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Support for e-cigarette policies among smokers in seven European countries: longitudinal findings from the 2016–18 EUREST-PLUS ITC Europe Surveys

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Background: The 2016 European Tobacco Products Directive (TPD) required Member States (MS) to implement new regulations for electronic cigarettes (ECs). We conducted a longitudinal study to assess changes over 2 years in smokers' support for EC policies and identify predictors of support in seven European countries after TPD implementation. **Methods:** Prospective cohort surveys were conducted among adult smokers in Germany, Greece, Hungary, Poland, Romania, Spain and England in 2016 ($n = 9547$; just after TPD) and 2018 ($n = 10\,287$; 2 years after TPD). Multivariable logistic regression models employing generalized estimating equations assessed changes in support for four EC policies, and tested for country differences and strength of key predictors of support. **Results:** Banning EC use in smoke-free places was supported by 53.1% in 2016 and 54.6% in 2018 with a significant increase in Greece (51.7–66.0%) and a decrease in Spain (60.1–48.6%). Restricting EC/e-liquid nicotine content was supported by 52.2 and 47.4% in 2016 and 2018, respectively, with a significant decrease in England (54.2–46.5%) and Romania (52.5–41.0%). An EC promotion ban was supported by 41.1 and 40.2%. A flavour ban was supported by 33.3% and 32.3% with a significant increase in Hungary (34.3–43.3%). Support was generally higher in Poland, Hungary and Greece vs. England. Support was lower among dual and EC-only users, and low-income smokers. **Conclusions:** Smokers in all countries strongly supported banning EC use in smoke-free places and restricting nicotine content after TPD implementation, with no clear trends for changes in policy support.

Introduction

The popularity of electronic cigarettes (ECs) has risen dramatically since their introduction onto the global market in early 2000.[1] Data from the Eurobarometer surveys conducted in the European Union (EU) show that the prevalence of ever use of ECs among respondents aged 15+ years increased from 7.2% in 2012 to 11.6% in 2014, with differences between individual Member States (MS),[2] and that the proportion of those who have at least tried ECs increased from 12.0% in 2014 to 15.0% in 2017.[3] In 2016, annual revenue from EC sales was estimated at EUR 1.3 billion and is expected to exceed EUR 10 billion by 2020.[4]

Comprehensive reviews of scientific evidence to date have concluded that ECs contain lower levels of toxic substances than cigarettes, and that completely switching from smoking cigarettes to e-cigarettes significantly reduces users' exposure to many of these toxicants.[5–7] However, there exists debate about the public health impact of inconsistent product standards for EC nicotine and chemical content,[8,9] the effectiveness of ECs for smoking cessation[5,6,10,11] and their potential role in renormalizing smoking.[12]

Table 1 EC prevalence (% daily or weekly EC use) among adults and implementation of EC policies in Germany, Greece, Hungary, Poland, Romania, Spain and England as of February 2018

		EC policies required by the TPD			Other EC policies[d-k]			
	% daily or weekly (i.e. regular) EC use, 2017 (95% CI)[a]	20 mg/ml nicotine limit[b]	30% front and back health warnings[c]	Advertising and promotion ban	Comprehensive advertising ban	Vape-free public places	Ban on characterizing flavours	Additional taxes beyond VAT
Germany	1.4 (0.9–2.3)	20 Nov 2016	20 Nov 2016	20 May 2016	x	x	x	x
Greece	2.3 (1.5–3.6)	20 Sept 2016	20 Sept 2016	20 Sept 2016	x	3 Aug 2010	x	x
Hungary	0.6 (0.2–1.5	20 May 2016	20 May 2016	20 May 2016	16 Aug 2016	16 Aug 2016	x	0.21 tax/ml
Poland	0.9 (0.5–1.8)	20 May 2016	20 May 2016	20 May 2016	8 Sept 2016	8 Sept 2016	x	0.50 tax/ml
Romania	0.3 (0.1–0.8)	10 Dec 2016	10 Dec 2016	10 Dec 2016	x	x	x	0.11 tax/ml
Spain	1.0 (0.5–2.1)	11 Jun 2017	11 Jun 2017	19 Nov 2017	x	11 Jun 2017	x	x
England	4.7 (3.4–6.3)	20 May 2016[l]	20 May 2016[l]	20 May 2016[m]	x	x	x	x

a: 2017 Eurobarometer survey data as reported in: Laverty AA, Filippidis FT, Vardavas CI. Patterns, trends and determinants of e-cigarette use in 28 European Union Member States 2014–2017. *Prev Med* 2018; 116:13–18. Prevalence for England in this table is based on 2017 survey data for the UK.
b: Implementation of TPD provision (at TPD level) for 20 mg/ml nicotine limit was required by 20 November 2016. The sale of ECs and EC refill containers manufactured or released for free circulation prior to 20 November 2016 was permitted until 20 May 2017.
c: Implementation of TPD provision (at TPD level) for health warnings was required by 20 November 2016.
d: Institute for Global Tobacco Control. Country laws regulating e-cigarettes: a policy scan. Baltimore, MD: Johns Hopkins Bloomberg School of Public Health. Available at: https://www.globaltobaccocontrol.org/e-cigarette_policyscan (12 February 2020, date last accessed).
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f: Available at: https://prawo.ug.edu.pl/sites/default/files/_nodes/strona-pia/33461/files/38balwicka.pdf (31 January 2020, date last accessed).
g: Tobacco Control Laws. Greece. Available at: https://www.tobaccocontrollaws.org/files/live/Greece/Greece%20-%20Law%20No.%203868.pdf (31 January 2020, date last accessed).
h: Tobacco Control Laws. Hungary. Available at: https://www.tobaccocontrollaws.org/legislation/country/hungary/laws (31 January 2020, date last accessed).
i: Tigova O, Amalia B, Castellano Y, et al. Secondhand exposure to e-cigarette aerosols among smokers: a cross-sectional study in six European countries of the EUREST-PLUS ITC Europe Surveys. *Tob Induc Dis* 2018; 16(2):11.
j: https://www.boe.es/boe/dias/2017/06/10/pdfs/BOE-A-2017-6585.pdf (31 January 2020, date last accessed).
k: Available at: https://www.boe.es/boe/dias/2017/11/18/pdfs/BOE-A-2017-13277.pdf (31 January 2020, date last accessed).
l: In England, there was a 1-year transition period for the implementation of regulations for EC/e-liquid nicotine limit, and health warnings on EC product packaging.
m: In England, bans on EC advertising on television and radio were implemented under the Tobacco and Related Products Regulations 2016, which came into force on 20 May 2016. Available at: http://www.legislation.gov.uk/uksi/2016/507/contents/made (31 Janauary 2020, date last accessed).

There continues to be significant debate about how to regulate ECs in order to balance potential benefits and harms, with divergent regulatory frameworks for these products across countries.[13–15] Under the EU Tobacco Products Directive (TPD)[16], all 28 MS were required to transpose new regulations for ECs into national law by 20 May 2016. Article 20 of the Directive sets out new rules for the harmonization of EC standards and protection of consumer health and safety. These include, among other measures: restrictions on nicotine concentration of e-liquids, child-resistant packaging, health warnings on EC product packaging and a ban on EC advertising on all broadcast media, print magazines, newspapers and periodicals, online media and some other forms of electronic media (including but not limited to commercial email and text messaging, marketers' online activities on websites and social media, paid online advertisements and social media placements and promotional marketing online). Individual MS have the option to implement additional measures, including a ban on characterizing flavours in ECs, ban on EC use in smoke-free places and minimum legal sales age laws. Table 1 provides EC prevalence rates and policy implementation dates in the seven countries of the EUREST-PLUS and International Tobacco Control Policy Evaluation (ITC) Project: Germany, Greece, Hungary, Poland, Romania, Spain and England.

Public support plays an important role for the successful implementation and enforcement of tobacco control policies.[17,18] Understanding public views on EC policies could help to inform policy decisions and contribute to the scientific evidence base as the debate on the potential harms and benefits of these rapidly evolving products continues. Additionally, if there is public support for policies that are not supported by the research evidence, this would provide governments with knowledge about the possible need for public health education campaigns to address misperceptions.

To date, there are limited data on support for EC policies that could inform regulatory efforts in the EU and other countries. Studies of adult smokers in Canada,[19] the USA [20] and Hong Kong[21] have generally found strong support for minimum legal sales age laws for ECs, restrictions on EC product advertising and bans on EC use in smoke-free places.

This study aims to: (i) assess changes in support from 2016 to 2018 (after implementation of the TPD) among adult smokers in seven EU MS (Germany, Greece, Hungary, Poland, Romania, Spain and England) for policies to restrict EC/e-liquid nicotine content, and bans on EC promotion, EC flavours and EC use in smoke-free places and (ii) examine how demographic characteristics and smoking and EC use status are associated with EC policy support across these seven EU MS.

Methods

Design

This study is part of a European Commission Horizon 2020 funded project entitled 'European Regulatory Science on Tobacco: Policy Implementation to Reduce Lung Diseases (EUREST-PLUS)', which aims to evaluate the implementation of the TPD and World Health Organization Framework Convention on Tobacco Control (WHO FCTC) across the EU.[22]

Table 2 ITC survey measures of EC policy support, by country

EC policy support measure	ITC 6E Survey	England arm of the ITC 4CV Survey
EC promotion ban Restrictions on EC/e-liquid nicotine content Ban on fruit- and candy-flavoured ECs[a] Ban on EC use in smoke-free places	(1) Do you support or oppose banning e-cigarette, vaping device and e-liquid promotions, such as free samples, coupons and price discounts? (2) Do you support or oppose limiting the amount of nicotine allowed in e-cigarettes and e-liquid? (3) Do you support or oppose banning fruit and candy flavours in e-cigarettes and e-liquid? (4) Do you support or oppose banning the use of e-cigarettes or vaping devices in places where smoking is already banned? Response options: strongly support; support; oppose; strongly oppose; refused; don't know	(1) Would you support or oppose a law that bans e-cigarette and e-liquid promotions, such as free samples, coupons and price discounts? (2) Would you support or oppose a law that limits the amount of nicotine allowed in e-cigarettes and/or e-liquid? (3) Would you support or oppose a law that bans fruit and candy flavours in e-cigarettes? (4) Would you support or oppose a law that bans the use of e-cigarettes in places where smoking is already banned? Response options: strongly support; support; oppose; strongly oppose; refused; don't know

a: Hereinafter referred to as EC flavour ban.

Data were from adult smokers aged 18+ years in seven European countries participating in the ITC Project: Germany, Greece, Hungary, Poland, Romania, and Spain [Waves 1 and 2 of the EUREST-PLUS ITC 6 European Country (6E) Survey] and England [Waves 1 and 2 of the ITC Four Country Smoking and Vaping (4CV) Survey].

The ITC Project is the first-ever international cohort study of tobacco use. A principal objective of the ITC Project is to measure the psychosocial and behavioural impact of WHO FCTC policies. To date, the ITC Project has conducted prospective cohort surveys in 29 countries, and over 160 survey waves across those 29 countries. ITC surveys in over 20 countries are designed to be nationally representative of adult smokers in each country, with sampling weights computed for all respondents and calibrated to national benchmark surveys; this is true of the seven countries whose findings are presented in this paper. More extensive details on the methodology and conceptual model of the ITC Project, including the methodology followed in these seven countries are described elsewhere.[23–25]

Study population

The ITC 6E Wave 1 (W1) sample was comprised of 6011 smokers (approximately 1000 per country; data collected from 16 June to 12 September 2016). The ITC 6E Wave 2 (W2) sample comprised the following cohorts: (i) recontact smokers and quitters who participated in Wave 1 survey ($n = 3195$) and (ii) newly recruited smokers ($n = 2832$) (data collected from 12 February to 6 May 2018). Wave 2 retention rates ranged from 36% in Hungary to 71% in Germany, with an overall retention rate of 53%. Briefly, respondents were recruited using probability sampling based on geographic strata according to the Nomenclature of Territorial Units for Statistics (NUTS) regions crossed with degree of urbanization (urban, intermediate, rural). Approximately 100 area clusters sampled in each country. Eligible households within each cluster were selected using a random walk method, and where possible up to two randomly selected smokers (one male and one female) were chosen for interviews. All interviews were conducted face-to-face using computer-assisted personal interviews (CAPI). Further details are available elsewhere.[26–28]

The England arm of the ITC 4CV1 sample comprised the following cohorts: (i) recontact smokers and quitters who participated in Wave 10 of the earlier 4 C Project in the UK ($n = 173$) and (ii) newly recruited current smokers ($n = 3363$) (data collected from 7 July to 16 November 2016). The 4CV2 sample comprised the following cohorts: (i) recontact smokers, EC users and ex-smokers who participated in the 4CV1 survey ($n = 1438$) and (ii) newly recruited current smokers ($n = 2822$) (data collected from 21 February to 8 July 2018). The Wave 2 retention rate was 40.7%. Briefly, respondents were recruited via probability-based sampling frames, non-probability opt-in panels or a combination of these. Respondents completed surveys on the web. Further details are available elsewhere.[26,29]

Measures

Demographics

Demographic variables were: sex (male, female), age (18–24, 25–39, 40–54, 55+ years), household income (low, medium, high and not stated) and education (low, medium, high and not stated).

Smoking and EC use status

Current smokers were defined as those who had smoked at least 100 cigarettes in their lifetime and were currently smoking cigarettes at least monthly. Current EC users were defined as those who have ever used an EC and were currently using ECs at least monthly. Respondents were categorized into four user groups: (i) cigarette-only smokers, (ii) dual users of cigarettes and ECs, (iii) EC-only users and (iv) non-users (includes ex-smokers who did not use ECs at W2 for 6E countries; includes ex-smokers who did not use ECs at W1 and W2, and less than monthly smokers for England).

Policy support

Support for EC policies was measured by six questions. The wording and response options for some measures differed between countries (see table 2). For all policy support measures across all countries, responses were dichotomized as 'strongly support/support' and 'oppose/strongly oppose/don't know'. Response 'refused' was excluded.

Statistical analysis

To examine cross-country differences and changes in overall support for each of the four EC policies among smokers, the following respondents across all seven countries were included in the analysis: (i) smokers at Wave 1, (ii) smokers at Wave 1 who were recontacted at Wave 2 (includes those who were still smoking and those who quit smoking at Wave 2) and (iii) newly replenished smokers at Wave 2 (to maintain the sample sizes and estimation power). Only respondents who had heard of ECs were included in the analysis.

To ensure that prevalence estimations were comparable at the same levels of the control variables, all data were pooled to estimate prevalence of support for each of the four EC policies. The rescaled cross-sectional weights at recruitment were applied to each respondent to ensure comparability of the between-wave data at the individual-level for the recontacted samples. Accordingly, Wave 1 estimates of the outcome variables were generated for all Wave 1 smokers and the Wave 2 estimates of those variables were the average of the estimates for the Wave 1 and Wave 2 smokers. Therefore, Wave 2 is not a purely cross-sectional estimation of the population

at the time of the Wave 2 Survey. However, we used this weighting method to maximize the comparability of the Wave 1 and Wave 2 data for examining any potential changes in EC policy support.

Thus, the constructed analytic data ensured that: (i) the estimates of EC policy support for each country were comparable since they represent the prevalence of each country at the average levels of the controlling variables of all seven countries and (ii) the Wave 1 and 2 estimates within each country are comparable, allowing for an appropriate analysis to assess changes in policy support over time.

Estimates were produced using longitudinal logistic regression models incorporating generalized estimating equations (GEE).[30] For prevalence estimation, in addition to country, wave and their interaction terms, the models also adjusted for sex, age, income, education, smoking and EC use status and time in sample (number of times respondents had been surveyed in each of the countries). Parameter estimations from these models were then provided to examine the potential associations between demographic characteristics, smoking and EC use status and support for each of the four policies. In addition to the country and wave interaction, we also tested interactions between country and other covariates to identify potential country-specific associations. There were only minor differences in a couple of countries, so the results without these interaction terms will be presented here for simplicity.

To address a potential design effect resulting from the complex survey design and within-individual correlations due to repeated measures at each wave, a nested structure that includes the strata, the primary sampling units and the respondent IDs was used to construct the models. All the analyses were conducted using SAS-callable SUDAAN (V.11). The predicted marginal standardization method in the SUDAAN GEE model (PREDMARG) was used for estimating prevalence.[31] General linear contrasts of the predicted marginals in the corresponding models were specified to test the significance of between-wave percent changes. Logistic regression results are presented as adjusted odds ratios (aOR), with all confidence intervals (CIs) and statistical significance tested at the 95% confidence level.

An additional validation analysis based on longitudinal data from smokers who participated at both survey waves was conducted to examine whether there were any individual-level changes in policy support over time and whether individual-level changes were different than the population estimates in the main analyses above. Results of the individual-level analysis are not presented here, as there were no significant differences in changes to the main estimates and changes in policy support over time.

Results

Table 3 presents the sample characteristics, by survey wave. At both waves, most respondents were from England, aged 25 years and older and of medium income and educational level. The vast majority of respondents werecigarette-only smokers.

Trends in EC policy support

Overall policy support

Across all countries, overall support was highest for policies to ban EC use in smoke-free places (W1: 53.1%, W2: 54.6%) and to restrict EC nicotine content (W1: 52.2%, W2: 47.4%), followed by EC promotion ban (W1: 41.1%, W2: 40.2%) and lowest for an EC flavour ban (W1: 33.3%, W2: 32.3%). There were no consistent patterns for changes in support over time for each of the four EC policies across all countries.

Ban on EC use in smoke-free places

Support for a ban on EC use in smoke-free places ranged from 51.2% in Hungary to 60.1% in Spain at W1 and 46.4% in Romania to 66.0% in Greece at W2. Support increased significantly from W1 to W2 in Greece (51.7–66.0%) and decreased in Spain (60.1–48.6%). There were no significant changes in support in all other countries (figure 1).

Table 3 Sample characteristics

	Wave 1		Wave 2	
	n = 9547		*n* = 10 287	
	N	Percent	*N*	Percent
Country				
Germany	1003	10.5	1010	9.8
Greece	1000	10.5	1010	9.8
Hungary	1000	10.5	1000	9.7
Poland	1006	10.5	996	9.7
Romania	1001	10.5	1003	9.8
Spain	1001	10.5	1008	9.8
England	3536	37.0	4260	41.4
Sex				
Male	5132	53.8	5247	51.0
Female	4415	46.2	5040	49.0
Age group (years)				
18–24	1312	13.7	1505	14.6
25–39	2645	27.7	2615	25.4
40–54	2942	30.8	3167	30.8
55+	2648	27.7	3000	29.2
Income				
Low	2109	22.1	2071	20.1
Medium	3804	39.8	3869	37.6
High	1966	20.6	2399	23.3
Not stated	1668	17.5	1948	18.9
Education				
Low	3221	33.7	3159	30.7
Medium	4508	47.2	5076	49.3
High	1714	18.0	1946	18.9
Not stated	104	1.1	106	1.0
Smoking and EC use status				
Cigarette-only smoker	8288	86.8	7774	75.6
Dual user	1259	13.2	1921	18.7
EC-only user	0	0.0	98	1.0
Non-user	0	0.0	494	4.8

Restrictions on EC/e-liquid nicotine content

Support for restrictions on EC nicotine content ranged from 43.2% in Germany to 56.8% in Poland at W1 and 41.0% in Romania to 57.2% in Hungary at W2. Support decreased significantly from W1 to W2 in England (54.2–46.5%) and Romania (52.5–41.0%). There were no significant changes in support in all other countries (figure 2).

EC promotion ban

Support for an EC promotion ban ranged from 35.7% in England to 55.1% in Poland at W1 and 32.9% in Spain to 57.0% in Poland at W2. There were no significant changes in support by country (figure 3).

EC flavour ban

Support for an EC flavour ban ranged from 27.3% in Greece to 45.3% in Romania at W1 and 24.1% in Spain to 43.3% in Hungary at W2. Support increased significantly from W1 to W2 in Hungary (34.3–43.3%). There were no significant changes in support in all other countries (figure 4).

Predictors of EC policy support

Table 4 presents the results of the weighted multivariate logistic regression models that tested differences in support for each of the four EC policies by survey wave, country, sex, age, income,

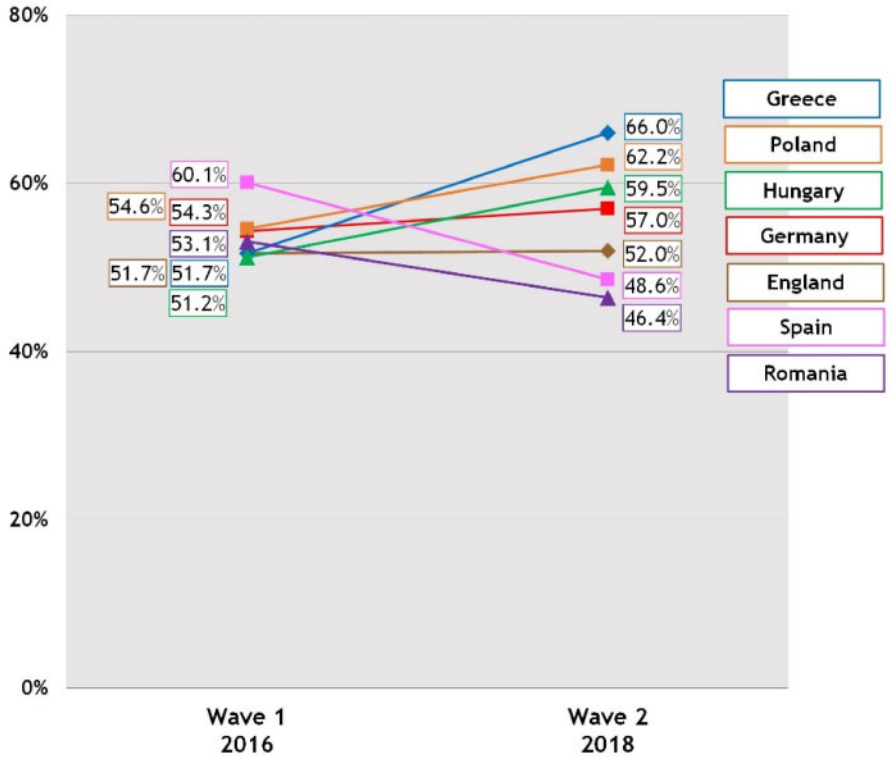

Figure 1 Percentage of smokers[†] who would 'support' or 'strongly support' a law that bans the use of ECs in places where smoking is already banned, by country and survey wave. [†]Among those who have heard of e-cigarettes

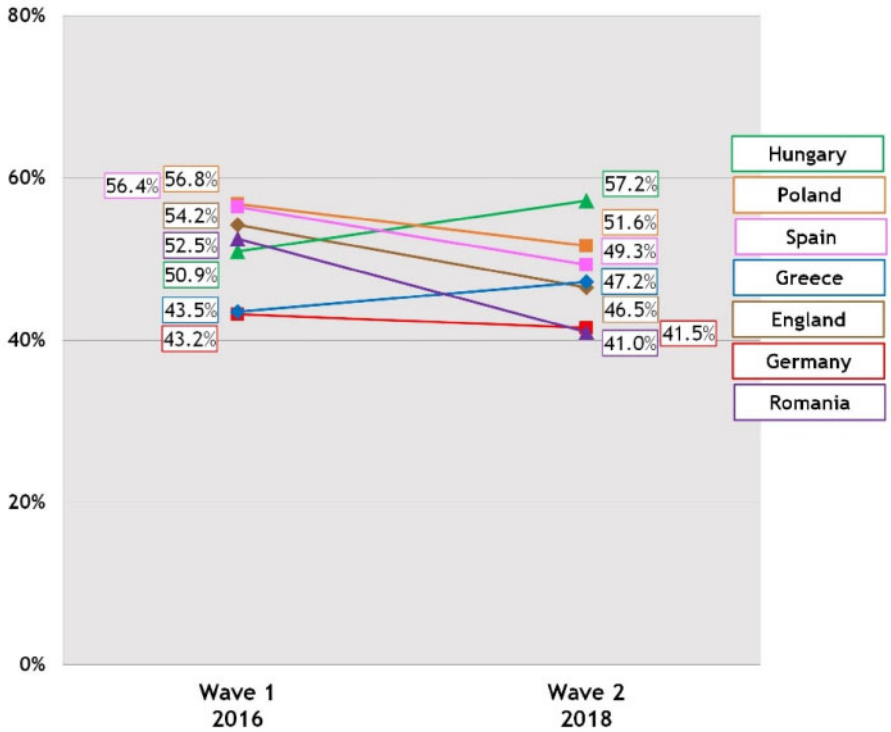

Figure 2 Percentage of smokers[†] who would 'support' or 'strongly support' a law that limits the amount of nicotine in ECs and e-liquid, by country and survey wave. [a]Among those who have heard of e-cigarettes

education and smoking and EC use status. Overall, country, income and smoking and EC use status were significantly associated with support for all four EC policies.

Smokers in Poland were generally more likely to support EC policies compared with those in England, with statistically significant differences in support for a ban on EC use in smoke-free places,

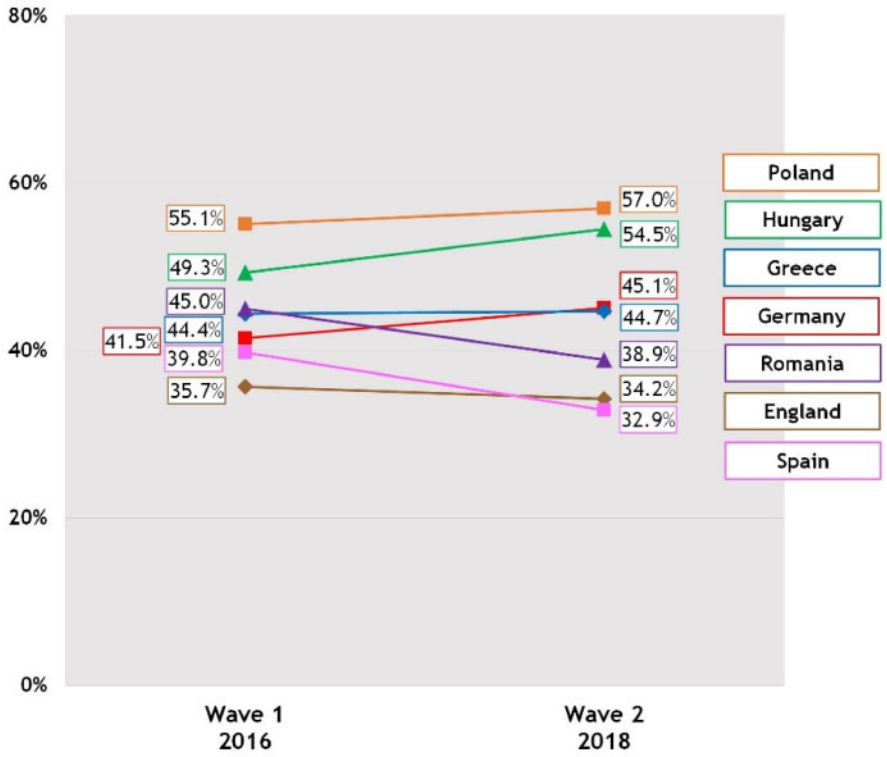

Figure 3 Percentage of smokers[†] who would 'support' or 'strongly support' a law that bans EC and e-liquid promotions, by country and survey wave. [a]Among those who have heard of e-cigarettes

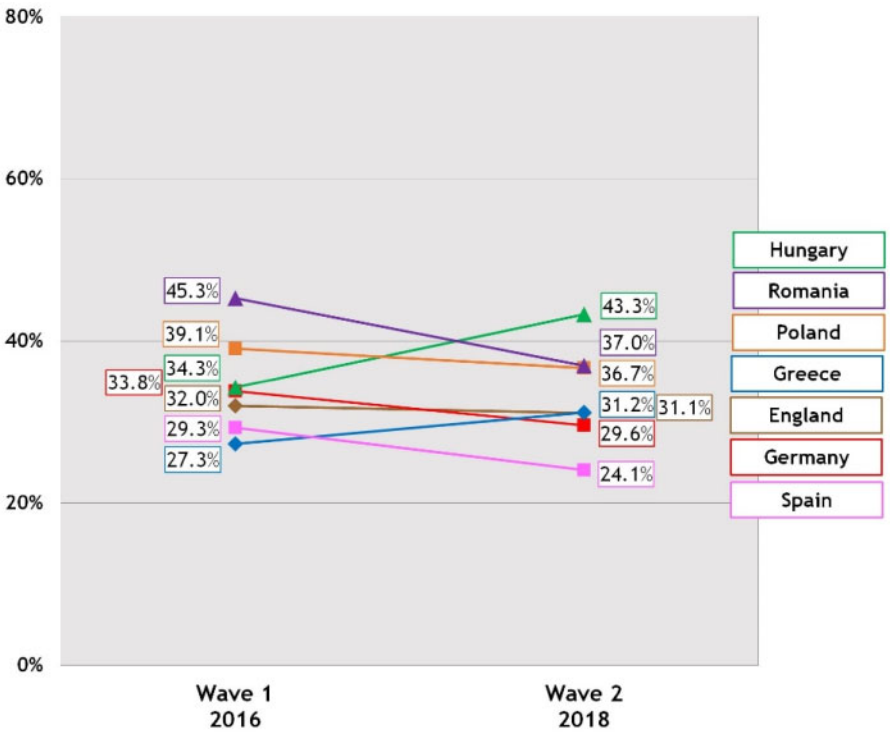

Figure 4 Percentage of smokers[†] who would 'support' or 'strongly support' a law that bans fruit and candy flavours in ECs and e-liquid, by country and survey wave. [a]Among those who have heard of e-cigarettes

Table 4 Factors associated with support for EC policies

	Ban on EC use in smoke-free places	Restrictions on EC/e-liquid nicotine content	EC promotion ban	EC flavour ban
Number of observations used	16 101	16 099	16 040	16 069
Number of individuals included	12 869	12 859	12 840	12 846
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Wave (year)				
1 (2016)	0.94 (0.84–1.05)	**1.23 (1.11–1.38)**	1.05 (0.94–1.19)	1.04 (0.92–1.17)
2 (2018)	1.00	1.00	1.00	1.00
Country				
Germany	1.19 (0.96–1.48)	**0.76 (0.59–0.97)**	**1.42 (1.13–1.79)**	1.03 (0.80–1.31)
Greece	**1.32 (1.07–1.62)**	0.79 (0.62–1.02)	**1.43 (1.08–1.90)**	0.90 (0.66–1.22)
Hungary	1.21 (0.94–1.55)	1.29 (1.00–1.67)	**1.98 (1.53–2.56)**	**1.48 (1.15–1.90)**
Poland	**1.37 (1.09–1.72)**	1.20 (0.95–1.50)	**2.37 (1.91–2.94)**	**1.41 (1.11–1.79)**
Romania	0.87 (0.70–1.08)	0.82 (0.66–1.02)	**1.25 (1.00–1.55)**	**1.53 (1.24–1.89)**
Spain	**1.26 (1.02–1.56)**	**1.24 (1.00–1.53)**	1.09 (0.86–1.39)	0.86 (0.68–1.09)
England	1.00	1.00	1.00	1.00
Sex				
Female	0.96 (0.89–1.05)	**1.11 (1.02–1.20)**	**0.92 (0.85–1.00)**	**0.90 (0.83–0.99)**
Male	1.00	1.00	1.00	1.00
Age group				
18–24	0.94 (0.81–1.09)	1.10 (0.95–1.27)	1.07 (0.92–1.25)	**0.72 (0.61–0.84)**
25–39	1.05 (0.93–1.18)	1.12 (1.00–1.26)	1.11 (0.99–1.24)	**0.87 (0.77–0.98)**
40–54	1.00 (0.90–1.11)	1.06 (0.96–1.17)	1.02 (0.91–1.13)	0.94 (0.84–1.04)
55+	1.00	1.00	1.00	1.00
Income				
Low	1.00	1.00	1.00	1.00
Medium	**1.17 (1.04–1.31)**	1.13 (1.00–1.27)	1.11 (0.98–1.25)	1.08 (0.95–1.23)
High	**1.33 (1.15–1.53)**	1.13 (0.98–1.31)	**1.25 (1.08–1.44)**	1.05 (0.90–1.21)
Not stated	**0.78 (0.66–0.91)**	**0.74 (0.63–0.86)**	0.90 (0.75–1.07)	**0.80 (0.67–0.96)**
Education				
Low	1.00	1.00	1.00	1.00
Medium	0.97 (0.88–1.08)	**1.14 (1.02–1.27)**	0.98 (0.87–1.09)	0.98 (0.87–1.09)
High	1.10 (0.96–1.27)	**1.24 (1.08–1.42)**	1.10 (0.95–1.27)	1.13 (0.97–1.30)
Not stated	0.78 (0.51–1.18)	0.74 (0.48–1.13)	0.71 (0.46–1.09)	0.86 (0.55–1.35)
Smoking and EC use status				
Cigarette-only smoker	1.00	1.00	1.00	1.00
Dual user	**0.51 (0.45–0.58)**	0.98 (0.87–1.12)	**0.70 (0.61–0.80)**	**0.79 (0.69–0.91)**
EC-only user	**0.45 (0.28–0.71)**	0.73 (0.46–1.15)	**0.33 (0.18–0.58)**	**0.29 (0.16–0.53)**
Non-user	**1.65 (1.25–2.17)**	**1.52 (1.17–1.98)**	**1.79 (1.37–2.32)**	**1.56 (1.20–2.02)**

Bold font indicates a statistically significant difference from the baseline category ($P < 0.05$).
aOR, adjusted odds ratio; CI, confidence interval.
Multivariable logistic regression models adjusted for country, wave, country x wave interactions, sex, age, education, smoking status, and EC use status. Models also controlled for time in sample, results not shown for simplicity.
Missing values for outcome variables were not included, resulting in slight differences in number of observations used for each outcome.

EC promotion ban and EC flavour ban. Compared with smokers in England, those in Hungary, Greece, Germany and Romania were significantly more likely to support a ban on EC promotion; those in Hungary and Romania were more likely to support an EC flavour ban; and those in Greece and Spain were more likely to support a ban on EC use in smoke-free places. Compared with smokers in England, those in Germany were less likely to support restrictions on EC/e-liquid nicotine content, while those in Spain were more likely to support such restrictions.

Smokers with high income were significantly more likely to support a ban on EC use in smoke-free places and a ban on EC promotion compared with those with low income. No consistent patterns for associations between sex, age and education and support for each of the four EC policies were observed.

There was a clear pattern for associations between product use and EC policy support, such that support was highest among non-users, followed by cigarette-only smokers, dual users and lowest among EC-only users. Non-users were significantly more likely than cigarette-only smokers to support all four EC policies. In contrast, dual users were significantly less likely than cigarette-only smokers to support all EC policies except for restrictions on EC/e-liquid nicotine content. Similarly, EC-only users were significantly less likely than cigarette-only users to support all EC policies except for restrictions on EC/e-liquid nicotine content.

There were no significant differences in support for EC policies from W1 to W2, except for a significant decrease in support for restrictions on EC nicotine content over this time period.

Discussion

This study examined changes in support for EC policies among smokers in seven EU MS after the implementation of the TPD, including support for new regulations to restrict EC nicotine content required for all MS, and bans on EC use in smoke-free places, EC promotion and EC flavours that individual MS may consider within their own jurisdictions.

Overall, more than half of smokers (53.1% in 2016 and 54.6% in 2018) across all seven countries supported a ban on EC use in smoke-free places—which is higher than the level of support found in previous studies conducted in Spain (45.0% of general population in 2013–14)[32] and Great Britain (42.5% of smokers and ex-smokers in 2014),[33] but lower compared with Eurobarometer survey results (63.0% of smokers, ex-smokers and non-smokers across 28 EU MS in 2017).[3] We also found majority support (52.2% in 2016 and 47.4% in 2018) for restrictions on EC nicotine content. While overall support for a ban on EC promotion was lower at ~40.0% across

both survey waves in this study, it was still higher compared with support for an EC advertising ban among smokers and ex-smokers in Great Britain (20.6% in 2013 and 30.9% in 2014).[33] We found the lowest levels of support for a ban on EC flavours at ~30.0% at both waves across all countries, which is lower compared with Eurobarometer survey results (40.0% of smokers, ex-smokers and non-smokers across 28 EU MS in 2017).[3] Further research is needed to better understand variations in the level of support for EC policies found in this study compared with previous studies, which could be due to the differences in methodology, sample composition and other contextual factors.

No clear trends were observed for changes in policy support from 2016 to 2018. We found significant increases in support over time for bans on EC use in smoke-free places in Greece, and EC flavours in Hungary. In contrast, there was a significant decrease in support for a ban on EC use in smoke-places in Spain, and restrictions on EC nicotine content in England and Romania over the study period. Further longitudinal studies to monitor changes in support are warranted.

Support for all EC policies was generally higher among smokers in Poland, Hungary and Greece than those in England. These country-level differences in support may reflect differences in the overall EC regulatory environment and government position on e-cigarette use. In countries that promote ECs for smoking cessation, one might expect lower support for restrictive EC policies than in countries with a more cautious approach to use of ECs. High levels of support in Poland, Hungary and Greece may be due to the fact that these countries have more cautious positions on ECs and have implemented other measures that go beyond required TPD provisions. These include a comprehensive ban on EC advertising and additional taxation beyond VAT in Hungary and Poland; and a ban on EC use in public places in Greece, Hungary and Poland (see table 1 for policy details). In contrast, England has not implemented any other regulations beyond TPD requirements. However, England has strict regulations to prevent exposure to EC advertising and to restrict access to these products among youth. There is also strong governmental support for the promotion of ECs for harm reduction in England which is endorsed by UK public health organizations[6,34] and aligns with the 2018 UK National Institute for Health Care Excellence guideline recommendation on use of ECs for smoking cessation.[35] Our findings suggest that differences in policy support across EU countries likely reflects government stance on ECs more broadly rather than a single dimension of 'restrictive' vs. 'less restrictive' policies per se.

Not surprisingly, we found that respondents who used ECs were less likely to support EC policies than non-users, which is consistent with findings of the 2017 Eurobarometer Survey conducted across 28 EU MS,[3] and previous studies in Great Britain,[33] the USA[20,36] and Spain.[32] We also found that cigarette smokers were less likely to support EC policies than ex-smokers, similar to results reported in studies in Great Britain,[33] Spain,[32] Hong Kong[21] and the USA.[36]

This study has some limitations. First, we were unable to assess pre–post changes in EC policy support in all seven countries. All EU MS were required to transpose most EC provisions of the TPD into their national legislation by 20 May 2016. In many countries, however, transposition and subsequent implementation of all EC provisions was delayed beyond deadlines specified in the TPD. There are also country differences with regards to their implementation of TPD provisions with transition periods. For example, some countries allowed for the sale of EC products produced before 20 November 2016 that were not in compliance with new restrictions on EC nicotine content until 20 May 2017. As a result of differences in TPD transposition and policy implementation dates at the country level, the ITC surveys (W1: June to September 2016; W2: February to May 2018) were not able to provide data for pre–post TPD evaluation of support for each of the four EC policies in all seven countries. Second, we only examined changes in support over time for four EC policies. Future studies to assess support for a broader range of policies, such as health warnings on EC product packaging, EC advertising bans and EC taxation are warranted. Third, our sample was limited to cigarette smokers and EC users. Future research should assess support for EC policies among other groups, including those who have never smoked cigarettes or used ECs. However, the focus in the present study on support among smokers and EC users was justified since those individuals would be most directly affected by EC policies.

Conclusions

In 2016 and 2018, about half of smokers in seven EU countries said that they would support a ban on EC use in smoke-free places and restrictions on nicotine content. There were no clear trends for changes in EC policy support over time in the seven countries, with support for some EC policies increasing over time in a few countries and decreasing in others. In general, the level of support for EC policies was lowest among smokers in England. Support for all EC policies was lower among those who used ECs and had low income. Future studies to explore how support for different EC policies may change as the policy landscape and evidence continues to evolve are needed.

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Key points

- The 2016 European Tobacco Products Directive (TPD) requires new regulations for electronic cigarettes (ECs).
- This study assessed changes in support for EC policies from 2016 to 2018 (post-TPD) among adult smokers in seven European Union member states.
- About half of smokers in all seven countries supported a ban on EC use in smoke-free places and restrictions on EC nicotine content after TPD implementation. There were no clear trends in changes in policy support over time.

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