



Public Health  
England

Protecting and improving the nation's health

# Vaping in England: an evidence update February 2019

A report commissioned by Public Health England

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UK Centre for Tobacco & Alcohol Studies

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## Conflict of interest statement

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## Acronyms and abbreviations

ASA = Advertising Standards Authority  
ASH = Action on Smoking and Health  
BCAP = Broadcast Committee of Advertising Practice  
CAP = Committee of Advertising Practice  
CINAHL = Cumulative Index to Nursing and Allied Health Literature  
CO = Carbon monoxide  
COT = Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment  
CRUK = Cancer Research UK  
EC = E-cigarettes  
EU TPD / TPD = European Union Tobacco Products Directive (2014/40/EU)  
FDA = US Food and Drug Administration  
GB = Great Britain  
HSE = Health Survey for England  
ICGBS = Internet Cohort Great Britain Survey  
MHRA = Medicines and Healthcare products Regulatory Agency  
MP = Member of Parliament  
NCSCCT = National Centre for Smoking Cessation and Training  
NHS = National Health Service  
NICE = National Institute for Health and Care Excellence  
NIHR = National Institute for Health Research  
NRS = National Readership Survey  
NRT = Nicotine Replacement Therapy  
NS-SEC = National Statistics Socio-economic Classification  
OPN = Opinions and Lifestyle Survey  
OR = Odds ratio  
PHE = Public Health England  
SES = Socio-economic status  
STS = Smoking Toolkit Study  
TRPR = Tobacco and Related Products Regulations 2016  
TVPA = Tobacco and Vaping Products Act (Canada)  
UKCTAS = UK Centre for Tobacco and Alcohol Studies



# Executive Summary

## 1 Introduction

This report was commissioned by Public Health England to summarise evidence to underpin policy and regulation of electronic cigarettes in England. It focuses mainly on the latest evidence on prevalence and characteristics of electronic cigarette use in young people and adults in England.

The context for the report is that smoking remains the leading preventable cause of illness and premature death and is one of the largest causes of health inequalities. So, alternative nicotine delivery systems, such as electronic cigarettes or e-cigarettes, could play a major role in improving public health.

### Terminology

E-cigarette is a term that was commonly used when the first devices became available. These devices resembled tobacco cigarettes, but there has since been a rapid evolution of the technology and products. The shape of the products now varies enormously.

This variation means that the term e-cigarettes is no longer appropriate, and we are aware of discussions going on in the UK and internationally to develop common terminology. For this report, we continue to use the term e-cigarettes (EC) but we hope to replace this terminology in future reports, when a consensus has been reached.

## 2 Recent policy and guidance developments

### Main changes

The National Institute for Health and Care Excellence (NICE) published guidance for health and social care workers on how to have an informed discussion about EC.

The House of Commons Science and Technology Committee published a report on EC which included recommendations about harm reduction, smoking cessation, EC in mental health settings and regulation.

The Government responded with a Command Paper which broadly accepted the Science and Technology's Committee's recommendations. The response said the government is firmly committed to more research in this area and to a proportionate regulation system.

Following a consultation, the Committee of Advertising Practice (CAP) and the Broadcast Committee of Advertising Practice (BCAP) announced that they were lifting the blanket ban on making health claims in non-broadcast advertising for EC. It is currently unclear how the new guidance will be applied in practice.

New NHS guidance has followed recommendations on fire risks from our previous evidence reviews and placed EC in the same category as mobile phones.

The NHS Long Term Plan for England recommended a new universal smoking cessation offer be available for long-term users of specialist mental health and learning disability services. This will include the option for smokers to switch to e-cigarettes while in inpatient settings.

Individual countries have amended their policies on EC to either further restrict their use or in the case of Canada and New Zealand, promote their use as less harmful alternatives to tobacco smoking.

The US Food and Drug Administration announced actions to restrict the sale and marketing of EC to young people.

## Implications

Overall, England continues to take small progressive steps towards ensuring vaping remains an accessible and appealing alternative to smoking.

If the House of Commons Science Technology's Committee recommendations are fully carried out by government, they have the potential to broaden this accessibility and appeal further, particularly in mental health settings, where smoking rates are high.

However, there is still no medicinally licenced EC in England, or anywhere else in the world. It is possible that more smokers may be attracted to vaping if a licensed EC was made available. Barriers to licensing and the commercialising of licensed products need further exploration.

### 3 Methods

We have used data from several surveys in the UK which assessed young people and adult vaping prevalence. We also drew on peer-reviewed publications of these surveys including any awaiting publication, for which we are co-authors.

We reviewed the international literature on vaping prevalence from 1 January 2017 to 5 November 2018.

Data collected from local authorities on stop smoking services by NHS Digital from 1 April 2017 to 30 June 2018 were also reported.

### 4 Vaping in young people

#### Main findings

In England and in Great Britain as a whole, experimentation with EC has steadily increased in recent years. However, regular use remains low, with 1.7% of 11 to 18 year olds in Great Britain reporting at least weekly use in 2018 (it was 0.4% among 11 year olds and 2.6% among 18 year olds).

Vaping continues to be associated with smoking. The proportion of young people who have never smoked who use EC at least weekly remains very low (0.2% of 11-18 year olds in 2018).

The latest smoking data used for measuring progress in reaching the goals of the tobacco control plan for England are from 2016. These indicated that 7% of 15 year olds were regular (at least weekly) smokers in 2016 (8% in 2014). The 2018 data are not yet available.

The proportion who haven't smoked but have tried vaping is increasing. The extent to which these young people would have tried smoking if vaping had not been available is unclear.

The proportion of 13 and 15 year olds who have ever smoked declined steadily between 1998 and 2015, including after the introduction of EC. In this period, young people's attitudes became more negative towards smoking. Further analyses of the period beyond 2015 are underway.

Studies from outside of the UK suggest a similar picture, with increasing experimentation and use of EC over time among youth. There is evidence from the US that increasing vaping is happening against a backdrop of reducing cigarette smoking.

## Implications

Trends in smoking and vaping should continue to be monitored, particularly in the light of concerns in North America about youth smoking and vaping.

Surveillance is needed on purchase sources of EC by young people, as recommended in our previous evidence review.

More research is also needed on how young people move from EC to smoking and vice versa.

## 5 Vaping in adults

### Main findings

Data from several representative surveys suggest that vaping prevalence among all adults in Great Britain has remained stable since 2015. In 2017 to 2018, estimates for prevalence were:

- 5.4% to 6.2% for all adults
- 14.9% to 18.5% for current smokers
- 0.4% to 0.8% for people who had never smoked
- 10.3% to 11.3% for ex-smokers (vaping prevalence declined as the time since they had stopped smoking increased)

Smoking prevalence ranged from 13.7% to 17.3% for the adult population but was substantially higher in lower socio-economic groups (for example, 35% in people living in social housing smoked).

Just over a third of all current smokers had never tried EC.

Use of EC in quit attempts is similar across socio-economic groups. Among long-term ex-smokers, EC use is higher in those from lower socio-economic groups. This suggests that those from higher socio-economic groups are using EC to quit smoking and then stop use, while those from more disadvantaged groups continue to use EC.

Overall, we found no clear association among past and current vapers between how long people use EC, the devices they used and socio-economic status.

There are possible associations between lower socio-economic groups and higher strength of nicotine, amount of liquid used and a greater variety of EC flavours used.

Over time, most vapers report either continuing to use the same nicotine strength (44.7% of participants in one survey, 54.4% in another) or reducing the nicotine strength (40.1% and 49.2% respectively in the same surveys).

One longitudinal survey indicated that most vapers use a single flavour type (tobacco, fruit, menthol were the most popular types) and tend to use the same flavour type over time. Within each flavour type, vapers may have been using a wide variety of different flavours.

Quitting smoking remains the main reason for vaping in all socio-economic groups. People from higher socio-economic groups were possibly more likely to vape for enjoyment than those from lower groups, who may be more likely to vape for financial reasons than those from higher groups.

Internationally, the US appears to have similar adult vaping prevalence as Great Britain. In other countries where information is available, prevalence is lower.

## Implications

More research is needed to explore the use of EC by different social grades.

Trends need to be monitored, particularly of EC use by never smokers, use alongside smoking and in long-term ex-smokers.

Given the importance of stopping smoking completely, smokers using EC should be advised to quit smoking as soon as possible.

Smokers should be advised to stop smoking as soon as possible and explore all available options for support, including EC.

## 6 Use of e-cigarettes in English stop smoking services

### Main findings

Monitoring data from stop smoking services have limitations, but such data suggest that using an EC as part of quit attempt continues to be helpful for people attending stop smoking services in England.

In stop smoking services, the proportion of quit attempts using an EC remains very small (4.1% of all quit attempts in stop smoking services).

There is inconclusive evidence to support suggestions that EC have contributed to the decline in demand for stop smoking services in England.

### Implications

Combining EC (the most popular source of support used by smokers in the general population), with stop smoking service support (the most effective type of support), should be a recommended option available to all smokers. This proposal from our previous evidence review is still valid. Stop smoking practitioners and health professionals should provide behavioural support to smokers who want to use an EC to help them quit smoking.

Stop smoking practitioners and health professionals supporting smokers to quit should receive education and training on using EC in quit attempts. Online training is available from the National Centre for Smoking Cessation and Training (NCSCT).

Local authorities should continue to fund and provide stop smoking services, in line with the evidence base.

# 1 Introduction

## Objective of the report

This report has been commissioned to summarise evidence to underpin policy and regulation of electronic cigarettes (EC) in England. The context for the report is that smoking remains the leading preventable cause of illness and premature death and is one of the largest causes of health inequalities, so alternative nicotine delivery systems could play a major role in public health strategies. This report is the fifth in a series commissioned by Public Health England (PHE) on this subject [1-4]. Our last report published in February 2018 covered a wide range of issues concerning vaping including prevalence, attitudes and beliefs, impact on smoking cessation and reduction, poisonings, fires and explosions, health risks, pricing, as well as chapters on nicotine and heated tobacco products. This report focuses only on EC (and does not cover heated tobacco products) and aims to provide the latest evidence on prevalence and characteristics of EC use in young people and adults. We pay particular attention to data from England that have emerged since the previous report was published in early 2018 [4]. Subsequent reports will update some of the other aspects covered in the earlier reports.

## Terminology

While e-cigarette is a term that was commonly used when the first devices, which resembled tobacco cigarettes, became available, there has since been a rapid evolution of these technologies in the market. The common features remain that they contain a battery-powered heating element designed to aerosolise a solution of propylene glycol and/or glycerol, water and frequently flavouring and nicotine (freebase or nicotine salts). However, the products are diverse and currently range from (1) one-time disposable products (often referred to as cigalikes), (2) reusable, rechargeable kits designed with replaceable cartridges or pods, (3) reusable, rechargeable kits designed to be refilled with liquid by the user (often referred to as tanks, but there are also refillable pods) and (4) reusable, rechargeable kits 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). The shape of these products varies enormously from flat, memory-stick shapes, to pebbles, to pens, and different shapes and sizes found in box mods. The variation means the term e-cigarettes is no longer

appropriate. We are aware that there are broader discussions ongoing in the United Kingdom (at the UK Electronic Cigarette Research Forum) and internationally (e.g Borland et al, draft in preparation) to develop common terminology. For this report, we continue to use the term e-cigarettes (with the acronym EC) with a view to replacing this terminology, in the next report, when a consensus has been reached. We do, however, refer to people who regularly use e-cigarettes as vapers and the act of using an e-cigarette as vaping.

## Structure of the report

Following this introduction, Chapter 2 summarises policy developments since our last report, and Chapter 3 describes the methods used in compiling this report. Chapter 4 provides a summary of the latest available data on vaping among young people and Chapter 5 summarises evidence on vaping among adults. Chapter 6 provides an update of EC use in stop smoking services in England. This report is focused on England, and draws on surveys from England, Great Britain and the UK. A brief overview is also given of the international situation.



## 2 Recent policy and guidance developments

This chapter provides an overview of the policy and guidance changes involving EC since our previous report [4].

### Key UK policy and guidance changes

In the 2018 PHE report [4], we described the new regulations implemented for EC as a result of the Revised European Union Tobacco Products Directive (EU TPD) [5], translated into UK law through the Tobacco and Related Products Regulations 2016 (TRPR) [6]. These regulations remain unchanged in the UK at the current time (Table 1), and in Chapter 5, we provide new evidence of the awareness of these regulations and use of TPD compliant vaping products in smokers, ex-smokers and vapers [7].

**Table 1. Minimum standards for safety and quality [4]**

**Maximum capacities and nicotine strength allowed:**

- tank capacity: 2ml
- e-liquid refill container capacity: 10ml
- nicotine 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

### National Institute for Health and Care Excellence (NICE)

In March 2018, NICE [8] published guidelines on stop smoking interventions and stop smoking services delivered in primary care and community settings. For the first time, NICE issued guidance to health and social care workers in order that smokers should not be discouraged from using EC to stop smoking and to allow an informed discussion on the products. The guidance recommends that health and social care workers should explain to people who smoke and who are using, or are interested in using a nicotine containing EC to quit smoking that:

- although EC are not licensed medicines, they are regulated by the Tobacco and Related Products Regulations 2016
- many people have found them helpful to quit smoking cigarettes
- people using EC should stop smoking tobacco completely, because any smoking is harmful
- the evidence suggests that EC are substantially less harmful to health than smoking but are not risk free
- the evidence in this area is still developing, including evidence on the long-term health impact

### Tobacco Control Delivery Plan

In June 2018, the Department of Health & Social Care published its delivery plan (2017-22) for the Tobacco Control Plan for England [9]. Most relevant to this report is the section under 2.3 'Backing evidence based innovation: Develop a strong evidence base on the full spectrum of nicotine delivery products'. Here it was noted that the MHRA was to a) engage with companies that have been in contact for scientific/regulatory advice as a follow up to discuss whether further assistance was required (by August 2018); b) produce a myth busters document clarifying the route to EC medicinal licensing (by September 2018); and c) host a meeting with EC trade associations to explore views of Small and Medium Enterprises on EC medicinal licensing (by August 2018). These have been actioned and reported in the Government's Command Paper response to the House of Commons Science and Technology Committee report (see below).

### House of Commons Science and Technology Committee

In August 2018, the House of Commons Science and Technology Committee [10] published a report of their examination of the impact of EC on health and the suitability of current regulations on their use. The Committee, chaired by Norman Lamb MP, received written evidence from 98 sources, held five oral evidence sessions and heard from 25 witnesses. The Government published a Command Paper in response in December 2018 and broadly accepted the Committee recommendations [11] (Table 2).

**Table 2. House of Commons Science and Technology Committee report and the Government's response**

<b>The Science and Technology Committee's recommendations (August 2018)</b>	<b>The Government's response (December 2018)</b>
<b>Harm reduction</b>	
<p>To help fill remaining gaps in the evidence on the relative risks of EC and heat-not-burn products, the government should:</p> <ul style="list-style-type: none"> <li>• maintain its planned annual 'evidence review' on EC and extend it to also cover heat-not-burn products</li> <li>• support a long-term research programme, to be overseen by Public Health England (PHE) and the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT), to ensure that health-related evidence is not dependent solely on the tobacco industry or the manufacturers of EC</li> <li>• ensure that PHE/COT research should include examining health risks arising from the flavourings added to EC</li> <li>• report each year on the state of research in its Tobacco Control Plan</li> <li>• establish an online hub for making the detailed evidence readily available to the public and to health professionals</li> </ul>	<p>These recommendations were accepted. It stated the government was firmly committed to more research in this area and providing the outputs of research to the public. They noted they had engaged with the UK E-Cigarette Research Forum to identify potential areas for future research.</p> <p>The Government response also highlighted they have already commissioned COT to consider areas of research and that COT is currently undertaking a programme of work on the toxicology of EC aerosols, flavourings, additives and the physiological effect of switching to EC.</p>
<b>Smoking cessation</b>	
<p>The Committee noted that a medically licensed EC could assist smoking cessation efforts</p>	<p>This recommendation was accepted but the response included little detail on how this</p>

<p>by making it easier for medical professionals to discuss and recommend them as a stop smoking treatment with patients. To support this, the Committee recommended that the government should:</p> <ul style="list-style-type: none"> <li>• review with MHRA and the EC industry how its systems for approving stop smoking therapies could be streamlined to be able to respond appropriately should manufacturers put forward an EC product for licensing</li> </ul> <p>The Committee expressed concern there was not a dedicated person within NHS England responsible for implementing the Government's Tobacco Control Plan, and that no one had central oversight for vaping related policies in mental health Trusts. They directly surveyed all NHS mental health Trusts in England and found that 75% allow vaping. The Committee recommended that NHS England should:</p> <ul style="list-style-type: none"> <li>• create such a position as a matter of urgency</li> <li>• take a strong leadership role in ensuring that everything is done to reduce the numbers of smokers amongst those with poor mental health</li> <li>• set a clear central NHS policy on EC in mental health facilities which establishes a default of allowing EC use by patients unless an NHS trust</li> </ul>	<p>recommendation will be met. The response highlighted that to date, two manufacturers have applied for a medicines marketing authorisation from the MHRA. One product has been authorised but not commercialised (referred to in our 2018 report [4]); the other has not yet been completed. Other manufacturers have expressed an interest but not made an application.</p> <p>This recommendation was broadly accepted and the response highlighted the Tobacco Control Plan Delivery Plan 2017-2022 [9]. The Government's response however did not address the Committee's concern about the lack of a dedicated person within NHS England responsible for implementing the Government's Tobacco Control Plan or provide a timeline by when the accepted recommendations should be achieved.</p>
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<p>can show reasons for not doing so which are demonstrably evidence-based</p> <ul style="list-style-type: none"> <li>• issue EC guidance to all NHS mental health trusts to ensure that they understand the physical and mental health benefits for their patients</li> </ul>	
<p><b>Regulation</b></p>	
<p>The Committee found that some aspects of the vaping related regulatory system appear to be holding back their use as a stop smoking tool and as such, recommended that the Government should:</p> <ul style="list-style-type: none"> <li>• review vaping related regulations (eg limits on nicotine strength, tank size, advertising ban on health claims), together with the ASA and the MHRA, and publish a plan for addressing ‘anomalies’ in the next annual Tobacco Control Plan</li> <li>• review the level of taxation on nicotine-related products which should directly correspond to the health risks that products present, to encourage less harmful consumption. Applying that logic, EC should remain the least-taxed and cigarettes the most, with heat-not-burn products falling between the two</li> <li>• conduct a review of regulations on EC and novel tobacco products which are currently applied under EU</li> </ul>	<p>These recommendations were accepted, and the Government expressed that it is committed to a proportionate system of regulation.</p> <p>It was noted that the Government will explore the 20mg/ml maximum nicotine refill limit, the 2ml size restriction on tanks, a block on EC advertising relative harm-reduction potential and the notification scheme for vaping ingredients. It was also noted that the Government had issued a direction to Ofcom clarifying that under the current code on television and radio advertising, it is permissible for public health campaigns to promote the generic use of EC for quitting smoking.</p> <p>The Government also acknowledged that regular use of EC by young people in the UK remains very low, but they will continue to track their use in this country and consider further regulatory action if the data suggest that vaping is</p>

<p>legislation, to identify scope for change post-Brexit, including an evidence-based review of the case for discontinuing the ban on 'snus' oral tobacco. This should be part of a wider shift to a more risk-proportionate regulatory environment</p>	<p>causing an increase in youth nicotine consumption.</p> <p>The response concluded that UK's exit from the European Union offers opportunities to re-appraise current regulation.</p>
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## Advertising

In our previous report we highlighted that the Committee of Advertising Practice (CAP) and the Broadcast Committee of Advertising Practice (BCAP) carried out a consultation about whether to remove the advertising ban on health claims about unlicensed EC from their Advertising Codes [12]. Following the consultation, in November 2018, the blanket ban on health claims was lifted [13]. This only applies to advertising mediums that are not part of the EU TPD requirements (ie advertising on public transport, in cinemas, leaflets, direct mail and outdoor advertising). Health claims must also be supported by robust evidence that the specific vaping product advertised possesses the advertised health benefit. The Advertising Standards Authority (ASA) provides guidance about the standards of evidence that are required, eg at least one randomised controlled trial in humans following recognised clinical trial methodology, and be of sufficient duration to ensure that any beneficial effect is maintained over a reasonable period of time [14]. When making a health claim, marketers can only do so about a specific product and not EC in general. Marketers must also avoid making explicit or implied claims that their product can help people cut down or quit tobacco, unless the product has a relevant medicines licence from the MHRA. CAP and BCAP specifically stated *“This means that studies and reports which describe the general benefits of using e-cigarettes rather than smoking tobacco are unlikely to be considered adequate substantiation for a claim about a specific product, even when those reports are authored by a credible body such as Public Health England”* [13]. The updated CAP Code 22 [15] retained recommendations that the new advertising rules applied to any advertisement for EC or related products, including e-shisha and e-hookah products, regardless of whether they contain nicotine. As previously, the advertisements must be socially responsible, not target, feature, or appeal to children and must also make clear that the product is an EC and not a tobacco product. It is currently unclear how the new guidance on health

claims will be applied in practice, and whether more prescriptive guidance (such as being given an array of health messages to choose from as in Health Canada's relative risk lower statements about vaping, see Table 4) might be more appropriate.

## Hospitals and fire safety

In January 2018, The UK's National Fire Chiefs Council published a Smoking, Vaping & Tobacco Position Statement [16]. Later in 2018 they released a Guidance Note on E-cigarette use in smokefree NHS settings, providing advice about the safe use of rechargeable electronic cigarettes and indoor vaping [17]. In December 2018, NHS Improvement (and NHS Wales, NHS Scotland and Department of Health for Northern Ireland) issued an NHS Estates and Facilities Alert about the prevention and management of fire risk from personal rechargeable electronic devices [18]. This alert has followed recommendations from our previous evidence reviews on fire risks, and placed EC in the same category as mobile phones in terms of fire risk within NHS settings. It replaces a previous NHS Estates and Facilities Alert that stated EC batteries should not be recharged in NHS premises (with some exemptions for mental health settings) [19].

## The NHS Long Term Plan

The NHS Long Term published in January 2019, aims to improve the quality of patient care and health outcomes in England. A new service model for hospital and community care is planned with support for people who smoke playing a central role: [20]

- by 2023/24, all people admitted to hospital who smoke will be offered NHS-funded tobacco treatment services
- the model will also be adapted for expectant mothers, and their partners, with a new smoke-free pregnancy pathway including focused sessions and treatments
- a new universal smoking cessation offer will also be available as part of specialist mental health services for long-term users of specialist mental health, and in learning disability services. On the advice of PHE, **this will include the option for smokers to switch to e-cigarettes while in inpatient settings**



## International policy update

Since our previous report, several countries have amended their existing legislation to either further restrict the use of EC or promote their use as less harmful alternatives to tobacco smoking. As of November 2018, there were 98 countries that have national/federal laws regulating EC. Of these 98, 29 countries ban the sale of all types of EC, of which seven of these prohibit the sale of nicotine containing products and six ban use of EC in their entirety (Table 3) [21].

**Table 3. Global picture of countries prohibiting sales and/or use of EC 2018 [21]**

Ban the sale of all types of EC	<i>Argentina, Bahrain, Brazil, Brunei Darussalam, Cambodia, Colombia, Gambia, Iran, Jordan, Kuwait, Lebanon, Mauritius, Nepal, Nicaragua, Oman, Panama, Qatar, Saudi Arabia, Seychelles, Singapore, Suriname, Syria, Thailand, Timor-Leste, Turkey, Turkmenistan, Uganda, United Arab Emirates and Uruguay</i>
Ban the sale of nicotine containing products	<i>Australia, Costa Rica, Jamaica, Japan, Mexico, Sri Lanka and Switzerland</i>
Ban use in entirety	<i>Cambodia, Jordan, Nepal, Panama, Syrian Arab Republic, Turkmenistan and United Arab Emirates</i>

## Individual country updates

A report of a Parliamentary inquiry into the use and marketing of EC and personal vaporisers in Australia was published in March 2018 [22]. As a result, there remains a precautionary approach to the regulation of EC containing nicotine in Australia. The sale of nicotine containing EC is prohibited unless approved as a smoking cessation aid by the Therapeutic Goods Administration (to date, none have been approved for this purpose). The report recommended that the National Health and Medical Research Council should fund a biennial independent review of the evidence relating to the health impacts of vaping and e-liquids, as well as a review of worldwide regulations. The Chair and one other member of the Parliamentary inquiry committee simultaneously published a dissenting report recommending the sale, purchase and possession of EC to be legalised [23]. Restrictions including prohibiting their sale to people under 18 years of age, a limit on the strength of nicotine, health warnings and the establishment of a notification system for vaping products were also recommended in the dissent.



In May 2018, in addition to the country's existing legislation, Canada enacted the Tobacco and Vaping Products Act (TVPA) [24]. This new legal framework regulates the manufacturing, sale, labelling and promotion of nicotine and non-nicotine EC and adds to other regulations already in place in individual provinces. It aims to limit youth access and prevent uptake whilst enabling a legal marketplace for adult use to access less harmful alternatives to smoking. The framework includes a minimum age of sale (18 years); ban on certain ingredients; restrictions on promotion including no promotion of products flavours that may appeal to youth, sponsorship or lifestyle advertising. In January 2019, the Canadian government published health education messages about the comparative relative risks of vaping (Table 4) [25].

**Table 4. Health Canada's lower relative risk statements about vaping:**

- completely replacing cigarette smoking with vaping will reduce your exposure to harmful chemicals
- there are short-term general health improvements if you completely switch from smoking cigarettes to vaping products
- vaping is less harmful than smoking. Many of the toxic and cancer-causing chemicals in tobacco and the tobacco smoke form when tobacco is burned
- except for nicotine, vaping products typically contain a fraction of the 7,000 chemicals found in tobacco smoke (and) lower levels of several of the harmful chemicals found in smoke
- vaping products and e-cigarettes deliver nicotine in a less harmful way than smoking cigarettes
- these products may reduce health risks for smokers who can't or don't want to quit using nicotine
- while quitting cigarettes, you may go through a time when you use both cigarettes and vaping products. Switching from tobacco cigarettes to vaping will reduce your exposure to many toxic and cancer causing chemicals

In May 2018, Greece became the first country to ban the sale of non-nicotine containing e-liquid, while still allowing (under EU TPD requirements) the sale of nicotine containing e-liquid [26].

Until June 2018, it was illegal to advertise or sell nicotine containing EC/e-liquid in New Zealand. Following *Philip Morris v Ministry of Health* [2018]

NZDC 4478, the District Court found that all tobacco products (except types that are chewed or absorbed orally) may be lawfully imported, sold and distributed under the Smokefree Environments Act 1990. The Ministry of Health did not appeal the decision and as such, default legislation allows for sale and supply of nicotine EC and e-liquid as consumer products. The Ministry of Health have since proposed risk-proportionate regulation to all tobacco and vaping products which includes the prohibition of the sale and supply of nicotine and non-nicotine EC/e-liquid to people under the age of 18 years; restrict their use of vending machines and allow their promotion and advertising at the point-of-sale display and instore. The requirement remains that EC manufacturers making a therapeutic claim must have a product approval under the Medicines Act 1981 [27].

In the US there have been reports of increases in vaping among Middle and High School adolescents in 2018 (see also Chapter 4). Concerns were raised in particular about flavoured EC and the popularity of EC pod devices released onto the market in the US in 2015. In response to these concerns, in September 2018, the US Food and Drug Administration (FDA) reported that there had been a significant rise in the use of flavoured e-cigarettes among teenagers and expressed concerns about EC increasing nicotine addiction among youth. The FDA announced enforcement actions related to the sale and marketing of EC to young people. It issued over a thousand warning letters [28] and fines to retailers who illegally sold EC to people below the legal age of purchase during an undercover operation in retail and online stores in the summer. The FDA also sent letters to the manufacturers of Vuse, Blu, JUUL, MarkTen XL, and Logic requiring them to submit information so that they could better understand the attraction and penetration of their EC products among youth and their plans to address youth access and use.

In November 2018, The FDA announced that the sale of all flavoured EC products (other than tobacco, mint and menthol flavours or non-flavoured products) should be sold in age-restricted, in-person locations and, if sold online, under heightened practices for age verification [29].

Some devices named by the FDA (above) have recently become available in the UK, although the nicotine content is capped at 20mg/ml in line with EU regulations. Surveillance data are not yet available but will be covered in future PHE reports.

## Conclusion

### Summary of key policy and guidance changes

NICE published guidance for health and social care workers on how to have an informed discussion about EC.

The House of Commons Science and Technology Committee published a report on EC which included recommendations about harm reduction, smoking cessation, EC in mental health settings and regulation.

The Government responded with a Command Paper which broadly accepted the Science and Technology Committee's recommendations. The Government stated it is firmly committed to more research in this area and a proportionate system of regulation.

Following a consultation, the Committee of Advertising Practice and the Broadcast Committee of Advertising Practice announced that they were lifting the blanket ban on making health claims in non-broadcast advertising for EC. It is currently unclear how the new guidance will be applied in practice.

New NHS guidance has followed recommendations from our previous evidence reviews and placed EC in the same category as mobile phones.

The NHS Long Term Plan for England recommended a new universal smoking cessation offer be available for long-term users of specialist mental health and learning disability services. This will include the option for smokers to switch to e-cigarettes while in inpatient settings.

Individual countries have amended their policies on EC to either further restrict their use or in the case of Canada and New Zealand, promote their use as less harmful alternatives to tobacco smoking.

The US Food and Drug Administration announced actions to restrict the sale and marketing of EC to young people.

## Implications

Overall, England continues to take small progressive steps towards ensuring vaping remains an accessible and appealing alternative to smoking.

If the House of Commons Science and Technology Committee recommendations are fully actioned by Government, they have the potential to broaden this accessibility and appeal further, particularly in mental health settings, where smoking rates are high.

However, there is no medicinally licenced EC in England, or anywhere else in the world. It is possible that more smokers may be attracted to vaping if a licensed EC was made available.

Barriers to licensing and the commercialising of licensed products need further exploration.

## 3 Methods

This chapter describes the sources of data used to inform this report. Data from surveys were analysed to describe vaping in Great Britain. Recent peer-reviewed literature on global prevalence of vaping was used to compare vaping prevalence in Great Britain with reported prevalence in other countries. Further data from reports by NHS Digital were used.

### Surveys

The surveys used in this report to update the evidence on vaping in the UK since our last report are described in a table for young people (Table 5) and for adults (Table 6). These surveys have robust methodologies and have all been the subject of peer-reviewed academic publications as we indicated in our previous 2018 report. We also draw on peer-reviewed publications of these surveys where appropriate, including any in press for which we are co-authors.

**Table 5. Surveys reporting vaping prevalence among young people used in this report**

<b>Survey name and acronym</b>	<b>Commissioned &amp; conducted by</b>	<b>Geographic coverage, sample</b>	<b>Representativeness</b>	<b>Design</b>	<b>Time-frame included</b>
ASH Smoke-free Great Britain-Youth survey (ASH-Y)	ASH, YouGov plc	GB, aged 11-18, annual n>2,000	Recruited via a panel, weighted to be representative of all GB 11-18 year olds	Online via parents for 11-15 yr olds, directly with 16-18 yr olds, repeated cross-sectional	2013 to 2018; annual surveys
Smoking, Drinking and Drugs Survey (SDD)	NHS Digital, Ipsos MORI	England, school pupils aged 11-15, 2016 n=12,051	Sample weighted to be in line with the pupil census at national level	Completed on paper in exam conditions, repeated cross-sectional	2014, 2016 (biennial)
Health survey for England (HSE) [30]	NHS Digital, NatCen Social Research and UCL	England, children aged 2 to 15 2017, n=1985	Households randomly selected in postcode sectors, responses weighted	Household face-to-face interviews, repeated cross-sectional	Annual, 2016 and 2017

**Table 6. Surveys reporting adult vaping prevalence used in this report**

<b>Name and acronym</b>	<b>Commissioned &amp; conducted by</b>	<b>Geographic coverage, sample</b>	<b>Representativeness</b>	<b>Design</b>	<b>Time-frame included</b>
ASH Smoke-free Great Britain-Adult survey (ASH-A)	ASH, YouGov plc	GB, aged 18+, annual n>12,000 2018: N=12,767	Recruited from a panel according to quotas; responses weighted to be representative	Online, repeated cross-sectional	Annually 2010 to 2018
Opinions and Lifestyle Survey (OPN) [31]	Office for National Statistics	GB, aged 16+, 2017: N=7,122	Two-stage stratified random probability sample, responses weighted	Household face-to-face interviews, repeated cross-sectional	Annually, 2010 to 2017
Smoking Toolkit study (STS)	University College London, Ipsos MORI	England, aged 16+, n~1700 per month; Jan- Nov 2018: N=18,954	Recruited and weighted to be nationally representative to the population of England according to census data	Household face-to-face interviews, repeated cross-sectional	Monthly 2011-2018 (for 2018 data were available for Jan-Nov)

<b>Name and acronym</b>	<b>Commissioned &amp; conducted by</b>	<b>Geographic coverage, sample</b>	<b>Representativeness</b>	<b>Design</b>	<b>Time-frame included</b>
Health survey for England (HSE) [30]	NHS Digital, NatCen Social Research and UCL	England, adults defined as 16+ 2016: N=7,959 2017: N=7,936	Households randomly selected in postcode sectors, responses weighted	Household face-to-face interviews, repeated cross-sectional	Annual, 2016 and 2017
Internet cohort Great Britain survey (ICGBS)	KCL, Ipsos MORI	GB, smokers and ex-smokers, aged 18+, 2012: N=5,000, 2013: N=2,182, 2014: N=1,519, 2016: N=3,431 (incl n=2,403 new recruits)	Recruited from a panel using quotas on age, sex and region	Online, longitudinal	2012, 2013, 2014, 2016

## Literature on vaping prevalence

Literature on international vaping prevalence were sought from 1 January 2017 to 5 November 2018 using the following search terms that were based on the terms used in previous PHE reports [3, 4].

*("2017/01/01"[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\*)) AND (Prevalence)*

Articles that reported new data or new analyses of vaping prevalence based on nationally representative sampling strategies were included. Literature reviews that did not report new data were excluded as were articles that appeared in previous PHE reports. The search was run on 5<sup>th</sup> November 2018 in CINAHL, Embase, Medline, PsychInfo, and PubMed databases and identified 1,501 articles, of which 405 were duplicates. Articles were screened by title and abstracts resulting in 62 full articles being accessed. Following full text screening 30 articles were included. One of the included articles was updated to a more recent publication on the advice of the authors.

## Other reports and databases

### NHS Digital

Data are collected from local authorities on stop smoking services by NHS Digital, the national information and technology partner to the health and social care system in England. We report data from 1 April 2017 to 30 June 2018.



## 4 Vaping in young people

### Objective

The objective of this chapter is to provide an updated overview of available data on prevalence of trial and use of EC in young people (age range 8 – 18 [*but please see note on HSE below*]) in Great Britain, with any information on characteristics of vaping and socio-economic status. This information will be followed by a brief overview of international evidence on prevalence of ever and regular use.

In our last report we summarised data from a peer reviewed publication analysing several surveys carried out in Great Britain [32]. This research indicated that a significant minority of young people were experimenting with EC, but that most experimentation and regular use was among those who had tried smoking or were regular smokers. We also reported on a study, since published [33], which used causal mediation analysis to assess trajectories of vaping and smoking in young people. This research indicated strong evidence of a direct effect from ever EC use to smoking initiation and from ever smoking to EC initiation. This study cannot infer causality, however, as we had high attrition and low numbers of smokers and EC users, could only focus on ever product use rather than regular product use because of low numbers and were not able to account for all possible confounders (or common liabilities). To our knowledge, no similar studies have since been reported in the UK literature, although we are aware of ongoing research in this area. We will therefore focus on trajectories of use in one of our subsequent reports.

### Surveys

We assess data from three surveys: 1) the ASH Smokefree Great Britain survey of youth (ASH-Y, respondents aged 11-18) which has the most recent data from a survey carried out in the spring of 2018, 2) the Smoking, Drinking and Drugs Survey in England (SDD) (11-15 year olds) 2016 data, and 3) the Health Survey for England (HSE) 2017 (8-15 year olds) data. See chapter 3 for additional detail on these surveys.

We also draw on a peer reviewed, in press, publication in which one co-author is involved as it addressed the question of whether EC had renormalised smoking in England, Wales and Scotland using data from 1998

to 2015. E-cigarettes were largely unregulated in the UK until 2016 and the impact of regulated e-cigarettes on renormalising smoking is the subject of subsequent research. This study used data from the SDD for England which was carried out annually from 1998 to 2014 (then biennially), but also from surveys in Scotland, the biennial Scottish Adolescent Lifestyle and Substance Use Survey (SALSUS) and for Wales, the Health Behaviour in School-aged Children (HBSC) from 1998 to 2013 and the 2015 School Health Research Network (SHRN) survey.

## Trial and use of EC in young people in Great Britain

Data from ASH-Y survey

In 2018, 93.0% of 11-18 year olds were aware of EC. Overall, 83.4% reported that they had never used an EC or were not aware of them, 11.7% reported that they had tried EC only once or twice, 3.4% reported using them currently (1.8% reported using them at least once a month but not weekly, a further 1.7% reported using them at least weekly) and 0.8% reported that they used EC in the past, but no longer used them; 0.6% didn't want to say. Experimentation and use of EC has been increasing steadily over time (Table 7). Smoking prevalence has been fairly stable since the ASH surveys began in 2014.

**Table 7. Smoking and vaping trial and prevalence in young people**

Survey	ASH-Y 2014	ASH-Y 2015	ASH-Y 2016	ASH -Y 2017	ASH-Y 2018	SDD 2014	SDD 2016
<b>Age</b>	<b>11-18</b>	<b>11-18</b>	<b>11-18</b>	<b>11-18</b>	<b>11-18</b>	<b>11-15</b>	<b>11-15</b>
<b>Smoking status</b>							
Never tried	77.9	77.8	80.0	77.1	78.9	81.8	81.0
Tried only	11.0	11.4	10.0	11.0	10.1	10.2	9.8
Former	2.8	2.9	3.4	3.4	3.5	2.5	2.8
Current	6.9	6.7	5.5	7.3	6.1	5.6	6.4
<b>Vaping status</b>							
Never tried	91.5	86.8	87.7	83.6	83.4	78.1	74.8
Tried only	6.5	10.2	9.4	10.7	11.7	14.3	15.3
Former	n/a	n/a	n/a	1.6	0.8	2.8	3.7
Current	1.6	2.4	2.6	3.4	3.4	4.0	6.2

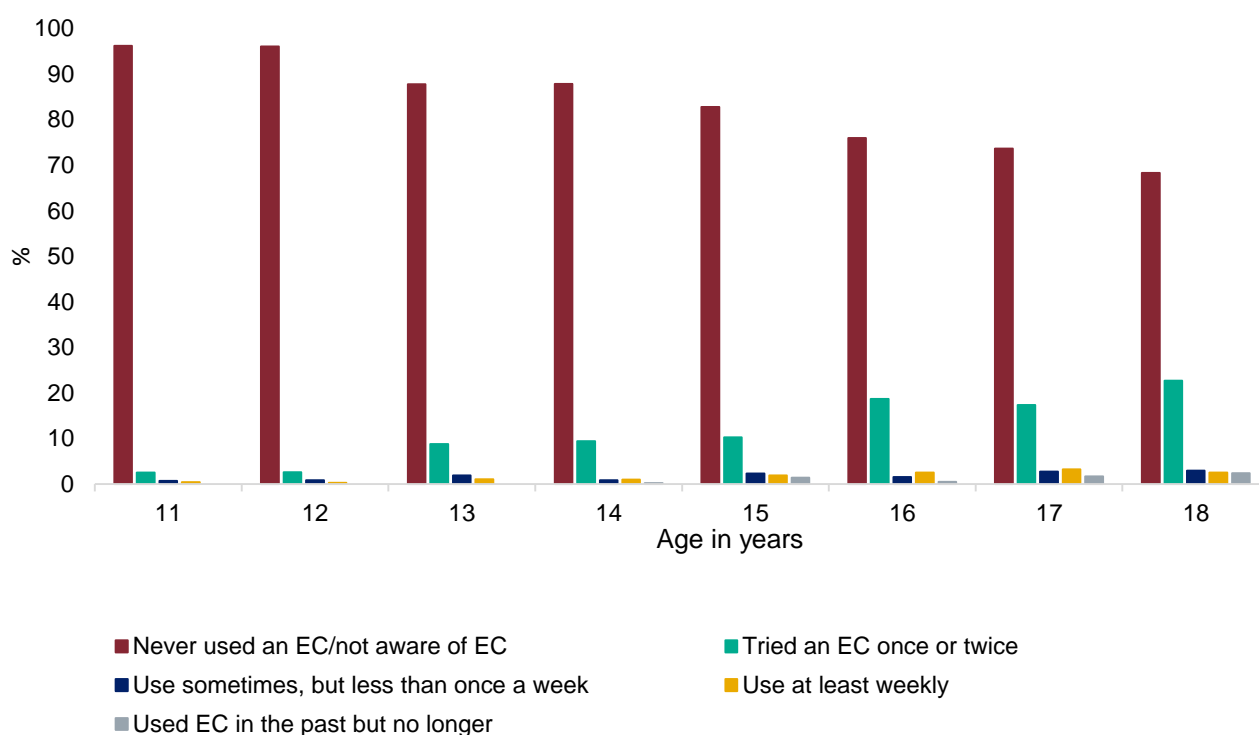
Notes: ASH-Y covers GB, SDD covers England

When never smokers were asked if they would try a cigarette soon, 0.6% reported that they would and 6.6% that they didn't know, with a further 0.7%

that they didn't want to say. When never users were asked the same question regarding trying an EC, the responses were: 1.4% yes, 8.6% didn't know, with a further 0.6% not wanting to say.

Awareness, experimentation and use are higher in the older age groups: for example, 96.3% of 11 year olds had never used an EC or were unaware, compared to 68.4% of 18 year olds; using at least weekly was 0.4% among 11 year olds and 2.6% among 18 year olds (Figure 1).

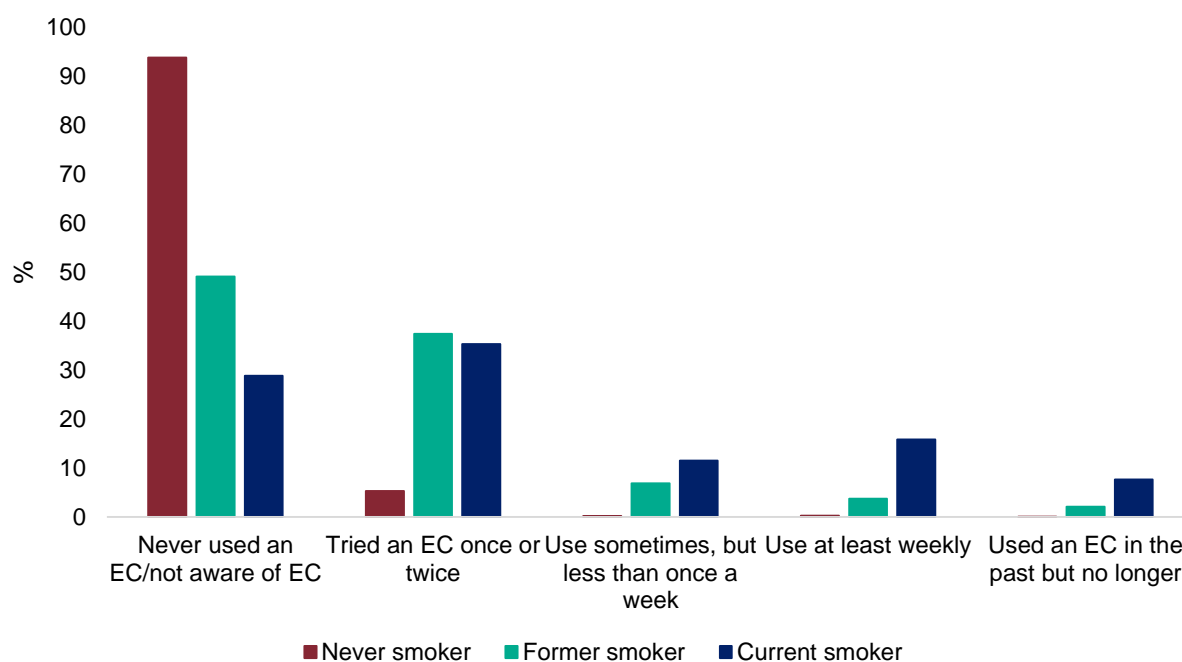
**Figure 1. Use of EC by age, GB youth (11-18) – ASH-Y 2018**



Notes: Unweighted bases: All 11-18 year olds (11 = 189, 12 = 242, 13 = 270, 14 = 322, 15 = 265, 16 = 182, 17 = 337, 18 = 484)

Experimentation and use of EC were also associated with smoking status: 93.9% of never smokers had *never* used an EC or were not aware of them, compared to 49.2% of former smokers and 28.9% of current smokers. Of current smokers, 15.8% used EC at least weekly, compared to 3.7% of former smokers and 0.2% of never smokers (Figure 2).

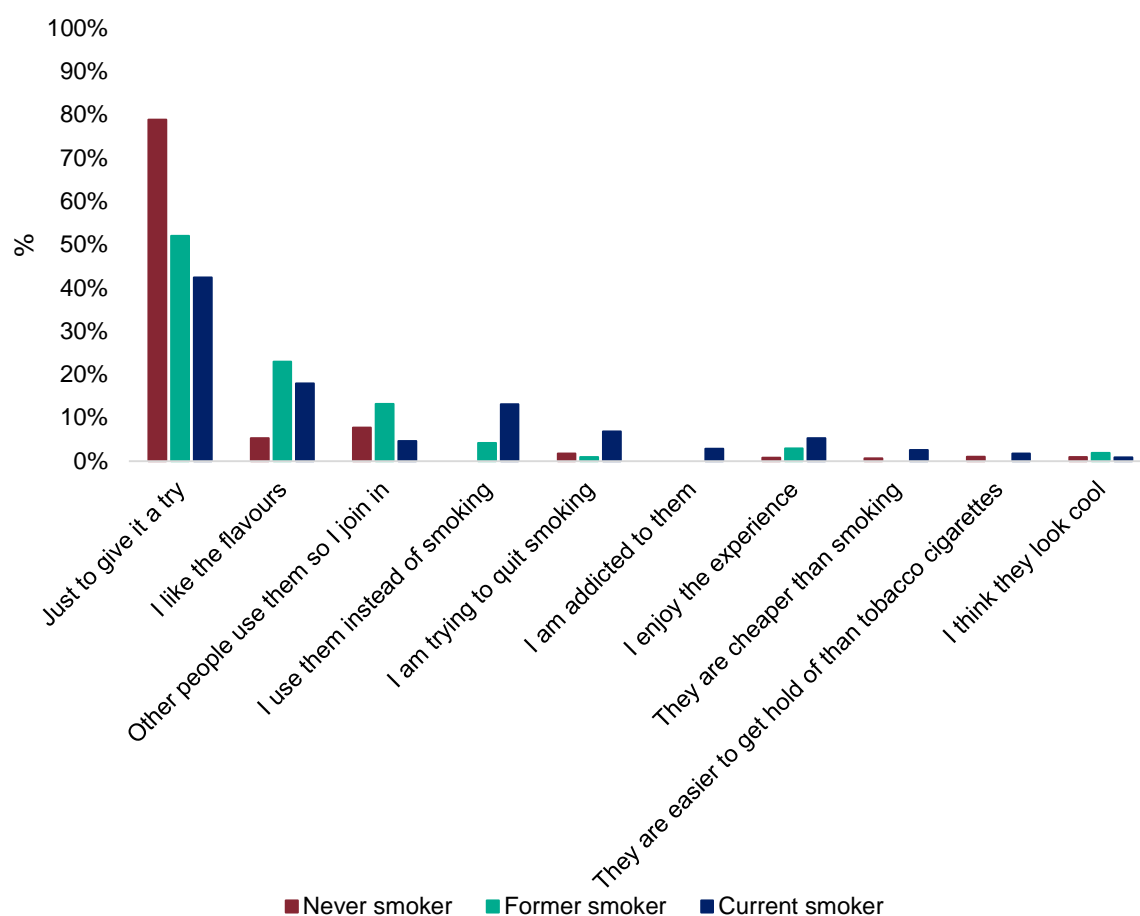
**Figure 2. Use of EC by tobacco smoking status, GB Youth (11-18)- ASH-Y 2018**



Notes: (Unweighted bases: Never smokers = 1,739, former smokers = 359, current smokers = 162).

When those who had tried an EC were asked the reasons for use, the most common response was ‘just to give it a try’ (57.2%) followed by ‘I like the flavours’ (16.1%). Responses varied somewhat by smoking status, for example 17.9% of those who currently smoked reported trying because they liked the flavours compared with 5.3% of those who had never smoked (Figure 3).

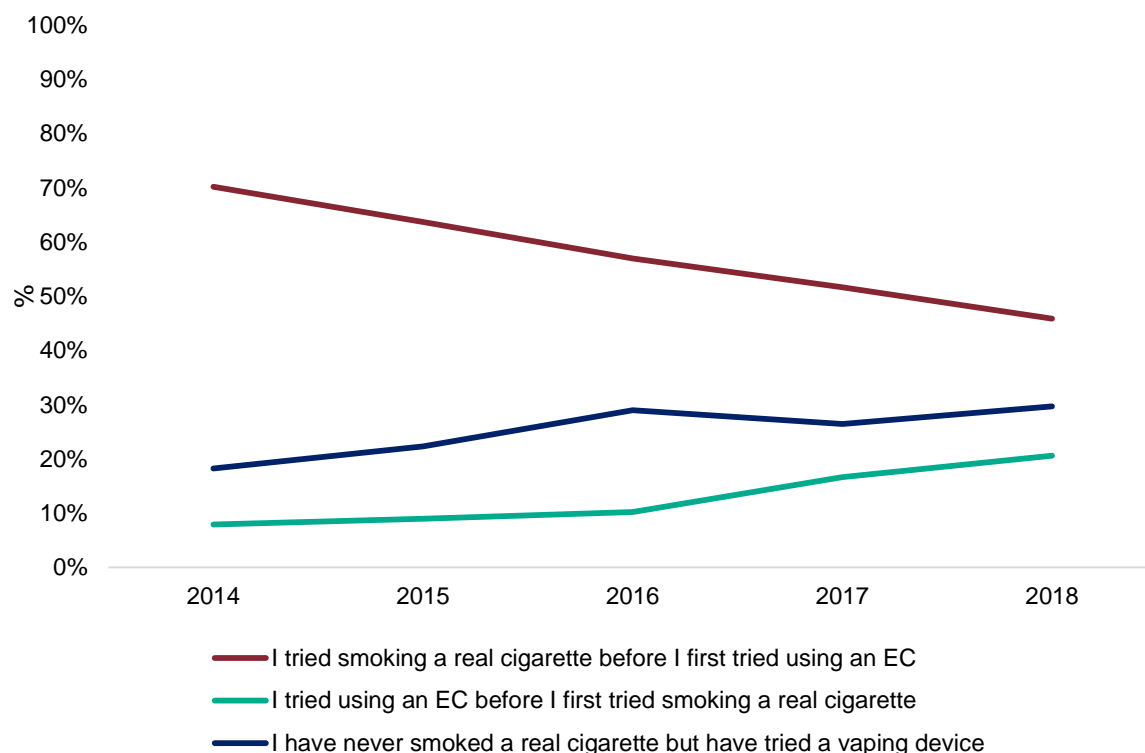
**Figure 3. Reasons for EC use, GB youth (11-18) – ASH-Y 2018**



Notes: Respondents that have tried EC (unweighted bases: Never smokers = 105, former smokers = 179, current smokers = 112). Percentages have been rounded to the nearest whole number

Of all those who had tried an EC, the proportion who had tried a tobacco cigarette first (before trying the EC) has been steadily declining (from 70% in 2014 to 46% in 2018) with increases in those who reported trying the EC before the tobacco cigarette (8% in 2014 to 21% in 2018) (Figure 4). During this period, the proportion of those who had tried an EC who had not also tried a tobacco cigarette has been steadily increasing (18% in 2014, 30% in 2018).

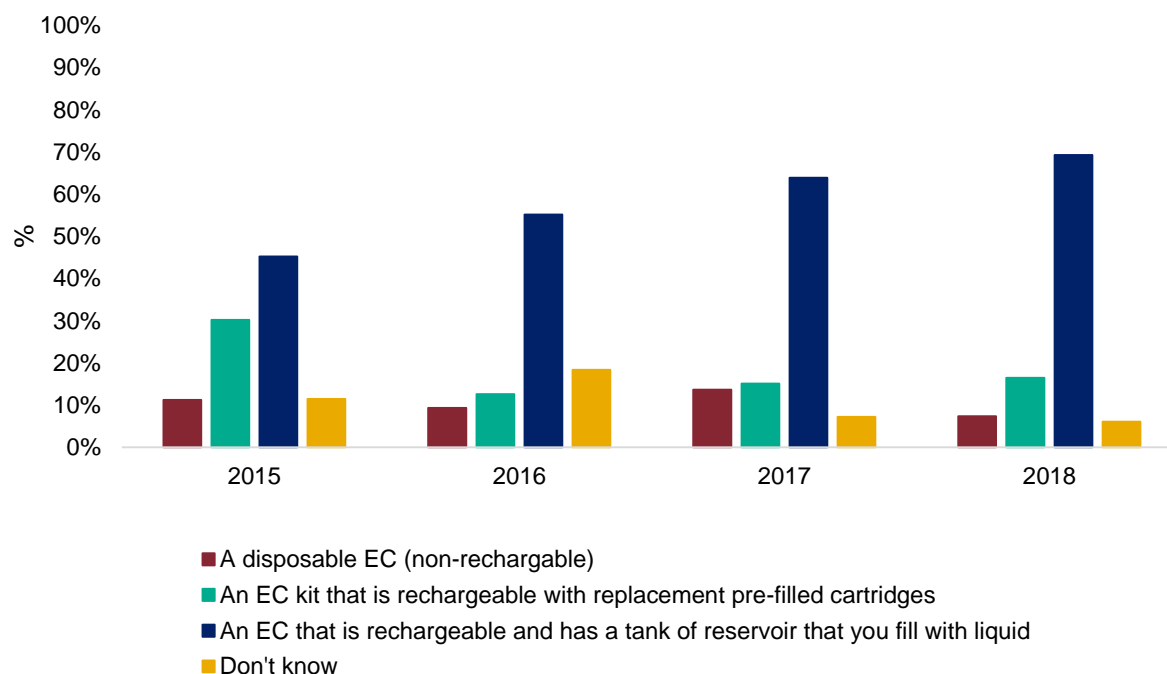
**Figure 4. Order of use between tobacco cigarettes and EC, GB youth (11-18) – ASH-Y 2014-2018**



*Notes: Respondents who said they have tried an EC (Unweighted bases: 2014 = 157, 2015 = 301, 2016 = 318, 2017 = 425, 2018 = 402)*

Since 2015 when the question about device used was first asked, the most popular EC has been a rechargeable device with a tank or reservoir that was filled with liquid (Figure 5). In 2018, 69% of current youth vapers reported using these devices compared with 45% who reported using them in 2015. Those who were past or current vapers were also asked if the device they used contained nicotine. This question related to the EC they used to use most often or use most often nowadays: 31.3% responded ‘yes, always’, 40.0% ‘yes, sometimes’, and 24.0% ‘no, never’, with 4.7% reporting that they did not know.

**Figure 5. Use of EC by device type, current GB youth (11-18) users of EC-ASH-Y 2018**



*Notes: Unweighted base: 11-18 year olds, respondents who are current users of EC (2015 = 59, 2016 = 66, 2017 = 92, 2018 = 85)*

#### Data from SDD survey

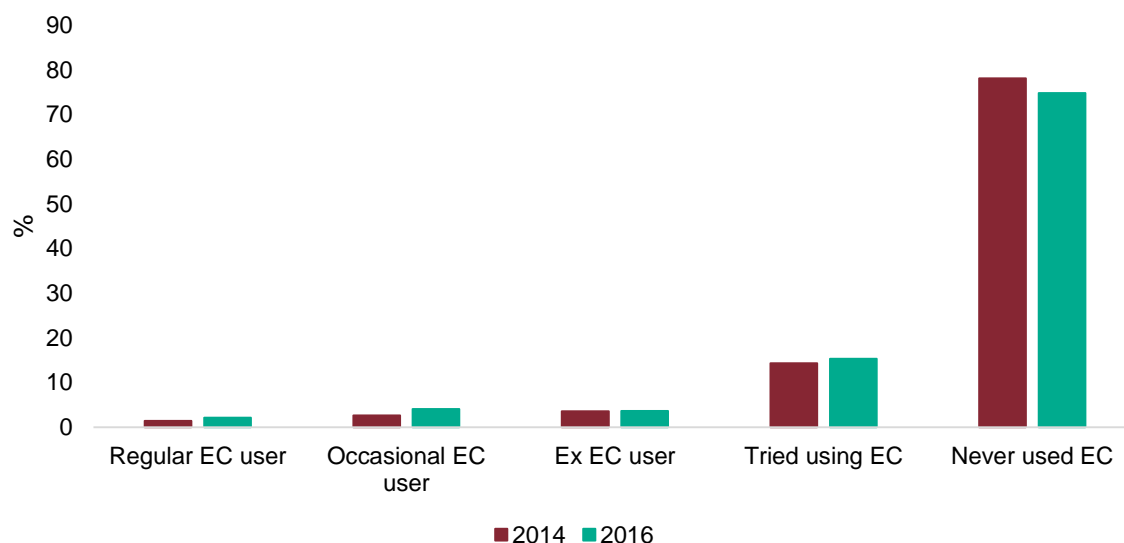
In our 2018 report [4], we reported data on smoking prevalence and EC purchase sources from the 2016 SDD young people's survey which had just been released. At the time of writing, the 2018 data were not available, so in this section, we give more details from the 2016 survey.

In 2016, 19% of the 11-15 year olds reported that they had tried smoking at least once (similar to 2014 where it was 18%); 6% were current smokers in both years (Table 7). The SDD (11-15 year olds) is the survey used by Government to assess its progress in reaching the goals of the Tobacco Control Plan for England [9]: for regular smoking (defined as usually smoking at least one cigarette a week) among 15 year olds to reduce from 8% in 2014 to 3% or less by the end of 2022. In 2016, 7% of 15 year olds were regular smokers (8% in 2014).

Questions on vaping were added in 2014 and vaping status in the 2014 and 2016 SDD surveys (England) are shown in Figure 6. In 2014, the proportion of 11-15 year olds who had ever used an EC was 21.9%, compared with

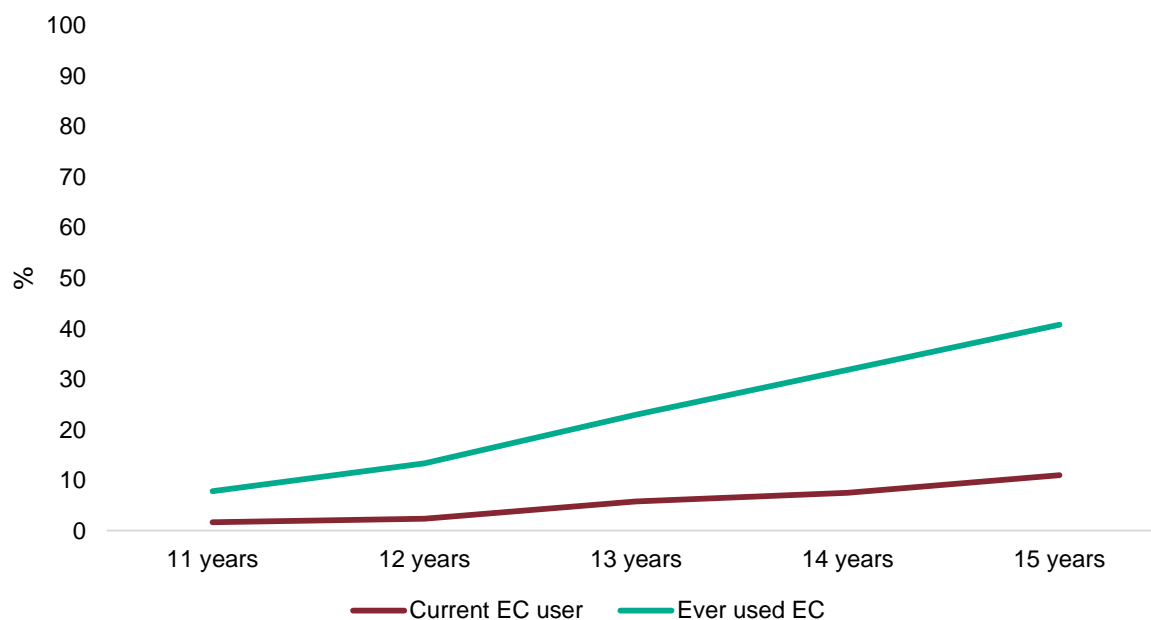
25.2% in 2016. There were 1.4% regular vapers (defined as using a vaping device at least once a week) in 2014, and 2.1% in 2016 (3% boys, 1% girls).

**Figure 6. EC use among children (11-15) in England in 2014 and 2016 - SDD**



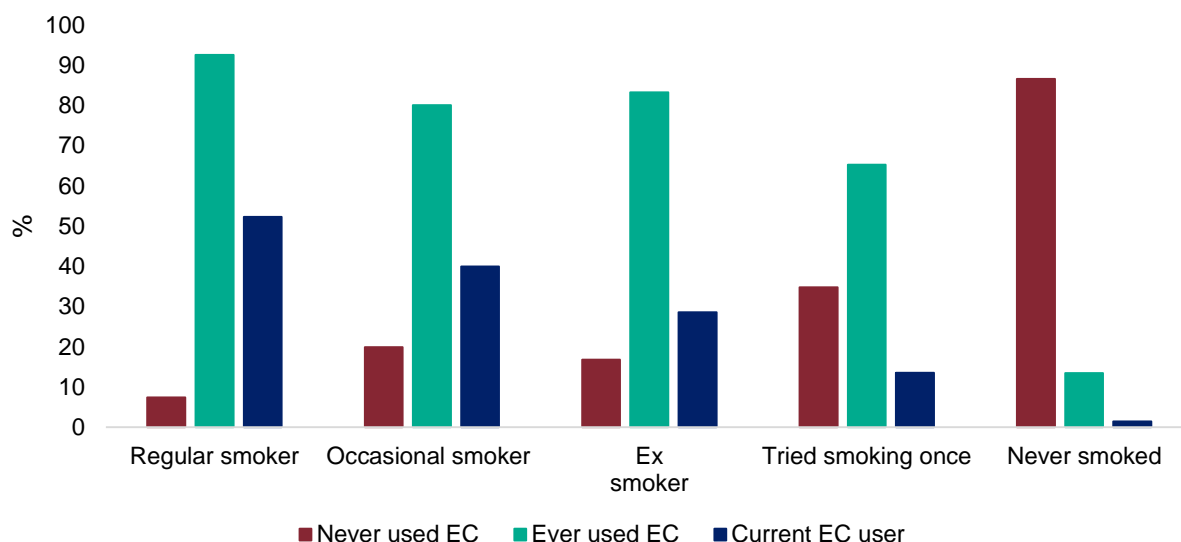
Similar to the ASH-Y survey data, experimentation with vaping increased with age (Figure 7), and experimentation with EC and use were associated with cigarette smoking status (Figure 8).

**Figure 7. EC use and ever use by age in England – SDD, 2016**





**Figure 8. Smoking status and EC use among children (11-15) in England - SDD, 2016**



Data from HSE

The HSE includes a question about cigarette smoking for children aged 8 to 15 years (see: <https://files.digital.nhs.uk/3E/EC36A2/HSE17-Child-Health-rep.pdf>). The questions are presented in a self-completion booklet, so that their parents do not see the answers. The question asks if they have tried smoking a cigarette followed by a second question on their smoking status. Those who answer yes to trying and something other than never smoking to the second question are counted as ever smoked.

In 1997, 18.7% of 8-15 year olds reported that they had ever smoked: 4.8% of 8-10 year olds, 11.7% of 11-12 year olds and 40.7% of 13-15 year olds). In 2017, these figures were 4.5% (0.4%, 0.8% and 10.8%) respectively. Levels of smoking in this age group have been similar since 2013. Survey estimates are subject to a margin of error given small sample sizes, and in 2017, it was likely that the proportion of children aged 8 to 15 years in the population who had ever smoked was between 3 and 7%. In 2017, it was made clear that the question excluded EC which were assessed separately for 13-15 year olds but these data are not yet available for analysis.

## Have EC renormalised smoking among young people in England, Scotland and Wales?

As part of an ongoing NIHR funded study examining the impact of the EU Tobacco Products Directive (TPD) on youth smoking in Great Britain, a team led by Dr Graham Moore at the University of Cardiff has recently completed a new analysis examining trends in youth smoking since EC became available [34]. The focus of this particular analysis was the period leading up to 2015, prior to the transposition of the TPD into UK law in May 2016. The TPD introduced restrictions on cross-border marketing of vaping products across the EU from 2016 and these were supplemented by additional marketing restrictions (print media and online) in the UK in 2017. Marketing restrictions were introduced at least in part to reduce the appeal of vaping products and protect non-smokers and young people from EC uptake [35], based on previous evidence that tobacco marketing influences smoking uptake [36]. The current analysis aimed to assess any relationship between youth smoking and EC use *during a period of growth in the popularity of vaping and limited regulation, prior to the implementation of the TPD*. The hypothesis was that the popularity and visibility of EC may have resulted in an interruption of a long-term downward trend in youth smoking, or may have been linked to young people softening their attitudes towards smoking - ie being more likely to believe that smoking was acceptable. Further analyses of the post TPD period are now underway within this NIHR funded study and we will add these findings in a subsequent report.

The authors conducted interrupted time-series analysis of repeated cross-sectional data from three national surveys in England, Scotland and Wales from the years 1998-2015, up to the implementation of the TPD and the introduction of stricter EC regulation in the UK from 2016. The surveys were: the SDD (England), SALSUS (Scotland) and the HBSC/SHRN (Wales) and the focus was on 13 and 15 year olds as data were available for all three countries for these age groups. The sample included 248,324 young people. The intervention was the unregulated growth of EC use from 2010 (when use became discernible in population surveys) until 2015. Earlier years were included to examine longer term trends in youth smoking and attitudes towards smoking.

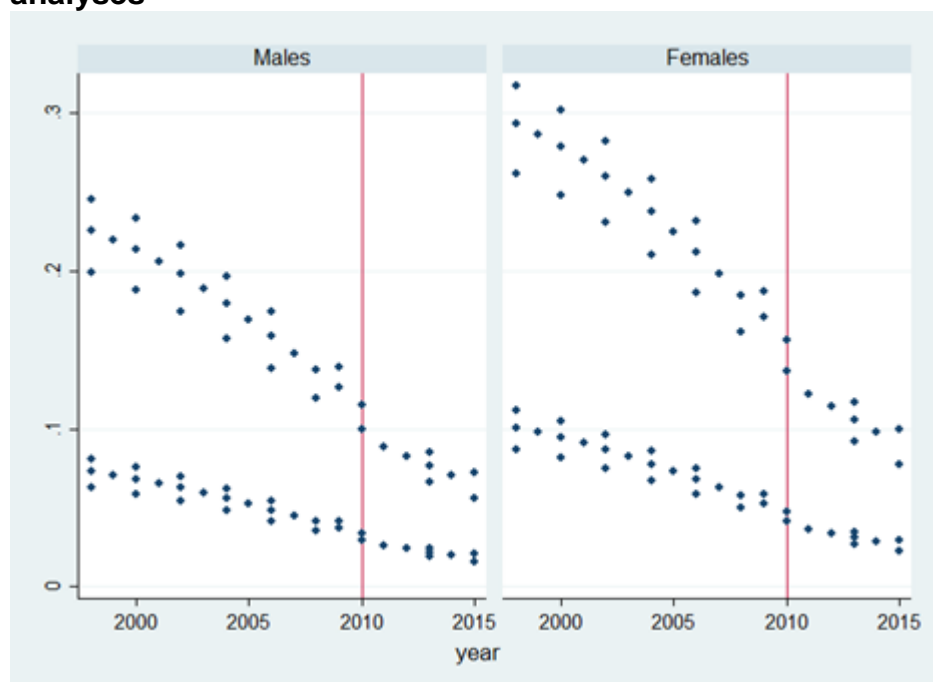
Primary outcomes were the prevalence of self-reported ever smoking and regular smoking (weekly or more frequently). Secondary outcomes were attitudes towards smoking. Attitudes were assessed by questions in the surveys that asked young people if they thought it was 'OK' to try a cigarette.

Analysis of the surveys from all three UK countries found that youth smoking prevalence rates declined between 1998 and 2015. The percentage of ever smokers aged 13 and 15 declined from 60% to 19% and regular smokers from 19% to 5%. In addition, perceptions of smoking changed during the period. The percentage of young people who reported that trying a cigarette was 'OK' decreased from 70% in 1999 (from when data were available for this measure) to 27% in 2015.

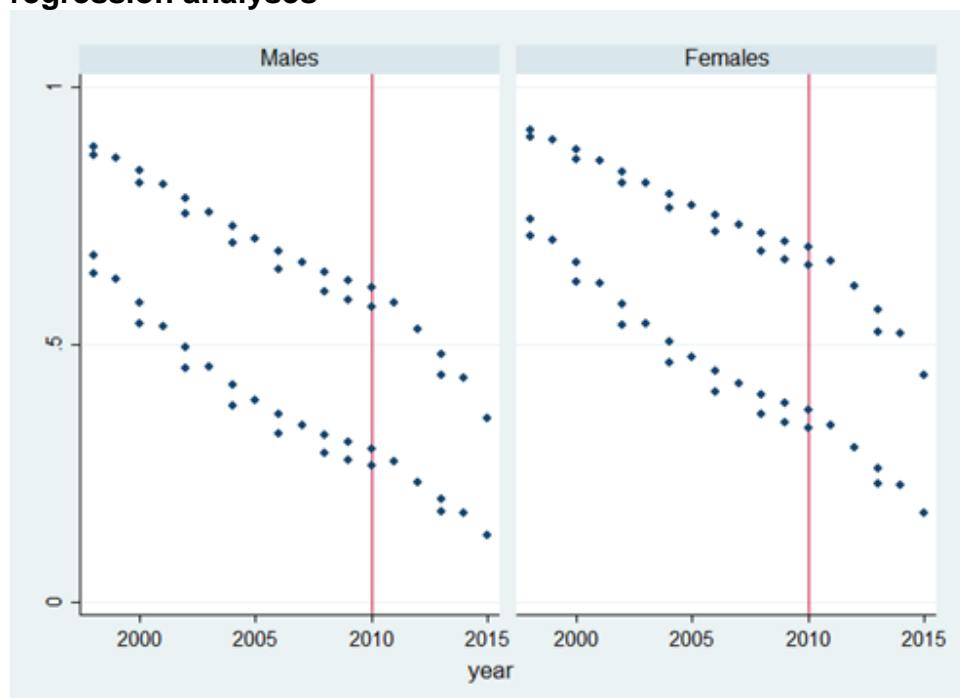
Results from the time-series analysis detected no interruption or slowing of the steady downward trend in ever smoking following the introduction of EC. Among 15 year olds, there was a significant increase in the rate of decline of ever smoking from 2010 onwards. For regular smoking, as illustrated in Figure 9 (with the top lines representing 15 year olds and the bottom 13 year olds) there was a marginal slowing in the decline in regular smoking from 2010 when EC were emerging but relatively unregulated. However, subgroup analyses found that the slowing decline in regular smoking after 2010 was limited to groups for whom rates had declined particularly rapidly before 2010 (females and 13 year olds), suggesting a likely floor effect.

Figure 10 illustrates results relating to attitudes towards smoking. From 2010 when EC became available, there was an increased rate of decline in the proportion of both aged 13 and 15 year olds saying that trying smoking is 'OK'.

**Figure 9. Predicted probabilities of regular smoking for males and females (aged 13 and 15) in England, Scotland and Wales, from logistic regression analyses**



**Figure 10. Predicted probabilities of stating that trying smoking is “OK” for males and females (aged 13 and 15) in England and Scotland, from logistic regression analyses**



These study results suggest that cigarette smoking has not been renormalised among 13 and 15 year olds in Great Britain in the period when EC were becoming popular and were relatively unregulated, ie prior to the

introduction of the TPD in 2016. Youth smoking rates continued to go down and showed little evidence of any stalling or reversing of a longer term steady decline. Over time, attitudes towards smoking have become more negative among 13 and 15 year olds, and there is some evidence that negative attitudes increased during the period since EC became available. These data suggest that fears that vaping might undermine the contribution that tobacco control measures have made to reducing youth smoking had not been realised, up to 2015, in Great Britain. Future research, including this ongoing NIHR funded study, will assess whether these patterns have changed in the three years since the TPD has been implemented given that the current analysis only covers the period up to 2015. We will report on these findings in subsequent PHE reports. Further research should also assess whether any other recent factors (such as the evolution of different vaping products) are affecting historic trends in youth smoking and attitudes towards smoking.

## International literature review of vaping among young people

### US

Since our last report, eleven studies were published within our search period reporting on the prevalence of vaping among young people in the US (Table 8). These ranged from 0.6% to 1.1% in 2011, with the most recent estimates estimating prevalence between 9.2% and 20.8%. This most recent estimate was provided by Cullen and colleagues [37] and reports vaping prevalence for High School students (commonly aged between 14 and 18 years) and Middle School students (commonly aged 11-14). They reported that vaping had increased substantially between 2017 and 2018 for both groups of young people, with 4.9% of Middle School students and 20.8% of High School students reporting past 30 day use in 2018.

Across a number of recent studies in the US, prevalence was found to be highest among Hispanic, male adolescents, as well as among current or former smokers. Vaping prevalence was routinely higher among older young people. In the same studies smoking prevalence was reported to be between 2.2% and 12.3%. Smoking was higher among older adolescents but contrasted with vaping and appeared to be reducing over time, with Dutra and Glantz reporting past 30-day cigarette use diminishing from 15.8% in 2004 to 6.4% in 2014 [38].

## Countries outside of the US

Since our last report, there have been seven studies published within our search period reporting prevalence of vaping among adolescents outside of the US (Table 9). The highest prevalence was found in South Korea where past 30-day use of EC was reported to be ‘around 4%’ among 11 to 18 year olds [39]. The authors highlighted that this had not changed between 2011 and 2015 which they compared to the US where prevalence has risen over the same period. The lowest prevalence was found in Taiwan where past year use was reported to be 0.5% in 2014 among 12 to 17-year olds [40]. That study compared vaping prevalence to the high prevalence of past-year smoking in Taiwan which the authors estimated to be 20.5% among adults and 3.2% among adolescents. Other studies estimated the prevalence of “current” or past 30 day EC use to be 3.3% in Thailand [41], 1% in Mexico [42] (where sale of EC is prohibited) and 1.2% in China [43].

None of the studies reported differences in EC prevalence for younger or older youth, and the different age ranges for participants across studies precluded comparison between studies. It was therefore not possible to infer whether reported EC prevalence was higher for older than for younger youth in the international literature from outside the US.

We are also involved in cross-country studies of youth smoking and vaping internationally through the International Tobacco Control (ITC) Study. At the time of writing, these data are not yet in the peer reviewed literature (or in press) but the Canadian data were reported to the media recently (see: <https://www.cbc.ca/news/health/health-canada-youth-teenage-vaping-smoking-hammond-1.4937593>) suggesting an increase in youth smoking and vaping in Canada. These data will be explored in detail in our next report.

**Table 8. Summary of research reporting prevalence of vaping among young people in the US (since our last report and within our search period)**

Study	Age	Data source and year	Prevalence of current vaping	Prevalence of ever vaping	Vaping prevalence other	Smoking prevalence
Agaku et al, 2018 [44]	School grade 6 to 12 (age 11 to 18)	National Youth Tobacco Survey (NYTS) 2015 to 2016	Past 30-day use of EC 6 <sup>th</sup> Graders = 2.6% 7 <sup>th</sup> = 3.6% 8 <sup>th</sup> = 6.6% 9 <sup>th</sup> = 8.7% 10 <sup>th</sup> = 12.0% 11 <sup>th</sup> = 11.4% 12 <sup>th</sup> = 13.6%		Prevalence declined slightly between 2015 and 2016 for 7th 9th 10th 11th and 12th graders	Past 30-day cigarette use 6 <sup>th</sup> Graders = 1.4% 7 <sup>th</sup> = 2.4% 8 <sup>th</sup> = 2.7% 9 <sup>th</sup> = 4.9% 10 <sup>th</sup> = 7.3% 11 <sup>th</sup> = 8.3% 12 <sup>th</sup> = 12.3%
Ali et al, 2018 [45]	Grade 6 to 12	NYTS 2011 to 2015		There was a steep rise in experimentation with EC over 5 years, particularly among older youth. <b>Male</b> 2013 = 8.5% 2014 = 21.7% 2015 = 29.3% <b>Female</b> 2013 = 6.4% 2014 = 17.3% 2015 = 24.3%	Use in the last 30 days was more likely among male, older, Cuban and Hawaiian participants	
Chaffee et al, 2017 [46]	Grade 6 to 12	NYTS 2011 to 2015	Past month use of EC 2011 = 0.6% 2015 = 9.4%	2011 = 11.6% 2015 = 24.8%	In 2011, three quarters of vapers were male, in 2015 the ratio was more equal Prevalence was higher among Hispanic / Latino or White than those identifying as Black or Other	Past 30-day cigarette use in 2011 Females = 9.7% Males = 12.2% Past 30-day cigarette use in 2015 Females = 5.4% Males = 7.2%
Chen et al,	Grade 6 to	NYTS	Past 30-day use of	Lifetime = 18.7%	Prevalence was higher among	

Study	Age	Data source and year	Prevalence of current vaping	Prevalence of ever vaping	Vaping prevalence other	Smoking prevalence
2017 [47]	12	2014	EC 8.9%		females, older youth, White, Hispanic and Multiracial	
Cullen et al, 2018 [37]	Grade 6 to 12	NYTS 2011 to 2018	Past 30-day use of EC <b>High School</b> 2011 = 1.5% 2017 = 11.7% 2018 = 20.8% <b>Middle School</b> 2011 = 0.6% 2017 = 3.3% 2018 = 4.9%		Prevalence increased 78% between 2017 and 2018 among high school students Prevalence Increased 48% between 2017 and 2018 among middle school students	
Dai and Hao, 2017 [48]	Grades 8, 10 and 12	Monitoring the Future Study 2014	Past 30-day use of EC "EC only"; excludes participants also using marijuana 7.9%		Prevalence was higher among former and current cigarette users, truants, and people whose father had lower levels of education. Prevalence was lower among Black people, higher among Hispanic people	
Demissie et al, 2017 [49]	Grade 9 to 12	The national Youth Risk Behaviour Survey (YRBS) 2015	Past 30-day use of electronic vapor products (EVPs) 15.8% used EVP only 7.5% dual users of EVP and cigarettes		Prevalence was higher among Hispanic people	Past 30-day cigarette use 3.2% smoked cigarettes only 7.5% Dual users of EVP and cigarettes
Dutra and Glanz, 2017 [38]	Grade 6 to 12	NYTS 2004, 2006, 2009, 2011, 2012, 2013, 2014 (ALTHOUGH ONLY 2011 and 2014 reported here)	Past 30-day use of EC 2011 = 0.3% EC only (0.8% dual use) 2014 = 5.8% EC only (3.6% dual use)	2011 = 0.3% EC only (3.0% dual use) 2014 = 6.5% EC only (13.4% Dual use)		Ever smoking 2004 = 40.0% 2014 = 22.1%  Past 30-day cigarette use 2004 = 15.8% 2014 = 6.4%
Jaber et al,	Age 13 to	NHANES	Used at least one			



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<b>Study</b>	<b>Age</b>	<b>Data source and year</b>	<b>Prevalence of current vaping</b>	<b>Prevalence of ever vaping</b>	<b>Vaping prevalence other</b>	<b>Smoking prevalence</b>
2018 [50]	17	2013 to 2014	day in the last five: 1.21%			
Jamal et al, 2017 [51]	Grade 6 to 12	NYTS 2015 to 2016	Past 30-day use of EC <b>High School</b> 11.3% <b>Middle school</b> 4.3%		Prevalence was higher among White, Hispanic and male students. EC were the most popular tobacco product	Past 30-day cigarette use in 2016 High school = 8.0% Middle school = 2.2%
Lanza et al, 2017 [52]	Age 11 to 19	NYTS 2014	Past 30-day use of EC 9.2%		Hispanic adolescents were more likely to use EC than white or black adolescents	Past 30-day cigarette use 6.4%

**Table 9. Summary of research reporting prevalence of vaping among young people in countries other than the US and UK (since our last report and within our search period)**

Location	Study	Age	Data source and year	Prevalence of current vaping	Prevalence of ever vaping	Vaping prevalence other	Smoking prevalence	EC policy / regulation [21]
China	Xiao et al, 2018 [43]	Middle school Age 13 to 15	Global Youth Tobacco Survey; 2013 to 2014	Past 30-day use of EC 1.2%			Past 30-day smoking 5.9% Trial or experimentation 17.9%	
European Union (EU) cities	Kristjansson et al, 2017 [53]	Age 14 to 16	Youth in Europe (YiE) programme, dates not reported		Ever use = 32.7%		Ever use = 60.2%	Policy and regulations vary between EU countries
Mexico	Zavala Arciniega et al, 2018 [42]	Age 12 to 17	National Survey of Drugs Alcohol and Tobacco Use (ENCODAT)	Use “daily” or “less than daily” Adolescent 1%	Adolescent trial 7%	More prevalent among people with higher wealth, greater education, Urban, and smokers	Adolescent smoking in the past 30 days 5%	“The national tobacco control law prohibits the sale, distribution, exhibition, promotion or manufacture of an object that imitates a tobacco product. These prohibitions are specific to nicotine-containing EC.”
South Korea	Hong-Jun et al, 2018 [39]	School grades 6 to 12 (Age 11 to 18, to enable comparison with the NYTS)	Korea Youth Risk Behaviours Web-based Survey (KYRBS) Compared to the US NYTS 2011 to 2015	Past 30-day vaping “Around 4%”		Prevalence in South Korea remained stable over the period whereas use of EC in US increased	Past 30-day use 2011 12.1 Past 30-day use 2015 7.8%	

Location	Study	Age	Data source and year	Prevalence of current vaping	Prevalence of ever vaping	Vaping prevalence other	Smoking prevalence	EC policy / regulation [21]
Taiwan	Chen et al, 2018 [40]	Age 12 to 17	National survey of substance use in Taiwan 2014	Past year use 0.5%	Lifetime use = 0.8%		Exclusive cigarette use (no dual vaping) Past year = 3.2% Lifetime = 4.7%	
Thailand	Chotbenjamaporn et al, 2017 [41]	Age 13 to 15	Global youth Tobacco Survey 2015	Past 30-day use of EC 3.3%	Ever use = 5.4%		Past 30-day use 11.3%	Manufacture and sale are prohibited. Use banned where smoking is banned.

## Conclusions

### Main findings

In England and in Great Britain as a whole, experimentation with EC has steadily increased in recent years. However, regular use remains low, with 1.7% of 11-18 year olds in Great Britain reporting at least weekly use in 2018 (it was 0.4% among 11 year olds and 2.6% among 18 year olds).

Vaping continues to be associated with smoking. The proportion of young people who have never smoked who use EC at least weekly remains very low (0.2% of 11-18 year olds in 2018).

The latest smoking data used for measuring progress in reaching the goals of the Tobacco Control Plan for England are from 2016. These indicated that 7% of 15 year olds were regular (at least weekly) smokers in 2016 (8% in 2014). The 2018 data are not yet available.

The proportion who haven't smoked but have tried vaping is increasing. The extent to which these young people would have tried smoking if vaping had not been available is unclear.

The proportion of 13 and 15 year olds who have ever smoked declined steadily between 1998 and 2015, including after the introduction of EC. In this period, young people's attitudes became more negative towards smoking. Further analyses of the period beyond 2015 are underway.

Studies from outside of the UK suggest a similar picture with increasing experimentation and use of EC over time among youth. There is evidence from the US that increasing vaping is happening against a backdrop of reducing cigarette smoking.

### Implications

Trends in smoking and vaping should continue to be monitored, particularly in the light of concerns expressed in North America about youth smoking and vaping.

Surveillance is needed on purchase sources of EC by young people as recommended in our previous review.

More research is also needed on how young people move from EC to smoking and vice versa.

## 5 Vaping in adults

### Objective

The objective of this chapter is to provide an updated overview of prevalence of trial and use of EC in adults in Great Britain, and information on characteristics of vapers with a focus on socio-economic status. To provide context on inequalities and because vaping prevalence is higher among smokers, smoking prevalence will be presented alongside vaping prevalence. This information will be followed by a brief overview of international evidence on prevalence of trial and use.

### Surveys

Surveys used to describe the situation in Great Britain are the ASH Smokefree Great Britain surveys of adults (ASH-A, respondents aged 18 and over), the OPN 'Adult smoking habits in Great Britain' (respondents aged 16 and over), the Smoking Toolkit Study from England (STS, respondents aged 16 and over), and the Health Survey for England (HSE). See chapter 3 for additional detail on these surveys. At the time of writing, HSE data for 2017 had been published in summary form but the raw data were not yet available, limiting the analyses that we were able to conduct using HSE data.

The Annual Population Survey is the survey used to assess the tobacco control ambitions in the Government's Tobacco Control Plan for England; the target for adult smoking prevalence in England (18 years and above) is 12% or lower by end 2022 from a baseline of 15.5% in 2016. Smoking prevalence in 2017, was 14.9% (95% CI: 14.6 to 15.1) down from 15.5% (95% CI: 15.3 to 15.8) in 2016 [54]. No information on vaping is available from this survey, so it is not included in the remainder of this chapter.

### Trial and use of EC in adults in Great Britain

For 2017/18, the estimates for prevalence of current use were very similar across the four available surveys and ranged from 5.5% to 6.2%, regardless of different geographical coverage and slightly different minimum age of respondents. Prevalence has remained very stable between 2015 and 2018 (Figure 11 and Table 10). Using the latest available population figure for Great Britain, this prevalence translates to about 3 million current adult

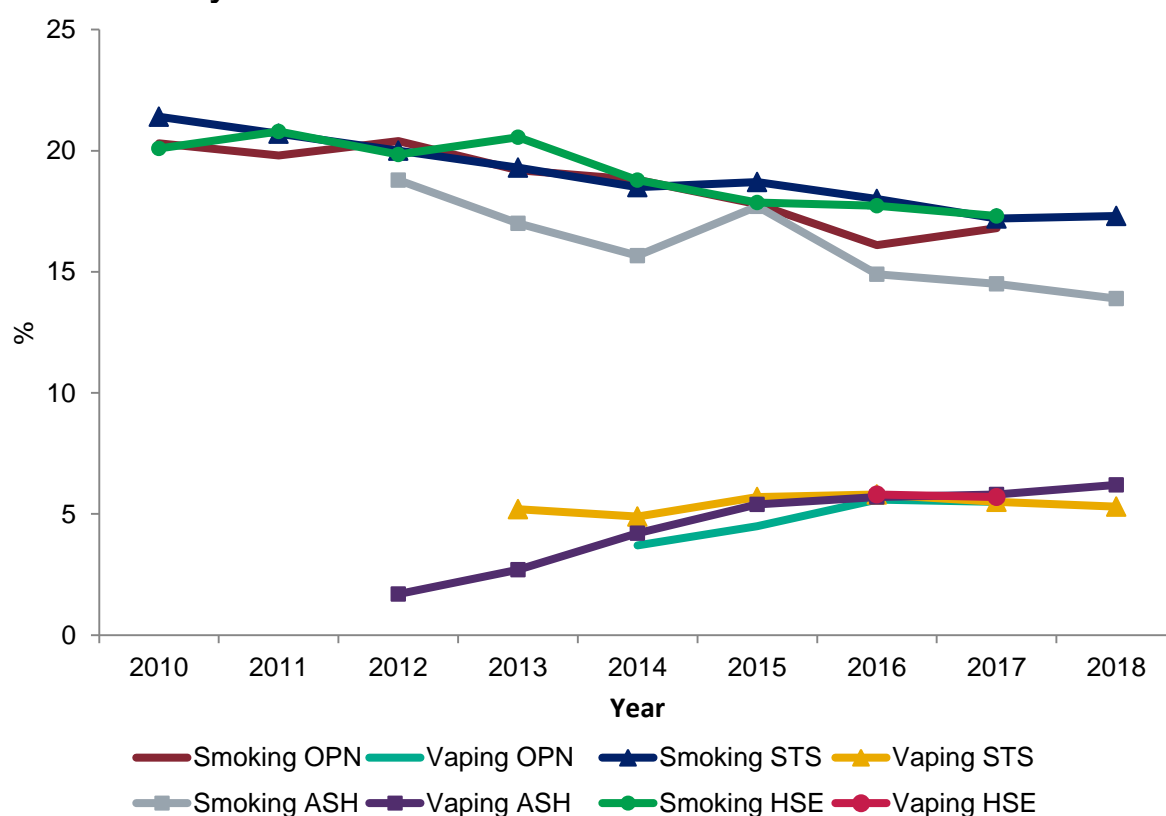
vapers in Great Britain. Even with the prevalence remaining stable, the number of vapers increases over time as the adult Great Britain population keeps growing. Information on smoking prevalence over time is less consistent across the surveys (Figure 11).

**Table 10. Current prevalence (%) of smoking, EC trial and use in adults in four national surveys**

	OPN 2017	ASH-A 2018	STS 2018	HSE 2017
Smoking GB <sup>1</sup>	16.8	13.9	-	-
Smoking England	16.4	13.7	17.3	17.3
Ever tried vaping GB	19.4	17.5	-	-
Ever tried vaping England	18.9	17.5	-	-
Current vaper GB	5.5	6.2	-	-
Current vaper England	5.5	6.2	5.4	5.7

Notes: <sup>1</sup> OPN, STS, HSE current cigarette smoking, ASH-A current smoking (any combustible)

**Figure 11. Prevalence of smoking and vaping in the adult population in four national surveys**



Notes: STS measured vaping from Quarter 4 in 2013, ASH-A is conducted in March. Ages 16+ for OPN, STS and HSE, 18+ for ASH-A. OPN, STS, HSE current cigarette smoking, ASH-A current smoking (any combustible).

## Vaping and smoking status

For current smokers, the OPN reports a lower prevalence of vaping than ASH-A and STS. Figures for vaping among never smokers and ex-smokers are very similar across surveys (Table 11). The STS and OPN allow some breakdown of vaping among ex-smokers by the time since they stopped smoking. Both report the highest prevalence of vaping for those who stopped smoking within the last year (STS: 33.8%; OPN: 38.5%). For those who stopped at any time more than one year ago, the STS reports 9.2%. The OPN allows further breakdown and reports a decline in vaping prevalence with time since stopping smoking with those who stopped more than 10 years ago on a level with never- smokers (Figure 12).

Overall, from the OPN survey, 7.8% of the population aged 16 and over in Great Britain describe themselves as having used EC in the past but no longer using them. Among current smokers, 31.1% are past vapers, among recent ex-smokers, 27.7% are also past vapers (ie have stopped both behaviours). Similar to current vaping, past vaping is less common among those who stopped smoking more than one year ago (4.7%) or never smoked (1.3%) (Figure 12).

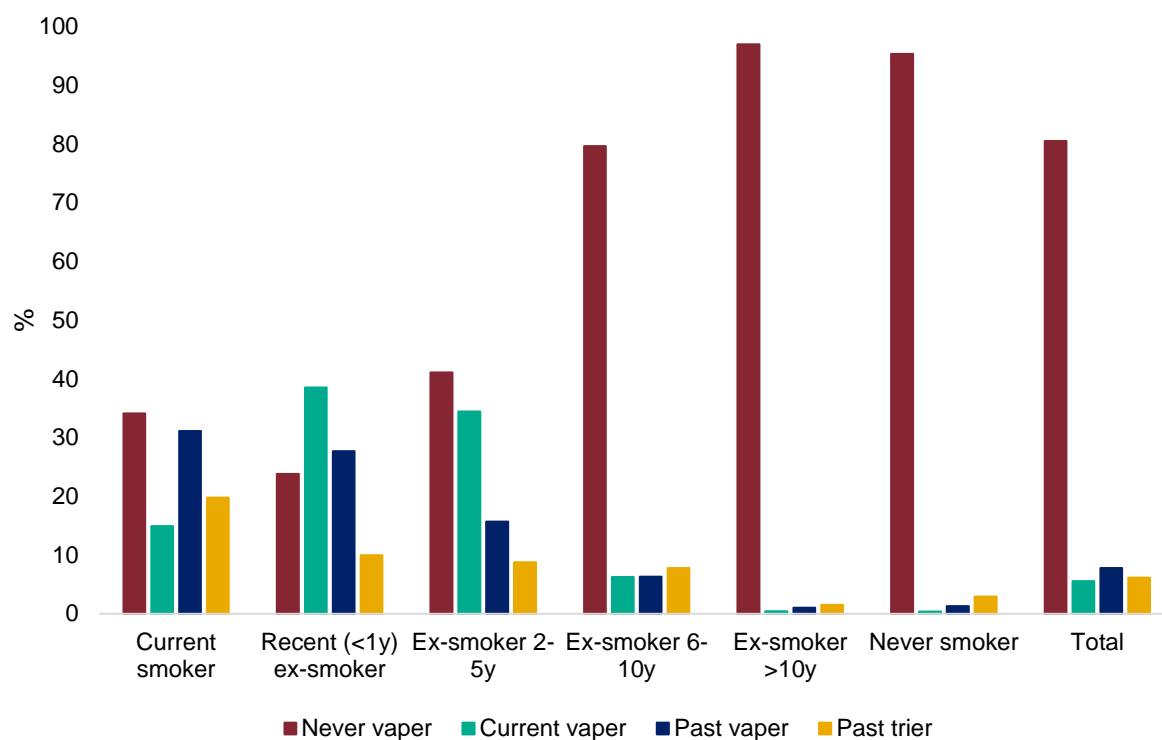
**Table 11. Current vaping prevalence (%) by smoking status, adults in four national surveys**

	OPN 2017	ASH-A 2018	STS 2018	HSE 2017
<b>Smoking status</b>				
Never-smokers <sup>1</sup>	0.4	0.5	0.4	0.8
Current smokers <sup>2</sup>	14.9	19.7	18.5	15.3
Ex-smokers <sup>1</sup>	11.3	10.3	11.0	10.3

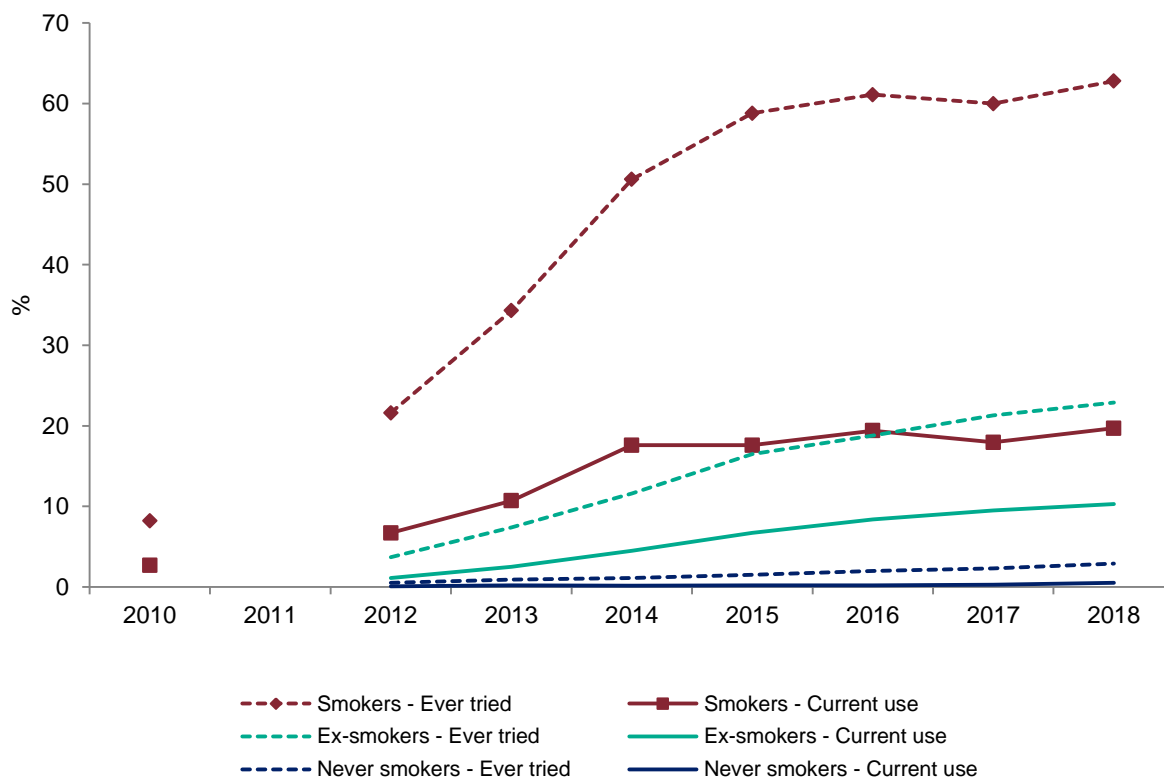
Notes: <sup>1</sup> HSE never-smokers: never regularly smoked, ex-smokers: ex regular smoker. <sup>2</sup> ONS, STS, HSE current cigarette smoking, ASH-A current smoking (any combustible)



**Figure 12. Vaping status by smoking status among adults – OPN 2017**

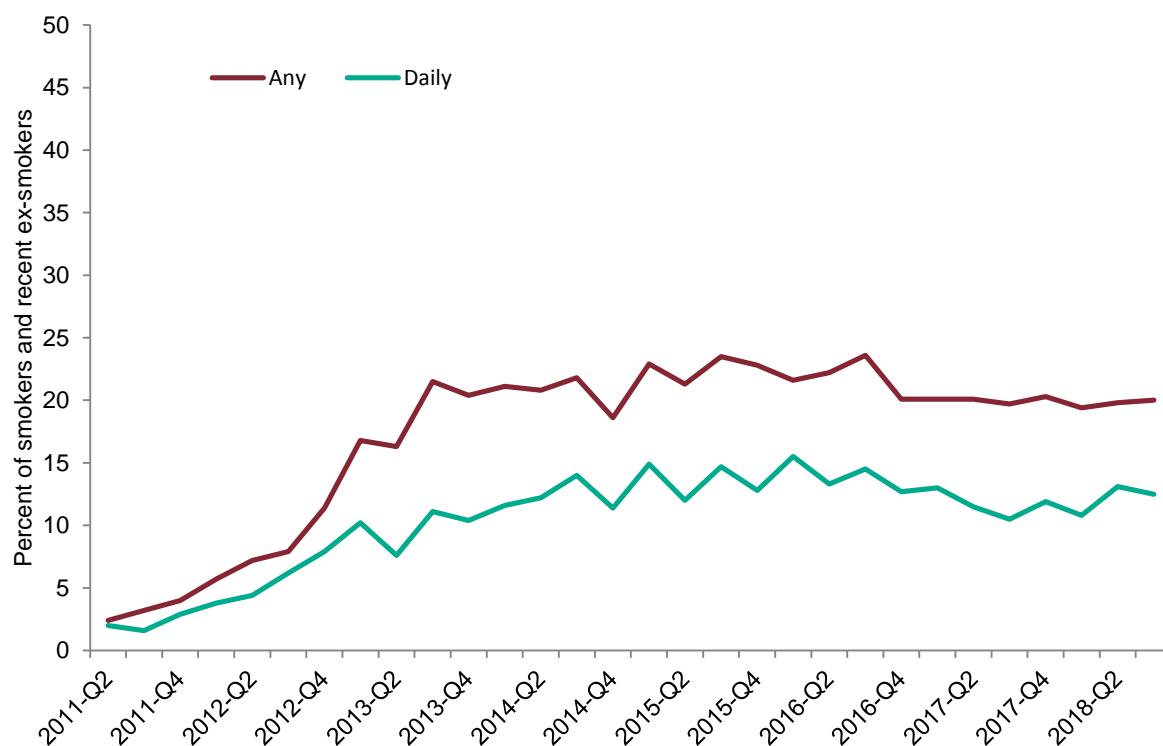


**Figure 13. Ever tried and current use of EC in adults by smoking status over time- ASH-A**



Note: Question about EC use only asked of smokers in 2010, not asked at all in 2011.

**Figure 14. Prevalence of vaping among smokers and recent ex-smokers – STS 2011-2018**

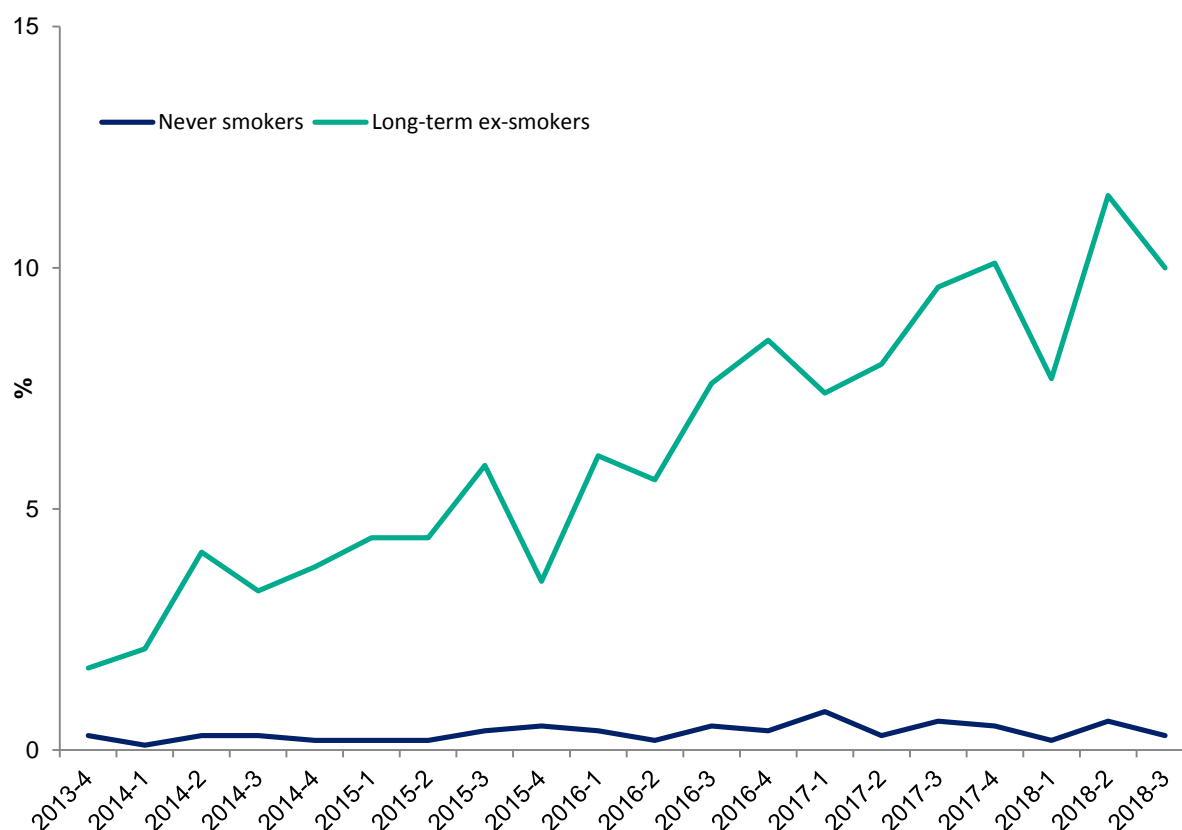


Notes: N=30,262 adults (16+) who smoke or who stopped smoking in the past year

Figure 13 shows ever vaping trial and current vaping by smoking status over time as recorded in the ASH-A survey. Vaping trial and use in current smokers has levelled off with small variations in the proportion using EC between 2014 and 2018; in 2018, 37.2% of all current smokers had never tried EC. In ex-smokers, we continue to see a year-on-year increase, although the rate of increase is declining (from 2.2 percentage points between 2014 and 2015 to 0.8 percentage points between 2017 and 2018). In never-smoking adults, vaping remains low at 0.5% in 2018. A similar picture emerges from the STS, where vaping among smokers is stable. However, among ex-smokers, the STS indicated that vaping among recent ex-smokers has plateaued (Figure 14) while use among long-term ex-smokers is increasing (Figure 15).

As there is concern about vaping particularly in young never smokers [55], we additionally looked at vaping among never smokers by age in the ASH-A. Among never smokers aged 18 to 24, vaping prevalence was 0.7%, among never smokers aged 25-34 it reached 1.0% (35-44: 0.3%, 45-54: 0.6%, 55+: 0.1%).

**Figure 15. Use of EC by never smokers and long-term (>1 year) ex-smokers over time – STS 2013-2018**

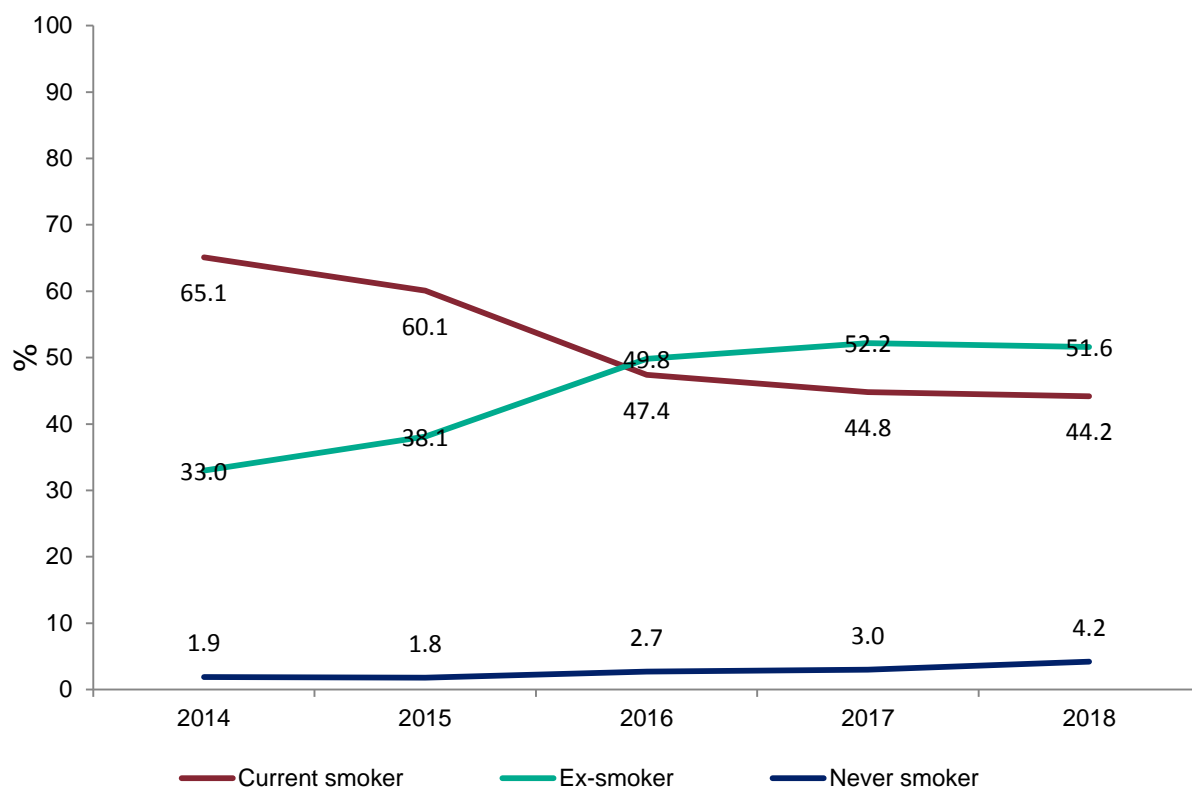


Notes: N=80,180 never and long-term ex-smokers aged 16+ from November 2013

In both the OPN and the ASH-A, the majority of vapers are ex-smokers. Proportions over time taken from the ASH-A are shown in Figure 16; for 2017, the OPN reported very similar figures: 45.4% of vapers were current smokers, 50.6% ex-smokers and 4.0% never smokers. The STS reports a similar figure for never smokers (4.6%), but a different split between ex-smokers (35.2%) and current smokers (60.2%), which may be due to differences in the wording of questions to establish prevalence and smoking status. While still very small, the proportion of vapers who have never smoked appears to be increasing.

The OPN also asked about the order of initiating the two behaviours in 2017. Of those who were both current or past vapers and current or past smokers (unweighted n=843), 86.7% took up cigarette smoking before vaping, 12.5% took up cigarette smoking after vaping and 0.7% started both at the same time.

**Figure 16. Smoking status of current vapers – ASH-A 2014-2018**



Notes: Reproduced [56]

### Vaping by demographics and selected indicators of inequality

Across all four surveys, smoking prevalence remains much higher than vaping prevalence in all groups. Additionally, smoking and vaping appear to be higher among men and in the 25 to 34 age group and lowest in the oldest age group which is likely in part a function of differential mortality. Across different regions of England, there is less consistency in survey findings, although London appears to have a relatively low prevalence of vaping (Table 12).

**Table 12. Current vaping and smoking prevalence (%) by gender, age and region in adults in four national survey**

		OPN 2017		ASH-A 2018		STS 2018		HSE 2017	
		Vaping	Smoking	Vaping	Smoking	Vaping	Smoking	Vaping	Smoking
<b>Gender</b> <sup>1</sup>	Men	6.5	18.7	6.8	14.1	6.0	18.8	6.4	19.2
	Women	4.6	15.0	5.6	13.7	4.7	15.8	5.1	15.5
<b>Age</b>	Under 25	5.4	19.9	3.7	13.4	5.0	20.8	6.2	19.2
	25 to 34	<b>7.3</b>	<b>21.9</b>	<b>7.7</b>	<b>17.4</b>	<b>8.0</b>	<b>24.6</b>	<b>7.5</b>	<b>21.9</b>
	35 to 44	7.2	20.4	7.2	14.7	6.8	19.6	6.3	20.0
	45 to 54	5.8	19.3	7.4	14.8	6.6	18.3	7.1	21.7
	55-64 <sup>2</sup>	6.4	15.1	<b>5.2</b>	<b>11.7</b>	4.4	14.7	6.1	15.5
	65+ <sup>3</sup>	<b>2.3</b>	<b>7.5</b>			<b>2.1</b>	<b>8.6</b>	<b>3.4</b>	<b>11.2</b>
<b>Region in England/ country</b>	North East	<b>8.2</b>	18.1	6.2	14.0	<b>9.1</b>	<b>21.6</b>		
	North West	6.5	15.7	6.0	14.1	7.2	19.6		
	Yorkshire & Humber	6.4	<b>21.0</b>	6.8	13.2	5.9	18.5		
	East Midlands	4.2	16.0	6.8	13.0	5.3	18.7		
	West Midlands	5.5	16.5	<b>8.1</b>	13.6	5.4	17.6		
	East of England	6.0	15.6	5.9	13.5	4.4	15.4		
	London	<b>3.3</b>	18.4	<b>5.3</b>	<b>16.7</b>	4.4	17.6		
	South East	5.5	<b>12.8</b>	6.3	12.9	<b>4.3</b>	<b>14.0</b>		
	South West	5.8	16.3	5.3	<b>11.8</b>	4.7	16.3		
	Wales	7.0	19.5	4.5	12.8				
	Scotland	5.1	18.7	6.9	15.9				

<sup>1</sup> In STS, n= 24 identified 'in another way', of whom n=3 used EC. <sup>2</sup> ASH-A uses age group 55+. <sup>3</sup> HSE separates 65-74 from 75+ where vaping prevalence is 0.8% and smoking prevalence is 4.8%. OPN and STS current cigarette smoking, ASH-A current smoking (any combustible). Highest and lowest values for age and region in bold

To assess socio-economic status, different surveys use different measures. As mentioned above, HSE data for 2017 had only been published in summary form and the raw data were not available which is why the HSE is not included in this section. For this report, the following measures were used:

Occupational grade: The OPN used National Statistics Socio-economic Classification (NS-SEC: coded managerial and professional; intermediate; small employers and own account; lower supervisory and technical; semi-routine and routine; not classified). The ASH-A and STS used social grade using categories originally developed for the National Readership Survey (NRS) which are coded AB for higher or intermediate managerial, administrative or professional occupation; C1 for Supervisory or clerical and junior managerial, administrative or professional; C2 for skilled manual workers; D for semi-skilled and unskilled manual workers; E for state pensioners (state pension is up to £164 per week), casual and lowest grade workers, unemployed with state benefits only) [57, 58].

Housing tenure, versions of which are used in all three surveys, separate those owning their own home with or without a mortgage, those renting from private landlords and those renting from local authority or other social housing. One limitation of this measure is that it is associated with age, as the oldest age groups are far more likely to own their home without a mortgage than younger age groups

A rating of the extent to which respondents are satisfied with their life used in the OPN and classified as low to medium, high and very high and

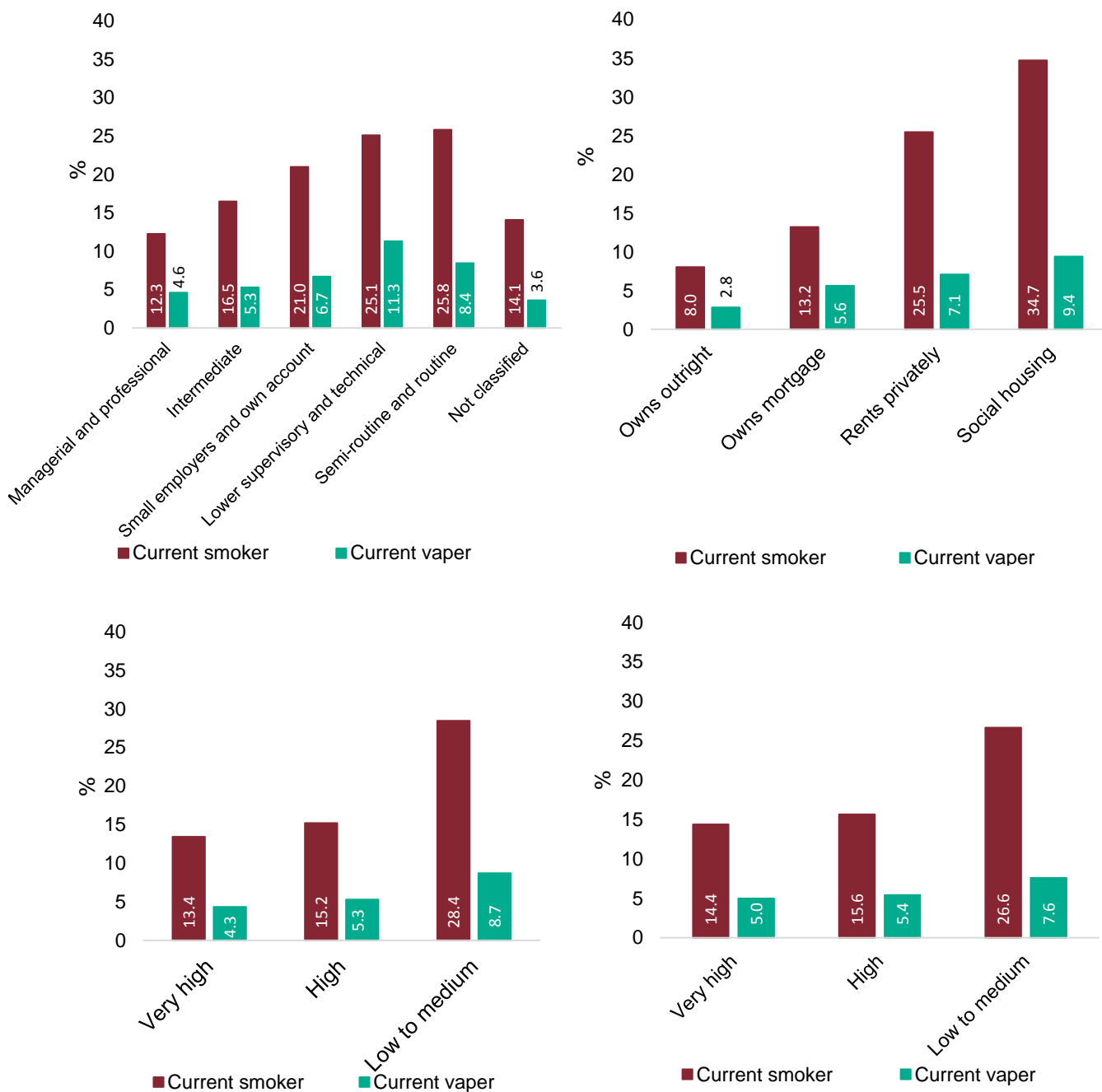
A rating of the extent to which respondents feel that the things they do in their life are worthwhile, also used in the OPN and classified as low to medium, high and very high.

Vaping in England from 2014 to 2017 as a function of socio-economic profile as measured by social grade and housing tenure was comprehensively assessed in a 2018 publication using STS data [59] discussed below. Similar published analyses are not available for the OPN or ASH-A, so subgroup prevalence will be presented for these surveys using available weighted data.

Smoking and vaping prevalence are both inversely related to measures of socio-economic status. In all groups, smoking prevalence was much higher than vaping prevalence (Figure 17 and Figure 18). Generally the findings for

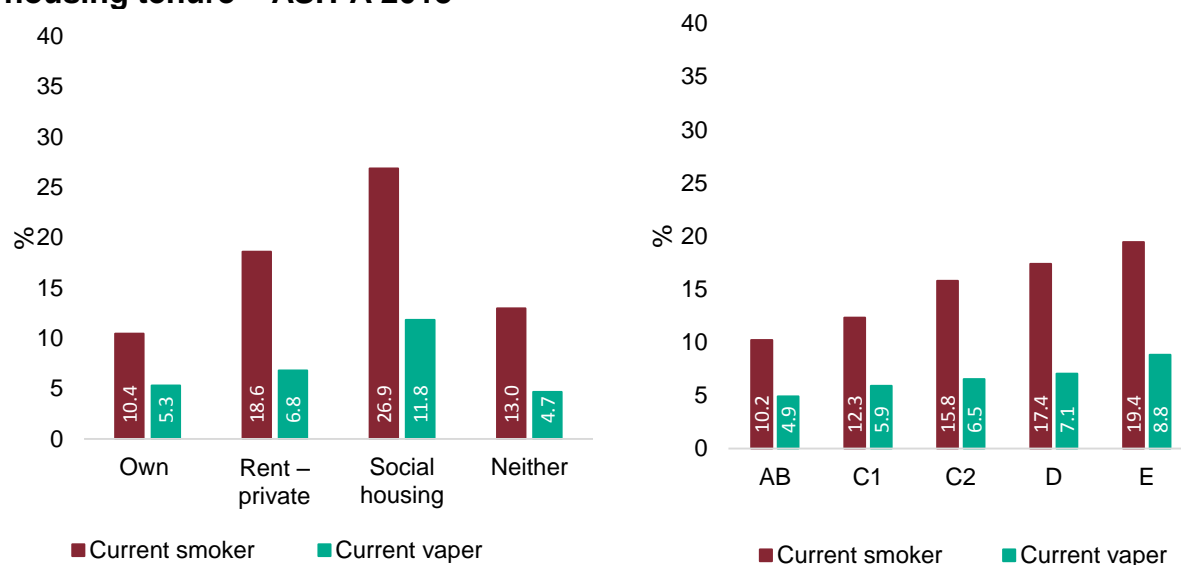
occupational grade, and housing tenure, but also measures of wellbeing, show that those in less advantaged groups are more burdened by smoking. For some groups, the difference between groups is particularly large; for example for housing tenure, smoking prevalence is 35% for those in social housing, 4.3 times the prevalence of those who own their home (vaping prevalence in social housing is 3.3 times that of those who own their home). Smoking in social housing has been explored in more detail in an ASH report [60] and a recent publication using STS data [61]. These showed that while smoking prevalence and dependence were higher in social housing, motivation to quit was similar to other smokers; quit attempts and use of support were higher, but success lower than in other groups [61]. Generally, as expected, vaping prevalence is higher in groups where smoking is more common. Across all groups, the highest vaping prevalence is found among those in lower supervisory and technical occupations (Figure 17).

**Figure 17. Smoking and vaping prevalence by a) occupational grade, b) housing tenure, c) life satisfaction and d) feeling that life is worthwhile – OPN 2017**





**Figure 18. Smoking and vaping prevalence by a) socio-economic status and b) housing tenure – ASH-A 2018**



Using STS data from January 2014 to December 2017, Kock and colleagues [59] examined associations between socio-economic status (using social grade and housing tenure) and current EC use and whether any associations between SES and current EC use varied over time.

Combining data across all years, *adults* from social grade E (smokers and non-smokers) were twice as likely to use an EC compared with those from AB (adjusted OR=2.23, 95% CI: 1.75–2.84) and those in social housing also had twice the odds of using EC compared with those in other types of housing (adjusted OR=2.11, 95% CI: 1.82-2.44). When stratified by year, the odds of EC use were greater in lower social grades compared with the AB group in each year, reflecting higher rates of smoking in lower social grades [59].

Among *past-year smokers*, the gradient was in the opposite direction, with significantly lower odds of vaping by social grades C2, D and E compared with AB (C2: adjusted OR=0.70, 95% CI: 0.54-0.91; D: adjusted OR=0.53, 95% CI: 0.40-0.71; E: adjusted OR=0.67, 95% CI: 0.50-0.89)[59]. There were no significant differences in prevalence of vaping between tenure groups among past-year smokers, the one exception being that in 2017 respondents from social housing were more likely to use an EC. There was convergence over time such that vaping among past-year smokers was similar across all social grades by 2017 [59].

Among *smokers attempting to quit smoking*, there were no significant associations between social grade or housing tenure and vaping and this remained the case when stratifying by year.

Among *long-term (>1 year) ex-smokers*, there was a social gradient with those from social grades C2 and D twice as likely to use EC compared with AB (C2: adjusted OR=2.03, 95% CI: 1.08-3.96; D: adjusted OR=2.29, 95% CI: 1.13-4.70) and those in social housing twice as likely to use EC than those in other types of housing (adjusted OR=2.26, 95% CI:1.40-3.57)[59]. For social grade, the social gradient among long-term ex-smokers remained similar over time, for housing tenure, the association became weaker over time and non-significant by 2016 [59].

With levels of use in quit attempts similar across social grades, the authors concluded that these findings suggest that vaping in this group is unlikely to have a negative impact on health inequalities [59]. Additional information on quit success by social grade would help assess the impact of use in quit attempts on inequalities. The social gradient of vaping in long-term ex-smokers may suggest that those from higher social groups are using EC to quit smoking and then stop use while those from more disadvantaged groups continue use. If vaping among long-term ex-smokers is protective against relapse to smoking, this gradient will have a positive impact on health inequalities, if vaping is not protective against relapse it may exacerbate health inequalities. No evidence is available on this yet.

## Characteristics of vaping by socio-economic indicators

Where the unweighted sample size is less than 50, percentages will not be reported because reliability of these figures would be low. To avoid small sample sizes, for current vapers in the OPN, occupational grade was categorised using three categories (managerial and professional, intermediate, routine and manual) instead of the more precise five.

## Frequency of use

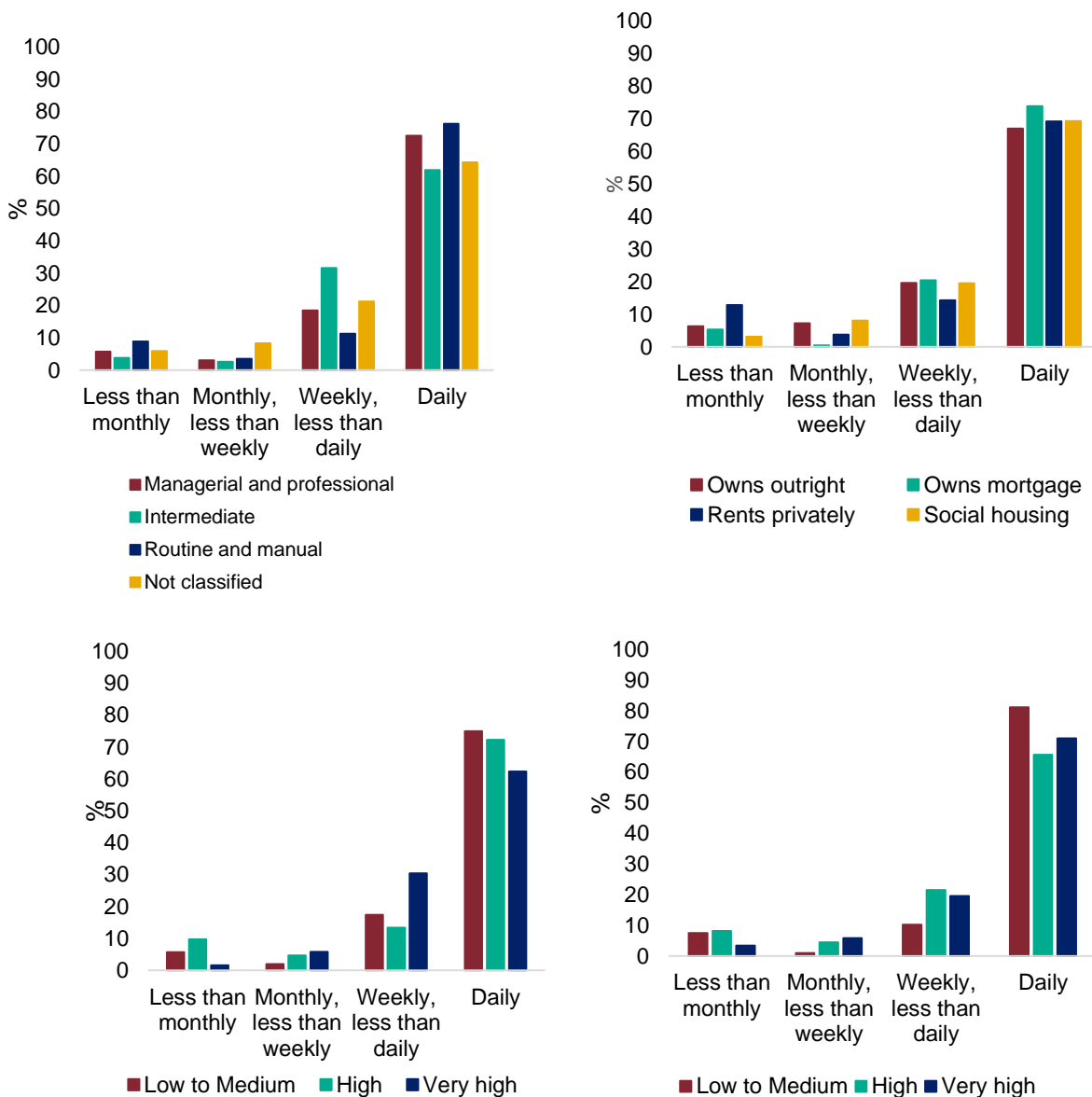
Across different surveys, most respondents who currently use EC report daily vaping: 70.4% in the OPN 2017, 63.6% in the ASH-A 2017 (both report for any vapers regardless of smoking status) and 61.6% in STS 2018 where it is recorded only for those who also smoked in the past year.

Among never-smokers, regular use was rare; of the 2.9% of never-smokers who had ever tried EC, 4.4% reported current or past daily use and an additional 6.8% at least weekly use currently or in the past while 60.9% had only tried an EC once or twice (ASH-A). This means that overall 0.3% of all never-smokers had ever used EC at least weekly. In the OPN, only current

vapers were asked about frequency of use and there were only 15 never smokers who were current vapers. In the STS, frequency of use was not available for never smokers who used EC (unweighted n=43 for January to November 2018).

From the OPN dataset, across all levels of occupational grade, housing tenure, life satisfaction and feeling that life is worthwhile, over 80% of current vapers used at least weekly, with most using daily (Figure 19) and there was little association with measures of SES.

**Figure 19. Frequency of vaping among current vapers by occupational grade, housing tenure, life satisfaction and feeling worthwhile – OPN 2017**



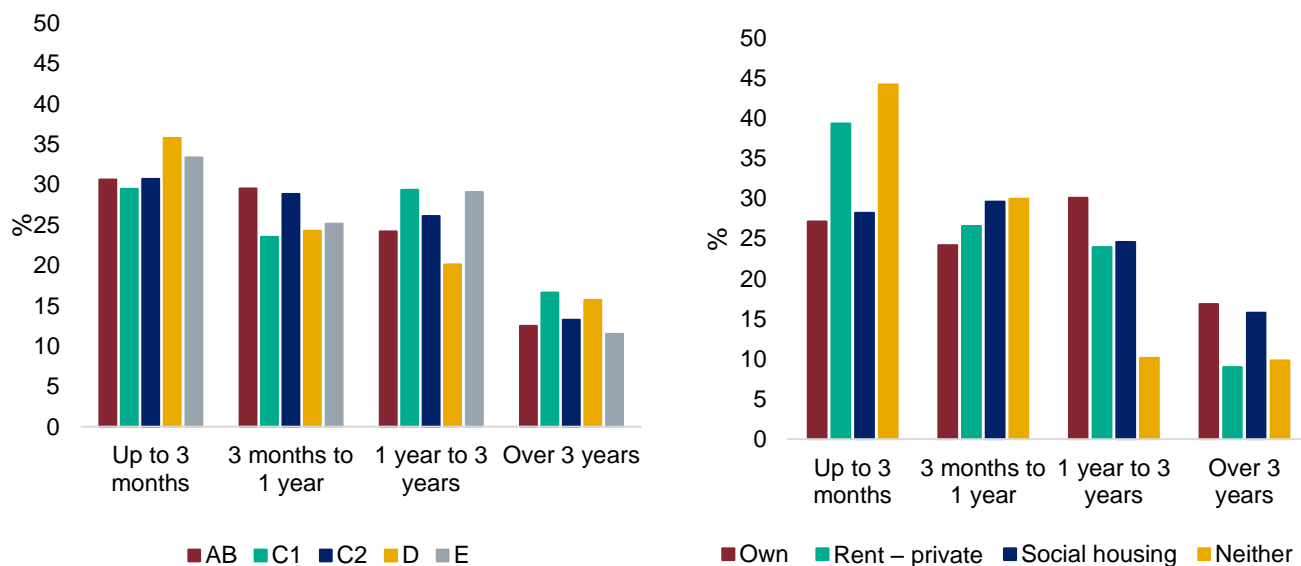
## Duration of use

Excluding those who had only used EC once or twice, there was a wide range in duration of vaping among current and past vapers with just over 40% who reported using for more than one year (ASH-A, Table 13). In subgroups defined by occupational grade or housing tenure, no clear pattern was apparent (Figure 20).

**Table 13. Duration of vaping among past and current vapers – ASH-A 2018**

Duration	%
One month or less	16.4%
More than one month, up to 3 months	15.1%
More than 3 months, up to 6 months	12.8%
More than 6 months, up to one year	13.5%
More than a year, up to two years	15.5%
More than two years, up to three years	10.4%
More than three years	14.3%
Don't know	2.1%

**Figure 20. Duration of vaping by occupational grade and housing tenure – ASH-A 2018**



## Device type

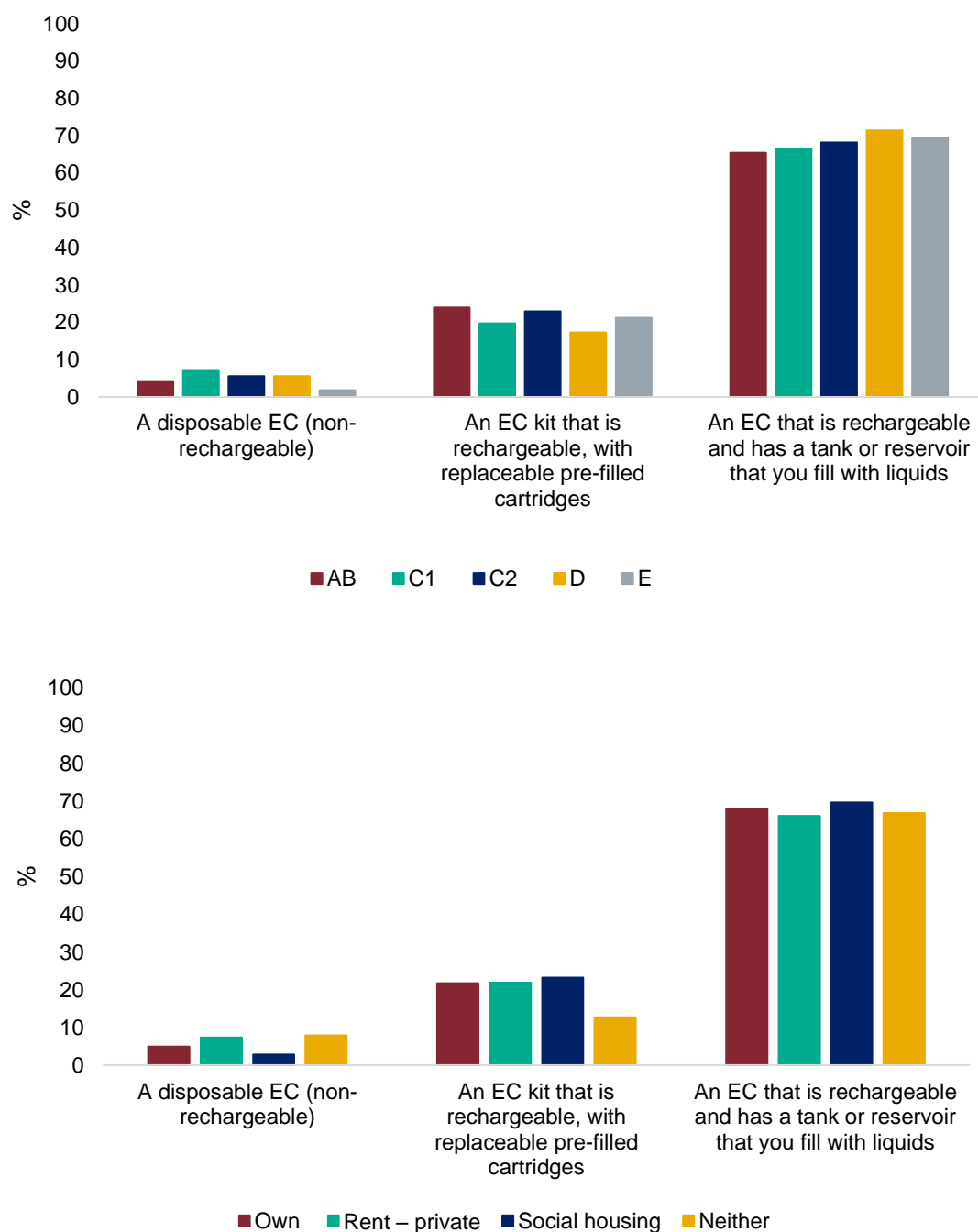
Devices with tanks that can be refilled with liquid continued to grow in popularity among current vapers. In 2014, 40.8% of current vapers responded that they most often used a tank type; this increased to around two thirds of current vapers in 2015 (66.2%), 2016 (71.0%) and 2017 (69.4%) and reached 83.1% in 2018 (ASH-A). Of those using a tank model, 50.2% were able to vary the level of power in their device. Devices that use replaceable cartridges were used by 13.8% of vapers in 2018, less than in previous years (2014: 46.7%. 2015: 26.3%, 2016: 22.7%) [56].

The STS uses slightly different categories and also found tank devices to be the most popular among vapers surveyed in 2018 (53.6%), followed by modular systems [described as “A modular system that you refill with liquids (you use your own combination of separate devices: batteries, atomizers, etc.)”] that were used by 23.1% of vapers, and devices using replaceable cartridges (17.5%).

The OPN used a simpler measure for type of device; here, 15.4% of vapers reported using one that resembles a cigarette, 73.7% one that does not resemble a cigarette and 10.9% some other kind. This question was only asked of a subsample so cannot be split by socio-demographics.

When splitting ASH-A data by occupational grade and housing tenure, there appeared to be little difference in the types of devices used, indicating that more advanced devices are not out of reach of less advantaged groups in the population (Figure 21).

**Figure 21. Device type by occupational grade and housing tenure among past and current users – ASH-A 2018**

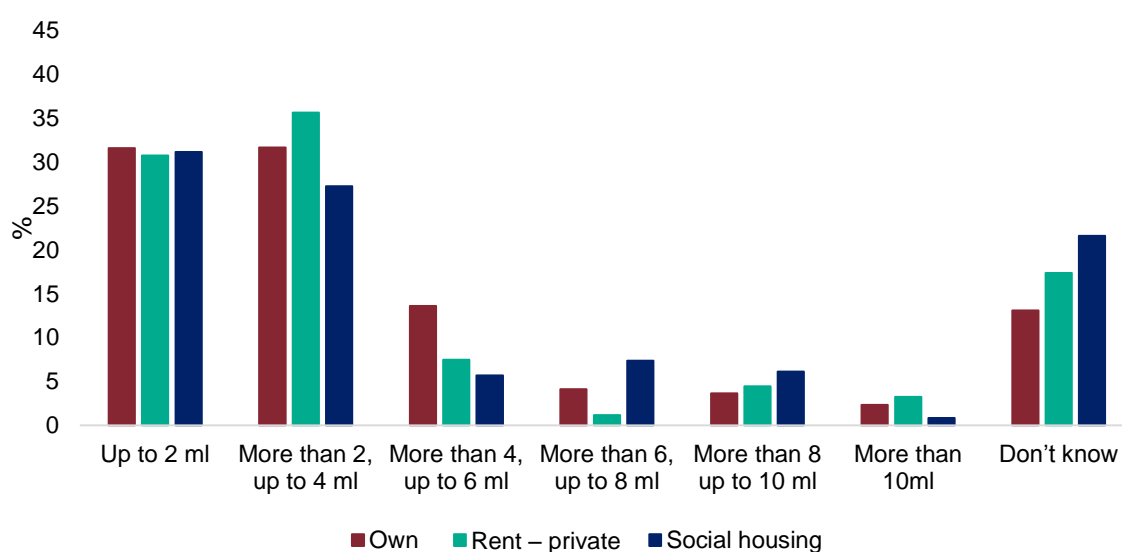
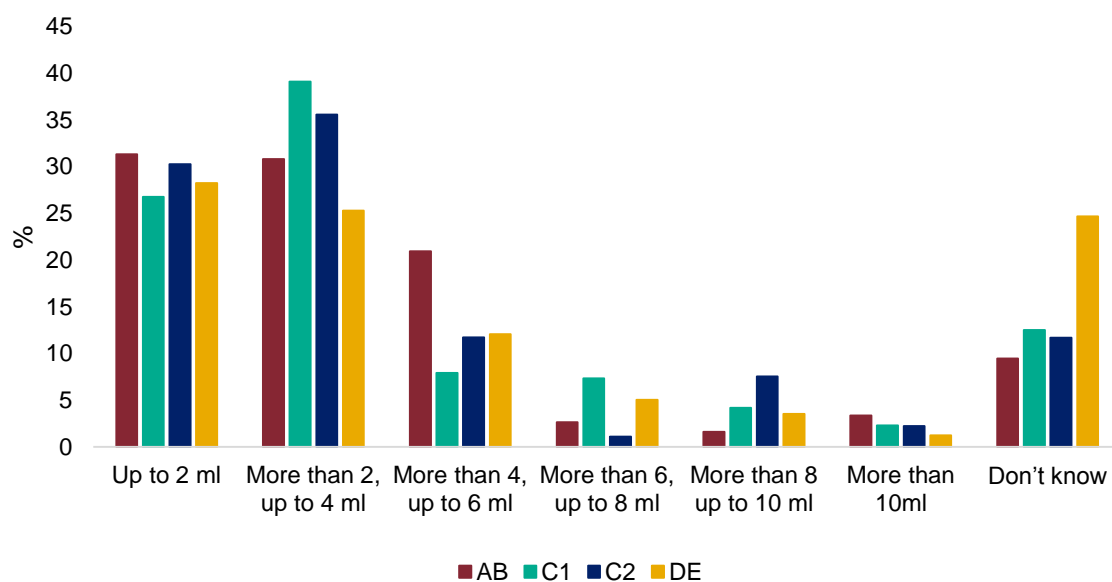


Notes: Graph includes past and current users, text reports use among current users only.

## Amount of liquid

The ASH-A was the only survey to ask about the amount of liquid used. Among daily users of tank models, only a small percentage (2.2%) reported using more than 10 mL a day, the maximum amount allowed under the Tobacco and Related Products Regulations 2016 (TRPR), to be sold in one refill bottle. A substantial proportion (15.2%) of daily vapers did not know how much liquid they use, indicating difficulty with self-report measures for consumption which was particularly visible in lower socio-economic groups as measured by occupational grade or housing tenure (Figure 22).

**Figure 22. Amount of liquid used by current daily tank users by occupational grade and housing tenure - ASH-A 2018**



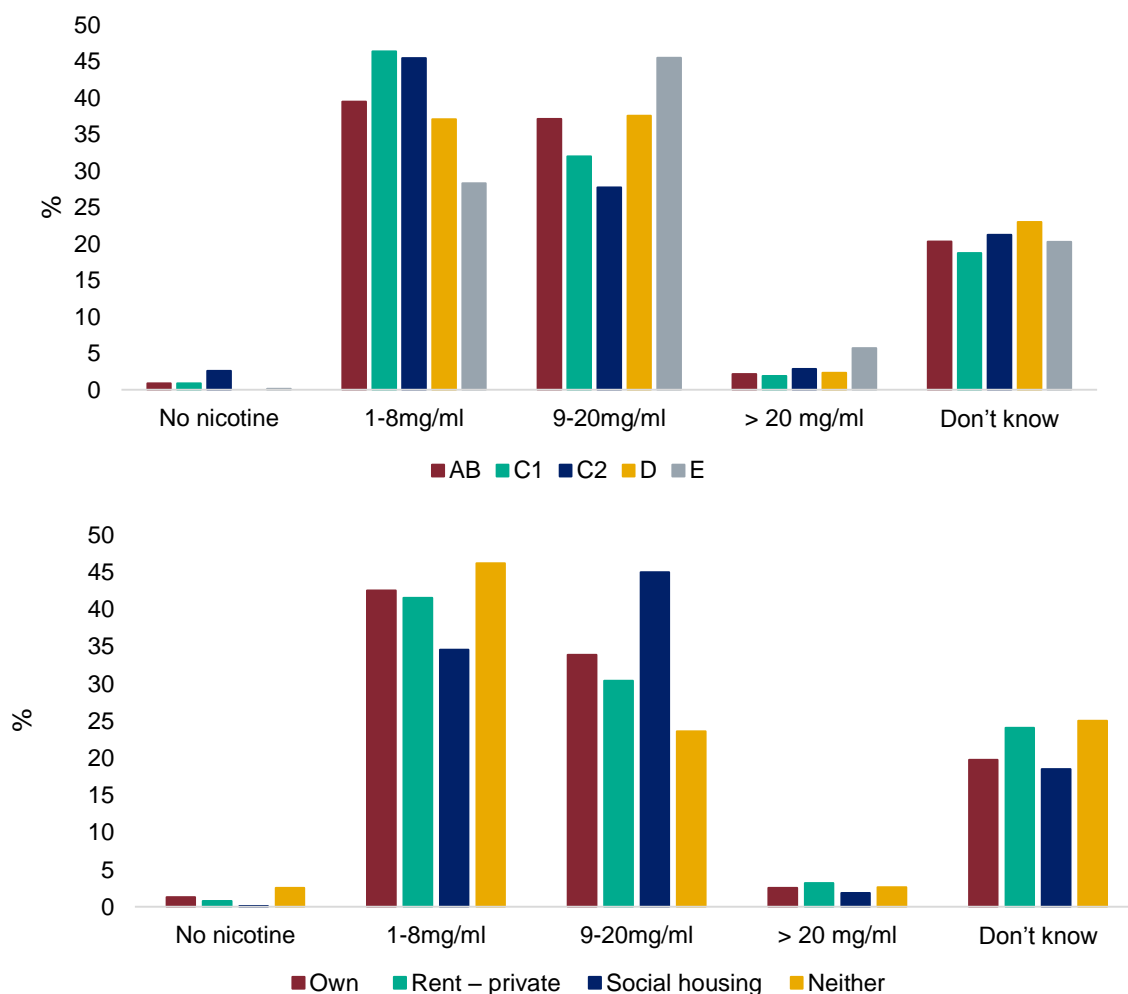
## Nicotine and nicotine strength

In all surveys, over 80% of current vapers report at least sometimes using nicotine in their devices and less than 5% used strengths higher than the 20mg/ml allowed under the TRPR. In the ASH-A, among current vapers, 88.2% always or sometimes used nicotine; 1.8% of those used nicotine strengths higher than those allowed under the TRPR and an additional 8.4% of current users were unsure about the strength [56]. The OPN provided different categories of nicotine strength, described in mg without volume alongside qualitative labels. Using those categories, 12.6% of current vapers reported using 0mg nicotine, 34.1% used 6mg ('low'), 26.0% 11-12mg ('medium/mild'), 11.5% used 18mg ('high/regular'), 3.5% 24mg ('strong') and 12.3% used another strength. In the STS from January to November 2018, 85.1% of current vapers mainly used their device with nicotine and of those, 4.6% mainly used nicotine strengths of 20mg or more.

When including current and past vapers in the ASH-A, the proportion unsure about the nicotine strength used rose to 20.6%. Splits by occupational grade and housing tenure suggested that compared with other groups, a higher proportion of users in grade E or social housing used higher strengths (Figure 23), but this pattern was not apparent in the OPN data (Figure 24).

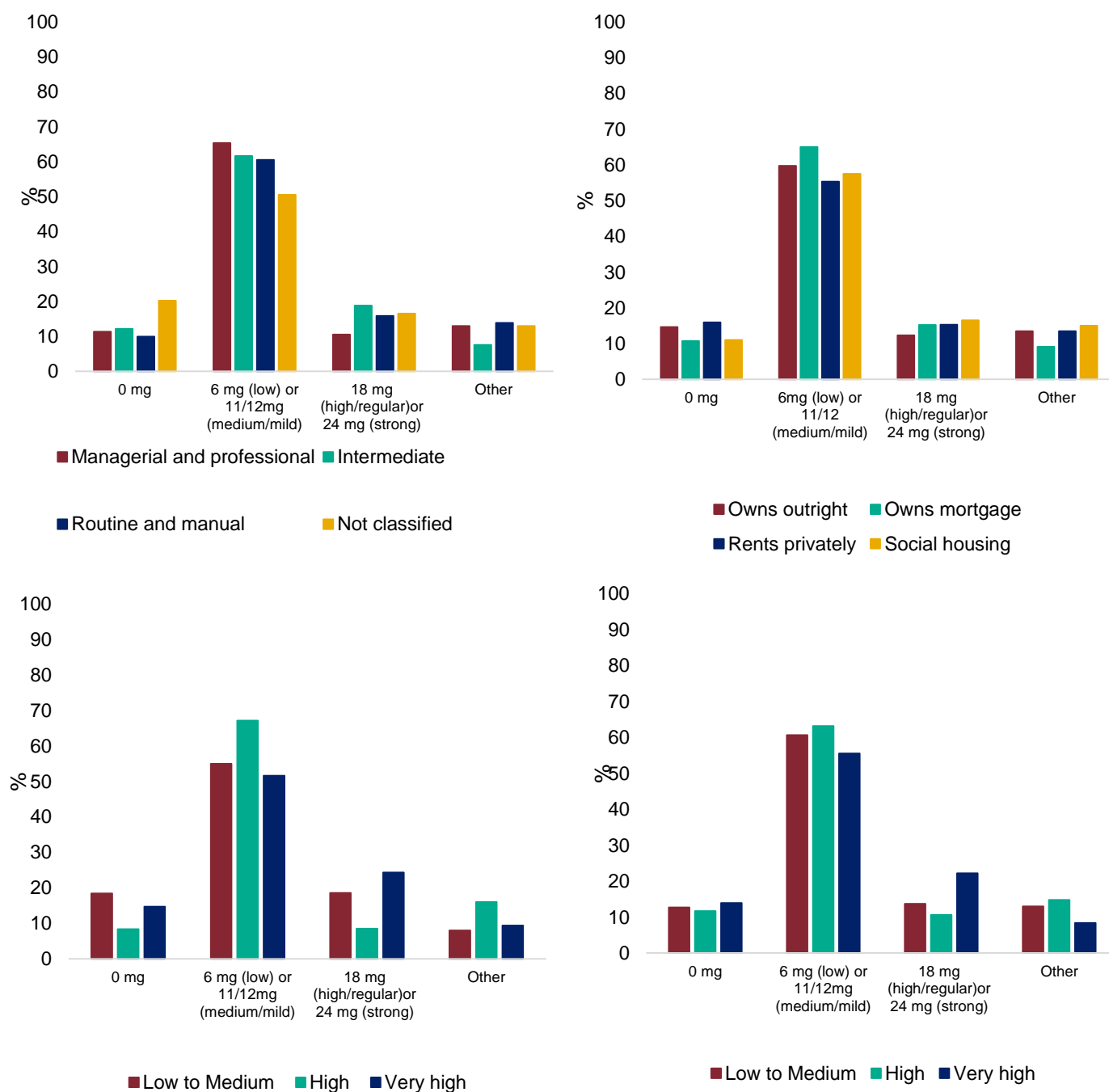


**Figure 23. Strength of nicotine used by occupational grade and housing tenure among current and past vapers who use/d nicotine – ASH-A 2018**



Notes: 'Other' housing tenure groups not shown due to small n

**Figure 24. Strength of nicotine used by occupational grade, housing tenure, life satisfaction and feeling worthwhile – OPN 2017**



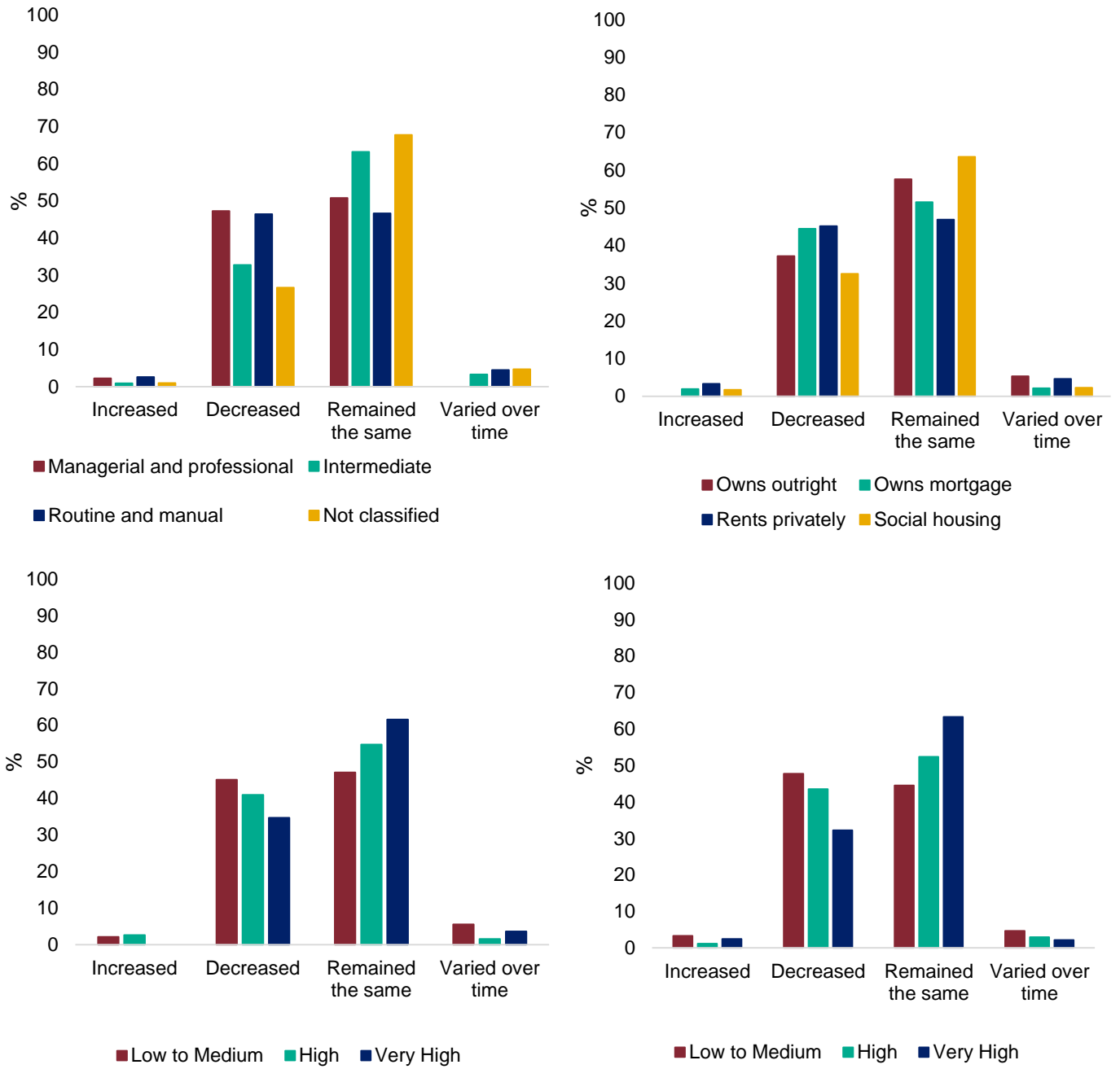
ASH-A and OPN provide information on change in nicotine strength over time. The OPN asked respondents a direct question on this while the ASH-A compared responses given to a question about first use and a question about current use. Both found that most current users had decreased the strength or had been using the same strength since they started (Table 14). There was variation but no clear gradient of change in nicotine strength across

occupational grade or housing tenure. Respondents with higher ratings for life satisfaction and feeling worthwhile were more likely to have continued using the same nicotine strength e-liquid and less likely to have decreased nicotine strength than respondents with lower such ratings (Figure 25).

**Table 14. Change in nicotine strength since started using EC among current users in OPN and ASH-A**

<b>Nicotine strength has</b>	<b>OPN 2017</b>	<b>ASH-A 2018</b>
Stayed the same	54.4	44.7
Decreased	40.1	49.2
Increased	1.9	6.1
Varied	3.2	Not a response option

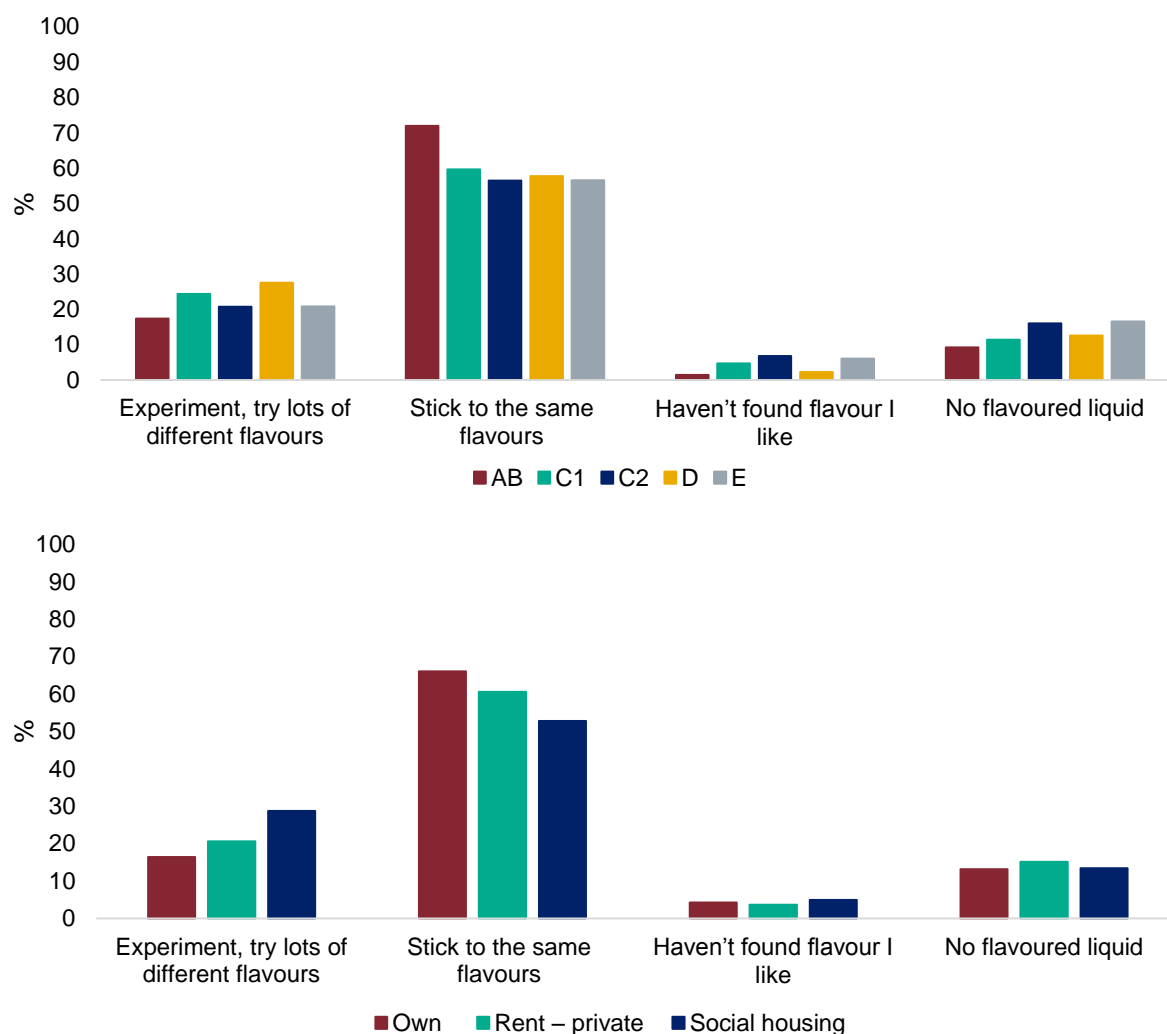
**Figure 25. Change in nicotine strength among current users by occupational grade, housing tenure, life satisfaction and feeling worthwhile OPN 2017**



## Flavours

None of the most recent population-level surveys in Great Britain asked vapers about which flavours they used. One question included in the ASH-A provides some information on whether vapers experiment with flavours or prefer to use the same flavours. Of all current vapers, 60.7% responded that they tended to stick to the same flavours they know they like, 22.3% that they liked to experiment and try lots of flavours, 12.8% said they did not use flavoured liquids and 4.2% said they had not yet found a flavour they liked. There appeared to be a gradient in the proportions sticking to the same flavours and experimenting associated with housing tenure with the difference between these response options least pronounced in vapers in social housing. Vapers in social grades AB were particularly likely to stick to the same flavours (Figure 26). The question did not assess what type or how many flavours were used by those who said they stick to the same flavours so they may have had a single favourite flavour or a range of different flavours that they used.

**Figure 26. Flavour preferences by occupational grade and housing tenure – ASH-A 2018**



*Housing tenure category 'Neither' not shown as n<50 for flavour question*

The ICGBS asked about the types of flavours used in 2014, 2016 and 2017. In all three waves, tobacco flavour was the most popular, in 2014 followed by 'no flavour', in 2016 and 2017, fruit flavours were the second most popular and 'no flavour' selected by very small proportions. Multiple responses were possible, but across all three waves, about two thirds of vapers selected a single flavour type (Table 15). Within each flavour type, vapers may have been using a wide variety of different flavours.

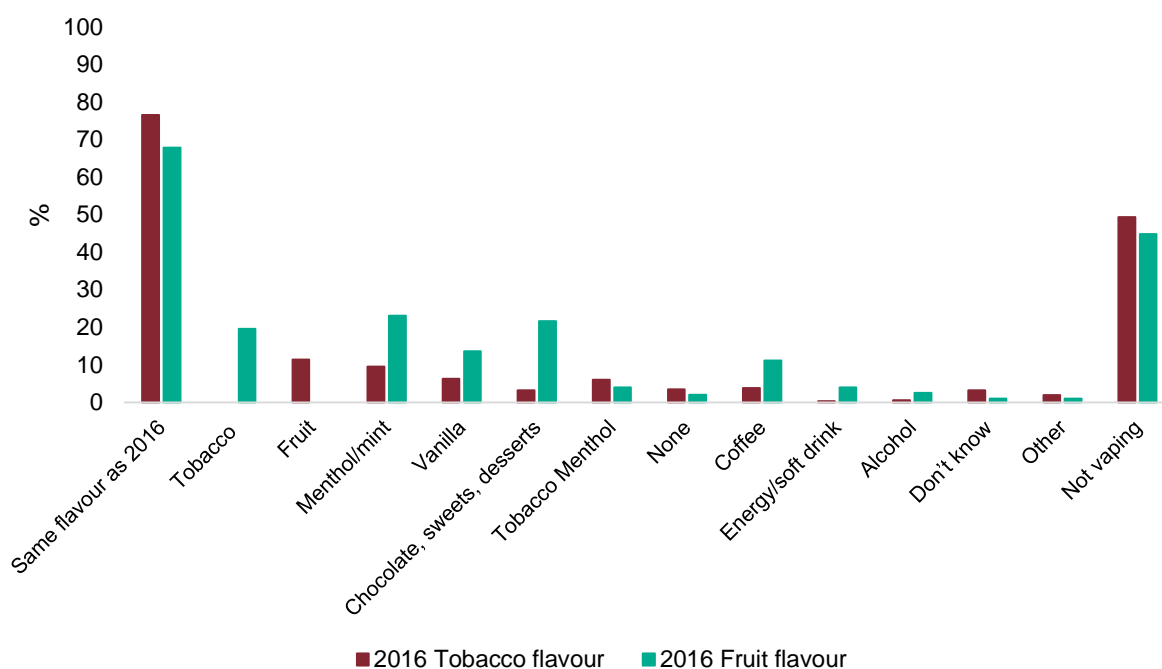
**Table 15. Flavour types over time - Internet Cohort GB**

	2014, n=505	2016, n=1,902	2017, n=836
<b>Flavour type (multiple responses allowed)</b>			
Tobacco	47.2	34.1	39.3
Fruit	18.0	27.6	28.3
Menthol	11.0	21.2	23.1
Vanilla	n/a	8.9	8.4
Chocolate, sweets, desserts	n/a	7.5	8.2
Tobacco Menthol	8.2	7.3	8.0
None	18.7	8.4	5.7
Coffee	n/a	5.9	5.7
Don't know	4.0	4.8	5.6
Other	5.4	2.2	1.9
Energy/soft drink	n/a	3.0	1.5
Alcohol	n/a	1.4	0.9
<b>Number of flavour types</b>			
0 (no flavour and don't know)	22.7	13.1	11.2
1	67.6	67.9	65.3
2	7.5	10.9	14.3
3	1.8	4.8	6.4
4 or more	0.5	3.3	2.8

*n/a: Option not provided in 2014. Current vapers, those who quit in the last year and those who tried a few times all included.*

The longitudinal design allows analysis of transitions between flavours over time. Of those who used one of the two most popular flavour types (tobacco or fruit) in 2016 and were followed up in 2017, the majority continued to use the same flavour type (Figure 27). The next biggest group were those who no longer reported vaping. The impact of flavours on quitting smoking and on relapse to smoking requires further study. Those using fruit flavours appear to be more open to using a variety of flavour types (Figure 27). It is worth noting that because the included respondents were already vaping in 2016, this does not provide information about whether new vapers start with tobacco flavours and then move on to other flavours.

**Figure 27. Flavour types in 2017 for those using tobacco (n=367) or fruit flavours (n=241) in 2016 - ICGBS**



## Regulations

To date, there has been little evaluation of the effect of the implementation of the Tobacco and Related Products Regulations 2016. See chapter 2 for a summary of regulations. One paper [7] used the ICGBS May/June 2016 and September 2017 waves to start to assess some effects. Its aims were to investigate 1) awareness of new EC regulations among the sample of 1,606 smokers, ex-smokers and vapers several months after implementation of new regulation; 2) product use among vapers before and after implementation (sample size between 199 and 388); 3) association between use of compliant tank sizes, nicotine strength and refill volumes before implementation and smoking after full implementation of the regulation among 480 vapers (regardless of their smoking status in 2016).

Awareness of regulations overall was low and higher among vapers; it was highest for restrictions to the refill volume (10.1%; 37.4% among vapers) and nicotine concentration (9.5%; 27.3% among vapers). Higher proportions in 2017 than in 2016 used TPD-compliant refill volumes (60.0% to 73.7%,  $\chi^2(1)=10.9$ ,  $p=0.001$ ) and nicotine concentrations (89.2% to 93.9%,  $\chi^2(1)=7.41$ ,  $p=0.007$ ), with little change for cartridge/tank volume (77.1% to 75.5%,  $\chi^2(1)=0.38$ ,  $p=0.540$ ).



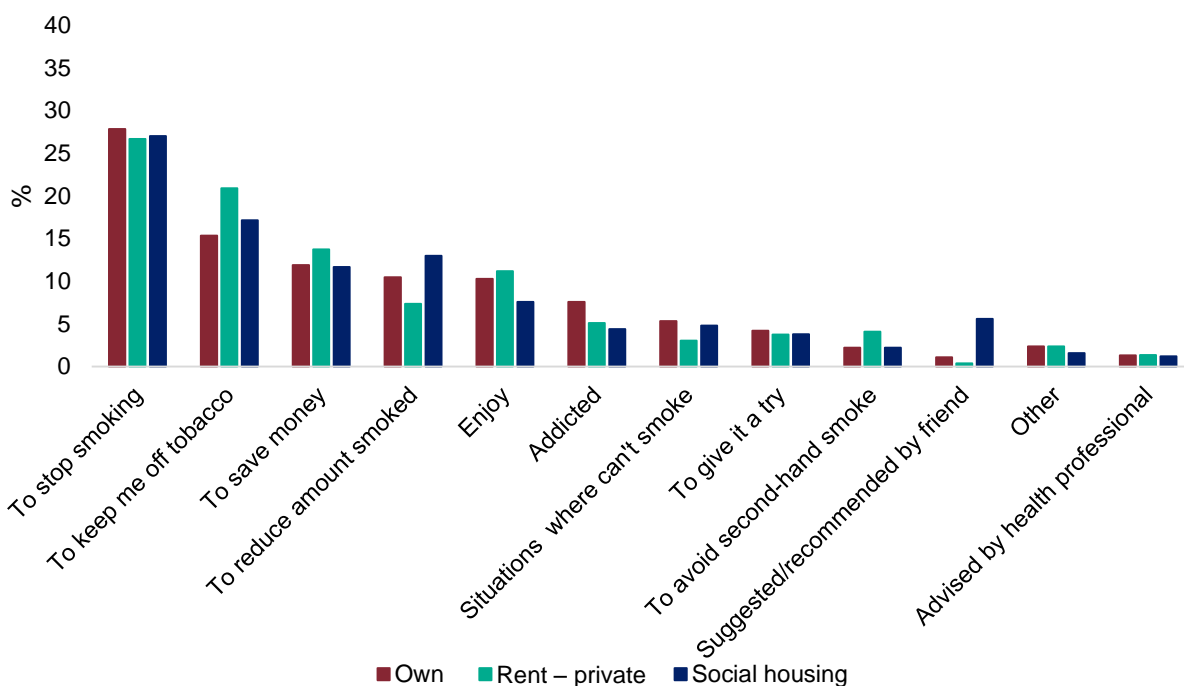
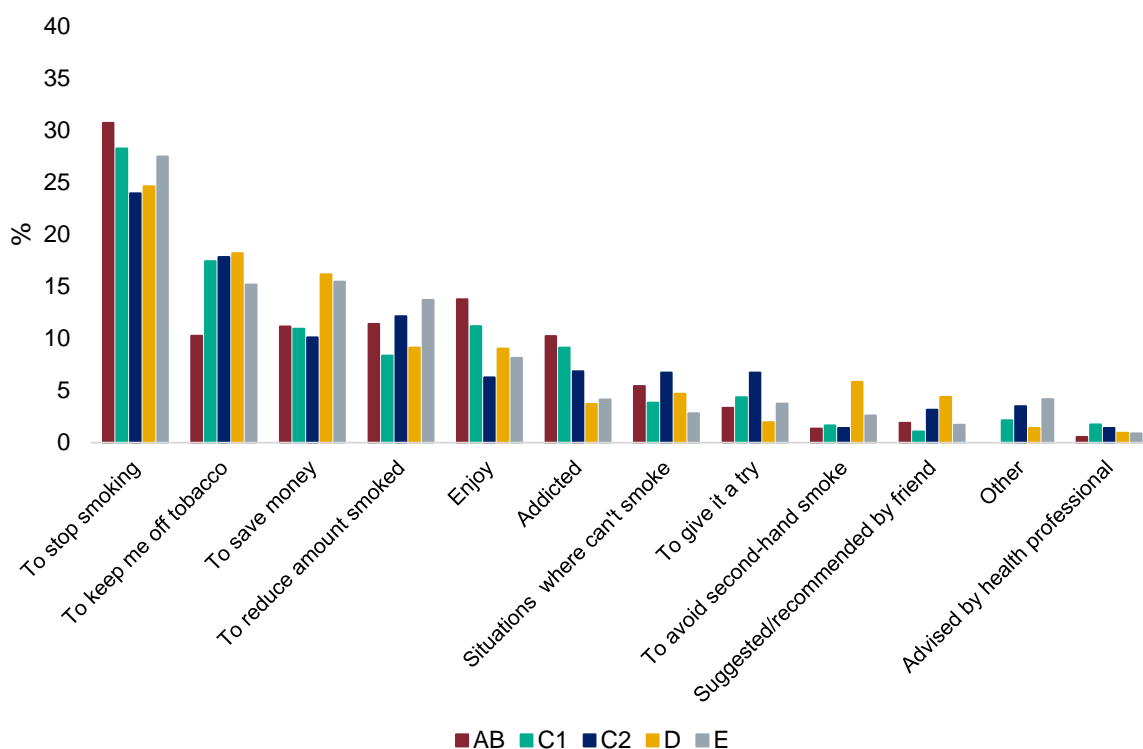
Use of compliant products in 2016 was not associated with smoking in 2017. The likelihood of smoking was similar for those using no or one TPD-compliant product (tank size, nicotine strength, refill volume) as it was for those using two (OR=1.10; 95% CI: 0.47-2.59) or three (OR 1.56, 95% CI: 0.69-3.55). As this is only one small-scale study, evaluation of the impact of regulation on behaviour remains needed.

## Main reasons for use

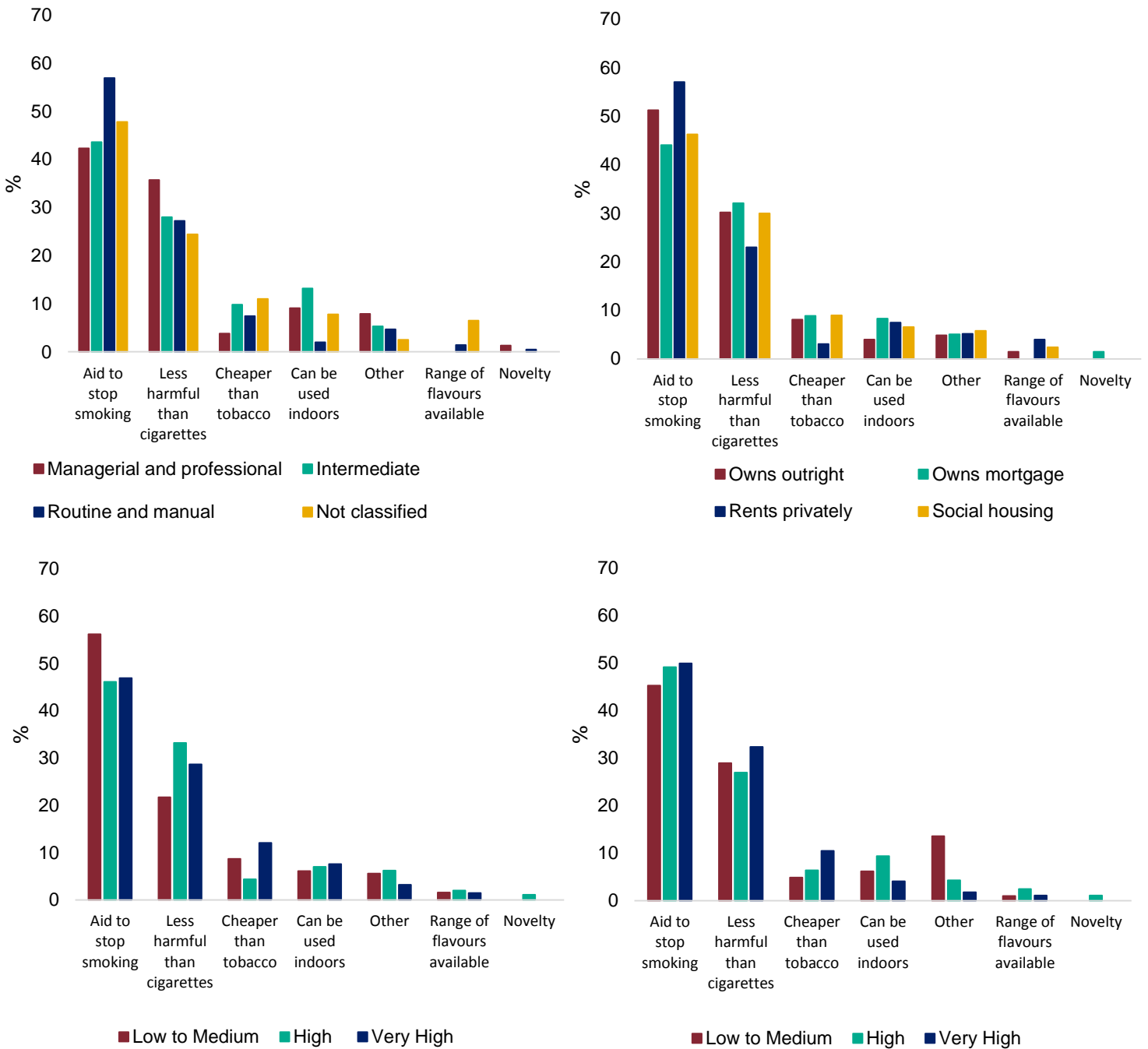
Surveys use different lists of reasons from which respondents can choose, but consistently find that the desire to stop smoking is an important reason. In the ASH-A 2018, across all adults (regardless of smoking status) who had ever tried EC, the most common reason was 'Just to give it a try' (36.2%), followed closely by 'To help me stop smoking entirely' (33.5%), 'To save money compared with smoking tobacco' (26.7%) and 'Because I had made an attempt to quit smoking already and I wanted an aid to help me keep off tobacco' (26.0%). When asking current vapers to select their main reason, the top three reasons in the ASH-A were 'to stop smoking' (27.1%), 'to keep me off tobacco' (15.9%) and 'to save money' (12.3%). The top main reason was the same across levels of occupational grade and housing tenure. The second most common reason showed some small variation across occupational grades. For those in group AB, it was 'enjoy', and for those in E 'to keep me off tobacco' shared second place with 'to save money' (Figure 28).

The OPN presented current vapers with a different list of reasons to select their main reason; 'aid to stop smoking' was the most frequently endorsed (47.8% overall), followed by 'less harmful than cigarettes' (29.2%); other reasons were selected by 7.5% or less (unweighted n=358). The top two reasons were the same across all levels of occupational grade, housing tenure, life satisfaction and feeling worthwhile (Figure 29).

**Figure 28. Main reason for use in current vapers by occupational grade and housing tenure – ASH-A 2018**



**Figure 29. Reasons for vaping among current users by occupational grade, housing tenure, life satisfaction and feeling worthwhile – OPN 2017**



## International literature review of vaping among adults

### US

Thirteen studies published within our search period reported vaping prevalence in the US among adults (Table 16). In those studies, estimates of vaping prevalence mostly ranged from 2.1% to 6.9% with three studies reporting prevalence between 9% and 13.1%. Those three studies [62-64] reported vaping prevalence for a comparatively young subpopulation of adults. These were high school seniors (included here as modal age 18 years) at 9.9% [63], people between 15 and 34 years old at 10% [64] and adults aged 18 to 24 at 13.1% [62]. Vallone and colleagues also reported that 3.3% of people between 15 and 34 years old currently used JUUL products [64]. Studies reported that vaping prevalence was higher among younger adults [65-68], males [65, 66, 68], non-Hispanic participants [66, 68, 69], and those with lower levels of SES, education and income [65, 67-70]. Studies reporting smoking prevalence estimated it to be between 14.8% and 22.8% [62-67, 71]. The study reporting smoking prevalence of 22.8% was the same study that reported prevalence among 18 to 24-year olds [62].

### Other countries

Six studies published within our search period reported prevalence of vaping among adults outside of the US and the UK (Table 17). The highest prevalence was found in the Attica prefecture in Greece where it was estimated at 5%. The lowest prevalence was reported from Mexico where the sale of EC is prohibited and where 0.3% of the population were estimated to use EC. In contrast to the findings from studies conducted in the US, prevalence in Mexico was higher among people with more wealth and a higher level of education. A study from Finland reported 0.7% daily use and 1.3% using EC occasionally. Prevalence was reported to be 1% in Taiwan and 1.9% in Germany (Table 17).

**Table 16. Summary of research reporting prevalence of vaping among US adults (since our last report and within our search period)**

Study	Age	Data source and year	Prevalence of current vaping	Prevalence of ever vaping	Vaping prevalence other	Prevalence Smoking
Bao et al, 2018 [72]	Age 18+	National Health Interview Survey (NHIS) 2014 to 2016	Using EC "every day" or "some days" 2014 = 3.7% 2015 = 3.5% 2016 = 3.2% P for trend, .02	Weighted prevalence of ever-use 2014 = 12.6% 2015 = 13.9% 2016 = 15.3% P for trend, <.001	Increase in prevalence was noted in almost all subgroups analysed	
Chou et al, 2017 [73]	Age 18+	National Epidemiologic Survey on Alcohol and Related Conditions – III (NESARC – III) 2013 to 2014	Past 12-month use of EC 3.8%	Lifetime = 5.4%		
Cohn et al, 2018 [62]	Age 18+	Population Assessment of Tobacco and Health (PATH) Study Wave 1 2013 to 2014	Past 30-day use of EC Overall sample = 6.9% 18 to 24 = 13.1% 24+ = 6%			Past 30-day use Overall = 22.8%  Age 18 to 24 = 29.1% Age 25+ = 21.8%
El-Shahawy et al, 2018 [71]	Age 18+	National adult Tobacco Survey 2012 to 2014	Using EC "everyday", "some days" or "rarely"; All surveyed between 2012 and 2014 5.4%	Ever use of all surveyed between 2012 and 2014 16.3%		Current (at least 100 in their life) cigarette use = 17.4%
Jaber et al, 2018 [50]	Age 18+	NAHNES 2013 to 2014	Past 5-day use Over 18 = 2.6%			
Levy et al, 2017 [70]	Age 18+	TUS-CPS 2014	Past 30-day use of EC 2.1% Regular use; at least 20 of the last 30 days 0.9%	Ever use = 7.7%	Higher among White and Other than Black and Asian people Lower among high income, married (spouse present) and employed.	

Study	Age	Data source and year	Prevalence of current vaping	Prevalence of ever vaping	Vaping prevalence other	Prevalence Smoking
McCabe et al, 2017 [63]	High school seniors (modal age 18 years)	Monitoring the Future Study (MTF) 2014	Past 30-day use of EC 9.9% Past 30-day dual use 7.3%			Past 30-day cigarette use (excludes dual use) 6.0% Past 30-day dual use 7.3%
Mlrbolouk et al, 2018 [69]	Age 18+	Behavioural Risk Factors Surveillance System (BRFSS) 2016	“Daily” or “occasional” vaping 4.5%		Higher among Lesbian / Gay and Bisexual people White, Alaskan and Native American, Native Hawaiian or Pacific Islander Higher among those out of work or unable to work, COPD, Depression, Asthma, Single Lower among Hispanic people	
Pericot-Valverde et al, 2017 [65]	Age 18+	BRFSS (see above) 2015		Ever use of EC = 21.4%	“Higher prevalence among younger adults, males, whites some college and incomes below \$20,000 and current users of CC”	Over 100 in a lifetime and using “daily” or “some days”. Current cigarette smokers 14.8% Current users of smokeless tobacco products = 2.6%
Phillips et al, 2017 [66]	Age 18+	NHIS 2015	Use EC “every” day or “some” days 3.5%		Higher among male, aged 18 to 24, Non-Hispanic Multirace, LGB and those with serious psychological distress (Kessler scale). Much lower among those with a graduate degree	Current use as “some days” or “every day” Any combustible tobacco product 17.6% Cigarettes 15.1%
Rodu and	Age	PATH Wave 1	Use EC “every” day or		More likely to be under 45	At least 100 in their

<b>Study</b>	<b>Age</b>	<b>Data source and year</b>	<b>Prevalence of current vaping</b>	<b>Prevalence of ever vaping</b>	<b>Vaping prevalence other</b>	<b>Prevalence Smoking</b>
Plurphanswat, 2018 [67]	18+	2013 to 2014	"some" days 2.4% (of which 1.4% "some day" and 1.0% "every day")		years old, white and have some college education, far less likely to have a college degree	entire life and now smoke "some days" or "every day" 18%
Vallone et al, 2018 [64]	Age 15 to 34	Truth Longitudinal Cohort (TLC) 2018	Past 30-day use of JUUL 3% Past 30-day vaping 10%	Ever use of JUUL = 6%		Past 30-day combustible tobacco use 17%
Wilson and Wang, 2017 [68]	Age 18+	NHIS 2014	Use EC "every" day or "some" days 3.7%	Ever use = 12.8%	Most likely among younger, male, non-Hispanic white, non-married, poorer and current smokers	

**Table 17. Summary of research reporting prevalence of vaping among adults outside the US and UK (since our last report and within our search period)**

Location	Study	Age	Data source and year	Prevalence of current vaping	Prevalence of ever vaping	Vaping prevalence other	Smoking prevalence	Vaping policy / regulation [21]
Finland	Ruokolainen et al, 2017 [74]	Age 15 to 69	Survey administered by Statistics Finland in 2014	Used occasionally 1.3% Daily use 0.7%	Tried a couple of times 10.5%	Vaping prevalence was higher among participants who were single, unemployed, male, young, urban and smokers		Prohibited sale to under 18s Advertising is banned (includes PoS)  Use banned where cigarettes are
Germany	Kotz et al, 2018 [75]	Age 14+	Cross section survey data from DEBRA study (Deutsche Befragung zum Rauchverhalten) 2014 to 2017	Self-report "current" vapers Overall = 1.9%  Male = 2.6% Female = 1.3%		Current vapers more likely to be Male, aged 18 to 24, no qualification, medium income, and current smoker	Self-report "current" smokers Male = 32.3% Female = 24.5%	Prohibited sale to under 18s  Restricted advertising. Prohibited on TV, radio and internet
Greece	Farsalinos et al, 2018 [76]	Age 18+	Cross-sectional survey representative of the prefecture of Attica and 35% of the Greek adult population 2017	Self-report "current", "past use" and "past experimentation" 5%	Ever use = 27%	Frequency of use (among current and past vapers) Daily use = 79.5% Occasional use = 20.2%	Current smoking "current" or "former" 32.6%	Restricted advertising. Prohibited on TV radio and internet
Mexico	Zavala Arciniega et al, 2018 [42]	Age 18 to 65	National Survey of Drugs Alcohol and Tobacco Use	Use "daily" or "less than daily" Adult non-smokers	Adult non-smokers Trial = 3%	More prevalent among people with higher wealth, greater	Total sample (including adolescents). Smoking in the	"The national tobacco control law prohibits the sale,



Location	Study	Age	Data source and year	Prevalence of current vaping	Prevalence of ever vaping	Vaping prevalence other	Smoking prevalence	Vaping policy / regulation [21]
			(ENCODAT) 2016	0.3% Adult smokers 5%	Adult smokers Trial = 18%	education, Urban, and smokers	past 30 days 17%	distribution, exhibition, promotion or manufacture of an object that imitates a tobacco product. These prohibitions are specific to nicotine-containing EC."
Taiwan	Chen et al, 2018 [40]	Age 18+	National survey of substance use in Taiwan 2014	Past year use 1.0%	Lifetime use = 2.2%		Exclusive cigarette use (no dual vaping) Past year = 20.5% Lifetime = 28.2%	
France	Pasquereau et al, 2018) [77]	Age 18 to 75	The 2017 Health Barometer survey	Self-report "current" use = 3.8% Self-report "daily" use = 2.7%	Ever use = 41.7%		Current = 31.9% Daily = 26.9%	

## Conclusions

### Main findings

Data from several representative surveys suggest that vaping prevalence among adults in Great Britain has remained stable since 2015. In 2017 to 2018, estimates for prevalence were:

- 5.4% to 6.2% for all adults
- 14.9% to 18.5% for current smokers
- 0.4% to 0.8% for people who had never smoked
- 10.3% to 11.3% for ex-smokers (vaping prevalence declined as the time since people had stopped smoking increased)

Smoking prevalence ranged from 13.7% to 17.3% for the adult population but was substantially higher in lower socio-economic groups (for example 35% in people living in social housing smoked).

Just over a third of all current smokers had never tried EC.

Use of EC in quit attempts is similar across socio-economic groups. Among long-term ex-smokers, EC use is higher in those from lower socio-economic groups. This suggests that those from higher socio-economic groups are using EC to quit smoking and then stop vaping, while those from more disadvantaged groups continue to use EC.

Overall, we found no clear association among past and current vapers between how long people use EC, the devices they used and socio-economic status.

There are possible associations between people from lower socio-economic groups and higher strength of nicotine, amount of liquid used and a greater variety of EC flavours used.

Over time, most vapers report continuing to use the same nicotine strength (44.7% of participants in one survey, 54.4% in another) or reducing the strength (40.1% and 49.2% respectively in the same surveys).

One longitudinal survey indicated that most vapers use a single flavour type (tobacco, fruit, menthol were the most popular types) and tend to use the same flavour type over time. Within each flavour type, vapers may have been using a variety of individual flavours (eg different tobacco flavours).

Quitting smoking remains the main reason for vaping in all socio-economic groups. People from higher socio-economic groups were possibly more likely to vape for

enjoyment than those from lower groups who may be more likely to vape for financial reasons than those from higher groups.

Internationally, the US appears to have similar adult vaping prevalence as Great Britain. In other countries where information is available, prevalence is lower.

### Implications

More research is needed to explore the use of EC by different social grades.

Trends need to be monitored particularly of EC use by never smokers, use alongside smoking and in long-term ex-smokers.

Given the importance of stopping smoking completely, smokers using EC should be advised to quit smoking as soon as possible.

Smokers should be advised to stop smoking as soon as possible and explore all available options for support, including EC.

## 6 Use of EC in English stop smoking services

### Introduction

We include an update on the use of EC in English stop smoking services. A more detailed update on the effectiveness of EC for smoking cessation and reduction based on recent and forthcoming studies will be included in a subsequent report. As discussed in our previous report [4] there has been a reduction in the availability and use of Stop Smoking Services in England. In January 2018, Cancer Research UK and ASH reported [78] findings from their fourth annual survey of tobacco leads in English local authorities with responsibility for public health. These surveys have tracked key indicators of the state of stop smoking services and wider tobacco control functions in the local government setting. Their most recent survey included responses from 117/152 local authorities. They reported that budgets for stop smoking services had been reduced by at least 5% in half (50%) of local authorities in 2017. Three quarters (74%) of local authorities commissioned a specialist stop smoking service in 2017 but only 61% commissioned a universal specialist service, which was open to all smokers. The remainder of services have been replaced by integrated lifestyle services instead of having a dedicated stop smoking service. The majority (75%) of respondents said that their local stop smoking services supported the use of EC, with the remaining 25% reporting that services 'neither support nor discourage' the use of EC. No-one reported that EC use was discouraged. This context is important in order to interpret the data below focusing on vaping in these services.

### Stop smoking services

Stop smoking services offer support that involves the use of pharmacotherapies (NRT, varenicline, bupropion), EC, in combination or alone and/or behavioural support. Data are collected by NHS Digital from local authority commissioned services every three months about: the number of quit attempts; 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 smoker is counted as a 'self-reported four-week quitter' if they are assessed (face to face or by telephone) four weeks after the designated quit date and declare that they have not smoked a single puff on a cigarette in the past two weeks. A smoker is counted as a CO-verified four-week quitter if they are a self-reported four-week quitter and his/her expired-air CO is assessed four weeks after the

designated quit date and found to be less than 10ppm. Treated smokers lost to follow up are counted as non-quitters.

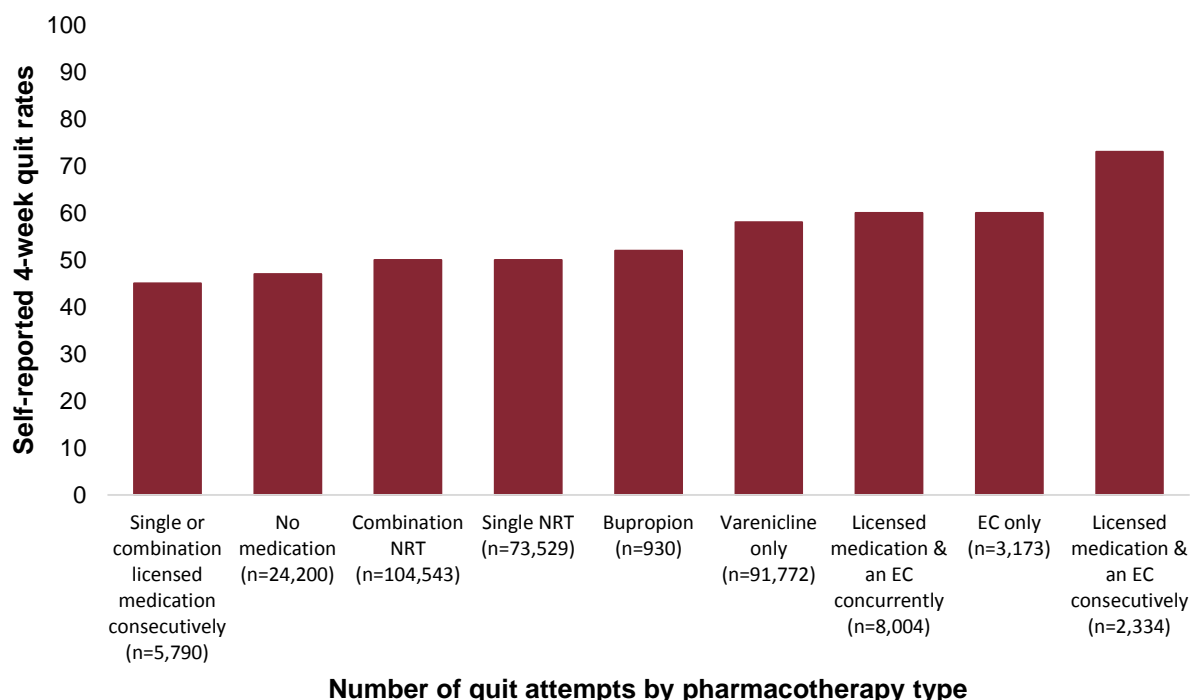
Since 2011, the number of quit attempts made with stop smoking services and the number of self-reported quits has declined annually (though self-reported quit rates have remained relatively stable). Between April 2017 and June 2018, 329,426 quit dates were set with a stop smoking service in England and 165,752 (50.3%) led to self-reported quits at four-week follow up (36% of those were CO validated quits).

### Vaping in quit attempts supported by stop smoking services

The data provided by NHS Digital do not include information about the demographic, smoking or vaping characteristics and therefore do not allow us to control for variables known to influence success rates such as a person's severity of tobacco dependence or type of EC used. It is possible that the people using an EC alone or in combination with licensed stop smoking medicines may differ from the rest of the smokers quitting with these services. However, these data provide valuable information about the use of EC within the services. Previous evidence reviews reported data about vaping in stop smoking services during the periods April 2014-March 2015 [3] and April 2015-March 2017 [21]. This report presents data from 1 April 2017 to 30 June 2018 (the most recent data provided by NHS Digital at the time of writing the report) [79].

The number of quit attempts with each type of support and the quit rates between April 2017 and June 2018 are presented in Figure 30. Where any type of pharmacotherapy was used, only 5% (n=13,511/290,075) of quit attempts involved the use of an EC on its own or in combination with a licensed medication; this represents 4.1% of all quit attempts. Combination NRT remains the most popular type of pharmacotherapy used in a quit attempt. However, similar to previous years [3, 4], the highest quit rates were observed when the quit attempt involved the use of a licensed medicine and an EC consecutively (73%), a licensed medicine and EC concurrently (60%) or an EC on its own (60%). Notwithstanding the limitations of the data, people who are treated by a stop smoking service with behavioural support and use EC with or without additional licensed medication, have at least comparable quit success to people who used licensed medication.

**Figure 30. Self-reported four week successful quits by pharmacotherapy type (April 2017-June 2018)**



### Vaping by region

Vaping as part of a quit attempt continues to vary by region (Table 18). The region with the lowest prevalence of EC use in a quit attempt was the West Midlands (3%) compared with the highest prevalence of use reported in the East Midlands region (12%).

**Table 18. Proportion of quit attempts using pharmacotherapy where an EC was used by region**

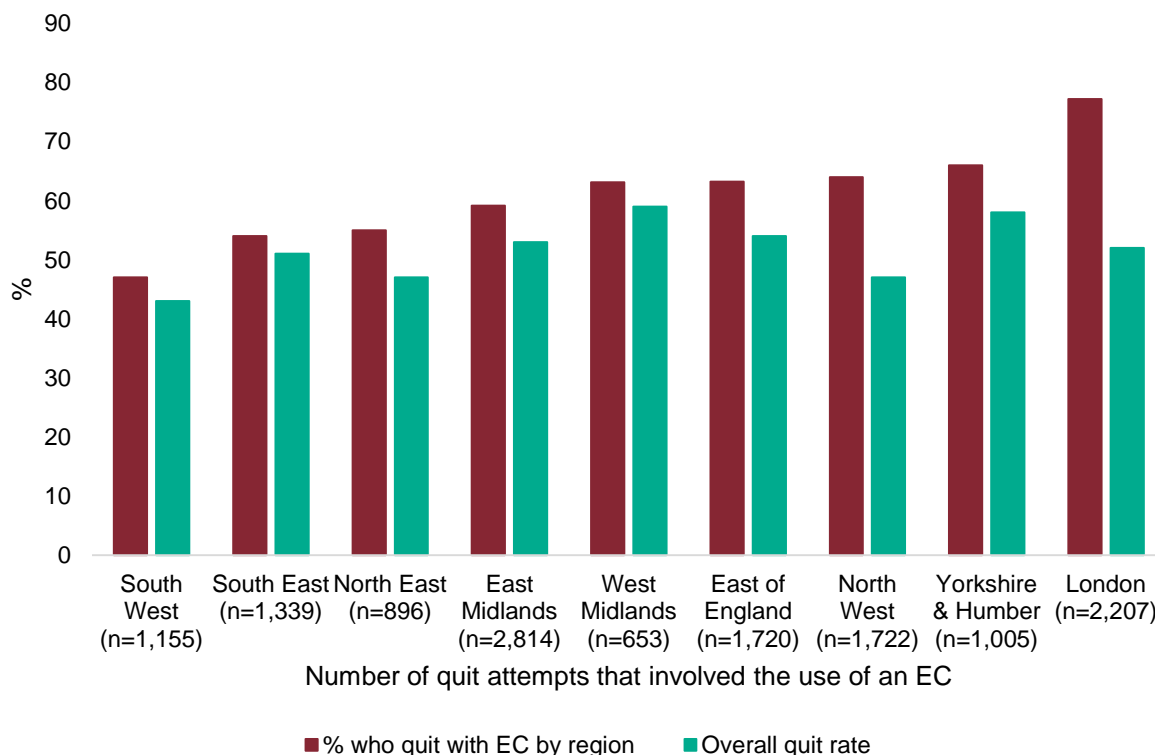
Region	EC used
North East	4%
North West	4%
Yorkshire & Humber	5%
East Midlands	12%
West Midlands	3%
East of England	5%
London	6%
South East	4%
South West	4%

*Notes: Proportion of quit attempts where any type of pharmacotherapy was used.*

As previously mentioned, although a range of factors will influence quit success rates, in April 2017-June 2018, 47.1% of the quit attempts in the South West region that involved

the use of an EC led to a self-reported quit compared with 77.2% in the London region. For comparison, in the earlier period April 2016-March 2017, 49% of quit attempts in the South West region that involved the use of an EC led to a successful quit (self-reported) compared with 68% in London. In every region, quit rates involving the use of an EC were higher than any other type of pharmacotherapy used (Figure 31).

**Figure 31. Self-reported four week successful quits and overall quit rate by region**



*\*Vaping includes people who had used an EC either alone or in combination with licenced medication concurrently or consecutively. Other type of pharmacotherapy excludes vaping, unknown use and people recorded as not using medication.*

As mentioned in our previous reports, these data have several limitations as they do not consider a number of important factors that affect success rates (eg level of dependence, age, socio-economic status etc), and only allow for a crude comparison between stop smoking services and within services. 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 EC. However, these data suggest that using an EC as part of quit attempt continues to be helpful for people attending stop smoking services, though the proportion who use them remains very small. This is in contrast to findings from the STS [80], that EC remain the most popular stop smoking aid in people who report making a quit attempt in the previous year. The most likely reasons for these differences are that the vast majority of smokers who use EC do not actively seek support from stop smoking services, and that some stop smoking services do not actively reach out to smokers who are using, or may want to use, EC as part of a quit attempt.

### Have EC affected use of stop smoking services?

NHS Digital commented [79] that there had been year on year declines in the numbers of quit attempts set with the stop smoking services, and that '*the reduction in recent years may be partly due to the increased use of e-cigarette which are widely available outside of these services*'. However, an analysis carried out in 2016 found inconclusive evidence as to whether there was an association between EC use during a quit attempt and the reduction in the use of stop smoking services [81]. It is also plausible that, against a backdrop of cuts to the stop smoking service budgets, the advent of EC has augmented the numbers attending the services by people who use them seeking concomitant behavioural support.

### Advice for stop smoking services

Stop smoking services need to maximise the potential benefits that EC may provide smokers. The National Centre for Smoking Cessation Training has published recommendations of the characteristics of an 'EC friendly service' [82] (Table 19) and also have produced online training for stop smoking practitioners ([http://elearning.ncsct.co.uk/e\\_cigarettes-launch](http://elearning.ncsct.co.uk/e_cigarettes-launch)).



**Table 19. What does an EC friendly service look like? [82]**

**An EC friendly service is one that:**

- Recognises the potential benefit that EC have in helping smokers to quit
- Respects the choices that clients make when considering what evidence-based methods to use for a quit attempt, including the choice to use an EC
- Operates a system of support, including behavioural support, for people who choose to use EC to quit smoking.

**Characteristics**

In addition to current best practice for established stop smoking interventions, an EC friendly service is one that:

1. Actively reaches out to smokers considering using an EC to stop smoking, and encourages them to come to the service for behavioural support.
2. Ensures that staff understand the current evidence on the safety and effectiveness of EC and encourages them to extend their knowledge base on EC and vaping by talking to people with lived experience.
3. Provides accurate and balanced information based on current scientific knowledge about the benefits and risks of EC.
4. Ensures that staff are familiar with common types of EC and use terminology which people understand.
5. Is clear that smoking is the problem, not nicotine, and that long term use of an EC may protect against relapse to smoking.
6. Recognises that EC regulated either as medicines or consumer products can help people quit smoking; and supports clients to choose the most appropriate in light of their circumstances or preferences.
7. Is prepared to work in partnership with reputable local vaping retailers by referring clients to them for product support and advice.
8. Accepts that some clients will choose to continue to use EC in the long term, and may have no intention of stopping the use of nicotine for recreational purposes.
9. Engages with other healthcare providers and frontline services in order to share knowledge and encourage a common approach to EC use across services in their area.
10. Celebrates a successful switch to vaping as it would a quit by any other method.

## Conclusions

### Main findings

Monitoring data from stop smoking services have limitations, but such data suggest that using an EC as part of quit attempt continues to be helpful for people attending stop smoking services in England.

In stop smoking services, the proportion of quit attempts using an EC remains very small (4.1% of all quit attempts in stop smoking services).

There is inconclusive evidence to support suggestions that EC have contributed to the decline in demand for stop smoking services in England.

## Implications

Combining EC (the most popular source of support used by smokers in the general population), with stop smoking service support (which is the most effective type of support), should be a recommended option available to all smokers. This was the proposal from the previous report, which is still valid. Stop smoking practitioners and health professionals should provide behavioural support to smokers who want to use an EC to help them quit smoking.

Stop smoking practitioners and health professionals supporting smokers to quit should receive education and training on using EC in quit attempts. Online training is available from the NCSCT.

Local authorities should continue to fund and provide stop smoking services in line with the evidence base.

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# Appendices

## Key questions in youth surveys

### Smoking status

#### ASH-Y

Which of the following statements BEST applies to you?

- I have never smoked, not even a puff or two
- I have only ever tried smoking cigarettes once
- I used to smoke sometimes but I never smoke cigarettes now
- I sometimes smoke cigarettes now but less than one a week
- I usually smoke between one and six cigarettes a week
- Don't want to say

#### SDD

Read the following statements carefully and tick the box next to the one which best describes you.

- I have never smoked
- I have only ever tried smoking once
- I used to smoke sometimes but I never smoke a cigarette now
- I sometimes smoke cigarettes now but I don't smoke as many as one a week
- I usually smoke between one and six cigarettes a week
- I usually smoke more than six cigarettes a week

Just to check, read the statements below carefully and tick the box next to the one which best describes you.

- I have never tried smoking a cigarette, not even a puff or two
- I did once have a puff or two of a cigarette, but I never smoke now
- I do sometimes smoke cigarettes

#### HSE

Have you ever tried smoking a cigarette, even if it was only a puff or two? Don't include electronic cigarettes here, we'll ask you about these later.

- Yes
- No



Now read all the following sentences very carefully and tick the box next to the one which best describes you.

- I have never smoked a cigarette
- I have only smoked a cigarette once or twice
- I used to smoke sometimes but I never smoke a cigarette now
- I sometimes smoke cigarettes now but I don't smoke every week
- I usually smoke between one and six cigarettes a week
- I usually smoke more than six cigarettes a week

## Vaping status

ASH-Y

Have you ever heard of e-cigarettes? They are also sometimes called vapes, shisha pens or electronic cigarettes?

- Yes, I have
- No, I haven't
- Don't know

Which ONE of the following is closest to describing your experience of e-cigarettes?

- I have never used an e-cigarette
- I have only tried an e-cigarette once or twice
- I use e-cigarettes sometimes, but no more than once a month
- I use e-cigarettes more than once a month, but less than once a week
- I use e-cigarettes more than once a week but not every day
- I use e-cigarettes every day
- I used e-cigarettes in the past but no longer do
- Don't want to say

You said that you have tried an e-cigarette.... Which ONE of the following BEST applies to you?

- I tried smoking a real cigarette before I first tried using an e-cigarette
- I tried using an e-cigarette before I first tried smoking a real cigarette
- I have never smoked a real cigarette but have tried an e-cigarette
- I don't remember
- Don't want to say

Which of the following best describes why you use/used an e-cigarette?

- Just to give it a try
- I like the flavours
- Other people use them so I join in

- I use them instead of smoking
- I am trying to quit smoking
- I am addicted to them
- I enjoy the experience
- They are cheaper than smoking
- They are easier to get hold of than tobacco cigarettes
- Other, please describe
- Don't know

Which of the following statements best describes the e-cigarette you use MOST OFTEN NOWADAYS?

- A disposable electronic-cigarette (non-rechargeable)
- An electronic cigarette kit that is rechargeable with replaceable pre-filled cartridges
- An electronic cigarette that is rechargeable and has a tank or reservoir that you fill with liquid
- Don't know
- Don't want to say

You told us that you either used to use or still use e-cigarettes... Does the e-cigarette you used to use most often/use MOST OFTEN NOWADAYS contain nicotine?

- Yes, always
- Yes, sometimes
- No, never
- Don't know

Do you think that you will try a cigarette soon?

- Yes, I do
- No, I don't
- Don't know
- Don't want to say

SDD

The next questions are about electronic cigarettes. Please include shisha pens or e-shisha when answering these questions on electronic cigarettes.

Have you ever heard of electronic cigarettes, sometimes called e-cigarettes?

- Yes
- No

Read the following statements carefully and tick the box next to the one which best describes you. Think about times when you may have had a puff or two as well as using whole electronic cigarettes.

- I have never tried electronic cigarettes
- I have used electronic cigarettes only once or twice
- I used to use electronic cigarettes but I don't now
- I sometimes use electronic cigarettes, but I don't use them every week
- I use electronic cigarettes regularly, once a week or more

## Key questions in adult surveys

### Smoking status

OPN

Have you ever smoked a cigarette, a cigar or a pipe? Please exclude electronic cigarettes.

- Yes
- No

Do you smoke cigarettes at all nowadays? Please exclude electronic cigarettes.

- Yes
- No

Have you ever smoked cigarettes regularly? Please exclude electronic cigarettes.

- Yes
- No

In what year did you last successfully quit smoking?

ASH-A

Smoking in this survey refers to all burnt tobacco products. It does NOT include e-cigarettes. Which of the following statements BEST applies to you?

- I have never smoked
- I used to smoke but I have given up now
- I smoke but I don't smoke every day
- I smoke every day

## STS

Which of the following best applies to you? Please note we are referring to cigarettes and other kinds of tobacco that you set light to and NOT electronic or 'heat-not-burn' cigarettes.

- I smoke cigarettes (including hand-rolled) every day
- I smoke cigarettes (including hand-rolled), but not every day
- I do not smoke cigarettes at all, but I do smoke tobacco of some kind (eg. Pipe, cigar or shisha)
- I have stopped smoking completely in the last year
- I stopped smoking completely more than a year ago
- I have never been a smoker (ie smoked for a year or more)

## HSE

Do you smoke cigarettes at all nowadays?

- Yes
- No

Have you ever smoked cigarettes?

- Yes
- No

Did you smoke cigarettes regularly, that is at least one cigarette a day, or did you smoke them only

- occasionally?
- Smoked cigarettes regularly, at least 1 per day
- Smoked them only occasionally
- SPONTANEOUS: Never really smoked cigarettes, just tried them once or twice

## Vaping status

### OPN

I am now going to ask you about electronic cigarettes. An electronic cigarette (also called an e-cigarette, electronic EC, personal vaporizer (PV) or electronic nicotine delivery system (ENDS)) is a battery powered device which simulates tobacco smoking. It generally uses a heating element that vaporizes a liquid solution. The solutions generally contain nicotine and flavourings.

Have you ever used an electronic cigarette (e-cigarette)?

- No, I have never used one and I will not use one in the future
- No, I have never used one but I might use one in the future
- Yes, I have used one in the past but I no longer use one
- Yes, I currently use one
- I tried one, but I did not go on to use it
- I don't know what an electronic cigarette is (Spontaneous only)

#### ASH-A

E-cigarettes are also sometimes called vapes or EC. Which of the following statements BEST applies to you?

- I have never heard of e-cigarettes and have never tried them
- I have heard of e-cigarettes but have never tried them
- I have tried e-cigarettes but do not use them (anymore)
- I have tried e-cigarettes and still use them
- Don't know

#### STS

Depending on smoking status, variations on the question "Are you using any of the following?" are asked, followed by a list of products including 'Electronic cigarette'. Those who smoked cigarettes in the past year and have made any attempts to quit smoking are also asked about aids used, these also include EC as an option.

#### HSE

Have you ever used an electronic cigarette (e-cigarette), or any other EC? EXPLAIN IF NECESSARY: An EC is any product that you can use to inhale vapour rather like you would a cigarette. It includes ones that have a battery as well as ones that do not such as voke.

- Yes
- Yes - Only tried once or twice
- No

Do you use an e-cigarette or EC at all nowadays?

- Yes
- No

## Unweighted ns in adult surveys OPN, ASH-A, HSE

OPN 2017		ASH-A 2018		HSE 2017	
<b>Gender</b>		<b>Gender</b>		<b>Gender</b>	
Men	3176	Men	6292	Men	3504
Women	3946	Women	6475	Women	4432
<b>Age</b>		<b>Age</b>		<b>Age</b>	
16 to 24	474	18-24	1300	16 – 24	606
25 to 34	1016	25 to 34	1085	25 to 34	1065
35 to 44	1029	35 to 44	1926	35 to 44	1330
45 to 54	1223	45 to 54	2936	45 to 54	1351
55-64	1236	55+	5520	55-64	1360
65+	2144	<b>Region</b>		65-74	1234
<b>Region</b>		North East	1194	75+	990
North East	342	North West	1201	<b>Vaping status</b>	
North West	811	Yorkshire & Humber	1009	Never vaper	?
Yorkshire & Humber	672	East Midlands	870	Current vaper	
East Midlands	601	West Midlands	920	Past vaper/trier	
West Midlands	596	East of England	1228	<b>Smoking status</b>	
East of England	734	London	1126	Current smoker	1299
London	723	South East	1915	Ex-regular smoker	2202
South East	914	South West	1115	Never regular smoker	4431
South West	690	Wales	1079		
Wales	386	Scotland	1110		
Scotland	653	<b>Social grade</b>			
<b>Occupation</b>		AB	3987		
Managrl & professl	2109	C1	3882		
Intermediate	1162	C2	2246		
Routine & manual	1543	D	1256		
Not classified	2308	E	1396		
<b>Housing tenure</b>		<b>Housing tenure</b>			
Owns outright	2661	Owns	8533		
Owns mortgage	2134	Rents privately	1684		
Rents privately	1149	Social housing	1325		
Social housing	1174	Neither	1039		
<b>Life satisfaction</b>		Other	186		
Low to medium	1357	<b>Vaping status</b>			
High	3549	Current vaper	738		
Very high	2162	Past vaper	1304		
<b>Life worthwhile</b>		Never vaper (+ DK)	10725		

Low to medium	1146	<b>Smoking status</b>	Current smoker	1633
High	3315		Ex-smoker	4388
Very high	2591		Never smoker	6746
<b>Vaping status</b>				
Current vaper	389			
Past vaper	510			
Past trier	369			
Never vaper	5851			
<b>Smoking status</b>				
Current smoker	1207			
Recent ex-smoker	183			
Ex-smoker 2-5y	311			
Ex-smoker 6-10y	232			
Ex-smoker >10y	1270			
Never smoker	3915			