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BMJ Open How do Europeans quit using tobacco, e-cigarettes and heated tobacco products? A cross-sectional analysis in 28 European countries

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ABSTRACT

Objectives While smoking tobacco remains a substantial cause of harm in Europe, novel products such as electronic cigarettes or e-cigarettes (ECs) and heated tobacco products (HTPs) have entered the market recently. While debate still persists over the role of these novel products, they are now in widespread use. This study aimed to explore the prevalence and methods of attempts to quit EC and HTP.

Setting We analysed the 2020 Eurobarometer survey, which collected data in 28 European countries.

Participants A representative sample of individuals residing in these countries aged ≥15 years.

Primary and secondary outcome measures Multilevel regression analyses were performed to assess differences in quit attempts and cessation methods among tobacco smokers and exclusive EC/HTP users separately.

Results 51.1% of current tobacco smokers and 27.1% of exclusive EC or HTP users reported having ever made a quit attempt. The majority of former and current smokers (75.8%) who made a quit attempt did so unassisted, with 28.8% reporting at least one attempt using a cessation aid. The most popular cessation aids were nicotine replacement therapy or other medication (13.4%) and ECs (11.3%). 58.8% of exclusive EC or HTP users who had made a quit attempt did so unassisted, with 39.5% reporting the use of a cessation aid.

Conclusion Most EC and HTP users in Europe try to quit unassisted, although more of them report the use of a cessation aid compared with tobacco smokers. Cessation support services should take into consideration the increasing numbers of users of EC and HTP who may be trying to quit.

INTRODUCTION

Tobacco continues to kill millions of people in Europe and globally.¹ While the prevalence of tobacco smoking has been declining in the European Union (EU),^{2,3} the popularity of heated tobacco products (HTPs) and other nicotine products, such as electronic cigarettes or e-cigarettes (ECs), is increasing.^{2,4} Overall, the prevalence of tobacco smoking,

Strengths and limitations of this study

- This is the first study to analyse quitting behaviours among electronic cigarette or e-cigarette and heated tobacco product users and compare them with smoking cessation in multiple European countries.
- Samples were nationally representative and the questionnaire was consistent across countries.
- Sample sizes in individual countries were relatively small, so we pooled data from 28 countries. Hence, findings may not reflect the situation in each individual country.
- Dual users (who also smoked cigarettes) were not assessed in this analysis.

as well as EC and HTP use in Europe, is among the highest in the world.

Despite their differences in technical design, ECs and HTP share many common characteristics such as their appealing packaging, variety of flavours and novelty that make them popular among adolescents and young adults.^{5,6} Furthermore, within the framework of the EU Tobacco Products Directive, they are not subject to the same regulations as cigarettes and other tobacco products with regard to packaging, flavourings, labelling and taxation.⁷ A key component of their promotion is the tobacco industry's claim that they are both products of 'reduced harm' compared with cigarettes, although the evidence on their health effects is far from conclusive.⁸ In this context, ECs have become very popular among European smokers who are trying to quit smoking, and recent data suggest that HTPs are following a similar trajectory.^{2,9,10}

The public health community is divided over the role of novel tobacco and nicotine products. Public Health England, for example, has largely embraced a harm reduction approach in which ECs play a key

role.¹¹ In contrast, the European Respiratory Society has not endorsed harm reduction in tobacco control.¹² This discrepancy reflects the conflicting evidence base, especially for ECs. For instance, there is mounting evidence that ECs may help some smokers to quit in clinical settings,^{13 14} but not at the population level.¹⁴ Daily use seems to increase the chances to quit smoking, but non-daily use actually hinders cessation.^{14 15} The picture is further complicated by the fact that many of those who attempt to quit with ECs become dual or long-term users.¹⁶ Regardless of perceptions on harm reduction and concerns around EC and HTP use among youth, it is widely accepted that none of these products is harmless. Therefore, from a public health perspective, the optimal outcome for all never and former smokers who use ECs or HTP would be to stop using them and become nicotine-free eventually.

However, little is known about EC and HTP use cessation, especially among people who do not concurrently use cigarettes. These products remain quite popular in Europe, although many users are trying to quit within an environment of strong tobacco control policies. Hence, Europe is a unique setting to explore quitting behaviours of EC or/and HTP users. The aim of our secondary dataset analysis was to assess factors associated with attempts to quit and the use of cessation aids among HTP and EC users, as well as tobacco smokers in 28 European countries.

METHODS

Data source

All data come from the Eurobarometer survey, wave 93.2, which were collected in August–September 2020.¹⁷ Eurobarometer surveys collect data from the 27 EU member states and the UK, which is a former member of the EU, through a multistage sampling design in which primary sampling units (PSU) are selected from each region within each country, proportional to population size. Within each PSU, starting addresses are selected randomly, and a standard random route is followed to systematically select participating households. Data are then collected through a face-to-face interview with a randomly selected person aged ≥ 15 years in each household. This approach was modified in some of the countries due to COVID-19 restrictions. Thus, all interviews were conducted online in Estonia, Finland, Ireland, Luxembourg, Sweden and the UK, while data were collected through a mix of online and face-to-face interviews in Belgium, Denmark, Spain and the Netherlands. In all cases, the online samples were selected through a probabilistic design.² Response rates, overall or by country, are not reported in the Eurobarometer; however, post-stratification and population size weighting is applied to ensure that samples are nationally representative in terms of age, sex and area of residence. The total sample was 28300 participants across the 28 countries.

Measures

Tobacco smoking, HTP and EC use

Interviewees were asked ‘Regarding smoking cigarettes, cigars or a pipe, which of the following applies to you?’ Responses included ‘You currently smoke’ (current smokers); ‘You used to smoke but you have stopped’ (former smokers); and ‘You have never smoked’ (never smokers).

All participants were asked ‘Thinking about the following products [heated tobacco products; e-cigarettes], which of the following applies to you?’ Responses were given separately for HTP and ECs and included ‘You currently use it’ (current users); ‘You used to use it but you have stopped’ (former users); ‘You have tried only once or twice’; ‘You have never used it’; ‘Don’t know’.

Quitting

Former and never smokers who reported current use of HTP or ECs (‘exclusive HTP or EC users’) were asked if they had ever tried to stop using ECs or HTPs. Those who responded ‘Yes, in the last 12 months’ or ‘Yes, more than a year ago’ were considered to have made a quit attempt, although it was not specified if this referred to ECs or HTP. Similarly, current tobacco smokers were asked if they had ever tried to quit smoking with the same response options.

EC or HTP users who did make a quit attempt, as well as all former users of ECs and HTP, were further asked what they used to stop or to try to stop using ECs or HTP. For each of the following categories they could answer ‘yes’ or ‘no’: ‘nicotine replacement medication (like nicotine gum, patch or inhaler) or other medication’; ‘oral tobacco (snus), chewing tobacco or nasal tobacco (snuff)’; ‘medical support or stop smoking services (such as a quitline)’; ‘you stopped or you tried to stop without assistance’; ‘electronic cigarettes or any similar device’; and ‘heated tobacco products’. The EC option was not presented to current EC users and the HTP option was not presented to current HTP users. All former smokers and current smokers who reported a past quit attempt were asked what they used to stop or to try to stop smoking and were given the same options.

Sociodemographic data

The survey collected data on age (15–24, 25–39, 40–54 and ≥ 55 years); sex (male and female); education (up to lower secondary, upper secondary, tertiary up to bachelor, masters degree or above); difficulties to pay bills during the last 12 months (almost never/never and from time to time/most of the time) and area of residence (rural and urban).

Statistical analysis

We fitted two-level multivariable logistic regression models with random intercepts, which accounted for clustering of observations within countries with different levels of cigarette, EC and HTP use to explore factors associated with (1) having tried to quit ECs or HTP among current

exclusive EC or HTP users and (2) having tried to quit smoking among current smokers. The independent variables included in the models were sex, age, difficulty paying bills, area of residence and education.

We used similar, two-level models to identify associations between these sociodemographic factors and use of cessation aids among (1) former EC or HTP users and current users who have tried to quit and (2) former smokers and current smokers who have tried to quit smoking. We applied the official Eurobarometer weights ('weight EU28') for descriptive analyses to account for the sampling design and produce estimates that are representative for each country and the 28 countries as a whole.¹⁸ Regression analyses were unweighted as it has been suggested that unweighted regression models may provide more robust results.^{19 20} Descriptive results are presented as weighted % with 95% CI. Regression results are presented as adjusted ORs (aORs) with 95% CI. All analyses were conducted using StataSE V.15.0.

Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination plans of our research.

RESULTS

Among the Eurobarometer sample of 28300 respondents from 28 countries, there were 6661 current smokers, 6529 former smokers and 895 current users of ECs or/and HTPs (609 of whom reported also smoking cigarettes). In total, 9889 ever smokers had ever attempted or succeeded to quit smoking. There were also 1103 respondents who had ever attempted or succeeded to quit ECs or HTP. A total of 284 respondents were exclusive EC or HTP users. Sample characteristics are presented in online supplemental table 1. Missing data were <0.1% in all variables with the exception of current EC and HTP use, where missing data were <1%.

Among current tobacco smokers, 51.1% (n=3369) reported having made a previous attempt to stop smoking. Those aged 25 years or older were more likely to have attempted to quit smoking compared with those 15–24 years old. Similarly, smokers with higher education were more likely to report an attempt to quit compared with those in the lowest educational category, as were men compared with women (table 1).

Among current exclusive EC or HTP users, 27.1% (n=69) reported having made an attempt to quit these

Table 1 Sociodemographic factors associated with attempts to quit smoking among current smokers and current exclusive EC or HTP users in 28 European countries in 2020

	Attempted to quit smoking		Attempted to quit EC or HTP	
	n (weighted %)	aOR (95% CI)	n (weighted %)	aOR (95% CI)
	n=6661	n=6604	n=284	n=283
Age (years)				
15–24 (reference)	194 (36.1)	1.00	16 (28.1)	1.00
25–39	871 (50.8)	1.77 (1.43 to 2.19)	24 (32.4)	0.56 (0.23 to 1.34)
40–54	1070 (52.7)	2.26 (1.83 to 2.79)	21 (36.7)	0.58 (0.23 to 1.45)
55+	1234 (55.2)	2.26 (1.83 to 2.78)	7 (10.2)	0.14 (0.05 to 0.40)
Sex				
Female (reference)	1617 (55.9)	1.00	28 (23.4)	1.00
Male	1752 (47.2)	0.90 (0.81 to 1.00)	41 (29.8)	1.18 (0.64 to 2.18)
Difficulty paying bills				
Never/almost never (reference)	2041 (52.4)	1.00	39 (26.0)	1.00
From time to time/most of the time	1307 (48.9)	0.94 (0.84 to 1.05)	30 (30.3)	1.59 (0.85 to 2.98)
Highest level of education completed				
Lower secondary or lower (reference)	762 (50.2)	1.00	11 (26.0)	1.00
Upper secondary	1644 (46.9)	1.12 (0.98 to 1.29)	25 (31.6)	0.87 (0.35 to 2.15)
Tertiary up to bachelor	632 (57.4)	1.21 (1.01 to 1.45)	24 (23.6)	0.86 (0.33 to 2.26)
Masters or above	331 (63.6)	1.27 (1.02 to 1.58)	9 (22.6)	1.24 (0.38 to 4.03)
Area of residence				
Rural (reference)	1057 (48.8)	1.00	18 (22.8)	1.00
Urban	2309 (52.0)	1.04 (0.93 to 1.16)	51 (28.5)	0.95 (0.47 to 1.89)
Total	3369 (51.1)		69 (27.1)	

Individuals with missing data in any of the included variables were excluded from the regression analyses.

aORs from multilevel logistic regression models, adjusting for all variables included in the table.

aOR, adjusted OR; EC, e-cigarette; HTP, heated tobacco product; ref, reference.

Table 2 Methods used in quit attempts of tobacco and ECs/HTPs in 28 European countries

	Quit attempts by ever smokers		Quit attempts by ECs or HTP users*	
	n	Weighted % (95% CI)	n	Weighted % (95% CI)
Nicotine replacement therapy or other pharmacotherapy	1298/9889	13.4 (12.2 to 14.6)	123/1103	10.1 (7.5 to 13.4)
Electronic cigarettes or any similar device	842/9889	11.3 (10.2 to 12.5)	210/1059	19.7 (15.9 to 24.2)
HTPs	220/9889	2.0 (1.6 to 2.6)	56/1050	5.3 (3.5 to 7.9)
Smokeless tobacco	192/9889	1.5 (1.2 to 1.9)	37/1103	2.1 (1.2 to 3.6)
Medical support or stop smoking services	555/9889	6.3 (5.5 to 7.2)	68/1103	6.1 (4.0 to 9.1)
Without assistance	7681/9889	75.8 (74.3 to 77.3)	657/1103	58.8 (53.7 to 63.7)
Any aid	2636/9889	28.8 (27.2 to 30.4)	453/1103	39.5 (34.7 to 44.6)

*Percentages shown among current EC or HTPs users who have tried to quit and former users. EC, e-cigarette; HTP, heated tobacco product.

products (table 1). Compared with users aged 15–24 years, those aged 55 and above were less likely to have attempted to quit EC or/and HTP products (aOR 0.14, 95% CI 0.05 to 0.40). All other sociodemographic factors assessed were not statistically significantly associated with having attempted to quit among exclusive EC or/and HTP users. Additional details regarding the regression models are shown in online supplemental table 2.

Methods used to quit or attempt to quit

Three quarters of ever smokers who had attempted to quit reported having done so without assistance (75.8%), with 28.8% reporting the use of a cessation aid in at least one quit attempt. The most popular cessation aid was nicotine replacement therapy (NRT) or other pharmacotherapy (13.4%) followed by ECs (11.3%) (table 2). Only 2% of those who had attempted to quit smoking tobacco reported using HTP as a cessation aid. Among those who had attempted or ever succeeded to quit ECs or HTP, 58.8% tried without assistance and 39.5% used at least one cessation aid. Within this group, using ECs was the most popular option (19.7% excluding current EC users) followed by NRT or other pharmacotherapy (10.1%). HTPs were used as a cessation aid by 5.3% of the respondents within this group (excluding current HTP users) (table 2). In both groups, just above 6% of the respondents had sought support from medical or smoking cessation services.

Sociodemographic factors associated with methods to quit

Older people (compared with those 15–24 years old) were generally less likely to have used ECs, HTP or smokeless tobacco to quit tobacco smoking; however, this pattern was not observed in quitting ECs or HTP (tables 3 and 4). Men were more likely to have used smokeless tobacco to quit all products, but no other statistically significant differences between men and women were observed. People with difficulties paying bills had higher odds of having used ECs to quit smoking (aOR 1.41) and having used HTP to quit ECs (aOR 2.70) compared with those with no financial difficulties. Finally, people at the highest educational level were the least likely to have used ECs to

quit smoking and HTP, while those living in urban areas were more likely—compared with those living in rural areas—to have used NRT or other pharmacotherapy to quit smoking (OR 1.19) or ECs/HTP (OR 1.78) (tables 3 and 4).

DISCUSSION

Our analysis of data from 28 European countries showed that around half of current tobacco smokers and a quarter of current EC/HTP users have attempted to quit. Among them, 3 out of 10 tobacco smokers and 4 out of 10 EC/HTP users used a cessation aid, with ECs and pharmacotherapy being the most popular aids in both groups. Younger users were less likely to have attempted to quit smoking but were more likely to have attempted to quit ECs/HTP compared with older users. We also found sociodemographic differences in the frequency and type of cessation aids used.

Only 27.1% of current EC/HTP users, who were not concurrently smoking, reported a past attempt to quit compared with 51.1% of current smokers. This group excludes the many users of novel tobacco products who also smoke tobacco (dual users); therefore, is not directly comparable to current smokers in our study. Similarly, the questions assessing use may not adequately differentiate between established and experimental users; experimentation with novel products could be more frequent than with smoking. However, even with these limitations, the proportion of EC/HTP users who had tried to quit was objectively low. This can be partly explained by the fact that EC/HTP users are younger on average than smokers, but even in the younger age group (15–24 years old), more smokers than EC/HTP users had tried to quit (36.1% vs 28.1%). This discrepancy may be in part due to perceptions of harm about different products. The majority of smokers want to quit and many have tried to as the health risks associated with smoking are well known.²¹ Novel tobacco products are perceived as less harmful than cigarettes by a substantial proportion of those who use them,^{2 22} which may weaken their incentive to quit

Table 3 Sociodemographic factors associated with methods to quit ECs or HTPs in 28 European countries, 2020

	Pharmacotherapy	ECs	HTPs	Smokeless tobacco	Medical support	Without assistance	Any aid
	aOR (95% CI) n=1095	aOR (95% CI) n=1057	aOR (95% CI) n=1043	aOR (95% CI) n=1095	aOR (95% CI) n=1095	aOR (95% CI) n=1095	aOR (95% CI) n=1095
Age (years)							
15–24 (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25–39	0.97 (0.47 to 1.97)	1.27 (0.73 to 2.22)	0.47 (0.21 to 1.08)	1.42 (0.50 to 4.07)	0.83 (0.30 to 2.26)	0.76 (0.49 to 1.16)	1.25 (0.82 to 1.91)
40–54	1.60 (0.80 to 3.20)	1.73 (0.99 to 3.00)	0.45 (0.19 to 1.07)	0.62 (0.19 to 1.98)	2.07 (0.81 to 5.28)	0.66 (0.43 to 1.02)	1.62 (1.05 to 2.48)
55+	1.65 (0.81 to 3.36)	1.05 (0.58 to 1.89)	0.55 (0.22 to 1.33)	0.64 (0.19 to 2.19)	1.99 (0.76 to 5.16)	0.66 (0.42 to 1.03)	1.43 (0.92 to 2.22)
Sex							
Female (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Male	0.98 (0.67 to 1.44)	0.84 (0.61 to 1.15)	0.67 (0.38 to 1.18)	3.15 (1.38 to 7.20)	0.98 (0.59 to 1.62)	1.03 (0.80 to 1.32)	1.03 (0.80 to 1.32)
Difficulty paying bills							
Never/ almost never (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
From time to time/most of the time	1.24 (0.82 to 1.85)	1.13 (0.80 to 1.58)	2.70 (1.47 to 4.96)	0.92 (0.43 to 1.98)	1.35 (0.79 to 2.30)	0.96 (0.73 to 1.25)	1.37 (1.05 to 1.79)
Education							
Lower secondary or lower (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upper secondary	1.20 (0.67 to 2.16)	0.99 (0.65 to 1.52)	1.18 (0.54 to 2.60)	0.68 (0.26 to 1.77)	1.53 (0.74 to 3.16)	0.98 (0.69 to 1.40)	1.09 (0.77 to 1.54)
Tertiary up to bachelor	2.34 (1.28 to 4.30)	0.83 (0.51 to 1.35)	1.15 (0.44 to 3.00)	0.52 (0.17 to 1.54)	1.11 (0.48 to 2.58)	0.89 (0.60 to 1.32)	1.22 (0.83 to 1.80)
Masters or above	1.10 (0.49 to 2.48)	0.48 (0.24 to 0.97)	1.07 (0.31 to 3.75)	0.18 (0.02 to 1.61)	1.49 (0.56 to 3.96)	1.15 (0.70 to 1.90)	0.65 (0.39 to 1.09)
Area of residence							
Rural (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Urban	1.78 (1.09 to 2.90)	1.04 (0.73 to 1.48)	0.97 (0.49 to 1.90)	2.95 (0.99 to 8.83)	0.84 (0.48 to 1.46)	0.97 (0.73 to 1.29)	1.20 (0.90 to 1.60)

Regression models fitted among those who have attempted or succeeded to quit ECs or HTP. Adjusted ORs from multilevel logistic regression models. EC, electronic cigarette; HTP, heated tobacco product; ref, reference.

Table 4 Sociodemographic factors associated with methods to quit smoking among ever smokers (n=9828), in 28 European countries, 2020

	Medication aOR (95% CI)	e-cigarettes aOR (95% CI)	Heated tobacco products aOR (95% CI)	Smokeless tobacco aOR (95% CI)	Medical support aOR (95% CI)	Without assistance aOR (95% CI)	Any aid aOR (95% CI)
Age (years)							
15–24 (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25–39	2.03 (1.33 to 3.10)	1.19 (0.86 to 1.65)	0.69 (0.43 to 1.11)	0.53 (0.30 to 0.95)	1.05 (0.59 to 1.87)	0.93 (0.72 to 1.20)	1.10 (0.86 to 1.41)
40–54	2.92 (1.94 to 4.41)	0.88 (0.64 to 1.22)	0.40 (0.25 to 0.66)	0.34 (0.19 to 0.61)	1.70 (0.98 to 2.94)	0.89 (0.69 to 1.14)	1.13 (0.89 to 1.43)
55+	1.97 (1.31 to 2.96)	0.38 (0.27 to 0.53)	0.14 (0.08 to 0.23)	0.14 (0.08 to 0.25)	1.70 (0.99 to 2.92)	1.36 (1.06 to 1.74)	0.70 (0.55 to 0.88)
Sex							
Female (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Male	0.88 (0.78 to 0.99)	0.95 (0.82 to 1.10)	1.14 (0.87 to 1.51)	2.85 (2.02 to 4.02)	0.74 (0.62 to 0.88)	1.06 (0.96 to 1.17)	0.98 (0.89 to 1.07)
Difficulty paying bills							
Never/almost never (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
From time to time/most of the time	1.24 (1.08 to 1.43)	1.41 (1.20 to 1.66)	1.22 (0.90 to 1.64)	1.25 (0.84 to 1.85)	1.16 (0.94 to 1.43)	0.81 (0.72 to 0.90)	1.26 (1.13 to 1.40)
Education							
Lower secondary or lower (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upper secondary	1.06 (0.88 to 1.26)	1.15 (0.93 to 1.42)	1.09 (0.71 to 1.67)	1.12 (0.69 to 1.82)	0.92 (0.72 to 1.17)	0.95 (0.82 to 1.09)	1.14 (1.00 to 1.31)
Tertiary up to bachelor	1.08 (0.89 to 1.31)	1.06 (0.83 to 1.34)	1.43 (0.88 to 2.31)	0.86 (0.50 to 1.49)	1.04 (0.79 to 1.36)	0.95 (0.82 to 1.12)	1.14 (0.98 to 1.32)
Masters or above	0.85 (0.68 to 1.07)	0.67 (0.50 to 0.90)	1.28 (0.74 to 2.21)	0.44 (0.22 to 0.91)	0.89 (0.65 to 1.23)	1.36 (1.13 to 1.64)	0.75 (0.63 to 0.90)
Area of residence							
Rural (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Urban	1.19 (1.04 to 1.36)	1.05 (0.89 to 1.24)	1.16 (0.84 to 1.59)	1.00 (0.70 to 1.43)	1.07 (0.88 to 1.30)	0.94 (0.85 to 1.05)	1.09 (0.99 to 1.21)

Regression models fitted among those who have attempted or succeeded to quit smoking.

Adjusted ORs from multilevel logistic regression models.
ref, reference.

entirely. Within this context, messaging to quit novel tobacco products should be part of tobacco control policies in Europe.

Although relatively few EC/HTP users had tried to quit, almost 40% of those who did used a cessation method. This was much higher than among ever smokers (current and former) in our study, as well as in previous studies in the EU and internationally.^{9 23} Many of the EC/HTP users in this analysis may have been former smokers who initially resorted to other nicotine products to quit smoking and therefore could be more inclined to use a cessation method again, especially by transitioning to another novel product. There is broad consensus regarding the effectiveness of pharmacotherapy and health professional support for smoking cessation, but to the authors' knowledge, there are no studies that examine these cessation methods within the context of quitting EC or HTP use.^{24–26} Our findings show that a considerable proportion of EC/HTP users are trying to quit and are open to using cessation aids. Thus, smoking cessation services need to prepare for a potentially more diverse group of nicotine users who may require support. Nevertheless, the majority of both smokers and EC/HTP users reported trying to quit without any aid, and only a minority of respondents used medication or medical services, which highlights the pressing need for expansion of cessation support across Europe, along with a wider set of tobacco control policies which are known to encourage people to quit with or without cessation aids.³

We found that education and financial constraints were associated with attempting to quit and use of cessation methods. People with lower education level or/and those who had difficulties paying bills were less likely to try to quit smoking and use pharmacotherapy to quit EC/HTP, as well as more likely to use ECs to quit smoking and HTP to quit ECs. These inequalities are not surprising; poor access of vulnerable populations to smoking cessation in Europe and elsewhere is a well-established problem,^{27 28} and socioeconomic differences in smoking and novel tobacco and nicotine product use have been shown in Europe before.^{2 4 29 30} Although HTP use is less prevalent among financially vulnerable groups in Europe and the USA,^{30 31} individuals facing financial problems may be more likely to switch to HTP to quit EC use due to poor access to medical services.

Strengths and limitations

Our analysis was conducted in a sample pooled from 28 countries which differ in smoking prevalence, regulations, taxation, tobacco control policies, attitudes towards novel tobacco products and quitting behaviours.^{1 2 32 33} As a result, findings from this study may not reflect the situation in each individual country. To our knowledge, this is the first study to analyse quitting behaviours among EC and HTP users and to compare them with smoking cessation in European countries and hence provides original groundwork data across many countries to be further built on. The number of respondents who were current EC/

HTP users or who have attempted to quit was relatively small; thus, analysis by country or within more specific subgroups was not feasible and CIs among current users were wide. However, the samples were representative and the methodology was largely consistent across all countries, although some adjustments were necessary due to COVID-19 restrictions. These adjustments, but also the COVID-19 pandemic itself may have had an impact on the findings; for instance, non-pharmaceutical interventions widely applied during the pandemic, such as lockdowns, may have limited the opportunities to use some of these products in social settings, whereas the focus of healthcare on COVID-19 increased barriers to accessing cessation services. Our analyses were also limited by the fact that the Eurobarometer questionnaire did not distinguish between ECs and HTP and did not assess quitting attempts among people concurrently using cigarettes (dual users). Considering that many of the users of novel products also smoke cigarettes,³⁰ our findings may not be generalisable to all users of ECs and HTP. Separating HTP and ECs in survey questions and assessing in detail dual and polyusers are becoming increasingly essential considering their popularity. Finally, due to the cross-sectional study design, we were only able to indicate associations but not causality.

CONCLUSION

In this analysis of data from 28 European countries, we found that a quarter of novel tobacco and nicotine users had tried to quit, and a substantial proportion of them used a cessation aid. This is a positive finding, although the proportion of those who had attempted to quit was lower than that among current tobacco smokers. Product experimentation is increasing; however, currently, there is no evidence-based approach to quitting ECs and HTPs as cessation services primarily remain targeted to tobacco smoking cessation. Our findings indicate populations that may be more receptive to cessation and hence motivate the tobacco control community to provide cessation support to users of all novel products and researchers to further explore quitting behaviours among different subgroups of EC and HTP users.

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Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was based on anonymised, publicly available survey data, so no ethical approval was required. The participants gave informed consent to participate in the study before taking part.

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Supplementary Table 1. Sample characteristics.

	Smoking		E-cigarettes or HTP	
	Have attempted or succeeded to quit N (weighted %)	Current smokers N (weighted %)	Have attempted or succeeded to quit N (weighted %)	Current users N (weighted %)
Age				
15-24 years	410 (5.4)	560 (10.7)	141 (13.9)	40 (19.8)
25-39 years	1,862 (21.2)	1,819 (2.3)	357 (36.5)	89 (30.3)
40-54 years	2,595 (27.2)	2,046 (29.3)	316 (29.3)	76 (24.8)
55+ years	5,020 (46.3)	2,236 (30.7)	289 (20.3)	78 (25.0)
Sex				
Female	4,462 (44.7)	3,067 (45.1)	502 (43.5)	123 (41.8)
Male	5,427 (55.3)	3,594 (54.9)	601 (56.5)	161 (58.2)
Difficulty paying bills				
Never/almost never	6,954 (69.6)	3,759 (57.5)	673 (57.1)	188 (70.8)
From time to time/most of the time	2,883 (30.4)	2,852 (42.5)	422 (42.9)	94 (29.2)
Education				
Lower secondary or lower	2,069 (28.3)	1,567 (29.5)	213 (28.5)	47 (25.7)
Upper secondary	4,116 (36.4)	3,436 (44.8)	500 (38.5)	108 (38.0)
Tertiary up to bachelor	2,292 (21.2)	1,088 (16.5)	274 (22.4)	95 (23.8)
Masters or above	1,409 (14.1)	566 (9.3)	116 (10.6)	34 (12.4)
Area of residence				
Rural	3,151 (28.8)	2,097 (27.4)	292 (23.7)	73 (24.4)
Urban	6,734 (71.2)	4,560 (72.6)	811 (76.3)	211 (75.6)
Smoking				
Never smoker	-	-	61 (6.3)	42 (21.5)
Current smoker	3,368 (35.0)	6,661 (100.0)	601 (56.8)	-
Former smoker	6,521 (65.0)	-	440 (36.9)	242 (78.5)
Total	9,889 (100)	6,661 (100)	1,103 (100)	284 (100)

Supplementary table 2. Regression models characteristics

Outcome	Number of observations	Number of groups	Average number of observations per group	Akaike's Information Criterion (AIC)	Bayesian Information Criterion (BIC)
Attempted to quit smoking	6604	28	235.9	8395.09	8469.84
Attempted to quit e-cigarette or HTP	283	28	10.4	310.23	350.25
Used pharmacotherapy to quit e-cigarettes or HTP	1095	28	39.1	769.36	824.34
Used e-cigarettes to quit HTP	1057	28	37.5	1046.71	1101.24
Used HTP to quit e-cigarettes	1043	28	37.3	422.58	477.03
Used smokeless tobacco to quit e-cigarettes or HTP	1095	28	39.1	301.23	356.21
Used medical support to quit e-cigarettes or HTP	1095	28	39.1	515.70	570.68
Used no aid to quit e-cigarettes or HTP	1095	28	39.1	1471.98	1526.97
Used any aid to quit e-cigarettes or HTP	1095	28	39.1	1473.39	1528.37
Used pharmacotherapy to quit smoking	9828	28	351.0	7298.57	7377.69
Used e-cigarettes to quit smoking	9828	28	351.0	5278.85	5357.97
Used HTP to quit smoking	9828	28	351.0	1923.69	2002.81
Used smokeless tobacco to quit smoking	9828	28	351.0	1440.92	1520.05
Used medical support to quit smoking	9828	28	351.0	4107.60	4186.72
Used no aid to quit smoking	9828	28	351.0	10086.68	10165.80
Used any aid to quit smoking	9828	28	351.0	10895.56	10974.69

