Secondhand smoke exposure in European countries with different smoke-free legislation. Findings from the EUREST-PLUS ITC Europe Surveys.

Authors/Affiliations

Sarah O. Nogueira[1,2,3,4], MSc, Esteve Fernández[1,2,3,4], PhD, Pete Driezen[5,6], PhD, Marcela Fu[1,2,3,4], PhD, Olena Tigova[1,2,4], MSc, Yolanda Castellano[1,2,4], MSc, Ute Mons[7,8], PhD, Aleksandra Herbeć[9,10], PhD, Christina N. Kyriakos[11,12], MSc, Tibor Demjén[13], PhD, Antigona C. Trofor[14,15], PhD, Krzysztof Przewoźniak[9,16,17], PhD, Paraskevi A. Katsaounou[18], PhD, Constantine I. Vardavas[12,19,20], PhD, Geoffrey T. Fong[5,6,21], PhD, on behalf of the EUREST-PLUS Consortium*

1 Catalan Institute of Oncology, L'Hospitalet de Llobregat, Spain

2 Bellvitge Biomedical Research Institute, L'Hospitalet de Llobregat, Spain

3 Faculty of Medicine and Health Sciences, University of Barcelona, Barcelona, Spain

4 Consortium for Biomedical Research in Respiratory Diseases, Madrid, Spain

5 Department of Psychology, University of Waterloo, Waterloo, Canada

6 School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, Canada

7 Cancer Prevention Unit and WHO Collaborating Centre for Tobacco Control, German Cancer Research Center, Heidelberg, Germany

8 Heart Center, Faculty of Medicine and University Hospital Cologne, University of Cologne Cologne, Germany

9 Health Promotion Foundation, Warsaw, Poland

10 Centre for Behaviour Change, Clinical, Educational and Health Psychology, University College London, United Kingdom

11 Department of Primary Care and Public Health, School of Public Health, Imperial College London, London, United Kingdom

12 European Network on Smoking and Tobacco Prevention, Brussels, Belgium

13 Smoking or Health Hungarian Foundation, Budapest, Hungary

14 University of Medicine and Pharmacy 'Grigore T. Popa' Iasi, Iasi, Romania

15 Aer Pur Romania, Bucharest, Romania

16 Maria Sklodowska-Curie National Research Institute of Oncology, Warsaw, Poland

17 Collegium Civitas, Warsaw, Poland

18 First ICU Evaggelismos Hospital Athens, National and Kapodistrian University of Athens, Athens, Greece

19 European Respiratory Society, Lausanne, Switzerland
20 Laboratory of Toxicology, School of Medicine, University of Crete, Heraklion, Greece
21 Ontario Institute for Cancer Research, Toronto, Canada

Corresponding author

Dr Esteve Fernández

Av. Granvia de L'Hospitalet, 199-203; 08908 L'Hospitalet de Llobregat, Spain

Tel.: (+34) 93 260 7357; email: efernandez@iconcologia.net

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ABSTRACT

Background: Exposure to secondhand smoke (SHS) poses serious and extensive health and economic-related consequences to European society and worldwide. Smoking bans are a key measure to reducing SHS exposure but have been implemented with varying levels of success. We assessed changes in the prevalence of self-reported SHS exposure and smoking behaviour in public places among smokers in six European countries and the influence of the country's type of smoking ban (partial or total ban) on such exposure and smoking behaviour.

Methods: The EUREST-PLUS ITC Europe Surveys were conducted among adult smokers in Germany, Greece, Hungary, Poland, Romania, and Spain in 2016 (Wave 1, n=6,011) and 2018 (Wave 2, n=6,027). We used generalised estimating equations models to assess changes between Waves 1 and 2 and to test the interaction between the type of smoking ban and 1) self-reported SHS exposure, 2) self-reported smoking in public places.

Results: A significant decrease in self-reported SHS exposure was observed in workplaces, from 19.1% in 2016 to 14.0% in 2018 (-5.1%; 95% CI: -8.0%;-2.2%). Self-reported smoking did not change significantly inside bars (22.7% in W2), restaurants (13.2% in W2) and discos/nightclubs (34.0% in W2). SHS exposure in public places was significantly less likely (OR=0.35; 95% CI: 0.26-0.47) in the countries with total bans as compared to those countries with partial bans.

Conclusion: The inverse association between smoking in public places and smoking bans indicates an opportunity for strengthening smoke-free legislation and protecting bystanders from exposure to SHS in public places.

KEYWORDS

Secondhand/environmental exposure; legislation, policy, population studies, survey research

WHAT THIS STUDY ADDS

- Prevalence of smokers engaging in and being exposed to smoking in public places varied by type of smoke-free legislation across six European Union countries in our study; those with total smoke bans reported significantly less exposure to SHS than those with partial or no bans.
- Our results indicate room for improvement, not only to decrease the prevalence of exposure to SHS in Europe but also to diminish the variability between countries through common, more restrictive smoke-free legislation, and importantly, strong and sustained enforcement.

INTRODUCTION

Smoke-free policies and exposure to smoking in public places are important indicators for the effectiveness of and progress in tobacco control.[1] Exposure to secondhand smoke (SHS) has serious and extensive health and economic-related consequences to European society and worldwide.[2,3] A study on health-related effects of tobacco control policies found that protecting people from tobacco smoke through smoking bans, together with increasing taxation, are the most effective government interventions to tackle the tobacco epidemic; smoke-free policies were associated with a decrease in smoking and SHS exposure, and with a decline in tobacco-related adverse health outcomes.[4] Furthermore, SHS exposure among smokers themselves is a marker of smoking environments and of exposure to social and other smoking cues that have been shown to hinder smoking cessation efforts and increase relapse into smoking.[5,6]

Article 8 of the World Health Organization's Framework Convention on Tobacco Control (WHO FCTC) requires Parties, including the European Union (EU), to adopt effective measures to protect people from exposure to tobacco smoke in public places.[7] As there is no safe level of exposure to SHS, provisions aim to achieve universal protection. Furthermore, the WHO FCTC calls for monitoring and evaluation of the implementation, enforcement and impact of smoke-free legislation.

Currently, different smoke-free laws are in effect across the six countries examined in this study. While Romania and Spain have total bans of smoking inside leisure venues, there are no such bans in Germany, Greece, Hungary, and Poland. Protection from exposure to SHS in outdoor areas of leisure venues is even weaker: only Romania and Spain have any type of legislation in place (Table 1).

Using data from the first and second waves of the EUREST-PLUS ITC Europe Surveys,[8] we assessed the prevalence of (a) SHS exposure and (b) self-reported smoking in public places among adult smokers, as well as the influence of the type of smoking ban (partial or total) on these outcomes in 2018. Assessing these outcomes among this population provides an important opportunity to understand not only the potential level of exposure to SHS among the general population, but also the exposure of smokers to smoking environments which are likely to negatively impact their cessation efforts.

METHODS

Data source

Data were collected as part of the International Tobacco Control Policy Evaluation (ITC) Project Six European Country (6E) Surveys, a nationally representative prospective cohort survey of adult smokers (aged ≥18) from six EU MS: Germany, Greece, Hungary, Poland, Romania, and Spain. The ITC 6E Survey was undertaken within the context of the European Commission Horizon-2020 funded study "European Regulatory Science on Tobacco: Policy Implementation to Reduce Lung Disease" (EURESTPLUS-HCO-06-2015), which aimed to evaluate the impact of the EU TPD and the WHO FCTC.[8]

Sampling frame

Sampling was based on geographic strata defined according to the Nomenclature of Territorial Units for Statistics regions and degree of urbanisation. Clusters proportional to population size were randomly sampled within strata. Within each cluster, up to two smokers (one female and one male) were interviewed face-to-face in each dwelling selected with the random walk method. Wave 1 was conducted in 2016. At Wave 2 (2018), we attempted to re-contact and

interview all of the Wave 1 respondents who had agreed to be re-contacted. Respondents lost to attrition (ranging from 29% in Spain to 64% in Hungary) were replaced by adult smokers recruited using the same sampling method as in Wave 1 and in the same cluster from dwellings not approached in Wave 1. 6,011 individuals were interviewed across the six countries in 2016 and 6,027 in 2018 (2,832 interviewed in Wave 2 only).

Measures

The outcome measures were (1) SHS exposure in public places, assessed by seeing someone else smoking in those places, and (2) self-reported smoking in public places, assessed by the respondents' own smoking behaviour in these places. The places studied were workplaces (only for SHS exposure), restaurants, bars/pubs and discos/nightclubs. The first outcome measure was assessed with the question "The last time you visited [name of a public place listed above], were people smoking inside [that place]?". The second outcome measure was assessed with the question "Did you smoke at all at [name of a public place listed above], including both inside and outside, during your last visit?". Both questions had the same response options ("yes", "no", "refuse", and "don't know"). The answers "refuse" and "don't know" were excluded from the analysis. Respondents declaring having smoked themselves were asked to report whether it was inside the venue, outside or both.

Each place in each country was classified as having a total ban, a partial ban or no ban. This classification was based in the information provided by tobacco control experts from each of the countries (Table 1). Those places with legislation that forbid smoking inside the place with no exception were considered as having a total ban. All those places for which the legislation regulating smoking allowing smoking to happen in certain circumstances (i.e., smoking areas, smoking rooms) were considered as having a partial ban. In those places/countries with no legislation restricting or banning smoking, were classified as having no smoking ban.

The sociodemographic variables analysed were country, age group (18–24, 25–39, 40–54, and ≥55), gender (female and male), degree of urbanisation (urban, intermediate, and rural), highest level of formal education completed (low, moderate, and high), monthly gross household income (low, moderate, and high), smoking status (daily smoker, non-daily smoker, and recent quitters). The type of smoking ban was defined as presented in Table 1, according to the information provided by tobacco control experts from each of the countries in our sample.

Analysis

All analyses included weighting to make the sample representative of all six countries' population of smokers and to adjust for the complex sample design. A full description of the weighting process can be found elsewhere.[9,10] Percentages were estimated from a logistic regression model with generalised estimating equations (GEE) to test the overall change in prevalence of SHS exposure and smoking in public places between Wave 1 and Wave 2, overall and by country. We derived percentages from the regression coefficients adjusted for country, degree of urbanisation, time-in-sample (one wave only or both waves), gender, age group, income, education, and smoking status. Marginal differences between waves were calculated as the difference between the estimated percentages in Wave 2 minus the percentages in Wave 1 for each of the outcomes. Next, using only the Wave 2 data, GEE was used to examine the interaction between country and venue type (workplaces, restaurants, bars, or discos/nightclubs) on self-reported SHS exposure and self-reported smoking controlling for covariates. In these models, different countries and places were combined to test the effect of total smoking bans vs. partial bans (Table 1) on SHS exposure and self-reported smoking inside public places. In the models in which we contrasted partial vs. total bans average across all countries and settings data from Greece were included in the model but excluded from the contrasts constructed to test effects as Greece had mixed policies in regard to total and partial

bans (Table 1). All statistical analysis was conducted using SAS-callable SUDAAN (Version 11.0.3).

RESULTS

Of 6,011 participants recruited in Wave 1, 53.2% were re-interviewed and 2,832 new respondents were recruited in Wave 2. Overall, 57.0% of the respondents were males, 33.7% were between ages 40-54, 95.8% smoked daily, 52.3% smoked 11-20 cigarettes per day.

Secondhand smoke exposure in public places

For all countries combined, we observed a statistically significant decrease in self-reported SHS exposure at workplaces, from 19.1% to 14.0% (−5.1%; 95% CI: −8.0%; −2.2%). As shown in Table 2, this decrease was driven by significant decreases in Greece (−17.9%; 95% CI: −24.2; −11.7%) and Romania (−6.4%; 95% CI: −11.8%; −0.9%). In the full sample, SHS exposure in restaurants, bars/pubs and discos/nightclubs remained stable (Table 2). In restaurants, we observed a significant decrease in Romania (−5.0%). In bars/pubs, there were significant decreases in Greece and Poland (−10.4% and −7.3%, respectively).

We assessed the role of total smoking bans vs. partial bans on SHS exposure in different scenarios controlling for other covariates (Table 3). When evaluating the association of type of ban with SHS exposure averaged across all indoor public places, SHS exposure (OR=0.35; 95% CI: 0.26-0.47) was significantly less likely to occur in places with a total ban as compared to those places with partial bans. Similarly, SHS exposure inside workplaces (OR=0.51; 95% CI: 0.38-0.69), bars (OR=0.25; 95% CI: 0.17-0.37), restaurants (OR=0.41; 95% CI: 0.26-0.67), and

night clubs (OR=0.22; 95% CI: 0.14-0.35) was significantly less likely to occur if there was a total ban as compared to partial ban.

Self-reported smoking in public places

Self-reported smoking inside restaurants, bars, and discos/nightclubs remained stable from W1 to W2 among all countries combined (Table 4). There were significant changes in self-reported smoking inside bars in Germany (increase of 9.7%; 95% CI: 1.5; 17.9%) and inside discos/nightclubs in Spain (decrease of 6.4%; 95% CI: -11.1%; -1.8%). Smokers had significantly greater odds of smoking inside public places with partial smoking bans than total bans (OR=0.17; 95% CI: 0.11-0.28) (Table 3). Similarly, all models assessing the contrast between total bans and partial bans have shown significantly lower odds of reported smoking in places/countries with total ban, except for the contrast between Romania (total ban) and Poland (partial ban) (OR=0.51; 95% CI: 0.25-1.05).

Among all countries combined, we found a significant decrease (all p-values <0.05) in self-reported smoking outside restaurants, bars, and discos/nightclubs (Table 4). All countries but Germany and Romania showed significant decreases in self-reported smoking outside the restaurants. As also shown in Table 4, a decrease in smoking outside bars occurred in all countries but Romania, and the only significant decrease of smoking outside discos/nightclubs was observed in Greece and Spain.

DISCUSSION

Among the six EU countries included in this study, we observed a decrease in the prevalence of self-reported SHS exposure in workplaces, but no other meaningful change in the remaining public places. By countries, nevertheless, there was some variation in self-reported exposure to

SHS, which was associated with the total or partial nature of their specific smoke-free legislation. In Germany and Poland, where there were only partial indoor smoking bans in these public places (Table 1), the prevalence of SHS exposure was significantly higher than in Hungary, Romania, and Spain, which are countries in which total indoor smoke bans are in place (since 2012, 2010, and 2011, respectively). Countries having partial indoor bans allowing exceptions to smoking restrictions in hospitality venues, often because of the tobacco industry pressure,[11] should improve their legislation according to Article 8 of the WHO FCTC to protect non-smokers from SHS exposure. Limiting exposure of smokers to SHS and thus also smoking cues is also important as these countries promote cessation efforts and smoking abstinence.[6]

The prevalence of self-reported SHS exposure in 2016 and 2018 in our study is lower than data previously reported in other studies. In 2012, the Eurobarometer showed higher prevalence in all six countries (but Germany) and an inverse association between SHS exposure and the extent and enforcement of smoke-free legislation.[12] Whilst our results six years later show lower prevalence, they also show room for improvement, not only to decrease the prevalence of exposure to SHS in Europe but also to diminish the variability between countries through common, more restrictive smoke-free legislation, and importantly, strong and sustained enforcement.

Self-reported smoking in public places remained stable in all places and countries, apart from an increase inside bars in Germany and a decrease inside discos/nightclubs in Spain. The unexpected increase in Germany could be related to a seasonality effect together with the lack of a comprehensive smoke-free legislation in the country. The decrease in smoking inside discos in Spain seems to be consistent with the decrease also observed in outdoor areas in this country as discos were the only indoor place in Spain with high self-reported smoking in W1.

While the WHO FCTC clearly advocates for promoting smoke-free places (Article 8), the common EU legislation does not include such tobacco control regulation and each country has its own smoke-free legislation. In the countries considered in this study, such legislation was heterogeneous in 2018 (Table 1). In Germany, smoking in public places is regulated at the regional level and there are multiple exemptions. There is a partial national smoking ban in workplaces and there are partial regional smoking bans in indoor areas of restaurants, pubs/bars and discos in 13 out of 16 federal states; and only three federal states have comprehensive smoking bans in the hospitality sector. In Greece, there is a total smoking ban in indoor areas of workplaces and restaurants whilst in indoor areas of pubs/bars and disco/nightclubs, smoking is permitted if their area exceeds 300 m^2. In Hungary, there is a total smoking ban in indoor areas of restaurants, pubs/bars, and discos/nightclubs, whilst in workplaces there is a ban with several exceptions: smoking rooms are allowed in places where the temperature is over 24°C and in those establishments with increased risk of fire and explosion. In Poland, there is a partial smoking ban in enclosed workplaces, restaurants, bars/clubs and discos/nightclubs, but smoking rooms are allowed. In Romania, smoking is forbidden in all indoor areas with the exception of maximum security prisons and designated rooms in the transit areas of international airports. Spain has the most comprehensive smoke-free law of the six countries, with a total ban without exceptions in indoor workplaces, restaurants, pubs/bars, and discos/nightclubs, and it is the only one that has enacted limitations to smoking in outdoor terraces, when they have a roof/ceiling and more than two walls.

Our results indicate that SHS exposure and smoking in public places is related to the type of smoke-free legislation, with smokers more likely to smoke in countries and settings with only partial bans. Apart from the existence of smoke-free legislation, another determinant of SHS exposure is the implementation and degree of enforcement of such legislation. The results indicate that the compliance with smoke-free laws is substantial in most countries/settings, but

not in all. For instance, in Greece, 48.8% of smokers reported smoking inside restaurants despite legislation forbidding it. Moreover, our results highlight that SHS exposure in indoor premises of public places still occurs; this must not be overlooked, since globally, SHS kills 1.2 million people a year and is one of the top 10 causes of death.[13] While current tobacco control initiatives are advocating for the expansion of smoke-free legislation to outdoor settings, the enforcement of existing legislation covering indoors areas should not be overshadowed, particularly as there are successful examples in Europe that smoke-free legislation can be successfully implemented leading to very low SHS exposure.[14,15]

Some limitations of the current study need consideration. First, seasonal effects could have influenced our results. Wave 1 was conducted during warm summer months (June-July) while Wave 2 was conducted in colder months (February-May). This could partially explain lower self-reported smoking outdoors in Wave 2 for each venue. This hypothesis would be supported by the findings that smoking indoors did not change between waves. Second, there were differences in the participants retention rates in W2 across countries. Spain and Germany retaining more than 70% of the sample, compared with less than 50% in other countries and therefore differential attraction rates.[16] It is possible that the differences in retention rates have resulted in bias. Additionally, the data come from a representative population of adult smokers and only a minimal percentage of smokers who had quit by Wave 2. Hence, the degree to which the findings on prevalence of SHS exposure in public spaces would generalise to the wider population is unknown. It is possible that current smokers (and recent ex-smokers) have a different perception of seeing smoking around them and exhibit attention bias for smoking cues than non-smokers.[17,18] Moreover, smokers may choose to attend venues that they know are more permissive of smoking (i.e. do not adhere to smoking bans) and are likely accompanied by other smokers, e.g., at work, and thus might be more perceptive of smoking cues, which could overestimate self-reported exposure to SHS. Finally, there is potential for

social desirability bias, as some smokers might not report their own smoking, especially if there is legislation forbidding and sanctioning such behaviour.

Our study, however, benefits from a longitudinal design, a sufficient sample size both for national and overall analyses, and the common methodology previously used in several other ITC surveys.[9] We also took advantage of the study design to perform GEE regression analysis to assess the effect modification in the changes observed by the type of ban in the countries.

CONCLUSION

Whilst we have observed a significant decrease in the overall prevalence of SHS exposure in workplaces and a decrease in self-reported smoking in all the public places studied, there are differences by country, and they are related to their different smoke-free legislation. To achieve a real protection of bystanders from SHS exposure in workplaces and other public places, countries with partial smoke-free legislation should promote total bans that can, in turn, be extended to include outdoor areas.

DATA AVAILABILITY

The data used in this study are jointly owned by a third party in each country that collaborates with the International Tobacco Control Policy Evaluation (ITC) Project. Data from the ITC Project are available to approved researchers two years after the date of issuance of cleaned data sets by the ITC Data Management Centre. Researchers interested in using ITC data are required to apply for approval by submitting an International Tobacco Control Data Repository (ITCDR) request application and subsequently to sign an ITCDR Data Usage Agreement. To avoid any real, potential, or perceived conflict of interest between researchers using ITC data

and tobacco-related entities, no ITCDR data will be provided directly or indirectly to any researcher, institution, or consultant that is in current receipt of any grant monies or in-kind contribution from any tobacco manufacturer, distributor, or other tobacco-related entity. The criteria for data usage approval and the contents of the Data Usage Agreement are described online (http://www.itcproject.org).

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CONFLICTS OF INTEREST

The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results. GTF has served

as an expert witness on behalf of governments in litigation involving the tobacco industry. KP reports grants and personal fees from the Polish League Against Cancer, outside the submitted work.

RESEARCH ETHICS APPROVAL

Study procedures and material including the survey questionnaires were approved by the ethics research committee at the University of Waterloo (Ontario, Canada - ID: ORE # 21262), and ethics committees in Germany (Ethikkommission der Medizinischen Fakulta¨t Heidelberg - ID: 196/2016), in Greece (Medical School, University of Athens—Research and Ethics Committee - ID: 1516023880), in Hungary (Medical Research Council – Scientific and Research Committee - ID: 46344), in Poland (State College of Higher Vocational Education—Committee and Dean of the Department of Health Care and Life Sciences - ID:1/2016), in Romania (Iuliu Hatieganu University of Medicine and Pharmacy - ID: 114/5.04.2016), and in Spain (Clinical Research Ethics Committee of Bellvitge, Hospital Universitari de Bellvitge, Catalonia - ID: PR100/2016).

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*EUREST-PLUS CONSORTIUM MEMBERS:

European Network on Smoking and Tobacco Prevention (ENSP), Belgium: Constantine I. Vardavas, Andrea Glahn, Christina N. Kyriakos, Dominick Nguyen, Katerina Nikitara, Cornel

Radu-Loghin, Polina Starchenko. University of Crete (UOC), Greece: Aristidis Tsatsakis, Charis Girvalaki, Chryssi Igoumenaki, Sophia Papadakis, Aikaterini Papathanasaki, Manolis Tzatzarakis, Alexander I. Vardavas. Kantar Public, Belgium: Nicolas Bécuwe, Lavinia Deaconu, Sophie Goudet, Christopher Hanley, Oscar Rivière. Smoking or Health Hungarian Foundation (SHHF), Hungary: Tibor Demjén, Judit Kiss, Anna Piroska Kovacs. Tobacco Control Unit, Catalan Institute of Oncology (ICO) and Bellvitge Biomedical Research Institute (IDIBELL), Catalonia: Esteve Fernández, Yolanda Castellano, Marcela Fu, Sarah O. Nogueira, Olena Tigova. Kings College London (KCL), United Kingdom: Ann McNeill, Katherine East, Sara C. Hitchman. Cancer Prevention Unit and WHO Collaborating Centre for Tobacco Control, German Cancer Research Center (DKFZ), Germany: Ute Mons, Sarah Kahnert. National and Kapodistrian University of Athens (UoA), Greece: Yannis Tountas, Panagiotis Behrakis, Filippos T. Filippidis, Christina Gratziou, Paraskevi Katsaounou, Theodosia Peleki, Ioanna Petroulia, Chara Tzavara. Aer Pur Romania, Romania: Antigona Carmen Trofor, Marius Eremia, Lucia Lotrean, Florin Mihaltan. European Respiratory Society (ERS), Switzerland: Gernot Rohde, Tamaki Asano, Claudia Cichon, Amy Far, Céline Genton, Melanie Jessner, Linnea Hedman, Christer Janson, Ann Lindberg, Beth Maguire, Sofia Ravara, Valérie Vaccaro, Brian Ward. Maastricht University, the Netherlands: Marc Willemsen, Hein de Vries, Karin Hummel, Gera E. Nagelhout. Health Promotion Foundation (HPF), Poland: Witold A. Zatoński, Aleksandra Herbeć, Kinga Janik-Koncewicz, Krzysztof Przewoźniak, Mateusz Zatoński. University of Waterloo (UW), Canada: Geoffrey T. Fong, Thomas K. Agar, Pete Driezen, Shannon Gravely, Anne C. K. Quah, Mary E. Thompson.

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Table 1. Smoke-free legislation in different public places in the six countries of the EUREST-PLUS ITC Europe surveys, with an indication of the characteristics of the ban − total (T), partial (P) or none− and the year of implementation.

	Germany	Greece	Hungary	Poland	Romania	Spain
Workplaces (indoors)	P (2007)[a]	T (2003)[c]	T (2012)[f]	P (2010)[g]	T (2016)[h]	T (2006)
Restaurants (indoors)	P (2007-2008)[a]	T (2003)[c]	T (2012)	P (2010)[g]	T (2016)	T (2011)
Restaurants (outdoors)	None	None	None	None	None	P (2011)[i]
Pubs/Bars (indoors)	P (2007-2008)[a,b]	P (2003)[c,e]	T (2012)	P (2010)[g]	T (2016)	T (2011)
Pubs/Bars (outdoors)	None	None	None	None	T (2016)	P (2011)[i]
Discos/Nightclubs (indoors)	P (2007-2008)[a,b]	P (2003)[c,e]	T (2012)	P (2010)[g]	T (2016)	T (2011)
Discos/Nightclubs (outdoors)	None	None	None	None	T (2016)	P (2011)[i]

[a]Smoke-free legislation at workplaces (except hospitality sector) is regulated at the national level. Separate, enclosed smoking rooms are allowed.

[b]Smoke-free legislation at the hospitality sector is regulated at the regional level. In most states, smaller establishments that do not serve food are exempted from the smoking ban altogether.

[c]Indoor areas mean also a patio or space with sliding or removable ceiling, or any space with a cover and simultaneously closed in any way perimetrically.

[e]Smoking is allowed in entertainment centres >300 m^2 with live music and in casinos.

[f]Smoking rooms are allowed under certain conditions in certain types of workplaces with increased risk of fire and/or explosion.

[g]Total smoking ban in enclosed public places. Smoking rooms are allowed in the hospitality sector and other workplaces if they are enclosed enough and have effective ventilation system to avoid the diffusion of tobacco smoke to non-smoking rooms; otherwise, these places have to be smoke-free.

[h]Smoking is forbidden in all enclosed public spaces which are considered those with a roof/ceiling and at least two walls.

[i]Smoking is forbidden in terraces with a roof or ceiling and more than two walls.

Table 2. Prevalence (and 95% confidence interval, CI*) of secondhand smoke exposure in public places in six European countries. The EUREST-PLUS ITC Europe Survey, 2016-2018.

		WORKPLACES	RESTAURANTS	BARS/PUBS	NIGHTCLUBS
		Prevalence (95% CI)	**Prevalence (95% CI)**	**Prevalence (95% CI)**	**Prevalence (95% CI)**
FULL SAMPLE	**Wave 1**	19.1 (17.0; 21.4)	21.5 (19.3; 23.9)	33.0 (29.9; 36.2)	44.4 (39.8; 49.2)
	Wave 2	14.0 (12.3; 15.9)	19.8 (17.7; 22.0)	30.9 (28.0; 33.9)	42.9 (38.4; 47.6)
	Difference	**-5.1 (-8.0; -2.2)**	-1.7 (-4.8; 1.4)	-2.1 (-6.6; 2.4)	-1.5 (-8.9; 5.9)
GERMANY	**Wave 1**	17.1 (12.7; 22.7)	11.8 (8.7; 15.8)	37.3 (30.0; 45.4)	52.9 (43.8; 61.7)
	Wave 2	17.9 (13.3; 0.23)	15.7 (11.2; 21.5)	43.4 (33.9; 53.4)	56.7 (46.0; 66.9)
	Difference	0.8 (-4.4; 5.9)	3.9 (-1.6; 9.4)	6.1 (-3.4; 15.6)	3.9 (-9.5; 17.2)
GREECE	**Wave 1**	42.9 (36.9; 49.1)	68.5 (58.4; 77.2)	86.4 (76.6; 92.5)	89.7 (79.4; 95.2)
	Wave 2	25.0 (20.7; 29.9)	61.0 (54.7; 67.0)	76.0 (70.7; 80.6)	91.3 (80.1; 96.4)
	Difference	**-17.9 (-24.2; -11.7)**	-7.5 (-17.2; 2.2)	**-10.4 (-20.5; -0.3)**	1.6 (-12.5; 15.7)
HUNGARY	**Wave 1**	4.2 (2.6; 6.9)	6.8 (4.1; 10.9)	4.7 (2.3; 9.3)	83.7 (43.2; 15.6)
	Wave 2	4.7 (3.0; 7.3)	4.1 (2.2; 7.7)	7.2 (3.9; 12.9)	67.4 (34.7; 12.7)
	Difference	0.4 (-2.3; 3.1)	-2.6 (-6.3; 1.0)	2.5 (-1.4; 6.4)	-1.6 (-7.5; 4.2)
POLAND	**Wave 1**	23.4 (18.6; 29.1)	8.2 (5.7; 11.6)	24.1 (18.7; 30.4)	27.7 (19.8; 37.2)
	Wave 2	17.8 (13.4; 23.1)	7.0 (4.2; 11.5)	16.7 (12.5; 22.1)	24.1 (15.4; 35.5)
	Difference	-5.6 (-12.1; 0.7)	-1.2 (-5.8; 3.4)	**-7.3 (-14.2; -0.5)**	-3.6 (-15.8; 8.5)
ROMANIA	**Wave 1**	20.4 (16.2; 25.2)	11.8 (8.8 ; 15.6)	14.2 (10.5; 19.1)	21.3 (14.5; 30.2)
	Wave 2	14.0 (10.5; 18.5)	6.8 (4.2; 10.7)	13.4 (9.1; 19.3)	15.8 (9.2; 25.7)
	Difference	**-6.4 (-11.8; -0.9)**	**-5.0 (-9.2; -0.8)**	-0.8 (-6.9; 5.3)	-5.6 (-14.0; 2.8)
SPAIN	**Wave 1**	9.9 (6.8; 14.3)	3.1 (2.0; 4.7)	7.2 (5.3; 9.7)	21.5 (16.4; 27.8)
	Wave 2	8.9 (5.8; 13.3)	5.7 (3.1; 10.2)	7.7 (5.3; 11.0)	15.1 (10.0; 22.1)
	Difference	-1.1 (-7.2; 5.1)	2.6 (-0.9; 6.1)	0.5 (-2.9; 3.7)	-6.5 (-14.5; 1.6)

*Estimated prevalence from a GEE model to test the overall change between Wave 1 and Wave 2. Percentages are adjusted for country, degree of urbanisation, time-in-sample, gender, age group, income, education and smoking status.

**at Wave 1, 100% of the sample were current smokers, and at Wave 2 there were 95.8% current smokers and 4.2% were recent ex-smokers.

Results in bold portray statistically significant changes.

Table 3. Models of the adjusted odds ratio of SHS exposure and self-reported smoking in different indoor public places and countries. The EUREST-PLUS ITC Survey, 2018.

	SHS exposure (n = 5265)†			Self-reported smoking (n = 4605)††		
	aOR§	(95% CI)	FDR p	aOR§§	(95% CI)	FDR p
Greece: total vs. partial	0.13	(0.09; 0.20)	< 0.001	0.32	(0.24; 0.43)	< 0.001
Total vs partial, averaged over all venues; excludes Greece	0.35	(0.26; 0.47)	< 0.001	0.17	(0.11; 0.28)	< 0.001
Hungary (total bans) vs. Germany (partial bans), averaged over all venues	0.16	(0.09; 0.28)	< 0.001	0.08	(0.03; 0.20)	< 0.001
Romania (total bans) vs. Germany (partial bans), averaged over all venues	0.36	(0.24; 0.53)	< 0.001	0.25	(0.12; 0.49)	< 0.001
Spain (total bans) vs. Germany (partial bans), averaged over all venues	0.28	(0.19; 0.42)	< 0.001	0.09	(0.04; 0.18)	< 0.001
Hungary (total bans) vs. Poland (partial bans), averaged over all venues	0.31	(0.18; 0.54)	< 0.001	0.17	(0.07; 0.43)	< 0.001
Romania (total bans) vs. Poland (partial bans), averaged over all venues	0.68	(0.45; 1.03)	0.066	0.51	(0.25; 1.05)	0.066
Spain (total bans) vs. Poland (partial bans), averaged over all venues	0.54	(0.34; 0.85)	0.008	0.18	(0.08; 0.40)	< 0.001
Workplaces, total (Hungary, Romania, Spain) vs. partial (Germany, Poland), excludes Greece	0.51	(0.38; 0.69)	< 0.001	-‡	-‡	-‡
Bars, total (Hungary, Romania, Spain) vs. partial (Germany, Poland), excludes Greece	0.25	(0.17; 0.37)	< 0.001	0.12	(0.07; 0.22)	< 0.001
Restaurants, total (Hungary, Romania, Spain) vs. partial (Germany, Poland), excludes Greece	0.41	(0.26; 0.67)	< 0.001	0.25	(0.13; 0.50)	< 0.001
Nightclubs, total (Hungary, Romania, Spain) vs. partial (Germany, Poland), excludes Greece	0.22	(0.14; 0.35)	< 0.001	0.17	(0.09; 0.32)	< 0.001

Based on a weighted logistic GEE model, treating SHS exposure and self-reported smoking in public venues as the outcome. Each model tests the interaction country and venue, where venue is an indicator for location where respondents reported SHS exposure and self-reported smoking (workplaces, bars, restaurants, or nightclubs). Models were adjusted for degree of urbanisation, time-in-sample, sex, age group at time of recruitment, income, education, smoking status ‡Participants were not asked about smoking in workplaces. Each respondent could therefore have up to 4 observations contributing to each of the models, depending on whether that respondent reported visiting each of the venues in the last 12 months/worked outside the home. † Based on a GEE model including respondents from all 6 countries: n = 12,892 observations from 5265 respondents. †† Based on a GEE model including respondents from all 6 countries: n = 9285 observations from 4605 respondents. § aOR = adjusted odds ratio estimating the odds of noticing other people smoking in a venue for venues/countries having total bans vs. partial bans only. §§ aOR = adjusted odds ratio estimating the odds of reporting smoking inside a

venue for venues/countries having total bans vs. partial bans only. FDR = Benjamini-Hochberg false discovery rate adjustment for multiple comparisons. Data from Greece were included in the models, although Greece was excluded from the contrasts constructed to test effects as that country had mixed policies in regard to total and partial bans.

Table 4. Prevalence* (and 95% confidence interval, CI) of **self-reported** smoking** in public places in six European countries according to the location (inside/outside). EUREST-PLUS ITC Survey, 2016-2018.

		RESTAURANTS		BARS/PUBS		DISCOS/NIGHTCLUBS	
		Inside	Outside	Inside	Outside	Inside	Outside
		Prevalence (95% CI)	Prevalence (95% CI)	Prevalence (95% CI)	Prevalence (95% CI)	Prevalence (95% CI)	Prevalence (95% CI)
FULL SAMPLE	**Wave 1**	11.6 (10.2; 13.2)	52.8 (49.3; 56.3)	20.0 (18.0; 22.2)	62.6 (59.6; 65.5)	34.1 (30.5; 37.8)	52.3 (48.2; 56.5)
	Wave 2	13.2 (11.5; 15.2)	41.5 (38.5; 44.5)	22.7 (20.3; 25.3)	46.6 (43.5; 49.7)	34.0 (30.1; 38.2)	41.4 (37.2; 45.8)
	Difference	1.7 (-0.4; 3.7)	**-11.3 (-16.2; -6.5)**	2.7 (-0.4; 5.8)	**-16.0 (-20.6; -11.4)**	-0.1 (-5.8; 5.7)	**-10.9 (-17.5; -4.4)**
GERMANY	**Wave 1**	3.8 (1.9; 7.3)	61.3 (53.9; 68.2)	26.3 (20.3; 33.2)	75.4 (69.6; 80.4)	36.6 (27.2; 47.2)	69.7 (61.9; 76.5)
	Wave 2	5.9 (3.3; 10.4)	59.9 (53.4; 66.0)	36.0 (28.2; 44.6)	66.1 (60.1; 71.6)	41.6 (30.1; 54.0)	76.1 (69.4; 81.7)
	Difference	2.1 (-1.1; 5.3)	-1.5 (-9.1; 6.2)	**9.7 (1.5; 17.9)**	**-9.3 (-15.8; -2.8)**	5.0 (-11.4; 21.5)	6.4 (-2.6; 15.4)
GREECE	**Wave 1**	43.4 (37.3; 49.8)	60.2 (53.2; 66.8)	54.9 (49.3; 60.4)	65.6 (59.5; 71.1)	81.4 (75.4; 86.2)	41.0 (33.4; 49.1)
	Wave 2	48.8 (41.7; 55.9)	38.0 (32.8; 43.5)	61.3 (55.1; 67.2)	44.1 (38.7; 49.6)	83.5 (75.8; 89.1)	23.8 (16.9; 32.5)
	Difference	5.4 (-2.4; 13.2)	**-22.2 (-30.5; -13.9)**	6.4 (-1.1; 13.9)	**-21.5 (-29.7; -13.3)**	2.0 (-8.0; 12.1)	**-17.2 (-28.9; -5.5)**
HUNGARY	**Wave 1**	0.5 (0.1; 2.4)	37.0 (29.0; 45.9)	1.5 (0.4; 4.9)	51.6 (42.9; 60.2)	1.9 (0.5; 6.7)	44.6 (32.8; 57.0)
	Wave 2	1.2 (0.5; 3.0)	25.8 (19.6; 33.1)	1.8 (0.6; 0.5)	40.1 (32.8; 47.9)	2.7 (1.0; 6.7)	47.1 (35.9; 58.5)
	Difference	0.8 (-0.5; 2.0)	**-11.2 (-21.3; -1.1)**	0.4 (-1.1; 1.8)	**-11.5 (-21.7; -1.2)**	0.8 (-2.2; 3.8)	2.5 (-10.9; 15.8)
POLAND	**Wave 1**	2.2 (1.1; 4.2)	36.7 (28.6; 45.6)	11.7 (8.2; 16.5)	49.5 (42.6; 56.4)	16.1 (9.6; 25.7)	42.2 (32.8; 52.3)
	Wave 2	4.8 (2.7; 8.5)	24.7 (17.7; 33.3)	12.6 (8.0; 19.2)	36.5 (29.0; 44.7)	15.6 (8.9; 25.9)	37.5 (27.1; 49.3)
	Difference	2.6 (-0.1; 5.3)	**-12.0 (-22.3; -1.1)**	0.9 (-4.8; 6.5)	**-12.9 (-22.6; -3.3)**	-0.5 (-10.8; 9.8)	-4.7 (-20.2; 10.8)
ROMANIA	**Wave 1**	6.7 (4.4; 10.1)	34.1 (26.7; 42.5)	7.5 (5.0; 11.1)	41.6 (33.7; 50.0)	14.3 (8.7; 22.6)	32.5 (22.7; 44.1)
	Wave 2	4.8 (2.4; 9.4)	37.5 (30.5; 44.9)	4.7 (2.4; 9.2)	35.7 (28.3; 43.9)	12.6 (6.4; 23.2)	28.7 (20.0; 39.2)
	Difference	-1.9 (-5.8; 2.1)	3.3 (-7.2; 13.8)	-2.8 (-7.1; 1.6)	-5.9 (-16.9; 5.1)	-1.7 (-9.8; 6.3)	-3.9 (-19.9; 12.1)
SPAIN	**Wave 1**	0.9 (0.4; 1.9)	64.0 (58.0; 69.6)	2.8 (1.8; 4.3)	76.2 (70.2; 81.4)	11.2 (7.6; 16.1)	75.2 (68.4; 81.0)
	Wave 2	0.8 (0.2; 2.4)	46.2 (39.7; 52.8)	2.9 (1.5; 5.4)	48.8 (42.1; 55.5)	4.7 (2.6; 8.4)	43.1 (34.2; 52.5)
	Difference	-0.1 (-0.1; 0.7)	**-17.8 (-26.7; -8.9)**	0.0 (-2.1; 2.1)	**-27.5 (-36.7; -18.3)**	**-6.4 (-11.1; -1.8)**	**-32.1 (-42.8; -21.3)**

*Estimated prevalence from a GEE model to test the overall change between Wave 1 and Wave 2. Percentages are adjusted for country, degree of urbanisation, time-in-sample, gender, age group, income, education and smoking status.

**at Wave 1, 100% of the sample were current smokers, and at Wave 2 there were 95.8% current smokers and 4.2% were recent ex-smokers.

Results in bold portray statistically significant changes.