% (inhalators); NVP 75% Frequency of strong cravings: “hourly to several times a day” NVP group: 52% at week 6, 48% at week 12; NRT group: 58% at week 6, 40% at week 12 Withdrawal symptoms (Minnesota Nicotine Withdrawal Scale): total scores fell at weeks 6 and 12 for both groups, with no significant differences between groups. Psychological distress (K10 scores): significant reductions for both groups ($p < 0.001$) with no significant differences between groups. Adverse events: no adverse or serious adverse events classified as probably or definitely caused by study products NVP group: 15 participants reported 19 adverse events; one serious adverse event. NRT group: 10 participants reported 14 adverse events Quitline calls: no differences by group.

Appendix 4b: Additional reported results from non-randomised intervention studies

Authors	Additional reported results
UK Studies	
Coffey et al. (2020)	Significant differences in quit rates by provider type: 76% pharmacy provider, 57.3% for community provider; community providers more likely to retain participants at FU. Community group participants significantly older, more likely to be sick or disabled, less likely to be home carers and less likely to be unemployed ($p < 0.001$). Community group participants more likely to have tried VP before ($p = 0.001$) – repeated attempt. Significant difference for age group and likelihood to have quit at FU: 18-24 73.1%, 55-64 55.9% Occupational status sick and disabled" less likely to quit at FU.
Cox et al. (2020)	Exposure to smoke: Smoke-free home: NRT 56%, VP with NRT 53%, VP alone 58% Smoke-free car: NRT 60%, VP with NRT 30%, VP alone 52% Others in household smoke: NRT 21%, VP with NRT 46%, VP alone 42% Children at home: NRT 27%, VP with NRT 15%, VP alone 12% Reasons for quitting: Worried about health: NRT 100% (n = 65), VP with NRT 100% (n = 13), VP alone 100% (n = 37) Family benefit: NRT 26% (n = 17), VP with NRT 15% (n = 2), VP alone 12% (n = 4) FTCD: NRT 4.45 (SD 1.84), VP with NRT 4.85 (SD 1.95), VP alone 4.37 (1.40)

Authors	Additional reported results
Hickling et al. (2019)	VP acceptability: 82.6% perceived VP less harmful than CC 41.3% said they would like to use VPs more and CCs less Predictors of VP use: significant association between smoking reduction at week 10 and agreement with the statement “the more I smoke, the more I risk my health” compared to baseline (p = 0.025) No significant associations between reduction and age, CPD at baseline, years smoking, years since first contact with mental health services, gender, occupation, qualification, motivation to quit and PANSS. Adverse effects: Effects such as throat irritation (n = 13), dry cough (n = 9) and dry mouth (n = 7) reported by participants. No significant changes in reporting of adverse effects from baseline (p > 0.05). Respiratory symptoms: no significant changes in respiratory symptoms and FEV1 between reducers and non-reducers (p > 0.005). PANSS, CDSS: no significant differences between reducers and non-reducers (p > 0.05). Serious adverse events: 5 psychiatric hospitalisations due to worsening of psychotic symptoms (n = 4) and depressive symptoms (n =1) but considered unrelated to intervention. Toxicants in urine: no significant changes in 3-HPMA (p = 0.092) or formic acid (p = 0.546).
McKeganey et al. (2018)	VP use: 30 days: 98.5% 60 days: 95.5% 90 days: 81.0% Intention to use after the study: 73.8%

Authors	Additional reported results
	VP acceptability: Intention to use VP after study: 73.8% (n = 45) Quitters planning to continue using VP: 68.2% (n = 15) VP helped cut down CCs: 92.1% (n = 26) E-liquid flavours: non-tobacco flavours more popular than exclusive tobacco flavour (p = 0.013); all of the participants found that flavours were important and helping quit/reduce, but no association between different nicotine strengths or flavours and abstinence. Self-reported e-liquid purchases: Day 30: 61% Day 60: 75% Day 90: 77% Adverse effects: none reported.
Non-UK Studies	
Blank et al. (2019)	Return to exclusive smoking: n = 3 (no change in CC consumption, very low S-ENDS use during week 1/used S-ENDS in intermittent, prolonged manner) High levels of intraparticipant variation. Frequent prolonged sessions among participants due to participants feeling that S-ENDS or e-liquid did not deliver sufficient nicotine to satisfy them; prolonged vaping alongside other behaviours (watching TV, driving); difficulty of self-regulating vaping (no natural conclusion unlike a CC).
Caponnetto et al. (2019)	Average e-liquid consumption: Vaporizer VP: 4mL/day Cigalike: 1 cartridge/day

Authors	Additional reported results
	Relapse rates at week 52: Varenicline + MI: 20.5% (n = 23) NRT + MI: 12.5% (n = 10) BPR + MI: 19.6% (n = 10) BPR + NRT + MI: 22.6% (n = 27) Vaporizer VP + MI: 13.5% (n = 14) Cigalike + MI: 19.6% (n = 25) Side effects: VP users: 5% reported transient mouth and throat irritation Varenicline: 8% reported nausea without vomiting Significant predictors of smoking cessation: male, non-smoker partner, previous quit attempt, low cigarettes daily consumption, high self-efficacy, low FTND scores.
Cioe et al. (2020)	Feasibility: 68.4% (n = 13) of participants attended all 8 sessions. VP use: Mean number of VP cartridges per day: 0.46 (n = 0.34) Mean number of days of no VP use during 8-week period: 7.6 (SD 10.3) Daily VP use on 54-56 days during 8-week period: 57.8% (n= 11) Mean intention to quit: Week 8: 7.2 (SD 1.6, $p < 0.05$) VP perceptions showed little change over time (non-significant): Perceived benefits: Baseline and week 8 17.79 (SD 1.16), week 12 15.95 (SD 1.48) Perceived harms: Baseline 3.53 (SD 0.69), week 8 3.84 (SD 1.04), week 12 4.00 (SD 0.92)

Authors	Additional reported results
	ATSQ scores: significantly decreased Baseline: 25 (SD 9.2) Week 8: 18.2 (SD 9.9, p= 0.0015), with greatest improvement seen in patients who fully switched to VP (13.2, SD 7.1, p = 0.06) No significant change was seen in mean systolic or diastolic blood pressure, heart rate, pulse oximetry or FEV1 over time Adverse effects: none reported
Martner and Dalleryl (2019)	Acceptability ratings: Help with quitting: 68% (SD 39.4) Craving reduction: 66.4% (SD 41.2) Recommend an VP to quit: 83.7% (SD 30.8) CM acceptability ratings: 68.2% agreed on helpfulness of intervention, and Mōtiv8 being easy to use (87.3%, SD 16.2) Mean CO: negative correlation between VP and VP + CM phases to mean number of VP puffs per day (r2 = -0.72, p < 0.01) Behaviour change inventory: Purchased 24mg/mL tobacco flavour e-liquid: n = 2 Purchased 24mg/mL clove and vanilla flavour e-liquid: n = 1 Purchased 16mg/mL fruit flavour e-liquid: n = 1 Marijuana use: n = 1 Adverse effects: none reported.

Authors	Additional reported results
Pulvers et al. (2018)	Change in nicotine intake and cotinine levels over the 4 weeks was non-significant (p = 0.90). Biomarkers NNAL (p < 0.01) and metabolites of benzene (p < .01) and acrylonitrile (p = 0.001) significantly decreased in smokers switching exclusively to ECs for at least half of the study period demonstrated significant reductions in metabolites of ethylene oxide (p = 0.03) and acrylamide (p < 0.01).
Rohsenow et al. (2018)	Mean VP cartomizers per week: Week 1: 3.4 (SD 3.8) Week 6: 4.6 (SD 5.4) Reasons to use VP mean scores: Baseline: 20.8 (SD 2.0) Week 6: 19.9 (SD 4.7) Reasons not to use VP mean scores: Baseline: 4.11 (SD 3.20) Week 6: 7.11 (SD 3.79) Adverse effects: none reported.
Truman et al. (2018)	Serum cotinine: median 120ng/mL (range 15-300ng/mL) Serum nicotine: median 6.5ng/mL (range 1-24ng/mL) Average number of VP use per day: 6 Perceptions: Control group politely positive about NRT (help cut down) Usefulness of VPs more positive than conventional NRT Technical problems with VP use: n = 4

Authors	Additional reported results
	Requests to take VP after discharge: n = 4 Requests on information to buy VPs on the internet: n = 3 Nursing staff attitudes towards VPs: Some resistance to allow VP use at the beginning of study, with worries about health aspects of the vapour; this dissipated after understanding VP use Preference for disposable VPs vs rechargeable (required more technical expertise for maintenance); patients enthusiasm diminished noticeably, with need for additional NRT in some cases. Staff more receptive to VP use after the end of trial.
Valentine et al. (2018) DeVito et al. (2019)	Money spent on CCs over time: significant decrease from baseline to week 4 and FU ($p < 0.001$) Effect of time: Intention to quit $p < 0.05$ FTND: $p = 0.003$ Acceptability: 10% of participants completed all 4 weeks and FU VP perceptions: Less harmful than smoking: 33% at baseline, 57% at FU Reduce one's smoking: 43% at baseline, 60% at FU. Less expensive: 57% at baseline, 70% at FU. VPs taste better than CCs: 20% at baseline, 33% at FU. Less judgement from others: 13% at baseline, 20% at FU. Reduce other tobacco use: 31% at baseline, 40% at FU. Half reported that VP use where one cannot smoke consisted of a reason for VP use. Qualitative measures:

Authors	Additional reported results
	Purchased or planned to purchase VP by end of the study: 38% Preferred ECs: baseline 17%, 43% at FU Preferred CCs: baseline 27%, 30% at FU No preference: 47% at baseline, 7% at FU VPs should be regulated like tobacco: baseline 33%, 47% at FU VPs not harmful: 50% at baseline, 63% at FU. Flavour variety not important: 33% at baseline Flavour variety important: 30% at baseline, 43% at FU. VPs as additive as tobacco products: 23% at baseline, 47% at FU. Adverse effects: none reported by pts
Yingst et al. (2019)	Acceptability: no differences (p = 0.54) between cigalike mean score (4.6, SD 2.4) and button-operated ENDS (5.1, SD 2.2) Participants reported less puffs per day with cigalike device compared to button-operated (p = 0.81): Cigalike: 45.6 (SD 42.6) Button-operated: 61.6 (SD 65.1) Adverse effects: little to none reported.

Notes

3-HPMA: 3-hydroxypropyl mercapturic acid; BPR: bupropion; CC: combustible cigarette; CDSS: Calgary Depression Scale for Schizophrenia; CO: expired carbon monoxide, in parts per million; CPD: cigarettes per day; ENDS: electronic nicotine delivery system; FEV1: forced expiratory volume; FTCD: Fagerström Test for Cigarette Dependence; FTND: Fagerström Test for Nicotine Dependence; FU: follow up; MI: motivational interviewing; NNAL: 4 - (methylnitrosamino)-1-(3-pyridyl)-1-butanol; NRT: nicotine replacement therapy; PANSS: Positive and Negative Syndrome Scale; S-ENDS: smart electronic nicotine delivery system; SD: standard deviation; VAS: Visual Analogue Scale; VP: vaping product.

Appendix 5: Overlap of primary studies included in systematic reviews

Reviews	**Grabovac 2020**		**Hartmann-Boyce 2020**		**The Joanna Briggs Institute 2019**		**Liu 2018**		**Gentry 2019**	**Maglia 2018**
Primary studies	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in review**
RCTs										
Adriaens 2014			x		x	x				
Baldassarri 2018	x	x	x	x	x	x				
Bullen 2010							x			
Bullen 2013	x	x	x	x	x	x	x		x	
Caponnetto 2013a		x	x	x	x	x	x		x	x
Caponnetto 2013b										
Carpenter 2017					x	x				
Cravo 2016					x	x				
Felicione 2019					x	x				

Reviews	**Grabovac 2020**		**Hartmann-Boyce 2020**		**The Joanna Briggs Institute 2019**		**Liu 2018**		**Gentry 2019**	**Maglia 2018**
Primary studies	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in review**
Hajek 2019	x	x	x	x	x	x				
Halpern 2018	x	x	x	x	x	X				
Holliday 2019			x	x						
Ioakeimidis 2018			x	x						
Lee 2019			x	x						
Lee 2018	x	x	x	x	x	x				
Masiero 2018	x	x								
Lucchiari 2020	x	x	x	x						
O’Brien 2015									x	
Tseng 2016	x	x			x	x			x	
Walele, 2016					x					

Reviews	**Grabovac 2020**		**Hartmann-Boyce 2020**		**The Joanna Briggs Institute 2019**		**Liu 2018**		**Gentry 2019**	**Maglia 2018**
Primary studies	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in review**
Walker 2019					x	x				
Walker 2020			x	x						
Observational										
Bell 2017			x							
Caponnetto 2013b			x				x		x	
Ely 2013			x							
Farsalinos 2013							x			
Pacifici 2015			x							
Polosa 2011			x				x			
Polosa 2014a			x							
Polosa 2014b							x			x

Reviews	**Grabovac 2020**		**Hartmann-Boyce 2020**		**The Joanna Briggs Institute 2019**		**Liu 2018**		**Gentry 2019**	**Maglia 2018**
Primary studies	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in review**
Polosa 2014c										
Pratt 2016									x	
Stein 2016									x	
Longitudinal studies										
Biener and Hargraves 2014										x
Etter and Bullen 2014										x
Polosa 2015			x							
McRobbie 2015										x
Prochaska 2014									x	
Cross-sectional studies										
Adkison et al. 2013										x

Reviews	**Grabovac 2020**		**Hartmann-Boyce 2020**		**The Joanna Briggs Institute 2019**		**Liu 2018**		**Gentry 2019**	**Maglia 2018**
Primary studies	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in m-a**	**Incl. in review**	**Incl. in review**
Etter and Bullen, 2011							x			x
Farsalinos, Romagna, Tsiapras, 2013							x			
Goniewicz 2013							x			
Siegel, Tanwar, and Wood, 2011							x			x
							3 missing references			
Clinical trial registries										
ISRCTN14140672			x	x						

Appendix 6: AMSTAR 2 quality assessment ratings for the systematic reviews

	AMSTAR Item	Hartmann-Boyce et al. (2020)	Grabovac et al. (2020)	The Joanna Briggs Institute (2019)	Liu et al. (2018)	Gentry et al. (2019)	Maglia et al. (2018)
1	Did the research questions and inclusion criteria include the components of PICO?	Yes	Yes	Yes	No	Yes	Yes
2	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?	Yes	Yes	Yes	Yes	Yes	No
3	Did the review authors explain their selection of the study designs for inclusion in the review?	Yes	No	Yes	Yes	Yes	No
4	Did the review authors use a comprehensive literature search strategy?	Yes	Partial Yes	Yes	Partial Yes	Yes	Partial Yes
5	Did the review authors perform study selection in duplicate?	Yes	Yes	Yes	Yes	Yes	Yes
6	Did the review authors perform data extraction in duplicate?	Yes	Yes	Yes	Yes	Yes	No

	AMSTAR Item	Hartmann-Boyce et al. (2020)	Grabovac et al. (2020)	The Joanna Briggs Institute (2019)	Liu et al. (2018)	Gentry et al. (2019)	Maglia et al. (2018)
7	Provide a list of excluded studies and justify the exclusions?	Yes	No	Yes	Partial Yes	Yes	No
8	Did the review authors describe the included studies in adequate detail?	Yes	Yes	Yes	Partial Yes	Yes	Yes
9	Did the review authors use a satisfactory technique for assessing the risk bias in individual studies that were included in the review?	Yes	Yes	Yes	Yes	Partial Yes	No
10	Report on the sources of funding for the studies included in the review?	Yes	No	Yes	No	No	No
11	If meta-analysis was performed, did the review authors use appropriate methods for statistical combination of results?	Yes	Yes	Yes	No	NA	NA
12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	Yes	Yes	Yes	No	NA	NA
13	Did the review authors account for RoB in primary studies when	Yes	Yes	Yes	No	Yes	No

	AMSTAR Item	Hartmann-Boyce et al. (2020)	Grabovac et al. (2020)	The Joanna Briggs Institute (2019)	Liu et al. (2018)	Gentry et al. (2019)	Maglia et al. (2018)
	interpreting or discussing the results of the review?						
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	Yes	Yes	Yes	Yes	Yes	No
15	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	Yes	Yes	Yes	Yes	No	No
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	Yes	Yes	Yes	Yes	Yes	No
	Overall quality	High	Moderate	High	Low	Moderate	Critically low

Appendix 7a: Risk of bias according to primary authors

	Random sequence allocation (selection bias)		**Allocation concealment (selection bias)**		**Blinding of participants and personnel (performance bias)**		**Blinding of outcome assessment (detection bias)**		**Incomplete outcome data (attrition bias)**		**Selective reporting (reporting bias)**	
	Hartmann-Boyce	JBI	Hartmann-Boyce	JBI	Hartmann-Boyce	JBI	Hartmann-Boyce	JBI	Hartmann-Boyce	JBI	Hartmann-Boyce	JBI
Adriaens 2014	+	+	?	?	+	+	+	+	+	+	?	?
Baldassarri 2018	+	+	?	?	+	+	+	+	-	+	+	?
Bullen 2013	+	+	+	+	+	+	+	+	+	+	+	+
Caponnetto 2013	+	+	+	+	+	+	+	+	+	+	?	?
Carpenter 2017	?	?	?	?	-	-	-	+	+	?	?	?
Cravo 2016		+		?		+		?		?		?
Felicione 2019	?	?	?	?	?	+	?	+	+	?	?	?
Hajek 2019	+	+	+	?	+	-	+	-	+	+	+	-
Halpern 2018	?	+	?	?	-	-	+	-	-	+	+	-
Hatsukami 2020	?		?		?		+		+		+	
Holliday 2019	+		+		-		+		+		+	
Ioakeimidis 2018	?		?		+		+		?		?	
ISRCTN14140672			?		-		+		-		+	

	Random sequence allocation (selection bias)		**Allocation concealment (selection bias)**		**Blinding of participants and personnel (performance bias)**		**Blinding of outcome assessment (detection bias)**		**Incomplete outcome data (attrition bias)**		**Selective reporting (reporting bias)**	
Lee 2018	+	+	+	+	+	-	+	+	+	+	+	-
Lee 2019	+		+		+		+		+		+	
Lucchiari 2020	+		+		+		+		+		-	
Smith 2020	?		?		+		+		+		?	
Tseng 2016	+	+	?	?	+	+	+	?	+	+	+	?
Veldheer 2020	+		+		+		+		?		-	
Walele 2016	+	+	+	?	-	?	-	?	+	+	+	?
Walker 2019		+		?		+		?		?		?
Walker 2020	+		+		-		+		+		?	

+	Low risk of bias
?	Unclear risk of bias
-	High risk of bias
	study not included in the review

Appendix 7b: Risk of bias assessment

	Random sequence allocation (selection bias)	**Allocation concealment (selection bias)**	**Blinding of participants and personnel (performance bias)**	**Blinding of outcome assessment (detection bias)**	**Incomplete outcome data (attrition bias)**	**Selective reporting (reporting bias)**
Bonevski 2020	+	?	?	?	+	+

+	Low risk of bias
?	Unclear risk of bias
-	High risk of bias
	study not included in the review

Appendix 8: Vaping products used in RCTs included in systematic reviews

Study	Device type	Nicotine strength mg/mL	Flavours
Adriaens 2014	Refillable, rechargeable:1) Joytech eGO-C, 2) Kanger T2-CC	8	Tobacco
Baldassarri 2018	Refillable, rechargeable: Joytech eGO	0 or 24	Tobacco
Bullen 2010	Cigalike, rechargeable: Ruyan V8	14	Not reported
Bullen 2013 and O'Brien 2015	Cig-a-like, rechargeable: Elusion	16	Not reported
Caponnetto 2013a	Cigalike, rechargeable: Categoria	7.4	Tobacco
Caponnetto 2013b	Cig-a-like, rechargeable: Categoria	7.4	Tobacco
Carpenter 2017	Cigalike, rechargeable: Blu, Blu-Plus	16 / 24	
Felicione 2019	Refillable, rechargeable: 1) Joytech eGo-T battery; 2) Kanger mini Protank-II	18	Tobacco, menthol
Hajek 2019	Refillable, rechargeable: OneKit (Aspire), OneKit 2016 (Innokin)	18	Tobacco
Halpern 2018	Cig-a-like, disposable: NJoy	10 / 15	
Holliday 2019	Refillable, rechargeable: Vype eTank	0 / 6 / 12 / 18	Blended Tobacco, Crisp Mint, Dark Cherry and flavourless

Study	Device type	Nicotine strength mg/mL	Flavours
Ioakeimidis 2018	Missing	12	Missing
Lee 2019	Refillable, rechargeable: Go-CTM EC	0.01	
Lee 2018	Cig-a-like, disposable: NJoy	24 / 45	
Masiero 2018 Lucchiari 2020	Refillable, rechargeable: eGO, VP5	8	Not reported
Tseng 2016	Cig-a-like, disposable: NJOY	45	Tobacco
Cravo 2016, Walele, 2016	Cig-a-like, rechargeable: EVP prototype	20	Tobacco, menthol
Walker 2019., 2020	Refillable, rechargeable: eVOD	18	Tobacco
ISRCTN14140672	ASPIRE Pockex	12 / 18	Fruit, menthol, tobacco

Appendix 9: Additional meta- analyses for cessation systematic reviews

Hartmann-Boyce et al. (2020)				**The Joanna Briggs Institute (2019)**			
Study	**VP**	**Control**	**RR (95%CI)**	**Study**	**VP**	**Control**	**RR (95%CI)**
VP containing nicotine vs varenicline							
Ioakeimidis 2018	4/27	13/27	0.31 (0.11-0.82)				
VP containing nicotine + NRT vs NRT alone							
Walker 2020	35/500	3/125	2.92 (0.91-9.33)	Walker 2020	35/500	3/125	2.92 (0.91-9.33)
VP without nicotine vs NRT							
Lee 2019	16/75	21/75	0.76 (0.43 – 1.34)				
VP without nicotine (placebo) + NRT vs NRT alone				**VP containing nicotine +/or NRT +/or financial incentive vs usual care**			
Walker 2020	20/499	3/125	1.67 (0.50-5.53)	Halpern 2018	38/5193	0/5193	12.07 (0.74-196.23)

Notes

CI: confidence interval; NRT: nicotine replacement therapy; RR: risk ratio VP: vaping product.

Appendix 10: MINORS quality assessment ratings for the non-randomised intervention studies

	Domains												
Study	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
Blank (2019)	2	1	1	1	1	2	1	1	-	-	-	-	10/16
Caponnetto (2019)	2	1	1	1	1	2	1	1	-	-	-	-	10/16
Coffey (2020)	2	1	1	1	1	2	1	1	-	-	-	-	10/16
Cox (2019)	2	1	1	2	1	2	1	2	2	1	1	1	17/24
Hickling (2019)	2	2	2	2	1	2	2	1	-	-	-	-	14/16
McKeganey (2018)	2	1	2	2	1	2	1	1	-	-	-	-	12/16
Cioe (2020)	2	2	2	2	1	2	2	1	-	-	-	-	14/16
Martner and Dalleryl (2019)	2	1	1	2	1	1	1	1	1	1	1	1	14/24
Rohsenow (2018)	2	2	2	2	1	2	2	1	-	-	-	-	14/16
Pulvers (2018)	2	2	2	2	2	2	2	1	-	-	-	-	15/16
Truman (2018)	2	2	2	1	1	1	1	1	1	1	1	1	15/24
Valentine (2018)	2	1	2	1	1	2	1	1	-	-	-	-	11/16
DeVito (2019)	2	1	1	1	1	1	1	1	-	-	-	-	9/16
Yingst (2019)	2	1	2	2	1	2	2	1	-	-	-	-	13/16

Notes

1: Clearly stated aim. 2: Inclusion of participants. 3: Prospective collection of data. 4: Endpoints appropriate to the aim of the study. 5: Unbiased assessment of study endpoint. 6: Follow up appropriate to aim of study. 7: Lost to follow up. 8: Prospective calculation of study size. Additional criteria in the case of comparative studies: 9: Adequate control group. 10: Contemporary groups. 11: Baseline equivalence of groups. 12: Adequate statistical analyses.
0 = not reported; 1 = reported but inadequate; 2 = reported and adequate.

Appendix 11: ROBINS-I risk of bias analysis for the non-randomised interventional studies

Authors	Bias due to confounding	Bias in selection of participants into the study	Bias in classification of interventions	Bias due to deviations from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of the reported result	Overall risk of bias
Blank et al. (2019)	Serious	Low	NA	Moderate	Moderate	Serious	Moderate	Serious
Caponnetto et al. (2019)	Serious	Low	Low	Low	Moderate	Moderate	Moderate	Serious
Coffey et al. (2020)	Serious	Low	NA	Low	Serious	Serious	Moderate	Serious
Cox et al. (2019)	Serious	Low	NA	Low	Moderate	Moderate	Low	Serious
Hickling et al. (2019)	Serious	Low	NA	Low	Moderate	Moderate	Low	Serious
McKeganey et al. (2018)	Serious	Low	NA	Low	Moderate	Serious risk	Low	Serious
Cioe et al. (2020)	Serious	Low	NA	Low	Moderate	Moderate	Low	Serious
Martner and Dalleryl (2019)	Serious	Low	Low	Moderate	Moderate	Moderate	Moderate	Serious

Authors	Bias due to confounding	Bias in selection of participants into the study	Bias in classification of interventions	Bias due to deviations from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of the reported result	Overall risk of bias
Rohsenow et al. (2018)	Serious	Low	NA	Low	Moderate	Moderate	Low	Serious
Pulvers et al. (2018)	Serious	Low	NA	Low	Moderate	Moderate	Low	Serious
Truman et al. (2018)	Serious	Low	NA	Low	Serious	Moderate	Moderate	Serious
Valentine et al. (2018)	Serious	Low	NA	Low	Serious	Moderate	Moderate	Serious
DeVito et al. (2019)	Serious	Low	NA	Low	Serious	Moderate	Moderate	Serious
Yingst et al. (2019)	Serious	Low	NA	Low	Moderate risk	Moderate	Moderate	Serious

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, research, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health and Social Care, and a distinct delivery organisation with operational autonomy. We provide government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific and delivery expertise and support.

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