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Beyond the current tobacco control legislation. Do europeans support further policies? Attitudes and associated factors

Sarah Oliveira Nogueira



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Beyond the current tobacco control legislation

Do Europeans support further policies?
Attitudes and associated factors

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Doctoral thesis

2021



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“The end of all education should surely be service to others. We cannot seek achievement for ourselves and forget about progress and prosperity for our community.”

— César Chávez

THESIS PRESENTATION

This thesis is the culmination of a three-year research period within the Tobacco Control Unit of the WHO Collaborating Centre for Tobacco Control Catalan Institute of Oncology.

The core of this thesis is the evaluation of the public opinion on a diverse set of tobacco control policies and factors associated with support in European countries. This was achieved through the compilation of four scientific publications in international peer-reviewed journals.

The document is written in English, and it is composed of the following sections: introduction, hypothesis, objectives, methods, results, discussion, conclusions, references, and annexes.

LIST OF ABBREVIATIONS

FCTC: Framework Convention on Tobacco Control

EC: European Commission

EU: European Union

SHS: Secondhand smoke

TPD: Tobacco Products Directive

US: United States

WHO: World Health Organization

ABSTRACTS

Abstract in English

Background. The consumption of tobacco products kills 810,000 Europeans per year. Although significant accomplishments were made since the recognition of the tobacco epidemic, public health still faces challenges to reduce the burden of tobacco consumption. As more comprehensive tobacco control policies are proposed, including policies that aim to a tobacco endgame in the European Union, evaluating the public support for such tobacco control policies is crucial. Furthermore, evaluating the support of those who will be most directly affected by such policies, the smokers, is key to plan interventions and ensure compliance.

Objectives. This PhD thesis aims to assess the general population and smokers' support for several tobacco control policies. The specific objectives are: (1) to evaluate non-smokers' and smokers' support for smoke-free legislation in indoor and outdoor settings and its correlates; (2) to assess smokers' support for smoke-free legislation to protect non-smokers and children inside private cars; (3) To assess smokers' support for measures that go beyond the current EU TPD and its psychosocial correlates; (4) To examine support for an endgame policy, banning smoking/cigarette sales, among Europeans and correlates to such support.

Methods. This PhD thesis compiles four articles with two primary data sources, the EUREST-PLUS and the TackSHS projects. The first is a cohort study with nationally representative smokers from 6 European countries (Germany, Greece, Hungary, Poland, Romania, and Spain). The latter, a cross-sectional study with nationally representative samples of the general population from 12 European countries (Bulgaria, England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Portugal, Romania, and Spain).

Results. (1) More than 70% of the general population supported smoking bans in indoor non-private settings in 12 European countries, and more than 45% supported smoking bans in outdoor settings. Support for smoke-free legislation were the lowest for restaurants/bar patios (non-smokers: 53.0%; smokers: 29.2%) and the highest in workplaces (non-smokers: 78.5%; smokers: 66.5%). For most settings, support for smoking bans was directly related to the countries' degree of adoption of tobacco control policies, the prevalence of secondhand smoke presence, and reported smoking. (2) Among smokers in six European countries in 2018, 96.3% supported smoking bans in cars carrying pre-school children, representing an increase of 2.4 percentage points compared to 2016. The level of support for a smoking ban in cars transporting non-smokers was 90.2% (95% CI 88.6–91.7%) in 2018. Among smokers who owned cars, there was a significant 7.2 percentage points increase in voluntary implementation of smoke-free cars carrying children from 2016 (60.7%, 95% CI 57.2–64.0%) to 2018 (67.9%, 95% CI 65.1–70.5%).

All sociodemographic groups of smokers reported support higher than 80% in 2018 for banning smoking in cars. Also, in 2018, approximately half of the smokers and recent quitters in six countries supported implementing policies to further regulate tobacco products (50.5%) and hold the tobacco companies accountable for the harm caused by smoking (48.8%).

(3) Additionally, 40% of smokers and recent quitters supported a total ban on cigarettes and other tobacco products within ten years if assistance to quit smoking is provided. Overall, support for all policies assessed was higher among recent quitters, those with higher knowledge of secondhand smoke exposure harms, and those who perceive smoking as less normalised in society. (4) Finally, regarding ending smoking/sales of cigarettes, approximately four out of ten people supported this endgame policy in 12 European countries in 2017/18. As expected, never smokers (44.7%) and ex-smokers (33.5%) were more supportive than smokers (21.4%). Also, people in countries with more tobacco control policies supported this

endgame strategy more than people in countries with fewer initiatives and support was higher among participants in countries with a relatively low smoking prevalence.

Conclusions. Government action is out-of-step with scientific evidence and the public opinion on implementing smoke-free legislation in all indoor settings and in the outdoor settings where children and healthcare facilities are involved. Furthermore, a substantial proportion of smokers support further tobacco control regulation that could be implemented in the next revision of the European Union Tobacco Products Directive. Finally, most of the population is still reluctant to prohibit cigarette sales if it were to happen now; however, almost one in four smokers would support an endgame approach to tobacco products in 10 years if this measure is implemented together with smoking cessation aids.

Resumen

Introducción. El consumo de productos de tabaco mata a 810.000 europeos al año. Aunque se obtuvieron logros importantes desde el reconocimiento de la epidemia del tabaquismo, la salud pública aún enfrenta desafíos para reducir la carga del consumo de tabaco. A medida que se proponen políticas de control del tabaco más integrales, incluidas políticas que apuntan a un final del tabaco en la Unión Europea, es fundamental evaluar el apoyo público a tales políticas de control del tabaco. Además, evaluar el apoyo de aquellos que se verán más directamente afectados por tales políticas, los fumadores, es clave para planificar intervenciones y asegurar su cumplimiento.

Objetivos. Esta tesis doctoral tiene como objetivo evaluar el apoyo de la población en general y de los fumadores a diversas políticas de control del tabaco. Los objetivos específicos son: (1) evaluar el apoyo de los fumadores a la legislación sobre ambientes libres de humo para proteger a los no fumadores y los niños dentro de los automóviles privados;

(2) evaluar el apoyo de los no fumadores y fumadores a la legislación libre de humo en ambientes interiores y exteriores y sus correlatos; (3) Evaluar el apoyo de los fumadores a las medidas que van más allá de la actual TPD de la UE y sus correlatos psicosociales; (4) Examinar el apoyo a una política de fin del tabaco entre los europeos, que prohíbe fumar/vender cigarrillos y los correlatos de dicho apoyo.

Métodos. Esta tesis doctoral recopila cuatro artículos con dos fuentes de datos primarias, los proyectos EUREST-PLUS y TackSHS. El primero es un estudio de cohortes con fumadores representativos a nivel nacional de 6 países europeos (Alemania, Grecia, Hungría, Polonia, Rumanía y España). El segundo es un estudio transversal con muestras representativas a nivel nacional de la población general de 12 países europeos (Bulgaria, Inglaterra, Francia, Alemania, Grecia, Irlanda, Italia, Letonia, Polonia, Portugal, Rumanía y España).

Resultados. Más del 70% de la población general apoya la prohibición de fumar en entornos interiores públicos en 12 países europeos, y más del 45% apoya la prohibición de fumar

en entornos al aire libre. El menor apoyo a la legislación libre de humo fue para los restaurantes / bares en los patios (no fumadores: 53,0%; fumadores: 29,2%) y el más alto para los lugares de trabajo (no fumadores: 78,5%; fumadores: 66,5%). En la mayoría de los entornos, el apoyo a la prohibición de fumar estaba directamente relacionado con el grado de adopción de políticas de control del tabaco en los países, la prevalencia de la presencia de humo ambiental del tabaco y haber reportado fumar en esos lugares. Entre los fumadores de seis países europeos en 2018, el 96,3% apoyó la prohibición de fumar en los automóviles en presencia de niños en edad preescolar, lo que representa un aumento de 2,4 puntos porcentuales en comparación con 2016. El nivel de apoyo a la prohibición de fumar en los automóviles en presencia de personas no fumadoras fue del 90,2% (IC del 95%: 88,6% a 91,7%) en 2018. Entre los fumadores que tenían automóviles, hubo un aumento significativo de 7,2 puntos porcentuales en la implementación voluntaria de regulaciones libres de humo en automóviles en presencia de niños de 2016 (60,7%, IC del 95%: 57,2% a 64,0%) a 2018 (67,9%, IC del 95%: 65,1–70,5%). Todos los grupos sociodemográficos de

fumadores reportaron un apoyo superior al 80% a la prohibición de fumar en los automóviles en 2018. Además, en 2018, aproximadamente la mitad de los fumadores y exfumadores que habían dejaron de fumar en el período comprendido entre ambas encuestas en seis países apoyaron la implementación de políticas para una mayor regulación de los productos de tabaco (50,5%) y para responsabilizar a las empresas tabacaleras por el daño causado por el consumo de tabaco (48,8%).

Además, el 40% de los fumadores y los que habían dejado de fumar recientemente apoyaron una prohibición total de los cigarrillos y otros productos de tabaco en un plazo de diez años si se brindara asistencia para dejar de fumar. En general, el apoyo a todas las políticas evaluadas fue mayor entre los que dejaron de fumar recientemente, aquellos con un mayor conocimiento de los daños ocasionados por la exposición al humo ambiental del tabaco y aquellos que perciben el tabaquismo como menos normalizado en la sociedad. Finalmente, con respecto a terminar con el tabaquismo/venta de cigarrillos, aproximadamente cuatro de cada diez personas apoyaron esta política de fin del tabaco en 12 países europeos

en 2017/18. Como era de esperar, los nunca fumadores (44,7%) y los exfumadores (33,5%) apoyaron más esta política que los fumadores (21,4%). Además, los participantes de países con más políticas de control del tabaco apoyaron más esta política que las personas en países con menos iniciativas y el apoyo fue mayor entre los participantes en países con una prevalencia de tabaquismo relativamente baja.

Conclusiones. La acción de los gobiernos está fuera de sintonía con la evidencia científica y la opinión pública sobre la implementación de la legislación libre de humo en todos los entornos interiores y exteriores que involucran niños y centros de atención sanitaria. Además, una gran proporción de fumadores apoya una mayor regulación del control del tabaco que podría implementarse en la próxima revisión de la Directiva de Productos de Tabaco de la Unión Europea. Por último, la mayoría de la población todavía se muestra reacia a prohibir la venta de cigarrillos si ocurriera ahora; sin embargo, casi uno de cada cuatro fumadores apoyaría una política de fin de los productos de tabaco en 10 años si esta medida se implementara junto con ayudas para dejar de fumar.

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PART ONE

INTRODUCTION

Why is smoking a problem? From an individual behaviour to a pandemic

The story of tobacco use in Europe dates from centuries. Tobacco was brought from America in the 16th century and, at that point, was largely known for having beneficial properties and even being used as a form of medicine.[1] The vertiginous increase in tobacco consumption came in 1880s with the invention of the automatic cigarette rolling machine allowing for mass production of cigarettes and, later on, with millions of cigarettes being included in soldiers' rations during Second World War.[2] By the beginning of the 20th century, smoking was widespread. Although there were variations among European countries, the prevalence of smoking peaked between the 50s and 70s, with as much as 80% of men smoking in England in 1950.[3]

In parallel with the increases in smoking prevalence, the significant increase in lung cancer incidence attracted much research. The growth was fast: it went from a rare disease, with an incidence of 1% among all cancers in 1878, to become one of the most prevalent types of cancer by 1930.[4] This unexpected growth prompted alarm and a lot of research. In 1929, the first study linking smoking and lung cancer was released.[5] About two decades later, the role of smoking as a causal agent of this disease was firmly established by epidemiological studies,[6–8] animal experiments,[9] and pathologic evidence.[10] In Europe, the medical community response to this evidence came with the release of the report Smoking and Health in 1962 and in the United States (US) with the Surgeon General report in 1964, reaffirming the evidence of the hazards of smoking, recognising smoking as a public health issue, and calling on governments to implement public health measures to reduce cigarette smoking.[11,12]

What is the dimension of the tobacco epidemic?

Since the recognition of smoking as a public health issue, a lot has been done in regulating and minimising the harms caused by it. However, much remains to be done, as 19% of adults globally (1.07 billion people) and 26% of European adults still smoke. Alarmingly, 8 million people die prematurely every year out of tobacco consumption, and approximately 810,000 of these premature deaths occur in Europe.[13,14] Only in the past three decades smoking has caused more than 200 million deaths, and it has been estimated that the tobacco epidemic is on track to kill one billion people in the XXI century.[15,16]

Lopez *et al.*[17] and later Thun *et al.*[18] have depicted the smoking epidemic as a continuum over the decades, making it

possible to better understand the impact that cigarettes consumption overtime has on the populations' mortality. As Figure 1 shows, the deadly health consequences of smoking usually happen after decades of continuous smoking in a population therefore, the rise in mortality is often to be expected to continue for years after the increases in smoking prevalence. Therefore, the countries suffer delayed consequences of their population' smoking habits on mortality for decades, which calls for action on preventing and promoting cessation.

Apart from the high mortality figures, tobacco consumption causes a major burden to society in areas ranging from smoking-related disability to economic burden, problems that are intrinsically connected, although there is still a false opposition of 'health versus economy' when it comes to tobacco control.[19] In 2018, the economic costs due to smoking exceeded US\$1 trillion a year, the equivalent to approximately 2% of the global economic output.[20] An expressive part of these deleterious effects is related to the harmful consequences to non-smokers. Secondhand smoke

exposure (SHS) costs €356 million annually only due to lost disability-adjusted life years in the European Union (EU).[21]

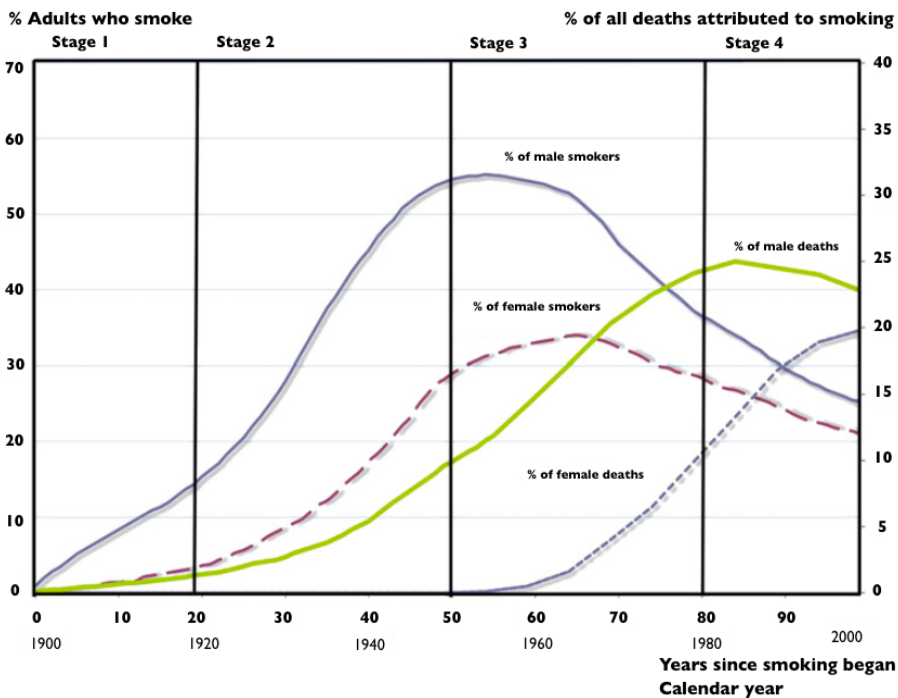


Figure 1. The four-stage model of the cigarette epidemic in developed countries. Source: Thun et al. [18]

The impact of smoking goes beyond the harms to the health of smokers and non-smokers or its economic consequences. With the attention towards environmental preservation and

climate crises growing in the past decade, tobacco's impact on the environment has been the target of further scrutiny. Tobacco growing, the manufacture of tobacco products, its distribution and use cause air pollution and worst air quality, the dumping and leaking of waste products in the natural environment, deforestation, the use of fossil fuels, and the realise/accumulation of over 700 toxic chemicals in the environment.[22]

The evolution of tobacco control policy in Europe

The evidence produced since the beginning of the 20th century revealing the harms of smoking was not immediately translated into public policy. For example, in 1968, an evaluation of the US Department of State about tobacco control in 22 countries revealed that few countries had taken first regulatory steps around tobacco advertising (Norway, Italy, Sweden), banning sales to minors (Austria, Norway), and implementing health communication campaigns (Canada, the United Kingdom, Italy).[23,24] Several reasons contributed to this: tobacco industry interference,[2] the reliable fiscal importance of tobacco, the high degree of socio-normalisation of smoking,[25] and the lack of public understanding about scientific evidence among others.[25]

Over the years, the evidence of the health harms caused by smoking advanced as well as the public health efforts to tackle what had become an epidemic advanced. By the 1970s, the World Health Organisation (WHO) headquarters in Switzerland recognized the importance of tobacco control.[26] By the 1980s, the evidence on the harms of secondhand smoke was consolidated, and legislation to protect non-smokers from secondhand smoke exposure started to be implemented.[27] According to the US Surgeon General, by 1990, smoking reached the position of the most extensively documented cause of disease ever investigated in the history of biomedical research.[28]

Europe was the first WHO Region to launch an action plan for a smoke-free Region, in 1987.[29] Concomitantly, the Europe Against Cancer programme, an initiative of the European Community (now known as the EU), was also released. Both initiatives played a role in the development of modern tobacco control policy.[29,30] The end of the 80's and beginning of the 90's was prolific for tobacco control in Europe, with seven directives and one non-binding resolution on tobacco control being adopted.[25] Labelling and taxation directives led to

stronger health warnings, cigarettes' prices increase, reduced price differences among the EU Member States, and ultimately empowered local politicians to act on tobacco control.[25,31]

The WHO Framework Convention on Tobacco Control

The next remarkable accomplishment in the tobacco control policy field happened in 1996, with the beginning of the development of the WHO Framework Convention on Tobacco Control (FCTC); the treaty was adopted in 2003 and came into force in 2005, with 168 signatories.[32,33] By 2020, the treaty reached 182 Parties, including all individual EU countries and the EU itself.[34] This global initiative was based on the understanding that the harms caused by tobacco and the solutions to them were a global public health issue, and as such, they should be tackled not only on the national but also on the global scale.[35] The WHO FCTC was the first ever legally binding international agreement on the public health sphere of all times. Its objective as indicated in its article 3 is

“to reduce continually and substantially the prevalence of tobacco use and exposure to tobacco smoke.”.[36]

This treaty, which was a culmination of the tobacco control efforts so far, establishes that the signatories should protect their population from the health, social, environmental, and economic consequences of tobacco consumption and smoke exposure. This should be done through the implementation of policies that had been established as cost-effective by the World Bank.[37] The focus of the treaty was to diminish the prevalence of smoking and, by doing so, diminish the burden smoking has on public health. The WHO FCTC was innovative in its focus on the spectrum of drug policy, as most of its articles are focused on diminishing the demand for tobacco and not the production or supply of the tobacco products themselves.

The MPOWER measures, which came associated with the WHO FCTC, laid down the path that countries should take, specifying the tobacco control policies to be implemented. The acronym MPOWER stands for policies in the following areas:

Monitoring tobacco consumption and the effectiveness of preventive measures,

Protecting people from tobacco smoke,

Offering help to quit tobacco use,

Warning about the dangers of tobacco,

Enforcing bans on tobacco advertising, promotion, and sponsorship, and

Raising taxes on tobacco.[38]

A study investigating the effectiveness of the measures proposed by the WHO FCTC in 126 countries found that those with a higher number of policies implemented had a higher reduction in smoking prevalence.[39] Another study in 27 European Union countries found that those that had implemented more of the tobacco control measures recommended by the FCTC had a lower prevalence of smokers, higher quit ratios and higher relative decreases in their prevalence rates of smokers.[40]

Tobacco regulation in the Europe Union countries

The EU competence regarding public health is limited as all legislation enacted by it requires a legal basis in the treaties that originally created the European Community.[41] Therefore, all the legislation related to tobacco control enacted by the EU is based on the regulation of the internal market and to the Articles around agriculture (Article 32 European Community), taxation (Article 93 European Community), internal market (Article 95 European Community), common commercial policy (Article 133 European Community), worker's protection (Article 137 European Community), consumer affairs (Article 153 European Community) and public health (Article 152 European Community).[41] The latter, however, has limited reach and cannot be used to impose harmonisation of policy across countries.

Despite this limitation, the EU has made substantial progress, releasing more than a dozen tobacco control legislation since 1989 in the form of directives, resolutions, recommendations, and conferences.[41] They set legislation on taxation, advertising, tar yields, smoking in workplaces, and labelling. In recent years, together with the adoption of the WHO FCTC by the EU and all member states, the most remarkable change in the supranational regulation level was the revision of the 2001 EU Tobacco Products Directive (TPD) that was adopted in 2014. This revised directive introduced new regulations regarding tobacco products manufacturing (ingredients and additives), presentation (labelling and packaging), and selling (cross border distance sales, traceability of products) among the EU member states.[42] Although the 2014 EU TPD was a progress in tobacco control policy, its final version was weaker than the initial drafts, leaving out some of the initially proposed policies, already shown to be effective tools to a more comprehensive tobacco control package.[43,44] The absence of policies such as the plain packaging and point of sale display ban, both assessed in this thesis, was associated to the tobacco industry lobby.[43]

In addition to the legislation, in 1987 the EU launched the Europe Against Cancer programme, which played a major role in promoting and influencing the development and adoption of tobacco control legislation in several European countries.[25] Besides all the progress done, the EU could play an even more significant part in promoting tobacco control, especially in regards to regulating the contents of tobacco products and the introduction of new products in the European market.[41]

As the EU has limited competencies regarding the enactment of tobacco control policies, each individual country holds most of the responsibility and attribution of tobacco control.[45] Tobacco control in Europe has been historically implemented heterogeneously across countries, a mark that can still be seen in evaluating the scenery of policy implementation in the present.[46,47] An estimate of this heterogeneity can be seen in Figure 2, which shows the level of policy initiatives in the European countries according to the Tobacco Control Scale 2019.[47] The maximum score in this scale would mean that a country had implemented all six cost-effective tobacco control interventions prescribed by the World Bank: price increases through taxes, smoke-free venues, consumer

information such as through media campaigns, advertising bans, health warnings, and smoking cessation treatment.

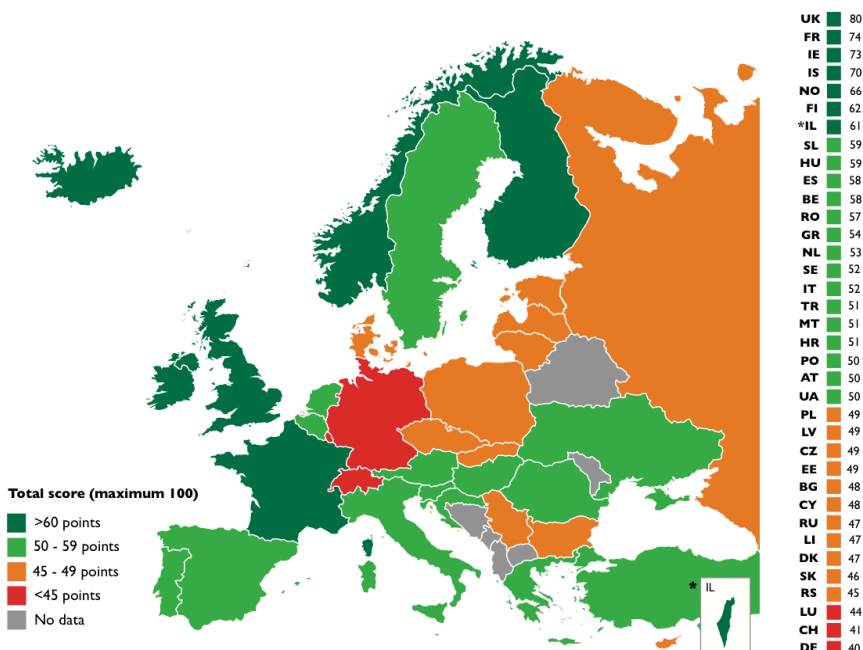


Figure 2. The Tobacco Control Scale score rank 2019.

Source: Feliu. [48]

As mentioned, the WHO FCTC was released in 2004 based on what was understood as the best cost-effective tobacco control measures at that time. Since then, some countries in

Europe have implemented virtually all the measures proposed by the FCTC and, naturally, new policy goals succeeded the older ones. Similarly, the most recent EU TPD was released seven years ago, in 2014 and new policies that could be part of the next revised version have been proposed. As Studlar *et al.* highlights, [45] the meaning of the concept ‘comprehensive’ tobacco control policies shift over time in light of new market and scientific developments. This can be seen, for instance, as countries evolve their legislation from smoking restrictions to complete smoking bans; from simple text warning messages to graphic warning labels, or one step ahead, to plain packaging; or from banning advertising in printed media to banning display/advertising in the point of sale.

Some EU countries have been progressing further than the WHO FCTC and the EU TPD and have implemented policies that are more comprehensive, for instance, five countries have implemented plain packaging (France, Ireland, Belgium, the Netherlands, and Hungary), [49] and four implemented point of sale display and advertising ban (France, Ireland, Hungary, and Finland) [49] and several have implemented smoke-free

policies in private cars when minors are present (Ireland, France, Finland, Italy, Malta, Cyprus, Luxembourg, Austria, Greece, and Belgium)[47] or in outdoor areas (Spain, Greece, Hungary, Romania, and Belgium).[50]

Besides the supranational and national level, tobacco control policy has also been enacted within subnational levels in Europe. Germany (with policies affecting several indoor and outdoor places) and Italy (affecting parks and beaches) are among the most well-known countries where subnational smoke-free policies can be more restrictive than those at the national level.[51,52]

Going further: the future of tobacco control

Since the 19th century, there have been five phases of tobacco control policy, and a sixth that is currently growing in importance (Table 1). [53,54] These phases are divided into two eras; the first (1885–1964) had as its paradigm the political economy, was aligned with the tobacco industry’s interests, and was marked by limited and ineffective legislation detrimental to the tobacco business. The final phase of this era (1950–1964) was characterised by the growing body of evidence described in the first section of this thesis. This last phase led to a shift in paradigm, with policy evolving to have the public health interests as guidance. The WHO FCTC and all the regulations at the EU level mentioned so far are part of this second era, in which the paradigm of public health dominates the tobacco control policy, and therefore by policies aiming at

tackling the harms of tobacco use. The emerging and current tobacco control policy phase, initiated after 2010, is characterised by two strands: decommercialization or neo-prohibitionism vs harm reduction.[53,54]

With the progress of tobacco control, and as some countries have implemented the traditional tobacco control measures and reached considerably low smoking prevalence, this new phase of tobacco control policy has gained momentum. This new approach, which represents a focus shift, is broadly known as the tobacco endgame.[55] Many propositions of which policies should be a part of such approach exist; however, there is a common rationale behind them: not only to control the tobacco pandemic but also to put an end to it, aiming for a smoke-free future.[56,57] They are initiatives designed to abolish the structural, political and social dynamics that sustain the tobacco epidemic and end it within a specific timeframe.[57]

Table 1. The eras and phases of tobacco control policy.

Period	Events
Era 1 – Paradigm: Political Economy (tobacco promotion)	
1885–1914: phase 1	Consolidation of the tobacco industry and early controversies over morality and public health
1914–1950: phase 2	Tobacco growing and manufacturing promoted by governments
1950–1964: phase 3	The gathering storm of health concerns
Era 2 – Paradigm: Public Health (tobacco restriction)	
1964–1984: phase 4	Regulatory hesitancy; tobacco control seen as a developed world issue
1984–2010: phase 5	Tobacco as a social and global menace
2010–current: phase 6	Decommercialization and/or neo-prohibitionism vs harm reduction

Table adapted from: Cairney, Paul, Donley Studlar, and Hadii Mamudu (2011). Global tobacco control: power, policy, governance and transfer.

The first country to announce an endgame goal was New Zealand in 2009, aiming to ‘reducing smoking prevalence and tobacco availability to minimal levels ... [to make] New Zealand essentially a smoke-free nation by 2025’.[28] In

Europe, a few countries have established endgame goals. Finland in 2010 (2% smoking prevalence target by 2040),[58] Ireland (<5% smoking prevalence by 2025),[59] Scotland (<5% smoking prevalence by 2034),[60] and the Netherlands (<5% smoking prevalence by 2040).[61] Additionally, the French government is currently debating a smoke-free generation by 2030.[62] Furthermore, in 2021, the European Commission has announced their goal to create a smoke-free generation in Europe, where less than 5% of people use tobacco by 2040.[63]

A qualitative review about the topic summarised the main policies proposed that could encompass an endgame strategy. [57] The review outlines policies such as: banning the sales of tobacco all together or gradually through a progressive decrease of the amount of tobacco available to consumers,[64,65] reducing tobacco outlets density in order to make them less accessible,[66,67] creating a license to smokers and restricting sales to them only;[68] transferring the agency of tobacco business to a non-profit or government organism responsible for reducing the societal harms of tobacco,[69,70] and redesigning the cigarette, for instance

through reducing the nicotine content to make them less addictive.[71,72]

What is the relevance of public support for tobacco control policy?

As discussed above, the understanding of the harms of tobacco use and its control has evolved throughout the 20th century from a matter of “individual choice” to a complex public health issue. As mentioned previously, effective policies to tackle this epidemic are available and have been proven cost-effective.[73] Nevertheless, they have not been introduced when the evidence became available, and we still see that the translation of evidence into policy does not happen straightforwardly. With this understanding came the need to study and influence the environment in which tobacco control happens, as policies are not created and implemented in the vacuum — social, political, and economic factors

influence all stages of public policy development, adoption and enforcement.[54]

Diverse theories and models on how to better understand, approach and develop tobacco control exist. One of the most widely accepted of these models is based on the Systems Theory,[74] that states that a behaviour of any entity —be it an organization or an individual— can only be truly understood not by focusing on the properties of its component parts, but by examining and characterising the collective nature of the roles and relationships among the parts.[75]

Using the Systems Theory as a conceptual background, the US National Cancer Institute has acknowledged the complexity of tobacco control, laying out its components, and how do such components dynamically interplay over time.[74]They state that, at the national level, two main factors are the precursors of the government’s willingness to implement solutions tackling the smoking epidemic: the government’s awareness of the problem and the balance of lobbying forces that propose or oppose policy solutions.[31,74]

Another theory, based on a simplification of the US National Cancer Institute model, is the Flywheel model of tobacco control.[31] Figure 3 shows a graphical representation of the theory. Within this theory, tobacco control is understood as an interplay of sociological population-level factors over time in a circular manner. Similarly to a flywheel, it is difficult to first set tobacco control in motion, but once it begins to move, it will continue moving for some time and finally come to a stop in the absence of any further input. The initial input to set the tobacco control flywheel in motion could be either the introduction of new tobacco control interventions or advances in the denormalisation of tobacco use in society. This initial input, in turn, influences all the other factors included in the model and vice-versa in a circular feedback. Political support, the government's decision to adopt tobacco control, the implementation of tobacco control, smoking rates, and public support are the factors that predict how inclined policymakers are to introduce tobacco control measures. The two parts at the heart of the flywheel are cultural values, which are stable and relatively insensitive to the outside, and social norms, which reflect the deeply held cultural values, and therefore,

determine the preferences of groups of people for some types of policy.[31]

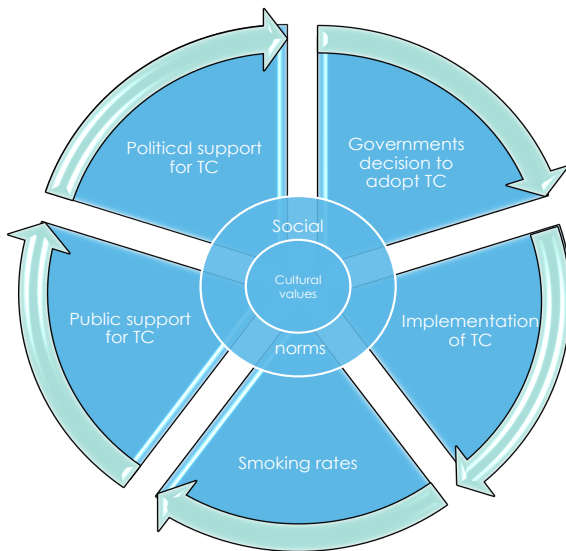


Figure 3. The flywheel model of tobacco control. Adapted from: Willemsen, 2018.[31]

In addition to the theoretical bases for the importance of evaluating the public support for tobacco control, empirical investigation has also pointed out the influence that such support can have on policymaking, implementation, and compliance with tobacco control policy in concrete cases.[76–79] Although there is some investigation on the role that

support for tobacco control policy plays in those areas, to the best of my knowledge, the specifics of how it might affect all the areas of tobacco control is still scarce.

The WHO established that ensuring sustained public support and shifting attitudes in favour of tobacco control are critical strategies for strengthening national capacity for tobacco control.[80] Furthermore, with this new phase of tobacco control policy, in which new measures are being proposed to achieve a smoke-free generation, it has been pointed out that, together with a smoking prevalence lower than 10%, there must be a wide public support for the tobacco endgame across diverse social groups.[56] In the case of Europe, research mapping the attitudes of citizens towards tobacco-control policies is particularly important for gaining insight into the effects of policies and interventions aiming for a tobacco-free generation.[81]

Support for tobacco control policy in the European Union

Before most countries in the EU had implemented major tobacco control policies, the European Commission had started monitoring support for tobacco control measures. In 1987, a survey in 12 countries assessed Europeans' support for increases in taxes for tobacco, a ban on advertising, a ban on the sale to young people under 16, a ban on the sale of duty-free tobacco in airports, and a ban on smoking in public places.[82] Most of the Europeans were supportive of all these measures. Following this survey, the EU has been carrying out periodic surveys to assess Europeans' attitudes towards tobacco control policies and tobacco consumption, within the Eurobarometer umbrella.[83] There have been ten tobacco-related editions of the Eurobarometer so far: 2003, 2006, 2007,

2009, 2010, 2012 (with two surveys), 2015, 2017 and 2021. The latest edition examined the support for only three policies, two on e-cigarettes and heated tobacco products (banning them in places where tobacco use is forbidden and banning flavours in them) and only one concerning cigarettes, examining the support for introducing plain packaging.[84] Apart from the limited number of policies assessed, the questions used in the survey have changed over the editions, undermining the possibility of assessing attitudes over time and having an up-to-date overview of the Europeans' support for various tobacco control policies.

In addition to the Eurobarometer surveys, several other cross-sectional and cohort studies on support for a range of policies have assessed support for tobacco control policies in multiple European countries. One of the most prominent examples of these studies is the International Tobacco Control Policy Evaluation Project (ITC Project) that was created to measure the psychosocial and behavioural impact of key national-level policies of the WHO FCTC. Within the ITC project, cohort studies with smokers, quitters and non-smokers have been created in several countries worldwide. In Europe, the first ITC

cohort study was created in the United Kingdom (2002), followed by Ireland (2004), Germany (2007), the Netherlands (2008), and France (2009). More recently, an ITC projects' joint study in 6 European countries (Germany, Greece, Hungary, Poland, Romania, and Spain) was initiated in 2016 and followed up in 2018, and two of the publications in this thesis were based on this study.

Regarding the production of results on public support for smoke-free legislation, a few ITC project studies related to smoke-free legislation are worth mentioning. By the beginning of the 2000s, smoke-free policies were being extensively discussed, and Ireland was the first country to implement them. However, during the implementation process, there was the perception among policymakers that the support for smoke-free legislation was low, which would cause low levels of compliance. A study using pre-post data to evaluate the Irish smoke-free law demonstrated that the public support for the legislation had increased after its implementation.[79] This evidence was used in several other countries that also implemented smoke-free legislation in the following years, with

similar studies being conducted in the countries with ITC project cohort studies.[85–88]

Other examples of studies in multiple countries regarding public support for tobacco control measures in European countries have also been published over the years using data from diverse representative samples of the population, evaluating support for taxation,[89] health warnings,[90] raising the minimum age-of-sales,[91,92] and of bans on cigarette sales.[93,94], and the role of protecting children on increased support for smoke-free legislation.[95]

Added value of this thesis

Considering the five main topics of this introduction (1) tobacco control policy is still not implemented homogeneously across European Union countries, (2) the evolution of what is understood as comprehensive tobacco control policies, with new policies being proposed, (3) the shift paradigm from tobacco control to tobacco endgame, (4) the importance of having information on the general population support for these policies and, (5) and the gap on the assessment of such support, this thesis will try to fill this knowledge gap by providing estimates of Europeans' attitudes towards tobacco control policies. Additionally, having comparative data on the public attitudes regarding the adoption of tobacco control policies across countries, should make an important contribution to the field of tobacco control in Europe.

Additionally, as the public sentiment around policies changes across time, our results are also valuable as we provide recent data on the topic and repeated evaluations of support in different years. Furthermore, despite widespread belief and scientific knowledge that public support can be critical to the success of tobacco control and of the tobacco endgame, systematic efforts to measure public opinion about tobacco control policies have been limited in recent years. Such effort, which is also an aim of this thesis, can inform scientists, advocates and policymakers on the possibilities and barriers to advancing tobacco control.

PART TWO
HYPOTHESIS

Hypothesis

The initial hypotheses of this thesis were:

Hypothesis 1: There are differences in support for smoke-free places across European countries and this support is correlated to SHS presence and smoking behaviour.

Hypothesis 2: The majority of smokers are supportive of smoke-free legislation to protect non-smokers and children inside cars.

Hypothesis 3: The level of smokers' support for tobacco control policies correlates with smoking-related psychosocial factors.

Hypothesis 4: The general population in countries with lower smoking prevalence will be significantly more supportive of

ending cigarette sales than those in countries with higher smoking prevalence.

PART THREE
OBJECTIVES

General objectives

The general objectives of this PhD thesis are:

1. To evaluate non-smokers' and smokers' support for smoke-free legislation in indoor and outdoor settings and its correlates.
2. To assess smokers' support for smoke-free legislation inside private cars to protect non-smokers and children.
3. To assess smokers' support for measures that go beyond the current EU TPD and its psychosocial correlates.
4. To examine support for banning smoking or cigarette sales to achieve the tobacco endgame among Europeans.

Specific objectives

Each main objective for this thesis was associated with specific objectives as follows:

1. To evaluate non-smokers' and smokers' support for smoke-free legislation in indoor and outdoor settings and its correlates.
 - a. To examine the percentage of non-smokers and smokers supporting smoke-free legislation inside restaurants/bars, discos/clubs, train stops/subway stops, indoor workplaces, private cars, private cars with minors.
 - b. To examine the percentage of non-smokers and smokers supporting smoke-free legislation in the following outdoor settings: restaurants/bars patios, tram/bus/subway stops,

outdoor areas of schools, parks, children's playgrounds, beaches, outdoor areas of hospitals, stadia.

c. To examine the relationships between expressed support for smoke-free legislation in outdoor settings, and noticing SHS presence, reported smoking themselves in the settings and sociodemographic factors at the country-level.

2. To assess smokers' support for smoke-free legislation inside private cars to protect non-smokers and children.

a. To estimate smokers' support for banning smoking in cars with non-smokers in them.

b. To estimate smokers' support for banning smoking in cars with children in them.

c. To examine smokers' implementation of rules of banning smoking in their private cars if children are present.

3. To assess smokers' support for measures that go beyond the current EU TPD.

a. To estimate smokers' support for seven tobacco control policies: (1) more products regulation, (2) a ban on cigarettes and other tobacco products in 10 years, (3) the tobacco industry being made more responsible for the harms caused by smoking (4) plain packaging, (5) restricting the cigarettes outlets (6) ban on display of cigarettes inside shops/stores, and (7) ban slim cigarettes.

b. To examine the association between support for the aforementioned tobacco control policies and sociodemographic factors, smoking-related beliefs and behaviours.

4. To examine support for banning cigarette sales to achieve the tobacco endgame among Europeans.

a. To evaluate the general population support for a cigarette sales ban in 12 European countries in 2017/18.

b. To examine the factors associated with support for the policy.

c. To compare the estimates of support in 2017/18 with the estimates of a companion study conducted in 11 common countries in 2010.

PART FOUR

METHODS

Thesis design

This thesis is comprised of four publications, based on two cross-sectional studies, one with nationally representative samples of smokers from 6 countries, and the other with nationally representative samples of the general population from 12 European countries. These two studies belong to two EU-funded projects developed in similar periods and that involved several European countries, the EUREST-Plus and the TackSHS projects.

The EUREST-PLUS project – The European Regulatory Science on Tobacco: policy implementation to reduce lung diseases

The EUREST-PLUS project was an EU-funded project, coordinated by Dr Constantine Vardavas at the European Network for Smoking and Tobacco Prevention (ENSP) and included research teams from 11 European countries. The main objective of EUREST-PLUS project was to monitor and evaluate the impact of the 2014 EU TPD through the creation of a longitudinal cohort of adult smokers in 6 EU countries (Germany, Greece, Hungary, Poland, Romania, and Spain) in a pre- vs. post-TPD implementation study design.[96] The content of the survey questions, similarly to previous ITC project surveys, was related to demographics, factors relevant to the policies of interest, psychosocial predictors of smoking behaviour and the behaviour itself. To be eligible, respondents had to be 18 years old or more, smoke at least monthly, and have smoked more than 100 cigarettes in their lives. Respondents in Wave 1 (2016) were recruited through a face-to-face multi-stage stratified random sample of the general population aged 18 or more. Wave 2 (2018) respondents were comprised of those successfully recontacted and the ones selected as replenishment respondents, recruited from newly screened households within the same sampling frame and the

same random selection approach. In each country, a probability sample of dwellings was approached. Approximately 1000 smokers were interviewed in each country in each wave. Retention rates varied from 35% in Hungary to 72% in Spain.[97] Two technical reports, one for each wave of data collection, provide detailed information on the surveys.[98,99]

The TackSHS project – Tackling secondhand tobacco smoke and e-cigarette emissions: exposure assessment, novel interventions, impact on lung diseases and economic burden in diverse European populations

The TackSHS project was another EU-funded project, coordinated by Dr Esteve Fernandez at the Catalan Institute of Oncology. The project had as an objective to evaluate the comprehensive health impact that SHS and e-cigarettes

emissions had on the respiratory health of the European population. The data used in this thesis comes from the “TackSHS survey” coordinated by Dr Silvano Gallus at the Mario Negri Institute for Pharmacological Research. The survey included a representative sample from the general population in 12 countries: Bulgaria, England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Portugal, Romania, and Spain.[100] The sampling methodology and weighting of the survey was design to produce nationally representative samples of 12 European countries. Around 1,000 subjects aged 15 or older were interviewed in each country, totalling 11,902 participants.[101]

PART FIVE

RESULTS

Summary of publications of this thesis

Table 2 shows the summary of the information regarding the four publications included in this thesis, two of which have been published and two are currently under peer review in high-impact journals. These publications are presented in the next pages.

Table 2. Summary of publications of this thesis.

Authors	Title	Reference	Journal's impact factor, category, and rank
Nogueira SO, Fu M, Lugo A, <i>et al.</i>	Should we go smoke-free? Non-smokers' and smokers' support for smoke-free legislation in 14 indoor and outdoor settings	<i>Under review/ submitted to Environ. Res., 10 jul. 2021</i>	6.498, Public Health, Environmental and Occupational Health (Q1)

across 12 European countries.

Nogueira SO, Tigova O, Driezen P, <i>et al.</i>	Do smokers want to protect non-smokers from the harms of second-hand smoke exposure in cars? Findings from the Eurest-PLUS ITC Europe Surveys.	<i>Eur. J. Public Health</i> 30, Supplement_3, July 2020, Pages iii108-iii112	3.367, Public Health, Environmental and Occupational Health (Q1)
Nogueira SO, Driezen P, Fu M, <i>et al.</i>	Beyond the European Union Tobacco Products Directive: smokers' and recent quitters' support for further tobacco control measures (2016-2018).	<i>Tob. Control</i> 2020;	6.726, Substance abuse (Q1, D1)
Nogueira SO, Lugo A, Fu M, <i>et al.</i>	Should we go smoke-free? Public support for making smoking or cigarette sales illegal in 12 European countries: the tobacco endgame in Europe.	Under review/submitted to <i>Tob. Control</i> , 27 sept. 2021	6.726, Substance abuse (Q1, D1)

PAPER 1.

Should we go smoke-free? Non-smokers' and smokers' support for smoke-free legislation in 14 indoor and outdoor settings across 12 European countries

Sarah O. Nogueira, Marcela Fu, Alessandra Lugo, Olena Tigova, Elisabet Henderson, María José López, Luke Clancy, Sean Semple, Joan B. Soriano, Esteve Fernandez, Silvano Gallus.

Environmental Research 2021 (under review).

Should we go smoke-free? Non-smokers' and smokers' support for smoke-free legislation in 14 indoor and outdoor settings across 12 European countries

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Word count: 3162

Under review

ABSTRACT

Background: European countries differ considerably in the scope and the extent of their policies to protect people from the harms of secondhand smoke exposure. Public opinion may have a substantial influence on several stages of policy development, implementation, and compliance. For this reason, we aimed to evaluate the population level of support for smoke-free policies and its correlates.

Methods: We used data from the TackSHS Survey (2017-2018), a cross-sectional study with representative samples of the general population aged ≥ 15 years from 12 European countries. We described the proportion of non-smokers' and smokers' support for the implementation of smoke-free legislation in 14 indoor and outdoor settings and the country-level characteristics associated with it.

Results: In the total sample ($n=11,902$), support for smoke-free legislation were the lowest for restaurants/bar patios (non-smokers=53.0%; smokers=29.2%) and the highest for workplaces (non-smokers=78.5%; smokers=66.5%). In the country-level analysis, the highest support among non-smokers was for workplaces in Bulgaria (93.1%) and the lowest for restaurants/bars patios in Greece (39.4%). Among smokers, the corresponding estimates were for children's playgrounds in Latvia (88.9%) and for cars in Portugal (21%). For most settings, support for smoke-free legislation was directly related with the countries' prevalence of secondhand smoke presence and reported smoking in each setting.

Discussion: Our results show that the majority of European adults (including a large proportion of smokers) are supportive of implementing smoke-free legislation in indoor settings and extending it to selected outdoor settings. Such expressive support can be seen as an opportunity to advance legislation and protect the European population from secondhand smoke exposure.

Keywords: Support, attitudes, smoke-free, Europe, smoking ban, second-hand smoke exposure

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ETHICAL APPROVAL

The TackSHS project was approved by the Clinical Research Ethics Committee of the Bellvitge University Hospital (PR341/15), and the protocol of this study was approved by all the countries' local Research Ethics Committees.

1. INTRODUCTION

Secondhand smoke (SHS) exposure is a known cause of disease among non-smokers, including lung cancer and cardiovascular disease in adults and asthma and sudden death syndrome in children (U.S. Department of Health and Human Services, 2006). According to the United States Centers for Disease Control and Prevention, there is no risk-free level of exposure to SHS as even brief exposures can be harmful (U.S. Department of Health and Human Services, 2006).

All European Union (EU) Member States are signatories of the World Health Organization Framework Convention on Tobacco Control (World Health Organization, 2003). and, consequently, most have implemented some sort of smoke-free legislation in their countries. However, countries differ considerably in the scope and the extent of policies to protect people from the harms of SHS exposure, both in indoor and outdoor settings (supplementary Table 1). Research shows that public opinion strongly impacts policy-making (Burstein, 2003). This is also true for the tobacco control field, in which public opinion has a substantial influence on policy design, implementation, compliance, and the behavioural changes related to such policies, being directly correlated to these outcomes (Gallus et al., 2006; Hyland et al., 2009; Nagelhout et al., 2012; Pacheco, 2012; Zhou et al., 2016). The tobacco industry seems to have recognised this effect and has taken action to influence attitudes in an attempt to resist tobacco control policies (Saloojee and Dagli, 2000). However, the efforts to have an extensive evaluation of public support for smoke-free legislation have been scarce in recent years in Europe, with the last Eurobarometer assessing this topic being released in 2009 (European Commission, 2009). Given the importance of public opinion in this matter, we aimed to evaluate the levels of support for the implementation of smoke-free legislation in different

indoor and outdoor settings across 12 European countries, and examine the relationships between expressed support, SHS exposure and sociodemographic factors at country level.

Under review

2. METHODS

2.1. Study Design

We used data from the TackSHS Survey, a cross-sectional survey with representative samples of the general population from 12 European countries (Bulgaria, England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Portugal, Romania and Spain) (Fernández et al., 2020). Data were collected between June 2017 and October 2018. The samples comprised subjects aged 15 years old or older, representative of the general population in terms of age, sex, habitat (i.e., geographic area and/or size of municipality) and, in some countries, socio-economic characteristics. A total of 11,902 subjects were interviewed, around 1,000 per country, with 8,562 being non-smokers (never or ex-smokers) and 3,340 current smokers.

Sampling methods varied across countries, with respondents being recruited using multistage sampling (Bulgaria, Greece, Italy, Latvia, Poland, and Romania), cluster sampling with quotas (England and France), and stratified random sampling (Germany, Ireland, Portugal, and Spain). Interviews were conducted face-to-face with computer-assisted personal interviewing. The questionnaire contained four sections: socio-economic and demographic characteristics; smoking and e-cigarettes use; exposure to SHS and e-cigarettes aerosol in different settings; and attitudes and perceptions to smoke-free policies in different of indoor and outdoor settings. Participants did not receive any incentive for participating in the interviews. Further details about the methodology of the TackSHS survey are available elsewhere (Gallus et al., 2021).

Ethics approval was obtained from an ethics committee in each of the 12 countries. Additionally, the study protocol has been registered in ClinicalTrials.gov (ID: NCT02928536). All respondents provided their written consent to participate.

2.2. Measures

2.2.1. Outcome measures

Outcomes were 14 indicators of support for smoke-free legislation in different indoor and outdoor settings. Participants were asked: “For each of the following sites, are you strongly in favour, moderately in favour, moderately against, or strongly against a total tobacco ban?” The indoor settings evaluated were restaurants and bars, discos/clubs/indoor arenas, train stations, workplaces, cars/private vehicles, cars/private vehicles with minors. The outdoor settings evaluated were restaurants/bars patios, stadia/outdoor arenas, tram/bus/subway stops, children’s playgrounds, and outdoor areas of schools, hospitals, parks, and beaches. Support for smoke-free legislation was asked for all settings in all countries, except for discos/clubs/indoor arenas in Germany and cars and cars with minors in England, due to logistic problems during data collection. For statistical analysis, all outcome indicators were dichotomised as *in favour* (‘strongly in favour’ and ‘moderately in favour’) vs *not in favour* (‘moderately against’ and ‘strongly against’).

2.2.2. Covariates

Sociodemographic characteristics studied were: country, sex (male/female), age (<25, 25–44, 45–64, 65 and older), education (tertiles of schooling years), self-assessed household economic status (higher than average, average, and lower than average), and smoking status, categorised as never smokers (never smoked or have smoked less than 100 cigarettes in their lifetime), ex-smokers (have smoked at least 100 cigarettes in their lifetime and have stopped smoking at the time of survey), and smokers (have smoked at least 100 cigarettes in their lifetime and were smoking by the time of survey).

We categorised the 12 countries by geographical regions according to the classification by the United Nations into Northern (England, Ireland, and Latvia), Western (France and Germany), Southern (Italy, Greece, Portugal, and Spain), and Eastern regions (Bulgaria, Poland, and Romania) (United Nations, n.d.); by their World Bank gross domestic product (GDP) *per*

capita into <25,000€ (Latvia, Romania, Poland, Portugal, Greece, and Bulgaria) and ≥25,000€ (England, France, Germany, Ireland, Italy, and Spain) (World Bank, n.d.); by their Tobacco Control Scale (TCS) score in 2016, score ≤50 (Bulgaria, Poland, Portugal, Latvia, Greece and Germany) and score >50 (England, Ireland, France, Romania, Italy and Spain) (Joossens and Raw, 2017); by their sociodemographic index (SDI) into high SDI (England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Spain) and middle-high SDI (Bulgaria, Portugal, Romania) (Global Burden of Disease Collaborative Network 2018), and by their smoking prevalence obtained from the TackSHS survey, <31% (Ireland, Italy and England, Germany, Latvia and Poland) and ≥31% (Bulgaria, France, Greece, Portugal, Romania and Spain) (Gallus et al., 2021).

SHS presence in outdoor settings was assessed with the following question asked to non-smokers: “In the last 6 months, were people smoking regular cigarettes the last time you visited the following sites?”. Current smokers reported smoking in outdoor setting was assessed with the following question asked to smokers: “In the last 6 months, did you smoke a regular cigarette the last time you visited the following sites?”. Response options for both questions were: “Yes”, “No” and “Never visited in the last 6 months”. The sites considered were patios of restaurants and bars, public transport stops, outdoor areas of hospitals, outdoor areas of schools, parks, children’s playgrounds, stadia, and beaches. Among participants who visited a place in the last 6 months, those non-smokers declaring to have seen people smoking regular cigarettes and those smokers declaring having smoked cigarettes in any of the above-mentioned settings accounted, respectively, for SHS presence and reported smoking in that setting (Henderson et al., 2021b).

2.3. Statistical analysis

All statistical analyses were weighted to ensure the sample represented the general population in each of the 12 countries (individual weights). Estimates for the entire sample were made using “country weights”, combining individual weights with an additional weighting factor, each country contributing in proportion to its population aged 15 years or over (European Commission 2018). We report the frequencies (%) and 95% confidence intervals (CIs) of the outcome measures. For each outcome measure, we tested for differences between non-smokers’ and smokers’ percentages of support using chi square tests. Additionally, we evaluated the associations between support for smoke-free policies in diverse settings and different country-level characteristics and have computed odds ratios to test for the association between each country-level characteristic and support using multilevel logistic regression models after adjustment for sex, age, level of education, and smoking status (current smokers and non-smokers) and with country as random effect to test for differences. Spearman’s correlation (r_{sp}) was used to test the association between support for smoke-free policies, (1) SHS presence and (2) reported smoking in outdoor settings (Henderson et al., 2021b). All analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC, USA).

3. RESULTS

The sample sociodemographic characteristics are presented in supplementary table 2.

3.1. Support for smoke-free legislation in indoor settings

Figure 1 and supplementary Table 3 show the overall and country-specific support for smoke-free legislation in indoor settings in 2017-2018. Supplementary tables 4 to 6 show the levels of support stratified by the four original response options ('strongly in favour', 'moderately in favour', 'moderately against' and 'strongly against'). Overall, the highest level of support among non-smokers was for workplaces (78.5%; 95% CI: 77.6-79.3) and the inside areas of restaurants and bars (77.6%; 95% CI: 76.7-78.4), while among smokers it was for workplaces (66.5%; 95% CI: 64.8-68.2) and train stations (64.0%; 95% CI: 62.3-65.8).

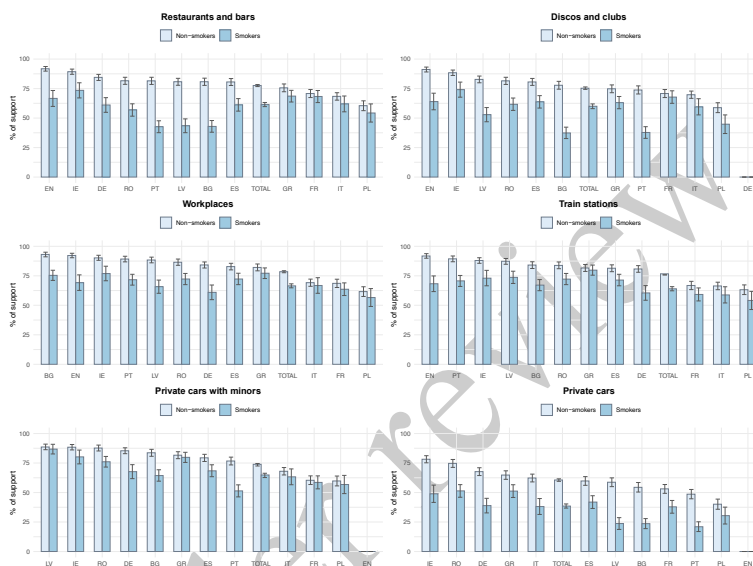
The point estimates of support for smoke-free legislation in indoor settings were higher among non-smokers than among smokers across all countries and settings, although some of these differences were not significant (see supplementary table 3). More than 60% of non-smokers supported smoke-free legislation in all indoor settings in each of the countries, except for private cars and private cars with minors in Poland, in which support was 40.1% and 59.8% respectively. Non-smokers in Poland had the lowest support for all settings, while those in England declared the highest support for all settings in which data for the country was collected (Figure 1). Smokers in Ireland reported the highest support in 3 out of the 6 indoor settings evaluated while smokers in Portugal and Poland each presented the lowest support for 2 of the 6 settings.

Differences in support for smoke-free restaurants and bars between non-smokers and smokers in Portugal (81.5% vs 42.7%), Bulgaria (80.8% vs 42.9%) and Latvia (80.8% vs 43.5%) were very pronounced. Similarly, support for smoke-free discos and clubs between non-smokers and

smokers was very pronounced in Portugal (73.8% vs 37.8%), Bulgaria (77.8% vs 37.4%) and Latvia (82.8% vs 52.9%).

Under review

Figure 1. Non-smokers' and smokers' support for smoke-free legislation in indoor settings in 12 European countries, the TackSHS survey, 2017-2018.



Data on support for smoke-free legislation in discos and clubs in Germany and on cars and cars with minors in England were not collected.

For estimates of the total sample, country weights were applied, combining individual weights with an additional weighting factor, each country contributing in proportion to its population aged 15 years or over.

EN=England, IE=Ireland, DE=Germany, RO=Romania, PT=Portugal, LV=Latvia, BG=Bulgaria, ES=Spain, GR=Greece, FR=France, IT=Italy, PL=Poland, TOTAL=Total sample.

3.2. Support for smoke-free legislation in outdoor settings

Figure 2 and supplementary table 4 show overall and country-specific support for smoke-free legislation in outdoor settings in 2017-2018. Supplementary tables 7 to 9 show the levels of support stratified by the four original response options ('strongly in favour', 'moderately in favour', 'moderately against' and 'strongly against'). There were differences between non-smokers' and smokers' support, with non-smokers supporting smoke-free legislation significantly more than smokers across all countries and settings. The exceptions were the levels of support for children's playgrounds in Latvia and Poland, outdoor areas of schools and stadia in Poland in which there were no significant differences in the support between non-smokers and smokers. The overall support among non-smokers and smokers was the highest for children's playgrounds (73.8%; 95% CI: 72.9-74.7 and 61.7%; 95% CI: 60.0-63.5, respectively) and the lowest was for restaurants/bars patios (53.0%; 95% CI: 52.0-54.1 and 29.2%; 95% CI: 27.6-30.8, respectively).

Figure 2. Non-smokers' and smokers' support for smoke-free legislation in outdoor settings in 12 European countries, the TackSHS survey, 2017-2018.



For estimates of the total sample, country weights were applied, combining individual weights with an additional weighting factor, each country contributing in proportion to its population aged 15 years or over. EN=England, IE=Ireland, DE=Germany, RO=Romania, PT=Portugal, LV=Latvia, BG=Bulgaria, ES=Spain, GR=Greece, FR=France, IT=Italy, PL=Poland, TOTAL=Total sample.

3.3. Country-level factors associated with support for smoke-free legislation

Support for smoke-free legislation in indoor and outdoor settings according to different country-level characteristics is shown in Tables 1 and 2. Supplementary tables 11 and 12 show the regression model testing for differences in support in countries by the country-level characteristics.

The group of countries scoring above 50 in the TCS (i.e., countries with high tobacco control initiatives) had significantly higher support for smoke-free legislation in discos and clubs (74.3%; OR:2.07; 95% CI: 1.20-3.56) and parks (50.5%; OR:1.34; 95% CI: 1.06-1.70) as compared to those countries with lower level of tobacco control policies. Those countries with smoking prevalence <31% had significantly higher support for smoke-free legislation in outdoor settings when compared to those with higher smoking prevalence, although these differences were only significant for restaurants/bars patios (OR:1.57; 95% CI: 1.27-1.93) and tram/bus/subway stops (OR:1.39; 95% CI:1.05-1.84). Countries in the Northern region had significantly higher support for smoke-free legislation across all indoor and outdoor settings, except for private cars, private cars with minors and restaurants/bars patios. Moreover, countries with higher GDP *per capita* had significantly higher support for smoke-free legislation in restaurants/bars (75.5%; OR:1.68; 95% CI: 1.02-2.77) and discos/clubs (74.3%; OR:1.79; 95% CI: 1.02-3.13) as compared to those with lower GDP *per capita*. The socio-demographic index differences were not significantly associated with higher support for any of the indoor or outdoor settings

Table 1. Support for smoke-free legislation in diverse indoor settings according to country-level characteristics in 12 European countries, the TackSHS Survey, 2017-2018.

INDOORS						
	Restaurants/bars % (95% CI)	Discos/clubs % (95% CI)	Train stops/subway stops % (95% CI)	Workplaces % (95% CI)	Private cars % (95% CI)	Private cars with minors % (95% CI)
Tobacco Control Scale score (2016)^a						
>50 points	74.1 (73.1,75.2)	74.3 (73.3,75.3)	73.5 (72.4-74.5)	75.6 (74.6,76.6)	55.0 (53.7,56.3)	69.0 (67.8,70.2)
≤50 points	72.2 (70.8,73.5)	60.2 (58.0,62.4)	73.4 (72.0-74.7)	75.0 (73.7,76.3)	52.7 (51.2,54.2)	74.7 (73.4,76.0)
Smoking prevalence (%)^b						
<31 %	74.6 (73.6,75.7)	71.4 (70.1,72.8)	73.5 (72.5-74.5)	75.4 (74.4,76.4)	55.6 (54.3,56.9)	72.5 (71.3,73.7)
≥31 %	71.5 (70.2,72.8)	71.2 (69.9,72.5)	73.3 (72.0-74.6)	75.3 (74.1,76.6)	52.2 (50.7,53.6)	70.2 (68.9,71.6)
Geographic area within Europe^c						
Northern	86.3 (84.7,88.0)	85.5 (83.8,87.3)	86.9 (85.3-88.5)	87.5 (85.9,89.0)	65.2 (58.2,72.2)	87.2 (82.3,92.0)
Western	75.1 (73.8,76.3)	69.9 (67.8,72.0)	71.0 (69.6-72.3)	73.6 (72.3,75.0)	55.5 (54.0,57.0)	72.0 (70.6,73.3)
Southern	70.3 (68.8,71.7)	70.2 (68.7,71.6)	72.8 (71.1-73.9)	74.7 (73.3,76.1)	55.1 (53.5,56.7)	71.5 (70.0,72.9)
Eastern	64.1 (61.9,66.3)	62.2 (60.0,64.5)	68.7 (66.6-70.8)	69.8 (67.7,71.9)	47.4 (45.1,49.7)	68.7 (66.6,70.8)
GDP per capita (€) 2018^d						
>25,000 euros	75.5 (74.6,76.4)	74.3 (73.2,75.3)	73.7 (72.8-74.7)	76.0 (75.1,76.9)	56.0 (54.9,57.2)	71.8 (70.7,72.8)
≤25,000 euros	65.8 (63.9,67.6)	63.4 (61.5,65.3)	72.2 (70.5-74.0)	73.0 (71.2,74.7)	48.0 (46.0,49.9)	70.5 (68.7,72.3)
Sociodemographic index (SDI) (2017)^e						
High SDI	73.7 (72.9,74.6)	71.7 (70.7,72.7)	72.7 (71.9-73.6)	74.6 (73.8,75.4)	54.0 (53.0,55.1)	70.7 (69.8,71.7)

High-middle SDI	70.1 (67.3;72.8)	68.3 (65.5;71.1)	80.2 (77.8-82.6)	82.9 (80.6;85.1)	54.0 (51.0;57.0)	77.7 (75.2;80.2)
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Country weights were applied, combining individual weights with an additional weighting factor, each country contributing in proportion to its population aged 15 years or over.

^aTobacco Control Scale 2016 score; (Joossens and Raw, 2017) ≤ 50 (Bulgaria, Poland, Portugal, Latvia, Greece and Germany) and score > 50 (England, Ireland, France, Romania, Italy and Spain).

^bCountry's total smoking prevalence; (Gallus et al., 2021) $< 30\%$ (Ireland, Italy and England, Germany, Latvia and Poland) and $\geq 31\%$ (Bulgaria, France, Greece, Portugal, Romania and Spain).

^cUnited Nations M49 Standard Geographical area; (United Nations, n.d.) Northern Europe (Ireland, Latvia and England), Western Europe (France and Germany), Southern Europe (Italy, Greece, Portugal and Spain) and Eastern Europe (Bulgaria, Poland and Romania).

^dWorld Bank gross domestic product (GDP) per capita; (World Bank, n.d.) GDP per capita $\leq 25,000\text{€}$ (Bulgaria, Latvia, Romania, Poland, Portugal and Greece) and GDP per capita $> 25,000\text{€}$ (England, France, Germany, Ireland, Italy and Spain).

^eSociodemographic index (SDI); (Global Burden of Disease Collaborative Network, 2018) into High SDI (England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Spain) and middle-high SDI (Bulgaria, Portugal, Romania)

Table 2. Support for smoke-free legislation in diverse outdoor settings according to country-level characteristics in 12 European countries; the TackSHS Survey, 2017-2018.

Country weights were applied, combining individual weights with an additional weighting factor, each country contributing in proportion to its population aged 15 years or over.

OUTDOORS									
	Restaurants/bars patios % (95% CI)	Tram/bus/subway stops % (95% CI)	Outdoor areas of schools % (95% CI)	Parks % (95% CI)	Children's playgrounds % (95% CI)	Beaches % (95% CI)	Outdoor areas of hospitals % (95% CI)	Stadia % (95% CI)	
Tobacco Control Scale score (2016)^a									
>50 points	47.9 (46.8,49.1)	51.0 (49.8,52.1)	65.6 (64.5,66.7)	50.5 (49.4,51.7)	70.0 (69.0,71.1)	49.6 (48.4,50.7)	56.9 (55.7,58.0)	52.5 (51.4,53.7)	
≤50 points	44.9 (43.5,46.4)	47.0 (45.5,48.4)	64.9 (63.5,66.3)	43.4 (42.0,44.9)	71.8 (70.5,73.1)	44.6 (43.1,46.1)	51.6 (50.2,53.1)	44.1 (42.6,45.6)	
Smoking prevalence (%)^b									
<31 %	52.0 (50.9,53.2)	53.5 (52.3,54.7)	67.8 (66.7,68.9)	49.2 (48.1,50.4)	73.3 (72.2,74.3)	49.7 (48.5,50.9)	56.4 (55.3,57.6)	50.4 (49.3,51.6)	
≥31 %	38.9 (37.5,40.3)	43.4 (41.9,44.8)	61.6 (60.2,63.0)	45.8 (44.4,47.2)	66.7 (65.4,68.1)	44.6 (43.2,46.1)	52.6 (51.1,54.0)	47.7 (46.2,49.1)	
Geographic area within Europe^c									
Northern	54.2 (51.8,56.6)	64.4 (62.1,66.6)	84.4 (82.7,86.1)	57.9 (55.6,60.3)	87.6 (86.1,89.2)	56.2 (53.8,58.6)	69.1 (66.9,71.3)	61.2 (58.8,63.5)	
Western	43.1 (41.6,44.6)	44.3 (42.8,45.8)	59.5 (58.0,61.0)	42.0 (40.5,43.5)	66.1 (64.7,67.5)	44.0 (42.6,45.5)	47.8 (46.3,49.3)	41.2 (29.8,42.7)	
Southern	48.5 (46.9,50.1)	48.4 (46.8,49.8)	61.9 (60.3,63.4)	48.5 (46.9,50.1)	67.1 (65.6,68.6)	46.2 (44.7,47.8)	55.4 (53.8,57.0)	49.8 (48.3,51.4)	
Eastern	45.0 (42.7,47.3)	49.9 (47.6,52.2)	68.2 (66.0,70.3)	50.9 (48.6,53.2)	72.9 (70.8,74.9)	51.6 (49.2,53.9)	57.1 (54.8,59.3)	56.4 (54.1,58.6)	
GDP per capita (€) 2018^d									
>25,000 euros	48.0 (47.0,49.0)	50.1 (49.1,51.1)	65.0 (64.0,66.0)	47.6 (46.6,48.7)	70.5 (69.6,71.4)	47.5 (46.4,48.5)	54.9 (53.9,56.0)	48.3 (47.3,49.3)	
≤25,000 euros	42.5 (40.6,44.5)	47.2 (45.3,49.2)	66.7 (64.8,68.5)	48.7 (46.7,50.6)	71.3 (69.6,73.1)	48.6 (46.6,50.5)	54.8 (52.8,56.7)	53.1 (51.1,55.0)	
Socio-demographic index (SDI) (2017)^e									
High SDI	47.6 (46.7,48.6)	49.8 (48.9,50.8)	64.5 (63.6,65.4)	47.4 (46.4,48.3)	69.8 (69.0,70.7)	47.8 (46.9,48.8)	54.3 (53.4,55.3)	49.1 (48.1,50.0)	
High-middle SDI	38.8 (35.9,41.7)	45.8 (42.8,48.7)	73.8 (71.2,76.4)	52.4 (49.4,55.4)	78.9 (76.5,81.3)	46.3 (43.3,49.3)	60.4 (57.5,63.3)	51.9 (48.9,54.9)	

- ¹Tobacco Control Scale 2016 score: (Joossens and Raw, 2017) ≤50 (Bulgaria, Poland, Portugal, Latvia, Greece and Germany) and score>50 (England, Ireland, France, Romania, Italy and Spain).
- ²Country's total smoking prevalence: (Gillus et al., 2021) <30% (Ireland, Italy and England, Germany, Latvia and Poland) and ≥31% (Bulgaria, France, Greece, Portugal, Romania and Spain).
- ³United Nations M49 Standard Geographical areas: (United Nations, n.d.) Northern Europe (Ireland, Latvia and England), Western Europe (France and Germany), Southern Europe (Italy, Greece, Portugal and Spain) and Eastern Europe (Bulgaria, Poland and Romania).
- ⁴World Bank gross domestic product (GDP) per capita: (World Bank, n.d.) GDP per capita ≤25,000€ (Bulgaria, Latvia, Romania, Poland, Portugal and Greece) and GDP per capita >25,000€ (England, France, Germany, Ireland, Italy and Spain).
- ⁵Sociodemographic index (SDI): (Global Burden of Disease Collaborative Network, 2018) into High SDI (England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Spain) and middle-high SDI (Bulgaria, Portugal, Romania)

Association between support for smoke-free legislation in outdoor settings, secondhand smoke presence and smoking behaviour

We explored the association between support for outdoor smoke-free legislation among non-smokers and their report of SHS presence in each of the 12 European countries. A lower SHS presence was significantly associated with a higher support for smoke-free legislation in each of the countries (r_{sp} between -0.78 in Italy and -0.93 in Bulgaria), except for Latvia and Poland (Figure 3).

Additionally, we explored the association between smokers' support for smoke-free legislation in outdoor settings and their reported smoking in each of the 12 European countries. Similarly, a lower reported smoking was significantly associated with a higher support for smoke-free legislation in all countries (Figure 4).

Figure 3. Scatterplots of the correlation (Spearman’s r_{sp} correlation and p-value) between non-smokers’ support for smoke-free legislation in diverse outdoors settings and prevalence of secondhand smoke presence in 12 European countries – The TackSHS Survey, 2017-2018.

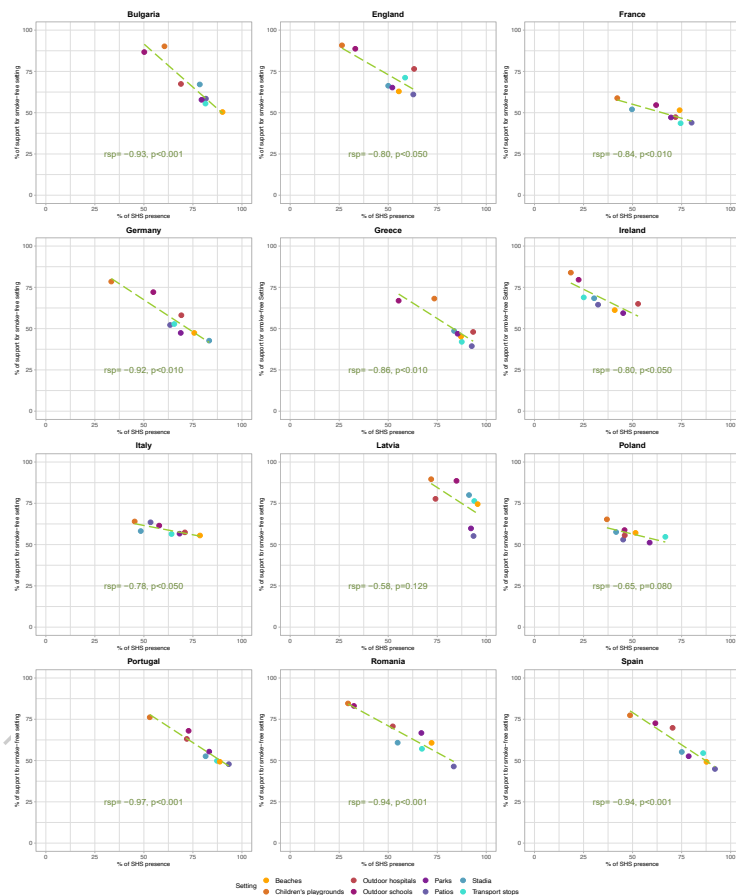
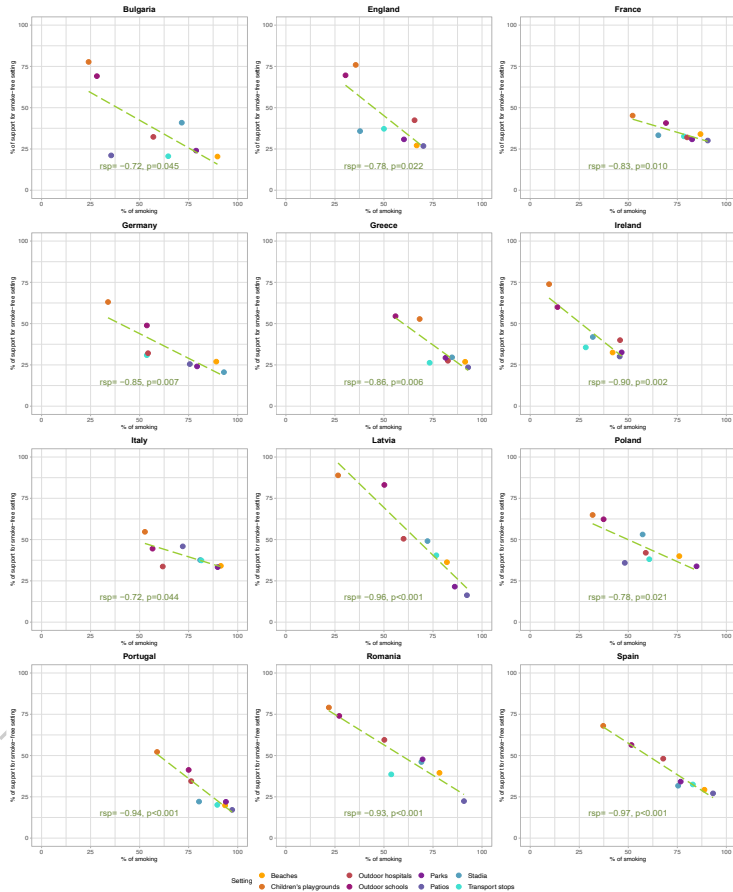


Figure 4. Scatterplots of the correlation (Spearman's r_{SP} correlation and p-value) between smokers' support for smoke-free legislation in diverse outdoors settings and reported smoking in 12 European countries – The TackSHS Survey, 2017-2018.



4. DISCUSSION

There is extensive support for the implementation of smoke-free legislation among non-smokers in this study, with the majority being in favour of smoke-free legislation in all indoor settings studied with only two exceptions: smoke-free legislation in private cars in Portugal (48.6%) and Poland (40.1%). Also, most non-smokers supported smoke-free legislation in outdoor settings in all countries, with exceptions in a few settings in Germany, France and Greece. Non-smokers' overall support, meaning the support of samples of all countries compiled, was higher than 75% for all indoor settings, apart from private cars/cars with minors, and higher than 50% for all outdoor settings. As expected, smokers' support for smoke-free legislation was lower than non-smokers' support; yet the level of support among smokers was also substantial, with the majority of the overall sample of smokers supporting smoke-free policy in all indoor settings and a considerable percentage supporting smoke-free outdoor settings.

Expectedly, our results also point to differences in support for smoke-free legislation across European countries and geographic regions. For most settings, the support for smoke-free legislation was directly correlated with the countries' geographic position within Europe, the prevalence of SHS presence, and the reported smoking among participants in each setting...

Non-smokers' support for smoke-free legislation was associated with prevalence of SHS presence and, although we have not tested this hypothesis here, it is very likely that the levels of support are also associated with the smoke-free legislation implemented in each country and with the levels of compliance. Our study adds to the body of research that shows an inverse association between the prevalence of SHS exposure and the support for smoke-free legislation (Feliu et al., 2019; Hyland et al., 2009; Mons et al., 2012) and more strict smoke-free legislation (Martínez-Sánchez et al., 2010).

Historically the demand for and implementation of smoke-free legislation has been associated with evidence of the harms caused by SHS exposure. Most of this evidence produced is relative to enclosed places, and so most of the smoke-free legislation implemented to date covers these indoor settings (IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2004). In more recent years, research has pointed that the prevalence of exposure to SHS in outdoor spaces (open and semi-open) is not negligible, especially in areas adjacent to enclosed settings where it is forbidden to smoke, highlighting the importance to extend smoke-free legislation to such areas (Fu et al., 2016; Sureda et al., 2018, 2013, 2012). Unsurprisingly, our results show that overall the population supported smoke-free legislation for indoor settings substantially more than for outdoor settings, as only a few countries have enacted legislation covering them, and therefore smoking is probably more normalised in these outdoor settings. However, our results show that the majority of non-smokers', who are 74.1% of the adult population across the 12 countries studied (Gallus et al., 2021), would be supportive of extending smoke-free legislation to these settings. Smokers, on the other hand, were less supportive of such legislation, and this lower support was associated to their reported smoking in these settings. Evidence points to the influence of smokers' support for smoke-free legislation and the levels of compliance with said policies (Fong et al., 2006; Francis et al., 2010). Therefore, it would be advisable to further investigate and manipulate other variables that might be associated with smokers' support, such as knowledge of secondhand smoke exposure harms and attitudes towards smoking, and design interventions to increase them (Nogueira et al., 2021).

Markedly, those legislations related to the protection of children, namely smoke-free playgrounds and outdoor areas of schools, were the settings with the highest level of support among all outdoor places assessed. Such association has also been pointed out in other studies with nationally representative samples (Fu et al., 2018; Gallus et al., 2012; Nogueira et al.,

2020). Additionally, support for protecting children inside cars was also high despite the fact that such restrictions would be applied to what some consider as a private setting, and that therefore it should not be regulated by the state (Rouch et al., 2010). Another study has also shown that support for the protection of children relates to tobacco control policy support and that this association was also true for smokers (Kuijpers et al., 2018). Considering that children continue to be exposed to high levels of SHS in such places (Henderson et al., 2021a, 2020), which points to the need for legislation to protect them, our study shows that the public opinion would be in favour of total smoking bans in playground, school entrances and private cars with minors.

In our study, given the cross-sectional nature of the data, we only explored the association of support with a few variables, therefore we did not have the intention to evaluate the causal factors of support for smoke-free legislation. However, we believe that it would be extremely beneficial for the advocacy of tobacco control to understand better the determinants of support and how we can influence public opinion, as some researchers point to it as a very influential (and sometimes underestimated) factor in policy adoption (Burstein, 1998).

Some limitations of this study merit consideration. Our results are based on self-reported data, collected in face-to-face interviews. This might have had implications on the results, more specifically when it comes to participants reporting support or opposition to smoke-free legislation, as social-desirability may be a source of bias. Additionally, it is important to mention that SHS presence and smoking was also based on participants' recollection of smoking/seeing someone smoking in the places and, therefore, recall bias might influence our results. Nevertheless, our study also has several strengths; it is based on representative samples of the adult population of the 12 countries studied, data on several diverse settings were

collected using a standardised questionnaire in all countries, making setting and cross-country comparisons possible.

5. CONCLUSIONS

In conclusion, our study demonstrates that there is a substantial support for smoke-free legislation, both for indoor and for selected outdoor settings in the 12 European countries studied. Considering that smoke-free legislation has not been implemented homogeneously in these countries, our results can be seen as an opportunity to advance legislation and protect the population from the harms of SHS exposure.

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REFERENCES

- Burstein, P., 2003. The Impact of Public Opinion on Public Policy: A Review and an Agenda. *Polit. Res. Q.* 56, 29–40. <https://doi.org/10.2307/3219881>
- Burstein, P., 1998. Bringing the Public Back In: Should Sociologists Consider the Impact of Public Opinion on Public Policy? *Soc. Forces* 77, 27–62. <https://doi.org/10.1093/sf/77.1.27>
- European Commission., 2018. Eurostat Database [WWW Document]. URL available: <https://ec.europa.eu/eurostat/data/database> (accessed 4.12.21).
- European Commission, 2009. Survey on tobacco. Analytical report. Flash Eurobarometer 253. [WWW Document]. URL <https://europa.eu/eurobarometer/api/deliverable/download/file?deliverableId=42428> (accessed 9.20.21).
- Feliu, A., Filippidis, F.T., Joossens, L., Fong, G.T., Vardavas, C.I., Baena, A., Castellano, Y., Martínez, C., Fernández, E., 2019. Impact of tobacco control policies on smoking prevalence and quit ratios in 27 European Union countries from 2006 to 2014. *Tob. Control* 28, 101–109. <https://doi.org/10.1136/tobaccocontrol-2017-054119>
- Fernández, E., López, M.J., Gallus, S., Semple, S., Clancy, L., Behrakis, P., Ruprecht, A., Gorini, G., López-Nicolás, Á., Radu-Loghin, C., Soriano, J.B., 2020. Tackling second-hand exposure to tobacco smoke and aerosols of electronic cigarettes: the TackSHS project protocol. *Gac. Sanit.* 34, 77–82. <https://doi.org/10.1016/j.gaceta.2019.07.002>
- Fong, G.T., Hyland, A., Borland, R., Hammond, D., Hastings, G., McNeill, A., Anderson, S., Cummings, K.M., Allwright, S., Mulcahy, M., Howell, F., Clancy, L., Thompson, M.E., Connolly, G., Driezen, P., 2006. Reductions in tobacco smoke pollution and increases in support for smoke-free public places following the implementation of comprehensive

- smoke-free workplace legislation in the Republic of Ireland: findings from the ITC Ireland/UK Survey. *Tob. Control* 15 Suppl 3, iii51-8.
<https://doi.org/10.1136/tc.2005.013649>
- Francis, J.A., Abramsohn, E.M., Park, H.-Y., 2010. Policy-driven tobacco control. *Tob. Control* 19 Suppl 1, i16–i20. <https://doi.org/10.1136/tc.2009.030718>
- Fu, M., Castellano, Y., Tigova, O., Mons, U., Agar, T., Kyriakos, C.N., Quah, A.C.K., Fong, G.T., Trofor, A.C., Przewoźniak, K., Zatoński, W.A., Demjén, T., Tountas, Y., Vardavas*, C.I., Fernández*, E., Consortium**, on behalf of the E.-P., 2018. Correlates of the support for smoke-free policies among smokers: A cross-sectional study in six European countries of the EUREST-PLUS ITC EUROPE SURVEYS. *Tob. Induc. Dis.* 16. <https://doi.org/10.18332/tid/103918>
- Fu, M., Fernández, E., Martínez-Sánchez, J.M., San Emeterio, N., Quirós, N., Sureda, X., Ballbè, M., Muñoz, G., Riccobene, A., Centrich, F., Saltó, E., López, M.J., 2016. Second-hand smoke exposure in indoor and outdoor areas of cafés and restaurants: Need for extending smoking regulation outdoors? *Environ. Res.* 148, 421–428.
<https://doi.org/10.1016/j.envres.2016.04.024>
- Gallus, S., Lugo, A., Liu, X., Behrakis, P., Boffi, R., Bosetti, C., Carreras, G., Chatenoud, L., Clancy, L., Contente, X., Dobson, R., Effertz, T., Filippidis, F.T., Fu, M., Geshanova, G., Gorini, G., Keogan, S., Ivanov, H., Lopez, M.J., Lopez-Nicolas, A., Precioso, J., Przewozniak, K., Radu-Loghin, C., Ruprecht, A., Semple, S., Soriano, J.B., Starchenko, P., Trapero-Bertran, M., Tigova, O., Tzortzi, A.S., Vardavas, C., Vyzikidou, V.K., Colombo, P., Fernandez, E., Investigators, the T.P., 2021. Who Smokes in Europe? Data From 12 European Countries in the TackSHS Survey (2017–2018). *J. Epidemiol.* 31, 145–151. <https://doi.org/10.2188/jea.JE20190344>
- Gallus, S., Rosato, V., Zuccaro, P., Pacifici, R., Colombo, P., Manzari, M., La Vecchia, C.,

2012. Attitudes towards the extension of smoking restrictions to selected outdoor areas in Italy. *Tob. Control* 21, 59–62. <https://doi.org/10.1136/tc.2010.040774>
- Gallus, S., Zuccaro, P., Colombo, P., Apolone, G., Pacifici, R., Garattini, S., La Vecchia, C., 2006. Effects of new smoking regulations in Italy. *Ann Oncol* 48 Suppl 1, S137-9. <https://doi.org/10.1590/s0036-36342006000700016>
- Global Burden of Disease Collaborative Network., 2018. Global Burden of Disease Study 2017 (GBD 2017) Socio-Demographic Index (SDI) 1950–2017. Seattle.
- Henderson, E., Contiente, X., Fernández, E., Tigova, O., Cortés-Francisco, N., Gallus, S., Lugo, A., Semple, S., O'Donnell, R., Clancy, L., Keogan, S., Ruprecht, A., Borgini, A., Tzortzi, A., Vyzikidou, V.K., Gorini, G., López-Nicolás, A., Soriano, J.B., Geshanova, G., Osman, J., Mons, U., Przewozniak, K., Precioso, J., Brad, R., López, M.J., 2021a. Secondhand smoke exposure in outdoor children's playgrounds in 11 European countries. *Environ. Int.* 149, 105775. <https://doi.org/https://doi.org/10.1016/j.envint.2020.105775>
- Henderson, E., Contiente, X., Fernández, E., Tigova, O., Cortés-Francisco, N., Gallus, S., Lugo, A., Semple, S., O'Donnell, R., Clancy, L., Keogan, S., Ruprecht, A., Borgini, A., Tzortzi, A., Vyzikidou, V.K., Gorini, G., López-Nicolás, A., Soriano, J.B., Geshanova, G., Osman, J., Mons, U., Przewozniak, K., Precioso, J., Brad, R., López, M.J., 2020. Secondhand smoke exposure and other signs of tobacco consumption at outdoor entrances of primary schools in 11 European countries. *Sci. Total Environ.* 743, 140743. <https://doi.org/https://doi.org/10.1016/j.scitotenv.2020.140743>
- Henderson, E., Lugo, A., Liu, X., Contiente, X., Fernández, E., López, M.J., Gallus, S., 2021b. Secondhand smoke presence in outdoor areas in 12 European countries. *Environ. Res.* 195, 110806. <https://doi.org/https://doi.org/10.1016/j.envres.2021.110806>
- Hyland, A., Higbee, C., Borland, R., Travers, M., Hastings, G., Fong, G.T., Cummings,

- K.M., 2009. Attitudes and beliefs about secondhand smoke and smoke-free policies in four countries: Findings from the International Tobacco Control Four Country Survey. *Nicotine Tob. Res.* 11, 642–649. <https://doi.org/10.1093/ntr/ntp063>
- IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2004. Tobacco smoke and involuntary smoking. *IARC Monogr. Eval. Carcinog. risks to humans* 83, 1–1438.
- Joossens, L., Raw, M., 2017. The tobacco control scale 2016 in Europe [WWW Document]. URL <https://www.tobaccocontrolscale.org/2016-edition/> (accessed 3.11.21).
- Kuijpers, T.G., Willemsen, M.C., Kunst, A.E., 2018. Public support for tobacco control policies: The role of the protection of children against tobacco. *Health Policy (New York)*. 122, 929–935. <https://doi.org/https://doi.org/10.1016/j.healthpol.2018.05.004>
- Martínez-Sánchez, J.M., Fernández, E., Fu, M., Gallus, S., Martínez, C., Sureda, X., La Vecchia, C., Clancy, L., 2010. Smoking behaviour, involuntary smoking, attitudes towards smoke-free legislations, and tobacco control activities in the European Union. *PLoS One* 5, e13881. <https://doi.org/10.1371/journal.pone.0013881>
- Mons, U., Nagelhout, G.E., Guignard, R., McNeill, A., van den Putte, B., Willemsen, M.C., Brenner, H., Pötschke-Langer, M., Breitling, L.P., 2012. Comprehensive smoke-free policies attract more support from smokers in Europe than partial policies. *Eur. J. Public Health* 22, 10–16. <https://doi.org/10.1093/eurpub/ckr202>
- Naghelout, G.E., de Vries, H., Fong, G.T., Candel, M.J.J.M., Thrasher, J.F., van den Putte, B., Thompson, M.E., Cummings, K.M., Willemsen, M.C., 2012. Pathways of change explaining the effect of smoke-free legislation on smoking cessation in The Netherlands. An application of the international tobacco control conceptual model. *Nicotine Tob. Res. Off. J. Soc. Res. Nicotine Tob.* 14, 1474–1482. <https://doi.org/10.1093/ntr/nts081>

- Nogueira, S.O., Driezen, P., Fu, M., Hitchman, S.C., Tigova, O., Castellano, Y., Kyriakos, C.N., Zatoński, M.Z., Mons, U., Quah, A.C.K., Demjén, T., Trofor, A.C., Przewoźniak, K., Katsaounou, P., Fong, G., Vardavas, C.I., Fernández, E., 2021. Beyond the European Union Tobacco Products Directive: smokers' and recent quitters' support for further tobacco control measures (2016–2018). *Tob. Control tobaccocontrol-2020-056177*.
<https://doi.org/10.1136/tobaccocontrol-2020-056177>
- Nogueira, S.O., Tigova, O., Driezen, P., Fu, M., Kyriakos, C.N., Zatoński, M., Mons, U., Quah, A.C.K., Demjén, T., Trofor, A.C., Przewoźniak, K., Katsaounou, P.A., Fong, G.T., Vardavas, C.I., Fernández, E., 2020. Do smokers want to protect non-smokers from the harms of second-hand smoke in cars? Findings from the EUREST-PLUS ITC Europe Surveys. *Eur. J. Public Health* 30, iii108–iii112.
<https://doi.org/10.1093/eurpub/ckaa056>
- Pacheco, J., 2012. The Social Contagion Model: Exploring the Role of Public Opinion on the Diffusion of Antismoking Legislation across the American States. *J. Polit.* 74, 187–202.
<https://doi.org/10.1017/S0022381611001241>
- Rouch, G., Thomson, G., Wilson, N., Hudson, S., Edwards, R., Gifford, H., Lanumata, T., 2010. Public, private and personal: Qualitative research on policymakers' opinions on smokefree interventions to protect children in "private" spaces. *BMC Public Health* 10, 797. <https://doi.org/10.1186/1471-2458-10-797>
- Saloojee, Y., Dagli, E., 2000. Tobacco industry tactics for resisting public policy on health. *Bull. World Health Organ.* 78, 902–910.
- Sureda, X., Bilal, U., Fernández, E., Valiente, R., Escobar, F.J., Navas-Acien, A., Franco, M., 2018. Second-hand smoke exposure in outdoor hospitality venues: Smoking visibility and assessment of airborne markers. *Environ. Res.* 165, 220–227.
<https://doi.org/10.1016/j.envres.2018.04.024>

- Sureda, X., Fernández, E., López, M.J., Nebot, M., 2013. Secondhand tobacco smoke exposure in open and semi-open settings: a systematic review. *Environ. Health Perspect.* 121, 766–773. <https://doi.org/10.1289/ehp.1205806>
- Sureda, X., Martínez-Sánchez, J.M., López, M.J., Fu, M., Agüero, F., Saltó, E., Nebot, M., Fernández, E., 2012. Secondhand smoke levels in public building main entrances: outdoor and indoor PM2.5 assessment. *Tob. Control* 21, 543–548. <https://doi.org/10.1136/tobaccocontrol-2011-050040>
- U.S. Department of Health and Human Services, 2006. *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General*. Atlanta, Georgia.
- United Nations, n.d. UNSD — methodology. [WWW Document]. URL <https://unstats.un.org/unsd/%0Amethodology/m49/> (accessed 3.11.21).
- World Bank, n.d. GDP per capita (current US\$) [WWW Document]. URL <http://data.worldbank.org/indicator/ny.gdp.pcap.cd> (accessed 3.11.21).
- World Health Organization, 2003. *WHO Framework Convention on Tobacco Control*. [WWW Document]. URL <http://www.who.int/fctc/en> (accessed 2.21.18).
- Zhou, L., Niu, L., Jiang, H., Jiang, C., Xiao, S., 2016. Facilitators and Barriers of Smokers' Compliance with Smoking Bans in Public Places: A Systematic Review of Quantitative and Qualitative Literature. *Int. J. Environ. Res. Public Heal.* . <https://doi.org/10.3390/ijerph13121228>

Supplementary Table 1. National smoke-free legislation in indoor and outdoor settings in 12 European countries in 2018.

Settings	Bulgaria	England	France	Germany	Greece	Ireland	Italy	Latvia	Poland	Portugal	Romania	Spain
INDOOR												
Restaurants and bars	■	■	■	■	■	■	■	■	■	■	■	■
Disco/clubs/indoor arenas	■	■	■	■	■	■	■	■	■	■	■	■
Train stations	■	■	■	■	■	■	■	■	■	■	■	■
Workplaces	■	■	■	■	■	■	■	■	■	■	■	■
Private cars	■	■	■	■	■	■	■	■	■	■	■	■
Private cars with minors	■	■	■	■	■	■	■	■	■	■	■	■
Restaurant/bar patios	■	■	■	■	■	■	■	■	■	■	■	■
Tram/bus/subway stops	■	■	■	■	■	■	■	■	■	■	■	■
Outdoor areas of hospitals	■	■	■	■	■	■	■	■	■	■	■	■
Outdoor areas of schools	■	■	■	■	■	■	■	■	■	■	■	■
Parks	■	■	■	■	■	■	■	■	■	■	■	■
Children's playgrounds	■	■	■	■	■	■	■	■	■	■	■	■
Stadiums/outdoor arenas	■	■	■	■	■	■	■	■	■	■	■	■
Beaches	■	■	■	■	■	■	■	■	■	■	■	■
OUTDOOR												

■ Total smoking ban ■ Partial smoking ban ■ No smoking ban

Source: <https://www.smokefreepartnership.eu/smokefree-map>

Supplementary Table 2. Sociodemographic characteristics of sample of the 12 European countries aged ≥ 15 years, the TackSHS survey, 2017-2018 (Total: 11,902)

	Unweighted sample size
Country	
Bulgaria	1,050
France	1,018
Germany	1,031
Greece	1,000
Ireland	941
Italy	1,059
Latvia	1,022
Poland	724
Portugal	1,000
Romania	1,018
Spain	1,026
England	1,013
Sex	
Women	6,270
Men	5,632
Age group (years)	
<25	1,446
25-44	4,079
45-64	4,330
≥ 65	2,047
Level of education	
Low	3,241
Intermediate	4,172
High	4,486
Smoking Status	
Non-smokers	8,562
Smokers	3,340
Geographic area within Europe	
Northern	2,976
Western	2,049
Southern	4,085
Eastern	2,792
GDP per capita (€) 2018	
>25,000 euros	6,088
$\leq 25,000$ euros	5,814
Tobacco Control Scale 2016	
>50 points	6,075
≤ 50 points	5,827
Sociodemographic index (SDI) (2017)	
High SDI	8,834
High-middle SDI	3,068
Smoking prevalence	
<31 %	5,790
≥ 31 %	6,112

Supplementary table 3. Non-smokers' and smokers' support for smoke-free legislation in indoor settings in 12 European countries, the TackSHS survey, 2017-2018.

	Restaurants and bars (%)		Disco/clubs (%)		Train stations (%)		Workplaces (%)		Cars (%)		Cars with minors (%)	
	Non-smoker	Smokers	Non-smokers	Smokers	Non-smokers	Smokers	Non-smokers	Smokers	Non-smokers	Smokers	Non-smokers	Smokers
Bulgaria	80.8	42.9	77.8	37.4	84.1	67.1	93.1	75.4	54.4	23.6	83.7	64.4
France	70.8	68.3	70.8	67.8	66.8	59.2	68.6	63.6	53.1	37.9	60.4	58.6
Germany	84.5	61.1	- (*)	- (*)	80.8	60.5	84.2	61.0	67.7	38.9	85.4	67.7
Greece	75.6	68.6	74.8	63.1	81.6	79.8	82.1	77.2	64.8	51.2	81.6	79.8
Ireland	89.3	73.5	88.4	74.1	88.0	73.0	90.2	76.9	78.2	48.9	88.4	80.2
Italy	68.4	62.0	69.8	59.5	66.4	58.8	69.2	66.8	62.3	38.1	68.0	63.3
Latvia	80.8	43.5	82.8	52.9	87.3	73.7	88.4	65.8	58.7	23.7	88.6	86.8
Poland	60.5	54.3	58.8	44.8	63.2	54.1	61.6	56.6	40.1	30.4	59.8	56.8
Portugal	81.5	42.7	73.8	37.8	89.4	70.7	89.2	71.7	48.6	21.0	76.7	51.4
Romania	81.6	56.9	81.5	61.7	83.8	72.2	86.5	72.3	74.7	51.4	87.7	76.1
Spain	80.6	61.2	80.6	63.8	81.4	71.4	82.8	72.3	59.8	41.9	79.4	68.4
England	91.8	66.7	91.2	64.0	91.8	68.3	92.2	69.2	- (*)	- (*)	- (*)	- (*)
Total	77.6	61.4	75.3	60.0	76.7	64.0	78.5	66.5	59.8	38.5	73.9	64.9

*Data for support for smoking bars in Germany inside disco/clubs and data on cars and cars with minors in England were not collected. Differences between non-smokers and smokers were assessed using chi square test. **NON-SIGNIFICANT DIFFERENCES ARE SHOWN IN BOLD.**

Supplementary table 4. Non-smokers' and smokers' support for smoke-free legislation in outdoor settings in 12 European countries, the TackSHS survey, 2017-2018.

	Restaurants/bars/pubs (%)		Tram/bus/subway stops (%)		Outdoor areas of schools (%)		Parks (%)		Children's playground (%)		Beaches (%)		Outdoor areas of hospitals (%)		Stadium (%)	
	Non-smoker	Smokers	Non-smokers	Smokers	Non-smokers	Smokers	Non-smokers	Smokers	Non-smokers	Smokers	Non-smokers	Smokers	Non-smokers	Smokers	Non-smokers	Smokers
Bulgaria	58.5	21.1	55.5	20.6	86.7	69.1	57.8	24.0	90.2	77.7	50.4	20.4	67.4	32.3	67.1	40.9
France	43.9	30.1	43.6	32.6	54.6	40.7	47.1	30.8	58.8	45.2	51.5	34.0	47.3	32.0	52.0	33.3
Germany	52.2	25.5	52.8	30.9	72.1	48.9	47.4	24.1	78.5	63.1	47.4	27.0	58.1	32.1	42.7	20.6
Greece	39.4	23.5	42.0	26.3	66.9	54.5	46.9	29.3	68.2	52.8	45.2	26.9	48.0	27.5	48.6	29.6
Ireland	64.5	30.1	68.9	35.6	79.6	60.0	59.4	32.6	83.9	73.9	61.2	32.5	65.0	40.0	68.4	41.9
Italy	63.5	45.9	56.4	37.4	61.5	44.5	56.6	33.3	64.0	54.7	55.5	34.1	57.4	33.7	58.2	37.6
Latvia	55.2	16.3	76.4	40.5	88.6	83.1	59.8	21.5	89.6	88.9	74.5	36.3	77.7	50.5	80.0	49.1
Poland	53.0	35.9	54.7	38.1	58.8	62.3	51.2	33.8	65.3	64.9	57.1	40.0	55.6	42.0	57.6	52.1
Portugal	47.8	17.1	49.8	20.1	68.0	41.3	55.4	22.0	76.2	52.2	49.3	19.8	63.1	34.5	52.6	22.1
Romania	46.4	22.4	57.1	38.6	83.1	74.0	66.7	47.7	84.6	79.1	60.7	39.5	70.7	59.5	60.8	46.1
Spain	44.9	27.1	54.5	32.5	72.6	56.4	52.6	34.2	77.4	68.0	49.2	29.3	69.8	48.1	55.2	31.7
England	61.0	26.8	71.2	37.2	88.7	69.6	65.2	30.8	90.8	75.9	62.9	27.1	76.5	42.4	66.3	35.8
Total	53.0	29.2	55.2	33.2	69.5	53.3	53.7	31.1	73.8	61.7	53.6	31.0	60.7	38.3	54.8	33.7

Differences between non-smokers and smokers was assessed using chi square test; **NON-SIGNIFICANT DIFFERENCES ARE SHOWN IN BOLD.**

Supplementary Table 5. General population support for smoke-free legislation in indoor in 12 European

	Bulgaria	France	Germany	Greece	Ireland	Italy	Latvia	Poland	Portugal	Romania	Spain	England
	%	%	%	%	%	%	%	%	%	%	%	%
Restaurants/bars												
SF	42.7	43.2	54.9	62.0	72.2	41.4	43.6	40.1	48.7	60.9	68.3	78.4
MF	23.6	26.8	24.1	11.3	14.0	25.8	26.5	18.9	18.5	12.2	6.1	8.5
MA	19.0	11.1	11.5	8.3	4.9	10.9	19.5	21.8	15.2	11.9	7.8	5.5
SA	14.7	18.9	9.5	18.5	8.9	22.0	10.5	19.2	17.7	15.1	17.8	7.6
Discos/clubs												
SF	40.1	47.1	.	60.6	74.0	42.2	48.0	33.9	42.4	62.8	69.6	77.4
MF	22.4	22.8	.	10.3	11.5	25.6	26.4	21.8	18.1	12.0	5.6	8.5
MA	21.1	10.4	.	8.5	5.5	10.8	16.9	20.5	15.6	8.1	5.8	6.3
SA	16.4	19.7	.	20.7	9.0	21.4	8.6	23.8	23.9	17.1	19.0	7.8
Train stations												
SF	58.3	43.1	53.8	74.3	71.4	40.5	62.0	42.2	65.3	68.1	73.3	77.3
MF	19.4	21.4	22.2	6.7	13.8	24.5	21.5	18.9	17.2	11.8	4.9	9.9
MA	14.8	13.9	13.6	3.0	5.2	13.1	9.4	18.2	5.4	6.6	3.6	5.4
SA	7.5	21.7	10.3	16.0	9.7	22.0	7.1	20.7	12.1	13.6	18.3	7.4
Workplaces												
SF	65.2	49.5	59.1	74.2	76.0	47.2	61.4	45.6	67.0	75.4	74.8	79.4
MF	21.2	17.6	19.6	6.3	11.6	21.5	20.7	14.8	15.8	6.3	4.6	8.3
MA	7.4	10.8	10.6	3.6	4.0	8.5	9.2	14.6	3.9	6.0	3.5	5.0
SA	6.2	22.1	10.7	15.9	8.4	22.8	8.7	25.0	13.3	12.4	17.1	7.3
Cars												
SF	27.8	25.5	45.0	51.6	59.4	36.8	32.3	25.2	26.3	57.7	46.7	.
MF	14.5	22.8	15.9	8.7	13.0	20.9	16.3	12.7	12.1	9.0	7.4	.
MA	27.0	19.6	18.2	8.8	10.6	16.9	20.5	29.4	17.0	9.2	9.9	.
SA	30.7	32.1	21.0	31.0	17.0	25.4	30.9	32.8	44.6	24.2	36.0	.
Cars with minors												
SF	53.2	37.3	61.1	76.8	74.8	44.6	68.5	43.7	52.9	79.8	69.2	.
MF	23.1	22.6	20.1	4.2	12.0	22.5	19.6	15.4	14.5	4.0	6.7	.
MA	11.9	14.1	7.3	2.8	4.0	10.2	3.5	15.4	9.6	4.0	3.9	.
SA	11.8	26.0	11.5	16.2	9.3	22.7	8.3	25.5	23.1	12.2	20.2	.

countries, the TackSHS survey, 2017-2018.

SF=strongly in favour; MF=moderately in favour; MA=moderately against; SA=strongly against

*Note: information about discos/clubs in Germany and about cars and cars with minors in England are not available.

Supplementary Table 6. Non-smokers' support for smoke-free legislation in indoor settings in 12 European countries, the TackSHS survey, 2017-2018.

	Bulgaria	France	Germany	Greece	Ireland	Italy	Latvia	Poland	Portugal	Romania	Spain	England
	%	%	%	%	%	%	%	%	%	%	%	%
Restaurants/bars												
SF	56.1	48.3	62.3	67.1	77.2	44.2	52.0	45.7	62.3	71.9	74.4	84.7
MF	24.7	22.5	22.2	8.5	12.2	24.2	28.8	14.8	19.3	9.7	6.2	7.1
MA	13.2	8.3	7.7	5.5	3.0	9.7	11.9	18.9	7.5	8.1	6.3	2.8
SA	6.0	20.9	7.9	18.9	7.7	22.0	7.4	20.7	11.0	10.3	13.1	5.4
Discos/clubs												
SF	52.7	50.9	.	66.6	78.7	44.9	55.9	39.6	55.3	69.4	75.2	83.9
MF	25.1	19.9	.	8.2	9.7	24.9	26.9	19.2	18.5	12.1	5.5	7.2
MA	15.5	8.5	.	4.7	4.0	10.1	10.6	17.8	9.3	5.6	3.8	3.4
SA	6.7	20.7	.	20.5	7.6	20.1	6.6	23.4	16.9	12.9	15.6	5.5
Train stations												
SF	65.8	48.7	59.3	76.1	75.8	43.2	67.9	47.9	75.4	72.5	75.7	84.1
MF	18.3	18.1	21.5	5.5	12.1	23.2	19.3	15.3	14.0	11.4	5.7	7.8
MA	11.0	11.0	10.1	2.0	4.0	11.6	5.8	14.1	2.5	4.7	3.5	2.7
SA	5.0	22.3	9.1	16.4	8.0	22.1	7.0	22.6	8.1	11.5	15.2	5.5
Workplaces												
SF	73.9	55.7	66.3	78.9	80.6	48.3	69.2	49.5	76.4	80.6	78.6	86.0
MF	19.2	12.9	17.8	3.2	9.7	20.9	19.2	12.1	12.9	6.0	4.1	6.1
MA	3.9	8.8	7.4	2.4	2.7	7.3	3.0	11.1	1.4	2.4	3.0	2.7
SA	3.0	22.6	8.4	15.5	7.0	23.5	8.6	27.3	9.4	11.1	14.2	5.1
Cars												
SF	36.5	29.7	51.7	56.5	65.6	41.8	40.3	30.2	34.7	66.8	51.0	.
MF	17.9	23.4	16.1	8.4	12.6	20.5	18.4	9.9	14.0	7.8	8.9	.
MA	27.4	19.2	17.6	6.2	8.1	14.3	17.3	29.5	16.5	6.9	10.9	.
SA	18.2	27.7	14.7	29.0	13.8	23.5	24.0	30.4	34.8	18.4	29.3	.
Cars with minors												
SF	63.5	42.3	68.1	77.5	77.4	46.3	72.5	45.5	60.9	85.0	73.2	.
MF	20.1	18.1	17.3	4.1	10.9	21.7	16.1	14.3	15.8	2.8	6.2	.
MA	9.7	13.7	4.7	1.7	3.2	9.5	2.4	12.8	6.1	1.9	3.2	.
SA	6.6	25.8	9.9	16.7	8.5	22.5	9.0	27.4	17.2	10.4	17.5	.

SF=strongly in favour; MF=moderately in favour; MA=moderately against; SA=strongly against

*Note: information about discos/clubs in Germany and about cars and cars with minors in England are not available.

Supplementary table 7. Smokers' support for smoke-free legislation in indoor settings in 12 European countries, the TackSHS survey, 2017-2018.

	Bulgaria	France	Germany	Greece	Ireland	Italy	Latvia	Poland	Portugal	Romania	Spain	England
	%	%	%	%	%	%	%	%	%	%	%	%
Restaurants/bars												
SF	21.0	31.7	30.7	51.8	51.8	29.4	22.6	21.7	25.5	39.9	55.2	52.2
MF	22.0	36.5	30.4	16.8	21.7	32.7	20.8	32.6	17.1	16.9	6.0	14.5
MA	28.4	17.3	24.0	13.8	13.0	16.1	38.4	31.5	28.3	19.0	10.9	16.7
SA	28.7	14.4	14.9	17.7	13.5	21.9	18.2	14.2	29.1	24.2	27.9	16.7
Discos/clubs												
SF	19.4	38.5	–*	48.7	54.9	31.0	27.7	14.1	20.4	50.1	57.8	50.0
MF	18.0	29.2	–*	14.4	19.1	28.5	25.2	30.6	17.4	11.6	5.9	14.0
MA	30.2	14.6	–*	15.9	11.4	13.8	33.3	29.8	26.4	13.0	10.0	18.5
SA	32.4	17.6	–*	21.0	14.5	26.7	13.9	25.4	35.9	25.3	26.2	17.4
Train stations												
SF	45.8	30.4	36.1	70.5	52.5	28.9	46.6	23.4	48.1	59.6	68.0	49.7
MF	21.3	28.8	24.4	9.2	20.6	29.9	27.0	30.7	22.6	12.6	3.4	18.5
MA	21.1	20.4	25.0	5.1	10.4	19.6	18.9	31.4	10.3	10.3	3.7	16.4
SA	11.7	20.4	14.5	15.2	16.5	21.6	7.5	14.5	19.0	17.5	24.9	15.3
Workplaces												
SF	50.8	35.4	35.7	64.9	57.3	42.3	41.1	32.9	51.0	65.3	66.6	52.1
MF	24.6	28.3	25.4	12.3	19.7	24.5	24.7	23.7	20.7	6.9	5.7	17.0
MA	13.2	15.3	20.7	6.0	9.2	13.4	25.3	25.9	8.2	12.8	4.6	14.4
SA	11.4	21.1	18.3	16.8	13.9	19.9	9.0	17.5	20.2	15.0	23.1	16.5
Cars												
SF	14.4	16.3	23.6	41.9	34.5	15.6	12.6	9.2	12.0	40.2	37.7	–*
MF	9.3	21.6	15.3	9.3	14.5	22.6	11.0	21.3	9.0	11.1	4.2	–*
MA	26.4	20.3	19.9	13.8	20.8	28.1	28.2	29.2	17.8	13.5	8.0	–*
SA	50.0	41.8	41.2	35.0	30.2	33.8	48.1	40.4	61.2	35.2	50.1	–*
Cars with minors												
SF	36.6	26.1	38.6	75.3	63.8	37.2	57.5	37.7	39.1	69.8	60.6	–*
MF	27.9	32.6	29.1	4.5	16.4	26.1	29.3	19.1	12.2	6.3	7.8	–*
MA	15.4	15.0	15.9	5.1	7.4	13.3	6.5	23.9	15.5	8.2	5.6	–*
SA	20.2	26.4	16.4	15.2	12.4	23.4	6.7	19.3	33.2	15.8	26.0	–*

SF=strongly in favour; MF=moderately in favour; MA= moderately against; SA= strongly against

*Note: information about discos/clubs in Germany and about cars and cars with minors in England are not available.

Supplementary table 8. General population support for smoke-free legislation in outdoor settings in 12 European countries, the TackSHS survey, 2017-2018.

	Bulgaria	France	Germany	Greece	Ireland	Italy	Latvia	Poland	Portugal	Romania	Spain	England
	%	%	%	%	%	%	%	%	%	%	%	%
Restaurants/bars patios												
SF	25.3	16.2	24.4	20.6	39.7	34.2	22.5	29.9	22.3	25.5	25.5	40.8
MF	18.8	23.3	21.5	13.4	17.9	26.0	21.6	18.9	14.1	12.6	13.6	13.5
MA	30.2	31.0	30.1	22.4	20.1	17.2	32.4	26.0	18.3	22.5	20.6	19.2
SA	25.6	29.4	24.0	43.6	22.3	22.6	23.6	25.2	45.2	39.5	40.3	26.6
Tram/bus/subway stops												
SF	24.8	18.5	23.4	22.2	43.3	25.6	41.4	33.8	24.1	38.8	30.6	48.1
MF	17.5	21.6	24.2	14.5	18.9	27.1	25.1	17.1	14.8	11.9	16.8	16.4
MA	32.1	31.9	30.7	19.7	19.4	24.0	20.2	26.8	17.6	18.5	18.6	15.1
SA	25.6	28.0	21.7	43.6	18.4	23.3	13.4	22.4	43.5	30.8	33.9	20.4
Outdoor areas of schools												
SF	62.4	27.9	45.6	51.5	58.3	32.9	69.6	45.2	40.1	73.6	53.6	75.6
MF	17.7	22.3	21.0	11.2	17.6	25.4	17.5	14.4	18.1	6.4	13.8	9.4
MA	11.0	22.6	18.5	10.9	11.8	18.0	4.0	14.6	13.5	5.8	13.2	5.2
SA	9.0	27.1	14.9	26.4	12.5	23.7	9.0	25.9	28.3	14.2	19.4	9.8
Parks												
SF	28.5	19.0	20.4	26.9	35.0	25.2	29.0	25.7	27.1	48.1	31.5	43.1
MF	16.4	23.1	21.5	14.0	19.1	26.9	19.8	21.4	16.0	12.0	15.2	15.5
MA	30.2	29.1	33.9	18.3	21.8	22.8	32.9	27.6	18.4	17.1	20.3	16.5
SA	24.8	28.8	24.2	40.8	24.2	25.2	18.3	25.3	38.5	22.7	33.0	24.9
Children's playground												
SF	65.3	32.4	54.9	52.7	65.0	36.1	74.1	48.7	50.6	76.4	63.3	79.5
MF	20.2	22.2	20.0	10.3	17.0	26.1	15.3	16.5	16.8	6.3	11.1	8.5
MA	7.6	17.7	11.7	10.9	7.4	13.9	2.8	11.3	12.7	4.4	9.3	3.7
SA	6.9	27.7	13.5	26.1	10.7	23.8	7.8	23.5	20.0	12.9	16.3	8.3
Beaches												
SF	21.3	21.1	21.2	23.9	34.3	27.6	42.5	34.7	24.5	42.0	25.6	39.9
MF	17.5	24.9	21.4	15.1	21.1	23.8	21.1	18.4	13.9	11.5	17.3	16.1
MA	32.1	25.4	32.8	19.3	19.9	23.9	20.6	22.2	18.0	17.0	16.7	14.7
SA	29.1	28.7	24.6	41.7	24.6	24.7	15.9	24.8	43.6	29.6	40.4	29.4
Outdoor areas of hospitals												
SF	32.8	21.0	29.7	28.8	42.3	28.6	50.3	36.5	33.4	58.4	42.9	55.9
MF	21.3	21.5	22.2	12.3	17.8	24.2	19.9	15.9	19.2	8.4	19.9	13.9
MA	27.6	29.4	28.2	19.1	20.2	24.0	15.5	24.0	16.5	12.5	14.3	12.1
SA	18.3	28.1	19.9	39.8	19.7	23.2	14.4	23.6	31.0	20.6	22.9	18.1
Stadium												
SF	36.2	22.2	18.6	27.6	44.2	28.1	52.4	35.3	24.7	44.0	30.6	45.7
MF	21.0	24.0	18.8	14.6	19.0	26.2	18.8	21.2	16.7	11.8	17.0	15.0
MA	25.1	25.2	34.3	18.0	19.6	23.0	15.7	19.4	18.9	16.6	17.7	15.7
SA	17.7	28.6	28.3	39.7	17.3	22.7	13.1	24.1	39.8	27.6	34.7	23.7

SF=strongly in favour; MF=moderately in favour; MA= moderately against; SA= strongly against

Supplementary table 9. Non-smokers' support for smoke-free legislation in outdoor settings in 12 European countries, the TackSHS survey, 2017-2018.

	Bulgaria	France	Germany	Greece	Ireland	Italy	Latvia	Poland	Portugal	Romania	Spain	England
	%	%	%	%	%	%	%	%	%	%	%	%
Restaurants/bars patios												
SF	34.3	17.4	28.5	22.1	44.4	36.8	28.4	35.6	27.6	32.2	27.4	46.5
MF	24.2	26.4	23.7	17.4	20.0	26.7	26.9	17.3	20.2	14.3	17.4	14.5
MA	28.7	33.7	29.9	23.4	18.8	14.8	29.9	23.1	25.2	24.8	25.1	17.6
SA	12.8	22.5	18.0	37.1	16.7	21.6	14.9	24.0	27.0	28.8	30.1	21.5
Tram/bus/subway stops												
SF	32.9	20.2	26.6	24.0	48.4	28.7	49.7	38.9	30.0	45.0	34.8	53.5
MF	22.6	23.4	26.1	17.9	20.5	27.6	26.7	15.9	19.8	12.1	19.8	17.7
MA	30.9	33.8	30.7	20.7	17.4	23.7	14.0	24.6	23.3	20.3	20.3	12.6
SA	13.6	22.7	16.5	37.4	13.7	20.0	9.7	20.7	26.8	22.6	25.2	16.3
Outdoor areas of schools												
SF	68.1	32.5	51.7	55.8	62.1	35.9	73.7	47.4	48.8	76.4	58.0	80.6
MF	18.6	22.1	20.4	11.1	17.5	25.6	14.9	11.4	19.2	6.7	14.6	8.2
MA	8.5	21.5	16.8	10.1	9.6	17.1	2.7	12.8	14.0	4.9	11.1	3.9
SA	4.8	23.9	11.0	23.0	10.8	21.4	8.7	28.4	18.0	12.1	16.3	7.4
Parks												
SF	37.5	22.9	23.0	31.2	39.6	29.0	36.4	29.6	34.0	54.2	34.3	48.4
MF	20.3	24.2	24.4	15.7	19.9	27.5	23.4	21.6	21.4	12.5	18.3	16.9
MA	27.9	28.5	34.5	16.7	21.5	21.1	30.5	23.4	19.7	14.7	19.9	16.0
SA	14.4	24.4	18.1	36.4	19.0	22.3	9.7	25.5	24.9	18.6	27.6	18.8
Children's playground												
SF	72.9	37.3	60.0	56.8	68.2	39.6	77.1	52.0	58.7	79.5	66.2	83.7
MF	17.3	21.5	18.6	11.5	15.7	24.4	12.5	13.3	17.5	5.1	11.1	7.2
MA	5.0	15.4	9.8	9.0	6.4	12.9	1.9	10.4	12.4	3.6	7.7	2.8
SA	4.8	25.9	11.7	22.8	9.7	23.1	8.5	24.3	11.5	11.8	14.9	6.4
Beaches												
SF	28.4	25.4	24.2	26.8	39.2	31.2	51.4	38.4	30.4	47.9	28.7	45.5
MF	22.0	26.1	23.2	18.4	22.0	24.3	23.2	18.7	18.9	12.8	20.6	17.4
MA	32.9	24.2	33.8	19.9	18.1	23.0	15.3	18.5	23.2	17.4	19.2	13.6
SA	16.8	24.3	18.8	34.9	20.7	21.6	10.2	24.4	27.5	22.0	31.6	23.6
Outdoor areas of hospitals												
SF	41.3	23.5	33.9	33.0	47.1	32.3	57.4	41.8	41.5	62.4	48.0	62.6
MF	26.1	23.8	24.3	15.0	17.9	25.1	20.3	13.7	21.6	8.3	21.8	13.9
MA	23.4	29.7	28.4	18.8	18.8	21.7	10.1	21.8	17.2	12.6	13.1	10.3
SA	9.2	23.1	13.5	33.2	16.2	20.9	12.3	22.6	19.7	16.7	17.1	13.2
Stadium												
SF	45.5	26.3	22.4	31.2	48.7	31.3	60.5	37.7	31.0	48.8	34.4	50.9
MF	21.7	25.7	20.3	17.5	19.7	27.0	19.4	19.9	21.6	12.0	20.8	15.4
MA	22.4	23.3	35.2	17.3	18.2	20.3	10.7	18.2	21.9	16.8	19.6	14.5
SA	10.5	24.7	22.2	34.0	13.5	21.5	9.4	24.2	25.4	22.4	25.3	19.2

SF=strongly in favour; MF=moderately in favour; MA= moderately against; SA= strongly against

Supplementary table 10. Smokers' support for smoke-free legislation in outdoor settings in 12 European countries, the TackSHS survey, 2017-2018.

	Bulgaria	France	Germany	Greece	Ireland	Italy	Latvia	Poland	Portugal	Romania	Spain	England
	%	%	%	%	%	%	%	%	%	%	%	%
Restaurants/bars patios												
SF	10.9	13.6	11.2	17.9	20.9	22.9	7.8	12.0	13.3	13.0	21.5	17.4
MF	10.2	16.5	14.3	5.7	9.3	23.0	8.5	23.9	3.8	9.5	5.6	9.5
MA	32.7	25.2	31.0	20.2	25.1	27.3	38.7	35.0	6.5	18.0	11.1	25.8
SA	46.3	44.7	43.5	56.3	44.8	26.8	45.0	29.1	76.4	59.6	61.8	47.4
Tram/bus/subway stops												
SF	11.5	14.8	12.8	18.5	22.9	12.4	19.7	17.0	13.9	27.0	21.9	26.2
MF	9.1	17.7	18.1	7.8	12.6	25.0	20.8	21.1	6.3	11.6	10.6	11.0
MA	34.1	27.7	30.8	17.9	27.2	25.1	36.6	34.0	7.9	15.1	15.2	25.7
SA	45.3	39.7	38.3	55.8	37.2	37.5	22.9	27.9	72.0	46.4	52.3	37.2
Outdoor areas of schools												
SF	52.9	18.0	26.2	43.2	42.4	19.7	59.0	37.5	25.3	68.3	44.4	55.0
MF	16.2	22.8	22.8	11.3	17.6	24.8	24.1	24.8	16.0	5.7	12.1	14.7
MA	15.1	25.0	23.9	12.5	20.5	21.9	7.3	20.5	12.8	7.7	17.7	10.5
SA	15.8	34.3	27.2	33.0	19.4	33.6	9.6	17.2	45.9	18.3	25.9	19.9
Parks												
SF	14.0	10.4	11.9	18.5	16.7	9.1	10.6	13.0	15.2	36.6	25.6	21.1
MF	10.1	20.5	12.2	10.8	15.9	24.2	10.9	20.8	6.8	11.1	8.6	9.7
MA	34.1	30.5	31.8	21.2	22.8	29.5	38.8	41.6	16.3	21.7	21.1	18.9
SA	41.9	38.6	44.1	49.6	44.7	37.2	39.7	24.6	61.7	30.6	44.7	50.3
Children's playground												
SF	52.7	21.5	38.5	44.8	51.8	21.2	66.3	37.9	36.7	70.5	57.1	61.5
MF	25.0	23.8	24.6	8.1	22.1	33.5	22.6	26.9	15.5	8.5	10.9	14.4
MA	11.9	23.1	17.8	14.6	11.2	18.1	5.3	14.2	13.3	5.9	12.6	7.5
SA	10.4	31.7	19.2	32.5	14.8	27.1	5.9	20.9	34.5	15.0	19.4	16.6
Beaches												
SF	9.9	11.9	11.3	18.2	15.1	12.4	20.3	22.8	14.4	30.6	19.0	16.6
MF	10.5	22.1	15.7	8.7	17.4	21.6	16.0	17.2	5.4	8.9	10.3	10.5
MA	30.8	27.9	29.9	17.9	27.3	28.0	33.7	34.2	9.0	16.2	11.5	19.3
SA	48.8	38.1	43.1	55.2	40.3	38.0	30.0	25.9	71.2	44.2	59.2	53.6
Outdoor areas of hospitals												
SF	18.8	15.5	16.3	20.6	22.7	13.1	31.8	18.8	19.6	50.7	32.2	28.3
MF	13.5	16.5	15.7	6.9	17.3	20.6	18.8	23.2	15.0	8.8	15.9	14.1
MA	34.5	28.8	27.6	19.7	26.0	33.7	29.6	31.2	15.2	12.5	16.7	19.4
SA	33.2	39.2	40.4	52.8	34.0	32.6	19.9	26.8	50.3	28.0	35.3	38.2
Stadium												
SF	21.0	13.1	6.6	20.7	26.1	14.7	31.8	27.6	13.9	34.8	22.7	22.7
MF	19.9	20.3	13.9	9.0	15.8	22.9	17.3	25.5	8.2	11.3	9.0	13.1
MA	29.6	29.4	31.3	19.5	25.2	34.6	28.6	23.2	13.6	16.3	13.8	21.0
SA	29.5	37.3	48.1	50.9	32.9	27.8	22.4	23.7	64.3	37.6	54.5	43.2

SF=strongly in favour; MF=moderately in favour; MA= moderately against; SA= strongly against

Supplementary Table 11. Odds ratios (OR) and 95% confidence intervals (CI) of support for diverse

	TCS score 2016 ^a		Smoking prevalence ^c		Geographic area within Europe ^d				GDP per capita ^e		Sociodemographic index (SDI) (2017) ^f	
	>50 points	≤50 points	<31 %	≥31 %	Northern	Western	Southern	Eastern	>25,000 euros	≤25,000 euros	High SDI	High-middle SDI
Restaurants/bars												
Non-smokers ^g	1.12 (0.56,2.23)	1	1.20 (0.60,2.40)	1	1	0.36 (0.19,0.70)	0.28 (0.14,0.55)	0.21 (0.10,0.43)	1.69 (0.82,3.49)	1	0.84 (0.26,2.75)	1
Smokers ^g	1.31 (0.99,1.73)	1	0.99 (0.72,1.35)	1	1	0.96 (0.65,1.41)	0.79 (0.53,1.17)	0.60 (0.39,0.93)	1.52 (1.16,2.00)	1	1.75 (1.20,2.57)	1
Total sample ^g	1.20 (0.73,1.98)	1	1.10 (0.66,1.85)	1	1	0.50 (0.33,0.76)	0.38 (0.25,0.59)	0.28 (0.18,0.45)	1.68 (1.02,2.77)	1	1.14 (0.48,2.72)	1
Discos/clubs												
Non-smokers ^g	2.02 (0.92,4.43)	1	1.04 (0.47,2.28)	1	1	0.24 (0.13,0.46)	0.30 (0.17,0.52)	0.20 (0.11,0.38)	1.71 (0.78,3.72)	1	0.86 (0.25,2.99)	1
Smokers ^g	2.14 (1.54,2.99)	1	0.80 (0.50,1.29)	1	1	1.22 (0.69,2.16)	0.85 (0.51,1.40)	0.53 (0.31,0.92)	1.90 (1.33,2.72)	1	1.63 (0.81,3.27)	1
Total sample ^g	2.07 (1.20,3.56)	1	0.95 (0.51,1.76)	1	1	0.42 (0.25,0.71)	0.41 (0.26,0.65)	0.28 (0.17,0.46)	1.79 (1.02,3.13)	1	1.10 (0.41,2.93)	1
Train stations												
Non-smokers ^g	1.09 (0.54,2.23)	1	1.06 (0.52,2.19)	1	1	0.28 (0.13,0.59)	0.29 (0.14,0.62)	0.23 (0.10,0.53)	1.21 (0.54,2.71)	1	0.57 (0.17,1.87)	1
Smokers ^g	1.14 (0.83,1.56)	1	0.77 (0.58,1.03)	1	1	0.70 (0.45,1.07)	0.93 (0.60,1.45)	0.72 (0.44,1.17)	0.95 (0.66,1.37)	1	0.72 (0.43,1.19)	1
Total sample ^g	1.11 (0.64,1.95)	1	0.95 (0.54,1.67)	1	1	0.38 (0.21,0.71)	0.42 (0.22,0.79)	0.33 (0.17,0.66)	1.14 (0.61,2.16)	1	0.65 (0.25,1.60)	1
Workplaces												
Non-smokers ^g	1.05 (0.49,2.24)	1	1.05 (0.49,2.26)	1	1	0.31 (0.13,0.73)	0.30 (0.13,0.73)	0.24 (0.09,0.62)	1.28 (0.55,2.98)	1	0.48 (0.14,1.65)	1
Smokers ^g	1.25 (0.97,1.62)	1	0.77 (0.61,0.98)	1	1	0.76 (0.54,1.07)	1.09 (0.77,1.54)	0.79 (0.54,1.16)	1.02 (0.74,1.40)	1	0.72 (0.48,1.10)	1
Total sample ^g	1.13 (0.64,1.99)	1	0.94 (0.53,1.66)	1	1	0.42 (0.22,0.81)	0.45 (0.23,0.87)	0.34 (0.16,0.69)	1.23 (0.66,2.33)	1	0.58 (0.23,1.47)	1
Private cars												
Non-smokers ^g	1.14 (0.69,1.90)	1	1.03 (0.62,1.73)	1	1	0.57 (0.11,3.05)	0.55 (0.10,2.94)	0.36 (0.07,2.00)	1.49 (0.89,2.48)	1	0.79 (0.35,1.82)	1
Smokers ^g	1.28 (0.92,1.77)	1	0.88 (0.62,1.25)	1	1	0.94 (0.25,3.50)	0.95 (0.25,3.58)	0.78 (0.20,2.99)	1.24 (0.85,1.81)	1	1.10 (0.62,1.93)	1
Total sample ^g	1.19 (0.76,1.86)	1	0.98 (0.62,1.56)	1	1	0.65 (0.14,2.91)	0.63 (0.14,2.85)	0.42 (0.09,1.97)	1.46 (0.92,2.30)	1	0.88 (0.42,1.87)	1
Private cars with minors												
Non-smokers ^g	0.70 (0.351,3.9)	1	1.08 (0.52,2.21)	1	1	0.45 (0.03,5.92)	0.40 (0.03,5.33)	0.34 (0.02,4.68)	1.11 (0.51,2.45)	1	0.53 (0.17,1.62)	1
Smokers ^g	1.02 (0.70,1.48)	1	0.97 (0.67,1.41)	1	1	0.39 (0.10,1.58)	0.42 (0.10,1.72)	0.37 (0.09,1.57)	1.05 (0.69,1.59)	1	0.90 (0.50,1.63)	1
Total sample ^g	0.80 (0.45,1.42)	1	1.03 (0.57,1.87)	1	1	0.42 (0.05,3.44)	0.39 (0.05,3.23)	0.33 (0.04,2.78)	1.12 (0.59,2.15)	1	0.65 (0.26,1.87)	1

smoke-free legislation in indoor settings. TackSHS survey, 2017-2018.

^aOdds ratios and 95% confidence intervals derived from multilevel logistic regression models adjusted for sex, age, and level of education.

Country weights were applied, combining individual weights with an additional weighting factor, each country contributing in proportion to its population aged 15 years or over.

^bTobacco Control Scale 2016 score (Joossens and Raw, 2017) ≤50 (Bulgaria, Poland, Portugal, Latvia, Greece and Germany) and score >50 (England, Ireland, France, Romania, Italy and Spain).

^cCountry's total smoking prevalence (Gallus et al., 2021) <30% (Ireland, Italy and England, Germany, Latvia and Poland) and >31% (Bulgaria, France, Greece, Portugal, Romania and Spain).

^dUnited Nations M49 Standard Geographical area (United Nations, n.d.) Northern Europe (Ireland, Latvia and England), Western Europe (France and Germany), Southern Europe (Italy, Greece, Portugal and Spain) and Eastern Europe (Bulgaria, Poland and Romania).

^eWorld Bank gross domestic product (GDP) per capita (World Bank, n.d.) GDP per capita ≤25,000€ (Bulgaria, Latvia, Romania, Poland, Portugal and Greece) and GDP per capita >25,000€ (England, France, Germany, Ireland, Italy and Spain).

^fSociodemographic index (SDI) (Global Burden of Disease Collaborative Network, 2018) into High SDI (England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Spain) and middle-high SDI (Bulgaria, Portugal, Romania)

Supplementary Table 12. Odds ratios (OR) and 95% confidence intervals (CI) of support for diverse

	TCS score 2016 ^b		Smoking prevalence ^c		Geographic area within Europe ^d				GDP per capita ^e		Sociodemographic index (SDI) (2017) ^f	
	>50 points	≤50 points	<31 %	≥31 %	Northern	Western	Southern	Eastern	>25,000 euros	≤25,000 euros	High SDI	High-middle SDI
Restaurants/bars/patios												
Non-smokers ^a	1.07 (0.75,1.52)	1	1.65 (1.33,2.04)	1	1	0.58 (0.38,0.90)	0.72 (0.46,1.12)	0.67 (0.41,1.10)	1.14 (0.77,1.68)	1	1.19 (0.65,2.15)	1
Smokers ^a	1.21 (0.83,1.78)	1	1.32 (0.92,1.90)	1	1	1.10 (0.63,1.96)	1.56 (0.82,2.61)	1.22 (0.65,2.32)	1.17 (0.77,1.83)	1	1.71 (0.94,3.11)	1
Total sample ^a	1.11 (0.81,1.53)	1	1.57 (1.27,1.93)	1	1	0.66 (0.43,1.02)	0.82 (0.53,1.28)	0.74 (0.46,1.20)	1.17 (0.81,1.67)	1	1.33 (0.78,2.27)	1
Tram/bus/subway stops												
Non-smokers ^a	1.15 (0.78,1.71)	1	1.47 (1.05,2.06)	1	1	0.38 (0.29,0.48)	0.46 (0.36,0.60)	0.50 (0.38,0.66)	1.06 (0.68,1.68)	1	1.03 (0.52,2.05)	1
Smokers ^a	1.22 (0.98,1.50)	1	1.16 (0.93,1.45)	1	1	0.78 (0.56,1.10)	0.82 (0.58,1.17)	0.95 (0.65,1.40)	1.04 (0.79,1.36)	1	1.20 (0.83,1.74)	1
Total sample ^a	1.18 (0.85,1.62)	1	1.39 (1.05,1.84)	1	1	0.45 (0.36,0.56)	0.53 (0.42,0.66)	0.57 (0.45,0.74)	1.07 (0.73,1.55)	1	1.09 (0.62,1.93)	1
Outdoor areas of schools												
Non-smokers ^a	1.16 (0.58,2.33)	1	1.27 (0.63,2.54)	1	1	0.24 (0.12,0.47)	0.26 (0.13,0.52)	0.29 (0.14,0.61)	1.09 (0.49,2.41)	1	0.57 (0.18,1.83)	1
Smokers ^a	1.00 (0.59,1.70)	1	1.15 (0.68,1.94)	1	1	0.36 (0.24,0.54)	0.44 (0.29,0.66)	0.88 (0.56,1.39)	0.62 (0.36,1.07)	1	0.61 (0.26,1.43)	1
Total sample ^a	1.13 (0.61,2.11)	1	1.22 (0.66,2.28)	1	1	0.30 (0.15,0.49)	0.39 (0.17,0.55)	0.39 (0.20,0.74)	0.96 (0.47,1.95)	1	0.59 (0.21,1.65)	1
Parks												
Non-smokers ^a	1.32 (1.00,1.73)	1	1.09 (0.80,1.49)	1	1	0.49 (0.39,0.62)	0.65 (0.51,0.82)	0.68 (0.51,0.89)	0.95 (0.66,1.36)	1	0.69 (0.42,1.14)	1
Smokers ^a	1.39 (1.08,1.79)	1	0.84 (0.63,1.11)	1	1	0.86 (0.58,1.29)	1.12 (0.74,1.67)	1.31 (0.84,2.05)	0.77 (0.61,1.20)	1	0.86 (0.48,1.24)	1
Total sample ^a	1.34 (1.06,1.70)	1	1.03 (0.77,1.37)	1	1	0.55 (0.43,0.70)	0.72 (0.56,0.92)	0.77 (0.58,1.02)	0.94 (0.68,1.30)	1	0.72 (0.46,1.14)	1
Children's playground												
Non-smokers ^a	1.02 (0.49,2.11)	1	1.33 (0.65,2.72)	1	1	0.25 (0.12,0.53)	0.25 (0.12,0.53)	0.29 (0.13,0.67)	1.09 (0.48,2.47)	1	0.56 (0.17,1.89)	1
Smokers ^a	0.96 (0.56,1.64)	1	1.27 (0.76,2.14)	1	1	0.39 (0.22,0.69)	0.46 (0.26,0.84)	0.73 (0.38,1.41)	0.79 (0.44,1.43)	1	0.62 (0.26,1.47)	1
Total sample ^a	1.02 (0.53,1.97)	1	1.31 (0.68,2.49)	1	1	0.29 (0.15,0.57)	0.30 (0.15,0.60)	0.38 (0.18,0.81)	1.01 (0.48,2.13)	1	0.59 (0.20,1.76)	1
Benches												
Non-smokers ^a	1.22 (0.96,1.55)	1	1.15 (0.90,1.49)	1	1	0.56 (0.46,0.68)	0.63 (0.52,0.77)	0.78 (0.62,0.97)	0.91 (0.67,1.22)	1	0.91 (0.58,1.43)	1
Smokers ^a	1.12 (0.86,1.47)	1	0.99 (0.76,1.31)	1	1	1.14 (0.78,1.68)	1.13 (0.77,1.67)	1.56 (1.02,2.39)	0.85 (0.62,1.15)	1	1.06 (0.68,1.67)	1
Total sample ^a	1.20 (0.97,1.49)	1	1.12 (0.89,1.41)	1	1	0.64 (0.51,0.80)	0.70 (0.56,0.88)	0.89 (0.69,1.15)	0.90 (0.69,1.17)	1	0.96 (0.64,1.45)	1
Outdoor areas of hospitals												
Non-smokers ^a	1.25 (0.79,1.98)	1	1.14 (0.71,1.83)	1	1	0.36 (0.23,0.55)	0.50 (0.32,0.78)	0.48 (0.30,0.78)	1.05 (0.61,1.80)	1	0.73 (0.33,1.62)	1
Smokers ^a	1.23 (0.86,1.77)	1	0.88 (0.61,1.28)	1	1	0.64 (0.41,1.00)	0.86 (0.55,1.36)	1.14 (0.69,1.87)	0.79 (0.53,1.19)	1	0.66 (0.37,1.19)	1
Total sample ^a	1.26 (0.84,1.89)	1	1.07 (0.69,1.64)	1	1	0.41 (0.27,0.63)	0.57 (0.37,0.87)	0.57 (0.37,0.95)	0.98 (0.61,1.60)	1	0.71 (0.35,1.43)	1
Stadium												
Non-smokers ^a	1.41 (1.03,1.94)	1	1.03 (0.71,1.50)	1	1	0.43 (0.33,0.55)	0.62 (0.47,0.80)	0.71 (0.53,0.94)	0.86 (0.57,1.31)	1	0.82 (0.43,1.54)	1
Smokers ^a	1.21 (0.74,1.97)	1	1.03 (0.62,1.69)	1	1	0.63 (0.41,0.98)	0.88 (0.56,1.38)	1.71 (1.05,2.78)	0.57 (0.36,0.90)	1	0.84 (0.36,1.93)	1
Total sample ^a	1.36 (0.98,1.91)	1	1.04 (0.71,1.52)	1	1	0.46 (0.35,0.61)	0.66 (0.50,0.87)	0.87 (0.64,1.18)	0.78 (0.52,1.17)	1	0.83 (0.44,1.57)	1

smoke-free legislation in outdoor settings. TackSHS survey, 2017-2018.

^aOdds ratios and 95% confidence intervals derived from multilevel logistic regression models adjusted for sex, age, and level of education.

Country weights were applied, combining individual weights with an additional weighting factor, each country contributing in proportion to its population aged 15 years or over.

^bTobacco Control Scale 2016 score:(Joossens and Raw, 2017) ≤ 50 (Bulgaria, Poland, Portugal, Latvia, Greece and Germany) and score > 50 (England, Ireland, France, Romania, Italy and Spain).

^cCountry's total smoking prevalence:(Gallus et al., 2021) $< 30\%$ (Ireland, Italy and England, Germany, Latvia and Poland) and $> 31\%$ (Bulgaria, France, Greece, Portugal, Romania and Spain).

^dUnited Nations M49 Standard Geographical area:(United Nations, n.d.) Northern Europe (Ireland, Latvia and England), Western Europe (France and Germany), Southern Europe (Italy, Greece, Portugal and Spain) and Eastern Europe (Bulgaria, Poland and Romania).

^eWorld Bank gross domestic product (GDP) per capita:(World Bank, n.d.) GDP per capita $\leq 25,000\text{€}$ (Bulgaria, Latvia, Romania, Poland, Portugal and Greece) and GDP per capita $> 25,000\text{€}$ (England, France, Germany, Ireland, Italy and Spain).

^fSociodemographic index (SDI):(Global Burden of Disease Collaborative Network., 2018) into High SDI (England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Spain) and middle-high SDI (Bulgaria, Portugal, Romania)

Under review

PAPER 2.

Do smokers want to protect non-smokers from the harms of second-hand smoke exposure in cars? Findings from the Eurest-PLUS ITC Europe Surveys.

Sarah O Nogueira, Olena Tigova, Pete Driezen, Marcela Fu, Christina N. Kyriakos, Mateusz Zatonski, Ute Mons, Anne C. K. Quah, Tibor Demjén, Antigona C. Trofor, Krzysztof Przewozniak, Paraskevi A. Katsaounou, Geoffrey T. Fong, Constantine Vardavas

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Do smokers want to protect non-smokers from the harms of second-hand smoke in cars? Findings from the EUREST-PLUS ITC Europe Surveys

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Background: There is currently no comprehensive legislation protecting non-smokers and children from second-hand smoke (SHS) exposure in private cars at the European Union (EU) level. This study aims to assess smokers' support for smoke-free cars legislation in six EU countries. **Methods:** Data come from the EUREST-PLUS ITC Europe Surveys: Wave 1 (2016, $n = 6011$) and Wave 2 (2018, $n = 6027$) conducted in Germany, Greece, Hungary, Poland, Romania and Spain. Support for smoke-free cars carrying pre-school children and non-smokers and voluntary implementation of smoke-free cars were assessed among adult smokers. Generalized estimating equations models were used to assess changes in support between waves. **Results:** In 2018, 96.3% [95% confidence interval (CI) 95.4–97.0%] of the overall sample supported smoke-free legislation for cars carrying pre-school children, representing an increase of 2.4 percentage points in comparison to 2016. Smoke-free legislation for cars transporting non-smokers was supported by 85.2% (95% CI 83.1–87.1%) of smokers' in 2016 and 90.2% (95% CI 88.6–91.7%) in 2018. Among smokers who owned cars, there was a significant 7.2 percentage points increase in voluntary implementation of smoke-free cars carrying children from 2016 (60.7%, 95% CI 57.2–64.0%) to 2018 (67.9%, 95% CI 65.1–70.5%). All sociodemographic groups of smokers reported support higher than 80% in 2018. **Conclusion:** The vast majority of smokers in all six EU countries support smoke-free legislation for cars carrying pre-school children and non-smokers. This almost universal support across countries and sociodemographic groups is a clear indicator of a window of opportunity for the introduction of comprehensive legislation to protect non-smokers and children from SHS exposure in cars.

Introduction

Second-hand smoke (SHS) is one of the most widespread air pollutants in indoor environments.¹ There is no safe level of SHS exposure,² and when it occurs in confined environments, such as cars, it is particularly harmful because of the small volume of space.³ Exposure to SHS in cars may be extremely high: smoking just a single cigarette can contribute to PM_{2.5} concentration up to 3851 µg/m³,⁴ over 10 times the concentration that was measured in

bars throughout the world that had no restrictions on smoking.⁵ Moreover, this extreme PM_{2.5} concentration could not be adequately reduced with typical strategies to ventilate the car through air conditioning or opening windows.^{4,6} In 2017, 1.2 million deaths were attributable to SHS exposure, with 63 822 being among those children aged 10 or younger.⁷ Although the implementation of smoke-free cars legislation in some jurisdictions has been associated with a drastic decrease in exposure to SHS,⁸ there is currently no comprehensive legislation to protect non-smokers in private cars at

the European Union (EU) level, apart from isolated initiatives, e.g. the ones in the UK⁸ and Italy.⁹

The successful implementation of and compliance with tobacco control policies may be influenced by their level of support among smokers.¹⁰ Specifically, the level of support for smoke-free cars legislation among smokers may be an important indicator of the future level of adherence to such regulations. Thus, the objective of this study is to assess the support for smoke-free private cars legislation among a cohort of European smokers assessed in 2016 and followed up in 2018.

Methods

Study design

This study is part of the European Commission Horizon-2020 funded study 'European Regulatory Science on Tobacco: Policy Implementation to Reduce Lung Diseases' (EUREST-PLUS-HCO-06-2015). Data come from the International Tobacco Control Policy Evaluation Six European Country (ITC 6E) Surveys, a cohort assessed in 2016 and followed up in 2018 that aims to evaluate psychosocial and behavioural impacts of the EU Tobacco Products Directive. The sample is comprised of smokers (>100 cigarettes in their lifetime and smoking currently at least monthly) aged 18 or older in six EU countries: Germany, Greece, Hungary, Poland, Romania and Spain. Respondents who could not be reached at Wave 2 were replaced by other smokers selected using the same sampling frame and the same random selection approach, as done in other ITC study cohorts.¹¹ Retention rates ranged from 36% in Hungary to 71% in Germany and Spain, with an average of 53% for the full sample. Further details about the EUREST-PLUS ITC surveys methodology and questionnaires can be found elsewhere.^{12–14}

Cross-sectional survey weights have been constructed for each of the survey waves in each country. After all, data were collected; each respondent was assigned a sampling weight according to their wave of recruitment. For those respondents present in both 2016 and 2018 waves, the sampling weight was their 2016 wave cross-sectional weight, rescaled to sum to the sample size for each country. For respondents newly recruited in 2018, the sampling weight was based on the cross-sectional weight rescaled to sum to the sample size of the 2018 wave recruits in each country. Weights were calibrated using national surveys from each of the respective countries.

Measures

Support for smoke-free cars legislation was assessed within a pool of questions: 'At which of the following places do you think smoking SHOULD be allowed: (i) In cars with pre-school children in them? and (ii) In cars with non-smokers in them?'. The possible answers were 'yes', 'no', 'do not know' and 'refused'. These answers were recorded as not supportive of the smoke-free cars legislation ('yes') and supportive ('no', 'do not know', 'refused').

Prevalence of voluntary implementation of smoke-free cars was assessed with the following question: 'What are the rules about smoking in your car or cars when there are children in the car? The possible answers were 'smoking is never allowed in any car', 'smoking is sometimes allowed or in some cars', 'smoking is allowed in all cars', 'do not have a car/you never have children in your car' and 'refused'. These possible answers were re-coded as 'smoking never allowed' vs 'otherwise'. Answers 'do not have a car', 'never have children in car' and 'refused' were excluded from the analyses.

The sociodemographic variables assessed were country, age group (18–24, 25–39, 40–54 and ≥ 55), sex (female, male) and degree of urbanization (urban, intermediate, rural). Additionally, the highest level of formal education completed, categorized as low (primary; lower pre-vocational secondary; middle pre-vocational secondary), moderate (secondary vocational); senior general secondary and pre-university) and high (higher professional and university bachelor,

university master), using the International Standard Classification of Education was assessed. Monthly gross household income was assessed and categorized as low (<€1750 for Germany, Greece and Spain, $\leq 150\,000$ Ft for Hungary, ≤ 2000 zł for Poland, ≤ 1000 lei for Romania), moderate (€1750–3000, 150 001–250 000 Ft, 2001–4000 zł, 1001–2500 lei) and high (>€3000, >250 000 Ft, >4000 zł, >2500 lei). The level of nicotine dependence was calculated with the Heaviness of Smoking Index (HSI), a measure of cigarette dependence categorized into three groups for analysis (0–1: low, 2–4: moderate, 5–6: high).¹⁵

Analysis

All analyses included weighting to make the sample representative for all six countries' populations and to adjust for the complex sampling design. A full description of the weighting process is detailed in an online technical report and other resources.^{9,11} Percentages of change were estimated from a logistic generalized estimating equations regression model to test the overall change in smoke-free measures between Wave 1 and Wave 2. One model was estimated per each policy. Percentages are adjusted estimates that control for the EU country, degree of urbanization, time-in-sample (one wave only or both waves), sex, age group, income, education and HSI. All analyses were conducted using SAS-callable SUDAAN Version 11.0.1.

Results

Prevalence of smokers' support for smoke-free cars legislation in both waves can be found in table 1. The support was very high in all countries, being over 90% when children are present and over 85% when non-smokers are present in Wave 2.

From Wave 1 to Wave 2, there was a significant increase in the support for smoke-free legislation for cars with pre-school children present in three countries (Hungary, Poland and Spain). The changes in the support ranged from 3.5 percentage points increase in Poland to 5.6 percentage points increase in Hungary. No significant changes occurred in Germany, Greece and Romania. There was a significant increase in the support between waves in all age groups (except in the 40–64 group), with the highest increase among young participants (aged 18–24), who were the ones with the lowest prevalence of support for the ban in both waves. Similarly, support for smoke-free cars legislation significantly increased both among females and males and in the moderate group of nicotine dependence.

Support for smoke-free legislation for cars with non-smokers also increased significantly between 2016 and 2018 among the same three countries (Hungary, Poland and Spain). The increase ranged from 7.3 (Hungary) to 12.2 (Spain) percentage points. All age groups (except those aged 55+), both sexes and those with low and moderate nicotine dependence also exhibited a significant increase in support for smoke-free cars legislation when non-smokers are present.

We restricted the analysis to those respondents who owned a car and reported carrying children in them ($n = 6133$). In such analysis, there was a significant increase of 7.2 percentage points in voluntary implementation of smoke-free cars from Wave 1 [60.7, 95% confidence interval (CI) 57.2–64.0] to Wave 2 (67.9, 95% CI 65.1–70.5; results not presented in the table).

Discussion

The findings from this study show that the vast majority of smokers in all six EU countries support smoke-free legislation for cars carrying pre-school children and non-smokers. This near-unanimous support is a clear indicator of a window of opportunity for the introduction of legislation to protect children and non-smokers from SHS exposure in cars. While smokers' support for smoke-

Table 1 Smokers' support for smoke-free cars legislation in six European countries (2016 and 2018)

	Support (%) (and 95% CI) for smoke-free legislation for cars with pre-school children in them (n = 8762)			Support (%) (and 95% CI) for smoke-free legislation for cars with non-smokers in them (n = 8740)		
	Wave 1 (2016)	Wave 2 (2018)	Difference ^a	Wave 1 (2016)	Wave 2 (2018)	Difference ^a
Overall	93.8 (92.4–95.0)	96.3 (95.4–97.0)	2.4 (0.93–4.0)	85.2 (83.1–87.1)	90.2 (88.6–91.7)	5.0 (2.4–7.7)
Country						
Germany	95.4 (93.0–97.0)	95.7 (93.3–97.3)	0.3 (-2.1 to 2.7)	85.0 (80.4–88.7)	85.3 (79.4–89.7)	0.3 (-6.3 to 7.0)
Greece	98.2 (96.6–99.1)	96.9 (93.6–98.5)	-1.3 (-3.1 to 0.5)	86.8 (82.6–90.1)	96.9 (93.6–98.5)	-1.3 (-3.1 to 0.5)
Hungary	90.8 (86.6–93.8)	96.4 (94.7–97.6)	5.6 (1.8–9.3)	86.2 (81.4–89.9)	93.4 (91.2–95.2)	7.3 (2.8–11.7)
Poland	90.1 (86.2–92.5)	93.6 (91.0–95.5)	3.5 (0.1–6.9)	83.1 (77.4–87.7)	92.7 (89.9–94.7)	9.5 (4.4–14.6)
Romania	97.0 (95.3–98.1)	98.3 (96.7–99.0)	1.2 (-0.5–3.0)	94.6 (91.8–96.5)	96.5 (94.3–97.9)	1.9 (-0.8 to 4.6)
Spain	91.5 (87.4–94.4)	96.7 (92.2–97.8)	5.3 (1.7–8.8)	76.0 (70.7–80.5)	88.1 (84.5–91.0)	12.2 (6.8–17.5)
Age group						
18–24	91.5 (87.7–94.2)	95.7 (93.2–97.7)	4.2 (0.6–7.8)	78.5 (72.7–83.3)	90.0 (86.2–92.8)	11.5 (5.3–17.7)
25–39	94.1 (92.3–95.5)	96.1 (94.8–97.1)	2.0 (0.1–4.0)	84.0 (81.4–86.2)	90.8 (88.8–92.4)	6.8 (3.9–9.6)
40–54	94.5 (92.7–95.8)	96.4 (95.1–97.4)	2.0 (-0.1 to 4.0)	86.4 (83.7–88.7)	91.1 (89.1–92.7)	4.6 (1.5–7.8)
55+	93.6 (91.6–95.1)	96.4 (94.8–97.5)	2.8 (0.8–4.8)	87.8 (85.3–89.9)	88.5 (85.5–91.0)	0.7 (-3.0 to 4.4)
Sex						
Female	94.7 (93.0–96.0)	96.8 (95.7–97.6)	2.1 (0.3–3.9)	88.0 (85.8–89.9)	92.3 (90.7–93.6)	4.3 (1.8–6.8)
Male	93.1 (91.6–94.4)	95.9 (94.8–96.7)	2.7 (1.0–4.5)	83.1 (80.6–85.3)	88.7 (86.6–90.4)	5.6 (2.4–8.8)
Nicotine dependence (HS)						
Low	94.3 (92.4–95.7)	96.4 (94.8–97.6)	2.1 (-0.1 to 4.3)	88.9 (86.3–91.1)	92.2 (89.7–94.1)	3.2 (0.0–6.5)
Moderate	94.1 (92.7–95.2)	96.3 (95.3–97.1)	2.2 (0.7–3.7)	84.7 (82.4–86.7)	89.8 (88.8–91.4)	5.2 (2.4–7.9)
High	78.0 (73.1–82.3)	84.0 (79.0–88.1)	6.0 (-0.7 to 12.7)	91.0 (87.2–93.8)	93.2 (89.2–95.8)	2.1 (-2.6 to 6.9)

a: Percentage of changes were estimated from a logistic generalized estimating equations regression model to test the overall change in smoke-free measures between Wave 1 and Wave 2. Percentages are adjusted for country, degree of urbanization (urban, intermediate and rural), time-in-sample (one wave only or both waves), sex, age group, income (low, moderate and high), education (low, moderate and high) and smoking status (daily or non-daily).

free cars legislation was higher than 90%, only around 70% of smokers reported implementing voluntary smoke-free rules in their vehicles while carrying children. The enactment of legislation for smoke-free cars could likely be a positive trigger for smokers who support such legislation but are still not protecting others from their smoking.

Notably, despite the already high support for smoke-free cars legislation in Wave 1, support increased significantly between survey waves. As expected, the largest increases occurred in countries that previously had the lowest support, which led to a reduction in variation between countries. Our findings on the increases of support for smoke-free cars legislation might be associated with changes in pictorial health warnings recently introduced by the new EU Tobacco Products Directive.¹⁶ The new warnings include explicit messages about the harms of SHS exposure to children and non-smokers.¹⁷ Another evidence that might support this assumption is the findings from a study indicating a relationship between allowing smoking in cars with non-smokers and knowledge of SHS harms in Australia, Canada, the UK and the USA.¹⁸

Regulating smoking in private settings might be challenging, but given that some other European countries have introduced similar laws may ease the promotion of these regulations in other EU countries. For instance, in the UK, support for smoke-free cars legislation among smokers has increased significantly after the implementation of smoke-free legislation for cars carrying children, from around 60% in 2014 to 82% in 2017.⁹ This indicates that the introduction of such legislation might not come with a rebound effect on population support to it. Furthermore, compliance with the smoke-free legislation has been associated with public opinion support for it,¹⁹ and, as shown by our results, support is almost unanimous.

With regards to sociodemographic groups, it is interesting to note that compared to older age groups, lower level of support of smoke-free cars legislation was observed among younger respondents (aged 18–24) in Wave 1; nevertheless, they were the group with the highest increase in the level of support for such legislation between 2016 and 2018, reaching support levels that are comparable to the older age groups.

Our article was restricted to private cars. However, there are interesting findings related to the relationship of voluntary smoke-free rules in cars and houses that have been explored in the North American, but not the European context.²⁰ Further research should be conducted to understand the similarities, differences and influences of smoke-free rules in private settings such as home and the ways of how having bans in each of them influence the implementation of bans in the other and, by consequence, the exposure to SHS.

The findings of this study are subjected to limitations. As support levels were already very high at Wave 1, ceiling effects might limit the potential for further increases. Self-reporting limits the accuracy of the data, especially concerning the prevalence of voluntary implementation of smoke-free cars. As an attempt to minimize such bias, those reporting applying only partial voluntary smoke-free rules in cars were included in the same group as those applying no rules. Finally, there is the potential for social desirability bias, as questions related to children might be especially sensitive to answer. In any case, this potential source of bias would operate similarly in both waves, and hence the percentage change between waves would not be biased. In terms of strengths, the sample of this study was representative of six EU countries population aged ≥ 18 years old. Additionally, the same sampling design was used in each country, allowing comparisons between countries. In our study, we chose to dichotomize the 'legislation support' in a rigorous way so that those smokers who were not sure about their support or opposition to the legislation ('do not know' answers) were included in the oppose-legislation group.

Conclusions

In conclusion, the vast majority of smokers in all six EU countries support banning smoking in cars carrying pre-school children and non-smokers. This near-universal support across countries and sociodemographic groups, along with the increase in voluntary implementation of smoke-free cars rules regulation, are clear indicators of a window of opportunity for the introduction of comprehensive

legislation to protect non-smokers and children from SHS exposure in cars.

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References

Key points

- There is currently no comprehensive legislation at the EU level to protect non-smokers and children from SHS exposure in private cars.
- This study aimed to examine smokers' support for smoke-free cars legislation in six EU countries and the prevalence of voluntary smoke-free cars among smokers in 2016 and 2018.
- We found a significant increase in the support for smoke-free legislation in private cars carrying pre-school children and non-smokers, reaching an overall level of support above 90% in 2018.
- Our results point to a clear opportunity for the introduction of legislation to protect non-smokers and children from SHS exposure in cars.

- Oberg M, Jaakkola MS, Woodward A, et al. Worldwide burden of disease from exposure to secondhand smoke: a retrospective analysis of data from 192 countries. *Lancet* 2011;377:139–46.
- US Department of Health and Human Services. *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2006.
- Jones MR, Navas-Acien A, Yuan J, Breyse PN. Secondhand tobacco smoke concentrations in motor vehicles: a pilot study. *Tob Control* 2009;18:399–404.
- Szendik T, Fong GT, Travers MJ, Hyland A. An experimental investigation of tobacco smoke pollution in cars. *Nicotine Tob Res* 2009;11:627–34.
- Conolly GN, Carpenter CM, Travers MJ, et al. How smoke-free laws improve air quality: a global study of Irish pubs. *Nicotine Tob Res* 2009;11:600–5.
- Semple S, Apsley A, Galea KS, et al. Secondhand smoke in cars: assessing children's potential exposure during typical journey conditions. *Tob Control* 2012;21:578–83.
- GBD 2017 Collaborators and Others. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet* 2018;392:1923–94.
- Faber T, Mizani MA, Sheikh A, et al. Investigating the effect of England's smoke-free private vehicle regulation on changes in tobacco smoke exposure and respiratory disease in children: a quasi-experimental study. *Lancet Public Health* 2019; 4:e607–17.
- Gallus S. Second-hand smoke in Italy. *Eur J Paediatr Dent* 2015;16:257.
- Francis JA, Abramson EM, Park H-Y. Policy-driven tobacco control. *Tob Control* 2010;19 Suppl 1:16–20.
- ITC Project. ITC Four Country Smoking and Vaping Survey Wave 1 (4CV1) Technical Report. University of Waterloo, Waterloo, Ontario, Canada; Medical University of South Carolina, Charleston, South Carolina, USA; Cancer Council Victoria, Melbourne, Australia; King's College London, London, UK; November 2018. Available at: https://itcproject.s3.amazonaws.com/uploads/documents/4CV1_Technical_Report_Nov23201.pdf (31 March 2020, date last accessed).
- Vardavas CJ, Bécuwe N, Demjén T, et al. EUREST-PLUS Consortium. Study Protocol of European Regulatory Science on Tobacco (EUREST-PLUS): policy implementation to reduce lung disease. *Tob Induc Dis* 2018;16 (Suppl 2):A2.
- Fong GT, Thompson ME, Boudreau C, et al. EUREST-PLUS Consortium. The Conceptual Model and Methods of Wave 1 (2016) of the EUREST-PLUS ITC 6 European Countries Survey. *Tob Induc Dis* 2018;16 (Suppl 2):A3.
- Thompson ME, Driezen P, Boudreau C, et al. Methods of the International Tobacco Control (ITC) EUREST-PLUS ITC Europe Surveys. *Eur J Public Health* 2020;30:i4–9.

- 15 Borland R, Yong H-H, O'Connor RJ, et al. The reliability and predictive validity of the Heaviness of Smoking Index and its two components: findings from the International Tobacco Control Four Country study. *Nicotine Tob Res* 2010;12 (Suppl 1):S45–50.
- 16 Directive 2014/60/EU of the European Parliament and of the Council. Of L 127, 3.4.2014. Available at: https://ec.europa.eu/health/sites/health/files/tobacco/docs/dir_201440_en.pdf (31 March 2020, date last accessed).
- 17 Trofor A, Papadakis S, Lotrean L, et al.; EUREST-PLUS Consortium. Knowledge of the health risks of smoking and impact of cigarette warning labels among tobacco users in six European countries: findings from the EUREST-PLUS ITC Europe Surveys. *Tob Induc Dis* 2018;16 (Suppl 2):A10.
- 18 Hitchman SC, Fong GT, Borland R, Hyland A. Predictors of smoking in cars with nonsmokers: findings from the 2007 Wave of the International Tobacco Control Four Country Survey. *Nicotine Tob Res* 2010;12:374–80.
- 19 Fong GT, Hyland A, Borland R, et al. Reductions in tobacco smoke pollution and increases in support for smoke-free public places following the implementation of comprehensive smoke-free workplace legislation in the Republic of Ireland: findings from the ITC Ireland/UK Survey. *Tob Control* 2006;15 (Suppl 3):S1–8.
- 20 Parks MI, Kingsbury J, Boyle R, Evered S. Smoke-free rules in homes and cars among smokers and nonsmokers in Minnesota. *Prev Chronic Dis* 2018;15: E32.

PAPER 3.

Beyond the European Union Tobacco Products Directive: smokers' and recent quitters' support for further tobacco control measures (2016–2018)

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Beyond the European Union Tobacco Products Directive: smokers' and recent quitters' support for further tobacco control measures (2016–2018)

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ABSTRACT

Background Several measures recommended by the WHO Framework Convention on Tobacco Control have not been implemented in the European Union, despite changes in the legislation such as the Tobacco Products Directive (TPD). This study aims to understand smokers' and recent quitters' levels of support for tobacco control measures that go beyond the TPD during and after its implementation.

Methods Data from wave 1 (2016, n=6011) and wave 2 (2018, n=6027) of the EUREST-PLUS International Tobacco Control Policy Evaluation Project Six European Countries Survey, a cohort of adult smokers in Germany, Greece, Hungary, Poland, Romania, Spain were used to estimate the level of support for seven different tobacco control measures, overall and by country.

Results In 2018, the highest support was for implementing measures to further regulate tobacco products (50.5%) and for holding tobacco companies accountable for the harm caused by smoking (48.8%). Additionally, in 2018, 40% of smokers and recent quitters supported a total ban on cigarettes and other tobacco products within ten years, if assistance to quit smoking is provided. Overall, support for tobacco control measures among smokers and recent quitters after the implementation of the TPD remained stable over time.

Conclusion There is considerable support among smokers and recent quitters for tobacco control measures that go beyond the current measures implemented. A significant percentage of smokers would support a ban on tobacco products in the future if the government provided assistance to quit smoking. This highlights the importance of implementing measures to increase smoking cessation in conjunction with other policies.

products labelling, packaging, ingredients and additives.³ Despite the introduction of the TPD, other measures recommended by the WHO Framework Convention on Tobacco Control (FCTC)⁴ and its guidelines have not been implemented homogeneously across EU MS.

Public opinion influences the impact of tobacco control measures; it plays a role in measures' adoption,⁵ effective implementation⁶ and in policy-related changes in smoking behaviours.⁷ As smokers constitute approximately one in four of the EU adult population and are affected by tobacco control measures, it is important to understand their level of support for such measures. Therefore, we examine support for seven tobacco control measures that go beyond the EU TPD in nationally representative samples of adult smokers in six EU MS during and after the implementation of the TPD.

METHODS

Design

We used data from the International Tobacco Control Policy Evaluation Project Six European Countries (ITC 6E) Survey, a prospective cohort study of representative samples of smokers from Germany, Greece, Hungary, Poland, Romania and Spain.^{8–11}

Wave 1 data were collected between June and September 2016, the year of TPD implementation, and the wave 2 data between February and May 2018, post-TPD implementation. Computer-assisted interviews were conducted face to face. The samples comprise current smokers (at least monthly smokers who smoked >100 cigarettes in their lifetime) aged 18 or older. Respondents were recruited using a multistage stratified random sampling procedure of the general population of smokers to produce nationally representative samples of smokers. The respondents participating in wave 1 (N=6011) were recontacted in wave 2, given they had provided consent to be recontacted. Respondents not successfully recontacted (N=2816) were replaced by newly recruited smokers (N=2832) from newly sampled households selected with the same sampling frame and design. Hence, a total of 6027 individuals participated in wave 2.



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INTRODUCTION

The prevalence of smoking in European Union (EU) Member States (MS) has decreased over the past decades. However, 26% of EU adults still smoke and approximately 810 000 die prematurely every year due to smoking.^{1 2} In recent years, progress has been made in tackling the tobacco epidemic in the EU through policy. The most recent EU Tobacco Products Directive (TPD), implemented in 2016, introduced new regulation regarding tobacco

Brief report

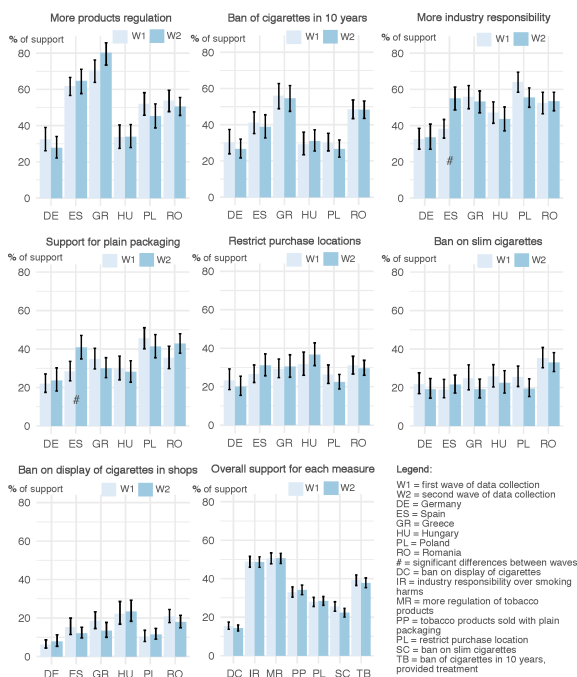


Figure 1 Smokers' and recent quitters* support for seven tobacco control measures in six European countries, EUREST-PLUS ITC Survey, 2016–2018. Estimated percentages are adjusted percentages from Generalized Estimated Equations (GEE) models testing the wave-country interaction to estimate support for each measure in each wave. GEE models adjusted for sex, age group, residence, education, employment status, smoking status, time-in-sample (country and wave included as main effects in addition to the interaction effect). * At wave 2, there were 95.8% current smokers and 4.2% recent quitters.

Further details about the ITC 6E methodology can be found elsewhere.^{8–11}

Measures

Outcomes were seven indicators of support for different tobacco control measures. Participants were asked about their support for, or agreement with, the following measures: (1) Tobacco products being subjected to more rules and regulations; (2) a total ban on tobacco products within 10 years, if the government provided assistance to help smokers quit; (3) holding tobacco companies accountable for the harm caused by smoking; (4) plain cigarette packaging; (5) restricting the number of places where cigarettes could be purchased; (6) a ban on all slim cigarettes; (7) cigarettes display ban at points of sale. Responses to these questions were dichotomised as 'strongly support' or 'support' vs otherwise (measures #2, 5, 6), 'strongly agree' or 'agree' vs otherwise (measures #1, 3, 4), and 'a lot' vs otherwise (measure #7). The otherwise category comprised the responses

'no' and 'don't know'. Online supplemental table S1 shows a full description of all the outcome measures.

Sociodemographic measures and measures assessing smoking-related beliefs and behaviours were collected.^{12–14} Online supplemental table S2 presents a full description of all correlate measures.

Statistical analysis

All analyses were weighted to ensure the sample represented the population of adult smokers in each country and accounted for the complex multistage sampling design.^{9–11} We estimated percentages of support for each tobacco control measure, overall and by country for each wave of the survey. All respondents from wave 1 and wave 2 were included in the analysis, irrespective of their smoking status by wave 2. A Bonferroni correction adjusted for multiple testing of country differences in support between waves. Regression models were used to examine the association between sociodemographic factors, smoking-related beliefs and

behaviours, and binary outcome measures of support at wave 2. Online supplemental table S3 presents details on this analysis.

RESULTS

Figure 1 presents the percentages and 95% CIs of support for tobacco control measures by country and overall at both survey waves. Overall, support was highest for measures to further regulate tobacco products (50.5%; 95% CI 47.9% to 53.3% in wave 2), and for holding tobacco companies accountable for the harms caused by smoking (48.7%; 95% CI 45.9% to 51.5% in wave 2). Almost 40% of participants (37.8%; 95% CI 35.3% to 40.4% in wave 2) supported a total ban on tobacco products within 10 years if assistance to quit smoking is provided. Support for plain cigarette packaging was reported by 34.2% (95% CI 31.7% to 36.7% in Wave 2) of the overall sample.

Across all countries combined, the rates of support for tobacco control measures after the TPD implementation presented no significant changes. In country-specific analysis, there was a significant increase between waves in the percentage of participants supporting the adoption of plain cigarette packaging in Spain (from 28.3%; 95% CI 23.5% to 33.6% in wave 1 to 40.9%; 95% CI 34.9% to 47.1% in wave 2), as also in supporting further accountability of the tobacco industry for the harms caused by smoking (from 38.1%; 95% CI 33.1% to 43.4% in wave 1 to 55.1%; 95% CI 48.7% to 61.3% in wave 2). Online supplemental table S3 shows results of sociodemographic factors and smoking-related beliefs and behaviours associated with support for all evaluated tobacco control measures in 2018.

DISCUSSION

This study examined support for tobacco control measures beyond the EU TPD current scope. Overall, support for tobacco control measures among smokers and recent quitters after TPD implementation remained stable, except for Spain where an increase in support for a few measures was observed.

In 2018, there was considerable variation in the support for different measures across countries, although some measures were endorsed by most smokers and recent quitters. The measure with the highest support was more regulation of tobacco products (50.6% in wave 2). Also, approximately 50% of smokers and recent quitters in all countries, with exception of Germany (33.5%), were in favour of the tobacco industry being held accountable for the harms caused by smoking. One of the most striking results was that almost 50% of smokers and recent quitters supported a total ban on tobacco products sales within 10 years if the government provided cessation aids. Our findings support the possibility for innovative tobacco control measures to be proposed and supported by smokers. For instance, policies aligned with tobacco endgame strategies aiming for a tobacco-free future,¹⁵ such as lowering the nicotine content of tobacco products to make them less addictive,^{16,17} and/or restricting sales of cigarettes to citizens born in or after a certain year with the goal of phasing out the sale of cigarettes in the future.¹⁸

Variations were observed in the country-specific results with some measures reaching very high rates of endorsement, while others were supported by a restricted number of smokers and recent quitters. For instance, 80.2% of smokers and recent quitters in Greece and 64.7% in Spain supported more tobacco products regulation. In contrast, the lowest support overall was for the ban on display of cigarettes at point of sale, with rates varying from 7.8% in Germany to 23.4% in Hungary. As previously pointed out, differences in support for tobacco control measures might reflect respondents' ambivalence about

their efficacy, practicality and effectiveness¹⁹ and/or the lack of knowledge about the benefits such measures could bring to smokers and non-smokers. Therefore, we assume that the low levels of support in Germany might be influenced by its generally protobacco environment, as exemplified by heavy marketing for tobacco products due to limited marketing restrictions,²⁰ which normalises smoking and diminishes smokers' harm perception.

The levels of support for tobacco control measures among smokers in European countries tend to be lower than in the general population,^{121–24} Nevertheless, population-based studies have shown an increase in support among smokers for diverse tobacco control measures after their adoption. For instance, in Australia, support for plain packaging among smokers has increased significantly after its implementation, from 28.2% in 2008–2009 to 49.0% in 2013.²⁵ Therefore, our findings should not be used to argue against the introduction of further tobacco control measures. In fact, the countries in our study, as Parties of the WHO FCTC treaty, are encouraged to implement measures beyond those required by the Convention and its protocols.⁴

This study has some limitations. First, question wording might have influenced respondents' answers. For instance, one of the tobacco control measures assessed was: 'Do you support complete bans on displays of cigarettes inside shops and stores?', which aims to assess whether tobacco products should be kept 'out of sight in points of sale'. A question with the latter wording was asked to smokers in the Eurobarometer Survey of 2017 in which 39.0% of smokers supported the measure while only 15.4% of smokers in our study supported it. Both measures touch very similar points, but the wording of the question might bias the response. Second, there were different levels of attrition across countries between waves, with retention rates ranging from 35.7% in Hungary to 70.5% in Germany and Spain, with an average of 53.2% for the total sample. Despite these limitations, our study is, to the best of our knowledge, the most thorough evaluation of support for these tobacco control measures, with nationally representative samples of smokers in the six European countries included in the survey.

CONCLUSIONS

There is considerable support among smokers for approaches to tobacco control that go beyond the current measures implemented. Most smokers support stronger government action to control the tobacco epidemic and many of them believe the tobacco industry should be held accountable for the harms caused by smoking. Additionally, a significant percentage of

What this paper adds

What is already known on this topic

- ▶ Public opinion plays an important role in adoption and effective implementation of tobacco control measures' and their effect on tobacco-related behaviours.

What important gaps in knowledge exist on this topic

- ▶ There is limited research on smokers' and recent quitters' support for tobacco control measures in European countries.

What this paper adds

- ▶ Using data from six European Union Member States, this study found considerable support among smokers and recent quitters for approaches to tobacco control that go beyond the current implemented measures, including Tobacco Endgame measures.

Brief report

smokers would support a ban on tobacco products in the future if the government provided assistance to quit smoking. This highlights the importance of implementing measures to increase smoking cessation in conjunction with other policies.

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Contributors Conceptualised and designed the study: SON, PD, UM, TD, ACT, KP, PK, GF, CIV and EF. Contributed to the strategy of analysis: SON, PD, UM, MF, OT, YC

and EF. Analysed data: PD. Interpreted data results: SON, PD, MF, UM, SCH, CK, MZZ and EF. Drafted manuscript: SON. Critically revised manuscript: All authors. Approved final manuscript version: All authors.

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REFERENCES

- 1 European Commission. Special Eurobarometer 458: attitudes of Europeans towards tobacco and electronic cigarettes. 2017. Available: <https://ec.europa.eu/commission/presscorner/detail/en/ip-17-187> [Accessed 29 May 2019].
- 2 James SL, Abate D, Abate KH, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: a systematic analysis for the global burden of disease study 2017. *Lancet* 2018;392:1751-52.
- 3 The European Commission. Revision of the tobacco products directive, 2014. Available: <https://ec.europa.eu/health/tobacco/products/revision/> [Accessed 24 May 2019].
- 4 World Health Organization. Who framework convention on tobacco control, 2003. Available: <http://www.who.int/tobacco/> [Accessed 21 Feb 2019].
- 5 Flynn BS, Goldstein AD, Salomon LJ, et al. Predictors of state legislators' intentions to vote for cigarette tax increases. *Prev Med* 1998;27:157-65.
- 6 Levy DT, Chaloupka F, Gitchell J. The effects of tobacco control policies on smoking rates: a tobacco control scorecard. *J Public Health Manag Pract* 2004;10:338-53.
- 7 Niederdeppe J, Farrell MK, Wenter D. Media advocacy, tobacco control policy change and teen smoking in Florida. *Tab Control* 2007;16:47-52.
- 8 Thompson ME, Drienen P, Boudreau C, et al. Methods of the international tobacco control (ITC) EUREST-PLUS ITC Europe surveys. *Eur J Public Health* 2020;30:iii4-9.
- 9 ITC Project. ITC 6 European country wave 1 (2016) technical report. University of Waterloo, Waterloo, Ontario, Canada, and European network on smoking and tobacco prevention, Brussels, Belgium, 2017. Available: https://itcproject.s3.amazonaws.com/uploads/documents/ITC6_Wave1_Tech.pdf [Accessed 19 Jul 2020].

- 10 Vardavas CI, Bécueve N, Demjén T, *et al*. Study protocol of European regulatory science on tobacco (EUREST-PLUS): policy implementation to reduce lung disease. *Tab Induc Dis* 2018;16:A2.
- 11 ITC Project. ITC 6 European country wave 2 (2018p) technical report. University of Waterloo, Waterloo, Ontario, Canada, and European network on smoking and tobacco prevention, Brussels, Belgium, 2019. Available: https://itcproject.s3.amazonaws.com/uploads/documents/ITC6e_Wave2_Tec.pdf [Accessed 19 Jul 2020].
- 12 Young D, Borland R, Siahpush M, *et al*. Australian smokers support stronger regulatory controls on tobacco: findings from the ITC Four-Country survey. *Aust N Z J Public Health* 2003;31:164–9.
- 13 Edwards R, Wilson N, Peace J, *et al*. Support for a tobacco endgame and increased regulation of the tobacco industry among New Zealand smokers: results from a national survey. *Tab Control* 2013;22:e86–93.
- 14 Borland R, Yong H-H, King B, *et al*. Use of and beliefs about light cigarettes in four countries: findings from the International tobacco control policy evaluation survey. *Nicotine Tob Res* 2004;6:311–21.
- 15 McDaniel PA, Smith EA, Malone RE. The tobacco endgame: a qualitative review and synthesis. *Tab Control* 2016;25:594–604.
- 16 Benowitz NL, Henningfield JE. Establishing a nicotine threshold for addiction. The implications for tobacco regulation. *N Engl J Med* 1994;331:123–5.
- 17 Gray N, Henningfield JE, Benowitz NL, *et al*. Toward a comprehensive long term nicotine policy. *Tab Control* 2005;14:161–5.
- 18 Khoo D, Chiam Y, Ng P, *et al*. Phasing-out tobacco: proposal to deny access to tobacco for those born from 2000. *Tab Control* 2010;19:355–60.
- 19 Gendall P, Hoek J, Maubach N, *et al*. Public support for more action on smoking. *N Z Med J* 2013;126:85–94.
- 20 Kahnet S, Demjén T, Tountas Y, *et al*. Extent and correlates of self-reported exposure to tobacco advertising, promotion, and sponsorship in smokers: findings from the EUREST-PLUS ITC Europe surveys. *Tab Induc Dis* 2018;16.
- 21 Gallus S, Lugo A, Fernandez E, *et al*. Support for a tobacco endgame strategy in 18 European countries. *Prev Med* 2014;67:255–8.
- 22 European Commission. Special eurobarometer 429. attitudes of Europeans towards tobacco, 2015. Available: http://ec.europa.eu/public_opinion/archives/ebs/ebs_429_en.pdf [Accessed 27 May 2019].
- 23 Filippidis F. Trends and correlates of tobacco use, smoking cessation and support for tobacco control policies in the European Union. *Tab Prev Cessat* 2018;4.
- 24 Filippidis FT, Giralaki C, Mechili E-A, *et al*. Are political views related to smoking and support for tobacco control policies? A survey across 28 European countries. *Tab Induc Dis* 2017;15:45.
- 25 Swift E, Borland R, Cummings KM, *et al*. Australian smokers' support for plain or standardised packs before and after implementation: findings from the ITC four country survey. *Tab Control* 2015;24:616–21.

Table S1. Tobacco control measures and response options, ITC 6E Survey, 2016-2018

Outcome measures	Response options
“How much do you agree with the following statement: tobacco products should be subject to more rules and regulations?”	strongly agree, agree, neither agree or disagree, disagree, strongly disagree refused, don't know
“Would you support or oppose a total ban on cigarettes and other smoked tobacco within 10 years, if the government provided assistance such as cessation clinics to help smokers quit?”	strongly support, support, oppose, strongly oppose, refused, don't know
“How much do you agree with the following statement: tobacco companies should take responsibility for the harm caused by smoking?”	strongly agree, agree, neither agree or disagree, disagree, strongly disagree, refused, don't know
“Tobacco companies should be required to sell cigarettes in plain packages -- that is, in packs without the usual brand colours and symbols, but keeping the warning labels”	strongly agree, agree, neither agree nor disagree, strongly disagree, refused, don't know
“Would you support or oppose a law that restricted the number of places where cigarettes could be purchased?”	strongly support, support, oppose, strongly oppose, refused, don't know
“Do you support complete bans on displays of cigarettes inside shops and stores?”	not at all, somewhat, a lot, refused, don't know

Table S2. Smoking-related indices, measures, and sociodemographics, ITC 6E Survey, 2016-2018

Indices, measures and	Variables
internal consistency	
(Cronbach's alpha)	
Knowledge of health effects of active smoking (10-item index) ($\alpha=0.88$)	"Based on what you know or believe, does smoking cause: heart disease, impotence, lung cancer, blindness, mouth cancer, throat cancer, stroke, COPD and emphysema, bronchitis, tuberculosis?" (yes/no/refused/don't know)
Secondhand smoke harm (3-item index) ($\alpha=0.74$)	"Based on what you know or believe, does smoking cause: 'Lung cancer in non-smokers from second-hand smoke', 'Heart attack in non-smokers from second-hand smoke', 'Asthma in children from second-hand smoke?'" (yes/no/refused/don't know)
Smoking restrictions (2-item index) ($\alpha=0.81$)	"To what extent, if at all, were each of the following things reasons for your quitting: 'Smoking restrictions at work?', 'Smoking restrictions in public places like restaurants, cafes and pubs?'" (not at all/somewhat/very much/refused/don't know)
Self-exemption beliefs (2-item index) ($\alpha=0.56$)	"The medical evidence that smoking is harmful is exaggerated" and "Smoking is no more risky than lots of other things that people do" (strongly agree/agree/neither agree nor disagree/disagree/strongly disagree/refused/don't know)
Smoking has damaged your health	"To what extent has smoking damaged your health?" (a little/somewhat/a lot/refused/don't know)
Overall attitude to smoking	"What is your overall opinion of smoking ordinary cigarettes?" (very positive/positive/neither positive nor negative/very negative/refused/don't know)
Smoking status	Daily smoker, non-daily smoker, quitter (only Wave 2)

Sociodemographics	Sex (male/female), age (18-24/25-39/40-54/55+), residence (rural/medium/urban), highest level of formal education completed (low - primary, lower pre-vocational secondary, middle pre-vocational secondary/moderate - secondary vocational; senior general secondary and pre-university/high - higher professional and university bachelor, university master), employment status (employed/otherwise), country, and survey wave
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Table S3. Association of sociodemographic factors, smoking-related beliefs and behaviours with smokers' and recent quitters' * support for seven tobacco control measures, EUREST-PLUS ITC Survey, 2018.

Variables	Products regulation (n=5562)		Ban in 10 years (n=5567)		Industry responsibility (n=5569)		Plain packaging (n=5562)	
	%	aOR (95% CI)**	%	aOR (95% CI)**	%	aOR (95% CI)**	%	aOR (95% CI)**
Sociodemographic factors								
Sex (male)	51.0	1.06 (0.92-1.22)	38.6	1.04 (0.90-1.19)	50.7	1.20 (1.05-1.37)	35.5	1.11 (0.96-1.30)
Sex (female)	51.9	Ref.	38.5	Ref.	46.9	Ref.	34.2	Ref.
Age (18-24 years)	51.9	0.95 (0.70-1.30)	36.7	0.95 (0.70-1.28)	54.1	1.03 (0.76-1.38)	38.5	1.16 (0.86-1.57)
Age (25-39 years)	51.0	0.98 (0.79-1.21)	36.0	0.92 (0.75-1.13)	45.7	0.77 (0.63-0.94)	35.1	1.08 (0.89-1.31)
Age (40-54 years)	51.2	0.87 (0.71-1.07)	39.8	1.07 (0.89-1.27)	49.1	0.85 (0.71-1.02)	35.1	1.06 (0.87-1.30)
Age (55+ years)	52.1	Ref.	40.9	Ref.	51.3	Ref.	33.3	Ref.
Residence (urban)	50.2	0.92 (0.68-1.26)	36.0	1.00 (0.75-1.32)	47.1	0.93 (0.71-1.22)	34.4	0.94 (0.72-1.24)
Residence (intermediate)	55.2	1.08 (0.81-1.44)	43.7	1.28 (0.97-1.68)	51.7	1.11 (0.84-1.47)	36.1	1.07 (0.82-1.39)
Residence (rural)	48.0	Ref.	35.2	Ref.	48.4	Ref.	34.1	Ref.
Education (low)	47.3	0.86 (0.67-1.11)	36.9	1.00 (0.76-1.31)	49.0	1.34 (1.02-1.76)	31.1	1.10 (0.82-1.50)
Education (intermediate)	52.4	0.85 (0.67-1.06)	38.7	0.95 (0.75-1.20)	49.8	1.24 (0.99-1.56)	38.1	1.14 (0.88-1.48)
Education (high)	60.3	Ref.	43.0	Ref.	44.9	Ref.	32.2	Ref.
Employment status (employed)	49.3	0.93 (0.78-1.11)	37.2	0.81 (0.69-0.96)	47.0	0.96 (0.82-1.13)	33.8	0.86 (0.72-1.03)
Employment status (otherwise)	54.7	Ref.	40.9	Ref.	52.5	Ref.	37.0	Ref.
Smoking status (daily smoker)	50.4	0.99 (0.71-1.39)	37.4	0.89 (0.63-1.26)	48.8	1.28 (0.97-1.69)	34.5	1.12 (0.83-1.53)
Smoking status (non-daily smoker)	58.0	1.91 (1.14-3.19)	41.9	1.12 (0.69-1.83)	55.7	2.12 (1.30-3.46)	40.0	1.49 (0.88-2.51)
Smoking status (quitter)	60.9	Ref.	53.1	Ref.	47.9	Ref.	38.7	Ref.
Smoking-related beliefs and behaviours								
Knowledge of smoking health harms	-	0.98 (0.94-1.02)	-	0.99 (0.95-1.03)	-	1.02 (0.97-1.06)	-	0.99 (0.95-1.03)
Knowledge of SHS harms	-	1.14 (1.03-1.25)	-	1.15 (1.05-1.26)	-	1.09 (0.99-1.20)	-	1.26 (1.15-1.39)
Smoking restrictions index	-	1.31 (1.12-1.53)	-	1.54 (1.34-1.77)	-	1.28 (1.11-1.48)	-	1.68 (1.45-1.94)
Self-exempting beliefs	-	0.87 (0.78-0.98)	-	0.86 (0.79-0.94)	-	1.00 (0.91-1.10)	-	1.06 (0.95-1.19)
Smoking has damaged health	-	1.03 (0.92-1.15)	-	1.26 (1.12-1.41)	-	1.06 (0.96-1.18)	-	0.96 (0.86-1.06)
Negative attitude to smoking	-	1.26 (1.13-1.40)	-	1.42 (1.26-1.59)	-	1.06 (0.96-1.17)	-	1.13 (1.02-1.27)

(Continuation) Table S3

Variables	Restrict purchase location (n=5569)		Ban slim cigarettes (n=5551)		Ban display in shops (n=5568)	
	%	aOR (95% CI)**	%	aOR (95% CI)**	%	aOR (95% CI)**
Sociodemographic factors						
Sex (male)	29.1	1.09 (0.94-1.27)	25.1	1.33 (1.14-1.56)	15.7	1.28 (1.09-1.51)
Sex (female)	28.8	Ref.	20.5	Ref.	14.1	Ref.
Age (18-24 years)	29.4	0.92 (0.65-1.30)	27.1	1.26 (0.90-1.77)	7.9	0.37 (0.23-0.59)
Age (25-39 years)	28.1	0.94 (0.74-1.18)	23.5	1.16 (0.93-1.43)	14.4	0.93 (0.73-1.20)
Age (40-54 years)	27.9	0.88 (0.73-1.07)	22.1	1.01 (0.81-1.26)	15.4	0.95 (0.76-1.20)
Age (55+ years)	31.4	Ref.	22.2	Ref.	18.1	Ref.
Residence (urban)	26.7	0.84 (0.65-1.09)	22.7	1.03 (0.76-1.39)	13.9	0.88 (0.64-1.21)
Residence (intermediate)	31.9	1.01 (0.78-1.29)	24.0	1.03 (0.78-1.36)	15.4	0.94 (0.67-1.31)
Residence (rural)	28.5	Ref.	22.4	Ref.	16.1	Ref.
Education (low)	28.2	0.81 (0.60-1.09)	22.7	1.36 (1.00-1.85)	16.2	1.00 (0.70-1.43)
Education (intermediate)	28.5	0.79 (0.63-0.99)	24.1	1.34 (1.02-1.74)	14.1	0.97 (0.73-1.29)
Education (high)	33.5	Ref.	19.3	Ref.	15.5	Ref.
Employment status (employed)	28.0	0.87 (0.72-1.05)	22.6	0.90 (0.75-1.08)	13.8	0.69 (0.55-0.86)
Employment status (otherwise)	30.7	Ref.	24.0	Ref.	17.1	Ref.
Smoking status (daily smoker)	26.8	0.60 (0.44-0.84)	22.1	0.84 (0.57-1.24)	13.7	0.62 (0.43-0.91)
Smoking status (non-daily smoker)	46.4	1.31 (0.94-2.46)	32.5	1.56 (0.97-2.50)	20.7	1.16 (0.68-1.98)
Smoking status (quitter)	48.8	Ref.	30.3	Ref.	29.0	Ref.
Smoking-related beliefs and behaviours						
Knowledge of smoking health harms	-	0.96 (0.92-1.00)	-	0.93 (0.89-0.98)	-	1.00 (0.93-1.07)
Knowledge of SHS harms	-	1.16 (1.07-1.27)	-	1.23 (1.12-1.36)	-	1.21 (1.06-1.39)
Smoking restrictions index	-	1.67 (1.43-1.94)	-	1.96 (1.70-2.26)	-	1.16 (0.97-1.38)
Self-exempting beliefs	-	0.87 (0.80-0.96)	-	1.02 (0.92-1.14)	-	0.87 (0.78-0.97)
Smoking has damaged health	-	1.17 (1.05-1.31)	-	1.22 (1.07-1.40)	-	1.10 (0.97-1.25)
Negative attitude to smoking	-	1.46 (1.30-1.63)	-	1.16 (1.03-1.30)	-	1.51 (1.32-1.72)

Results of weighted logistic regression analyses, aOR= adjusted odds ratio, CI= confidence interval, SHS=secondhand smoke, *at Wave 2 there were 95.8% current smokers and 4.2% recent quitters **1 logistic regression models controlled for sex, age, area of residence, level of education, employment status, country, knowledge of smoking harms, knowledge of secondhand smoke harms, smoking restriction index, smoking damaged health, self-exemption beliefs and overall attitude to smoking.

Daily smokers had significantly lower odds of supporting restricting purchase locations (OR=0.60; 95% CI: 0.44-0.84) and of banning the display of tobacco products in shops (OR=0.62; 95% CI: 0.43-0.90) compared to quitters.

Having more negative attitudes towards smoking was significantly associated with higher support for all tobacco control measures except for support of further industry responsibility, with the highest association being for support for cigarette display bans in shops (OR=1.51; 95% CI: 1.32-1.72) and for restricting purchase location (OR=1.46; 95% CI: 1.30-1.63).

Those with high knowledge of the harms of secondhand smoke exposure were significantly more likely to support six of the seven tobacco control measures, with the highest odds of support being for plain packaging implementation (OR=1.26; 95% CI: 1.15-1.39) and for ban on slim cigarettes (OR=1.23; 95% CI: 1.12-1.36).

Participants who believed that smoking had damaged their health had significantly higher odds of supporting the restriction of purchase locations (OR=1.17; 95% CI: 1.05-1.31), a ban on slim cigarettes (OR=1.22; 95% CI: 1.07-1.40) and a ban on cigarettes sale in 10 years, if the government provided cessation aid (OR=1.26; 95% CI: 1.12-1.41).

Self-exempting beliefs were significantly associated with lower support for four tobacco control measures, particularly more tobacco products rules and regulation (OR=0.87; 95% CI: 0.78-0.98), a ban on cigarettes in 10 years, given assistance to quit smoking is provided (OR=0.86; 95% CI: 0.79-0.94), restriction in purchase locations (OR=0.87; 95% CI: 0.80-0.96), and a ban on the display of cigarettes in shops (OR=0.87; 95% CI: 0.78-0.97).

Paper 4.

Support for making smoking or cigarette sales illegal in 12 European countries

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Public support for making smoking or cigarette sales illegal in 12 European countries: the tobacco endgame in Europe

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WHAT THIS PAPER ADDS

What is already known on this subject

- Wide public support has been identified as vital to the success of any tobacco endgame strategy.
- The last extensive evaluation of public opinion on making smoking or cigarette sales illegal in several European countries dates from 2010.

What important gaps in knowledge exist on this topic

- Very few publications have evaluated support for making smoking or cigarette sales illegal among the general population of European countries.

What this study adds

- In 2017-2018, there was some support for this endgame policy in the 12 European countries evaluated (37%), still the majority did not support this approach in all countries surveyed.
- The levels of support for making smoking or cigarette sales illegal varied considerably across countries, from 25% in Greece to 44% in Ireland. Policy aiming towards an endgame in Europe should be mindful of the differences in support among countries.

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ABSTRACT (250/250)

Background: The European Commission as well as several European countries have set targets and deadlines for a tobacco endgame. As these deadlines come closer and understanding that ending the sales of cigarettes has been proposed as one possible endgame policy, it is relevant to assess public support for making smoking or cigarette sales illegal.

Methods: The TackSHS Survey was conducted among representative samples of the adult population in Bulgaria, England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Portugal, Romania, and Spain in 2017-2018. Descriptive analysis and multilevel logistic regression models assessed support for making smoking or cigarette sales illegal, testing differences in individual and country-level characteristics.

Results: Among the total sample ($n=11,902$), 36.7% supported making smoking or cigarette sales illegal. The lowest support were in Greece (25.0%) and Germany (30.2%), and the highest were in Italy (43.7%) and Ireland (43.8%). Overall, higher support was observed among never smokers (44.7%; OR:2.94; 95% CI: 2.63–3.22) compared to current smokers (21.4%); in countries with lower smoking prevalence (43.4%) compared to those with moderate (30.8%; OR:0.59; 95%CI: 0.50-0.69); and in countries with stronger tobacco control policies (40.4%; OR:1.59; 95%CI: 1.43-1.77).

Conclusion: Our results show non-negligible, although variable, support for making smoking or cigarette sales illegal, but most of the population did not agree with such a policy approach. As banning cigarette sales is considered as a possible future endgame policy, these results may help inform the timeline for its implementation and serve as a baseline for future evaluation of support for this policy.

Keywords

support; endgame; total ban; public opinion; smoking; cigarette sales.

INTRODUCTION

In recent years a shift in the public policy approaches to tobacco control has been gaining momentum, the tobacco endgame strategies, aiming for a tobacco-free future with near-zero smoking prevalence. Several paths to achieve such an endgame have been proposed and are still being debated.[1] One of the endgame strategies, considered to be a radical and unprecedented measure, is the ban of cigarette sales.[2,3]

In 2021, the European Commission set as a target a tobacco-free generation by 2040, with less than 5% of the population using tobacco.[4] Additionally, some countries in Europe have also set their own endgame targets to reach a tobacco-free generation, such as Ireland by 2025,[5] Scotland by 2034,[6] Finland by 2040,[7] and the Netherlands by 2040.[8] As the target dates move closer, and understanding the vital importance of public support to the success of any endgame strategy,[9,10] this study aims to evaluate general population level of support for a cigarette sales ban in 12 European countries in 2017/18. Understanding public opinion can be valuable in setting realistic goals and programming effective policies and interventions to improve acceptability and support for a tobacco-free generation.

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METHODS

Data come from a survey performed within the TackSHS project (www.tackshs.eu).[11] This cross-sectional survey was conducted in 12 European countries (Bulgaria, England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Portugal, Romania, and Spain). The survey methods have been reported in detail elsewhere.[12] In brief, the survey used representative samples of the general population in terms of age (adults 15 or older), sex, habitat (i.e., geographic area and/or size of the municipality) and, in some countries, socio-economic characteristics. Interviews were conducted face-to-face with computer-assisted personal interviewing. Data were collected between June 2017 and October 2018. Around 1000 participants were interviewed in each country, totalling 11,902. Three sampling methods were used in each country, multistage sampling (Bulgaria, Greece, Italy, Latvia, Poland, and Romania), cluster sampling with quotas (England and France), and stratified random sampling (Germany, Ireland, Portugal, and Spain).

We assessed support for the tobacco endgame with the following question: “To control and limit tobacco use, the government or the national political decision-makers could adopt several strategies. How useful do you assess the following: making smoking or cigarette sales illegal?”. Response options were: very useful, quite useful, rather useless, completely useless, don’t know/refused to answer. The outcome measure was dichotomised in supportive (very useful, quite useful) and non-supportive (rather useless, completely useless). Subjects answering “don’t know/refused to answer” were considered as missing values.

Weighted estimates of attitudes and 95% confidence intervals (CIs) were calculated overall, by country, by country-level characteristics (smoking prevalence obtained from the same survey[12] and tobacco control policies measured with the Tobacco Control Scale in 2016[13]) and by individual-level sociodemographic (sex, age group, level of education and smoking status). Odds ratios (OR) and the corresponding 95% CIs for support vs. non-support were

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estimated using unconditional and multilevel logistic regression models, after adjustment for sex, age, and smoking status.

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RESULTS

Figure 1 shows Europeans' support for making smoking or cigarette sales illegal, overall and by country. The overall support for banning smoking/cigarette sales was 36.7% (95% CI: 35.8-37.6). The highest support was among people in Ireland (43.8%; 95% CI: 40.6-47.1), Italy (43.7%; 95% CI: 40.7-46.8), and England (42.9%; 95% CI: 39.7-46.0); and the lowest was reported by those in Greece (25.0%; 95% CI: 22.2-27.7), Germany (30.2%; 95% CI: 27.3-33.1) and Bulgaria (30.8%; 95% CI: 28.0-33.7). Respondents in all countries reported significantly higher support than in Greece, apart from those in Germany, Bulgaria and Poland.

Table 1 shows support for ending smoking or sales of cigarettes in 12 European countries according to country-level and individual characteristics. Among the individuals' characteristics, never smokers (44.7%; OR: 2.94; 95% CI: 2.63-3.22) and ex-smokers (33.5%; OR: 1.79; 95% CI: 1.42-2.19) were significantly more likely to support the endgame policy as compared to current smokers (21.4%). Support also varied by age group, with all age groups supporting the endgame policy significantly more than the younger age group except for those between 45 and 64 years. There were no differences in support by sex and level of education. Regarding country-level characteristics, participants in countries with more tobacco control policies (scoring >50 points in the tobacco control scale) were significantly more likely to support the endgame policy (OR: 1.59; 95% CI: 1.43-1.77). There was no significant trend in support relative to the smoking prevalence of various countries, but those respondents from the countries with a prevalence of smoking lower than 20% reported significantly higher support (43.4%) than those in countries with rates between 20-30% (30.8%; OR: 0.59; 95% CI: 0.50-0.69).

Table 1. Prevalence of support^a (%; 95% confidence interval, CI) and factors associated with support (aOR)^b for making smoking or cigarette sales illegal, in order to control and limit tobacco use. The TackSHS Survey, 2017-2018.

	Percentage of support ^a (95% CI)	aOR ^b (95% CI) of support	aOR ^c (95% CI) of support
Overall	36.7 (35.8-37.6)	----	----
Country			
Greece	25.0 (22.2-27.7)	1 ^d	----
Germany	30.2 (27.3-33.1)	1.05 (0.80-1.39)	----
Bulgaria	30.8 (28.0-33.7)	1.28 (0.86-1.92)	----
Poland	31.8 (28.3-35.3)	1.16 (0.86-1.55)	----
Portugal	33.9 (31.0-36.9)	1.45 (1.01-2.07)	----
France	36.2 (33.2-39.2)	1.60 (1.21-2.12)	----
Spain	38.2 (35.2-41.3)	1.73 (1.30-2.30)	----
Romania	41.4 (38.2-44.5)	2.03 (1.48-2.78)	----
Latvia	42.1 (39.0-45.2)	1.97 (1.07-3.64)	----
England	42.9 (39.7-46.0)	1.92 (1.45-2.55)	----
Italy	43.7 (40.7-46.8)	1.90 (1.21-2.97)	----
Ireland	43.8 (40.6-47.1)	1.81 (1.37-2.40)	----
Sex			
Women	38.3 (37.1-39.5)	----	1.01 (0.93-1.09)
Men	35.0 (33.8-36.3)	----	1 ^d
Age group (years)			
15-24	35.5 (33.1-38.0)	----	1 ^d
25-44	36.4 (34.9-38.0)	----	1.15 (1.01-1.31)
45-64	33.9 (32.4-35.3)	----	1.04 (0.91-1.18)
>=65	43.5 (41.4-45.6)	----	1.34 (1.16-1.55)
p for trend			0.003
Education			
High	37.1 (35.4-38.9)	----	1 ^d
Medium	33.9 (32.4-35.3)	----	0.96 (0.77-1.16)
Low	39.2 (37.7-40.6)	----	1.10 (0.98-1.22)
p for trend			0.065
Smoking Status			
Current smoker	21.4 (19.9-22.8)	----	1 ^d
Ex-smoker	33.5 (31.4-35.7)	----	1.79 (1.42-2.19)
Never smoker	44.7 (43.5-45.9)	----	2.94 (2.63-3.22)
Country smoking prevalence^a			
<20 %	43.4 (41.7-45.0)	----	1 ^d
20-30 %	30.8 (29.3-32.4)	----	0.59 (0.50-0.69)
>30 %	36.2 (34.8-37.4)	----	0.86 (0.74-1.01)
p for trend			0.527
Tobacco Control Scale score (2016)^f			
score ≤50 points	30.6 (29.3-32.0)	----	1 ^d
score >50 points	40.4 (39.3-41.5)	----	1.59 (1.43-1.77)

CI: confidence interval; aOR: adjusted odds ratio.

^aPrevalence estimates were computed weighting each country in proportion to the country-specific population aged 15 years or over. "Percentage of support" is the proportion of respondents who rated making cigarette smoking or sales illegal as quite or very useful.

^bAdjusted odds ratios (aOR) were estimated using unconditional logistic regression model, after adjustment for sex, age and smoking status. Estimates in bold are statistically significant at 0.05 level.

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^eAdjusted odds ratios (aOR) were estimated using a multilevel logistic regression model, after adjustment for sex, age, and smoking status, and considering the study country effects as random intercepts. Estimates in bold are statistically significant at 0.05 level.

^fReference category.

^gCountry's total smoking prevalence: <20 (Ireland, England, Italy) 20%-30% (Germany, Latvia and Poland) and >30% (Bulgaria, France, Greece, Portugal, Romania and Spain).[12]

^hTobacco Control Scale 2016 score: ≤50 (Bulgaria, Poland, Portugal, Latvia, Greece and Germany) and score>50 (England, Ireland, France, Romania, Italy and Spain).[13]

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DISCUSSION

Approximately four out of ten people supported making smoking or cigarette sales illegal in 12 European countries in 2017-2018, with the majority not supporting the measure. As expected, never smokers and ex-smokers were more supportive than smokers. Also, people in countries with more tobacco control policies were more supportive of this endgame strategy than people in countries with fewer policies. Finally, support was higher among participants in countries with a relatively low smoking prevalence.

Has the public support for this endgame strategy changed over time? We can compare the TackSHS Survey estimates with those from a companion study within the PPACTE project,[14] a study conducted in 18 European countries (Albania, Austria, Bulgaria, Czech Republic, Croatia, England, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Poland, Portugal, Romania, Spain and Sweden) in 2010, applying similar sampling methodology, sample size and questions on smoking and attitudes. Out of the 11 countries in common between both studies, the most pronounced endgame support increases were in France (from 20.6% in 2010 to 36.2% in 2017-2018) and Portugal (from 18.3% in 2010 to 33.9% in 2017-2018). Decreases in support were observed in four countries, the highest being in Italy (from 57.8% to 43.7%) and Poland (from 49.7% to 31.8%). Overall, there was a slight increase in support, from 35.4% in 2010 to 38.4% in 2017-2018 in the 11 common countries. Contrary to expected, these changes do not follow fluctuations in smoking prevalence in these countries.[15] One alternative explanation for these changes could be the tobacco control policies in these countries, such as the enactment of plain packaging and public campaigns in France.[16] Another could be the penetration of alternative tobacco products that might have played a role in renormalising smoking and thus modified public support for ending smoking or cigarette sales.[17] Future research should explore and identify further reasons at the individual and country levels.

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4 Apart from the study mentioned above, very few prior studies have evaluated the levels of
5 support for banning smoking or cigarette sales in European countries. One of them, using data
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7 from a survey with smokers in 6 European countries (Germany, Greece, Hungary, Poland,
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9 Romania, and Spain) in 2018, found that 40% of smokers would support a total ban on
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11 cigarettes within ten years if the government helped smokers quit.[18] A study in Denmark
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13 comparing data from 2013 and 2017 on support for a ban on smoking in 10 years established
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15 that support increased from 30.6% to 50.3% among the general adult population.[19] Finally,
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17 a study evaluating support for a tobacco ban among individuals aged 15-24 in 27 European
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19 Union Member States showed that 16.5% of them supported the policy in 2014.[20] The
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21 contrast between these results and ours suggest that setting a future data frame instead of an
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23 immediate one and introducing the total ban together with policies to help smokers quit may
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25 influence public support, even among those who historically have been the most reluctant
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27 towards tobacco control. Furthermore, these findings suggest that there might have been an
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29 increase in support for a total smoking ban among the younger age group in Europe, although
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31 they are still the age group least supportive of a smoking ban.
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38 Our results are particularly relevant as the European Commission has recently set the target to
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40 reach a smoking prevalence of less than 5% by 2040,[4] since they highlight that the public is
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42 more supportive of this measure in some countries than in others and that there is still arduous
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44 and country-specific progress to make into denormalising smoking and cigarette sales and
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46 informing the public about the feasibility and benefits that this policy could bring.[3] As
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48 previously mentioned, ending smoking or cigarette sales is only one of the several strategies
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50 proposed to achieve a tobacco endgame; and most of the countries included in this study are
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52 still to fully implement a comprehensive set of tobacco control measures[21] that could
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54 contribute to denormalising smoking and fomenting the readiness for more radical endgame
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56 approaches among the population, such as the ban on cigarette sales.
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4 Those arguing for a ban on cigarette sales as part of the endgame approach have set
5 requirements and obstacles to the success of this policy; two of the requirements being a
6 smoking prevalence below 10% by the time a sales ban is instituted and a gradual rather than
7 sudden implementation of the ban, allowing time for smokers to quit and catalysing public
8 discussion and awareness about the policy. In addition, they present public opposition as one
9 obstacle to the success of a ban on sales.[3] Currently, none of the countries included in our
10 study has reached a smoking prevalence of less than 10%, with England (19.8%), Ireland
11 (19.6%) and Italy (18.9%) presenting the lowest ones.[12] Among these three, only Ireland has
12 established its aim for a tobacco-free country (less than 5% prevalence by 2025) and did not
13 include the ban on cigarette sales as part of the approach. Furthermore, our results show that
14 there was extensive public opposition to the policy in 2017-2018. Taking these together might
15 suggest that envisioning a ban on cigarette sales in any of these countries in the short term
16 could be premature, although our findings should not be used as evidence against the further
17 consideration and, if deemed appropriate, the future implementation of a cigarette sales ban.

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Some limitations of this study merit consideration. We acknowledge that the phrasing of the
endgame question in our survey could be interpreted in several ways. One of the most evident
alternatives could be the evaluation the public has of the feasibility of making smoking or
cigarette sales illegal. Understanding that the tobacco endgame and the phasing out strategy
are relatively new approaches and that most tobacco control policies face scepticism when first
proposed, our findings could also reflect that a large part of the people in the countries here
included are still reluctant about the new possibility. It is important consider these findings, as
banning cigarette sales without public support could lead to a growth in illicit tobacco markets
or non-compliance.[22] Second, the question mentions two elements to the policy, making
illegal the personal activity of smoking and also the commercialisation of cigarettes, which
might have influenced the levels of support; it would be valuable that future evaluations make

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3 the distinction between these two, as they do not necessarily overlap. Additionally, our results
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5 come from a survey conducted in 2017-2018, and therefore the support for ending cigarette
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7 sales could have changed since, particularly given major societal changes that have occurred
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9 during the COVID-19 pandemic. Nonetheless, our study is based on nationally representative
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11 samples of 12 European countries, and we have used a standardised questionnaire for all
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13 countries, enabling cross-country comparisons.
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16 17 **CONCLUSION**

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19 Our results show that there are variable levels of support across European countries for making
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21 smoking or cigarette sales illegal, with the majority of the population in all countries not
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23 supporting this policy in 2017-2018. These results might guide the plans on how to get to the
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25 tobacco endgame in each country, as tobacco endgame approaches that are less radical might
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27 be currently more widely supported by the public and, therefore, considered before
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29 implementation of a total ban on smoking or cigarette sales.
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Figure 1. Support (%) and 95% confidence interval (bars) for making smoking or cigarettes sales illegal in order to control and limit tobacco use in 12 European countries and overall. The TackSHS Survey, 2017-18.

GR=Greece, DE=Germany, BG=Bulgaria, PL=Poland, PT=Portugal, FR=France, TOTAL=overall sample, ES=Spain, RO=Romania, LV=Latvia, EN=England, IT=Italy, IE=Ireland.

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CONFLICT OF INTEREST

None to declare.

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REFERENCES

- 1 McDaniel PA, Smith EA, Malone RE. The tobacco endgame: a qualitative review and synthesis. *Tob Control* 2016;**25**:594 LP – 604. doi:10.1136/tobaccocontrol-2015-052356 [published Online First: 28 August 2015].
- 2 Laugesen M, Glover M, Fraser T, *et al*. Four policies to end the sale of cigarettes and smoking tobacco in New Zealand by 2020. *NZ Med J* 2010;**123**:55–65.
- 3 Smith EA, Malone RE. An argument for phasing out sales of cigarettes. *Tob Control* 2020;**29**:703–8. doi: 10.1136/tobaccocontrol-2019-055079 [published Online First: 21 September 2019].
- 4 The European Commission. World No Tobacco Day 2021: Statement by Health and Food Safety Commissioner Stella Kyriakides. 2021. Available: https://ec.europa.eu/commission/presscorner/detail/en/statement_21_2761 [accessed 21 Jul 2021].
- 5 Mooney T. Towards a tobacco free society: report of the tobacco free policy review group. *Dublin, Dep Heal Child* 2000. Available: https://www.drugsandalcohol.ie/5337/1/DOHC_towards_tobacco_free_society.pdf [accessed 21 Jul 2021].
- 6 Reid G, Rennick L, Laird Y, *et al*. Review of ‘Creating a tobacco-free generation: A Tobacco Control Strategy for Scotland’. *Edinburgh NHS Heal Scotl* 2017. Available: <http://www.healthscotland.scot/media/1545/review-of-creating-a-tobacco-free-generation-a-tobacco-control-policy-for-scotland.pdf> [accessed 21 Jul 2021].
- 7 Health M of SA and. Roadmap to a Tobacco-free Finland: Action Plan on Tobacco Control. 2014. Available: https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/70305/URN_ISBN_978-952-00-3513-6.pdf?sequence=1 [accessed 22 Jul 2021].

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- 8 Preventieakkoord N. Naar een gezonder Nederland. *Den Haag Minist van Volksgezond Welz en Sport* 2018.
- 9 Malone RE. The race to a tobacco endgame. *Tob Control* 2016;*25*:607-608. doi:
10.1136/tobaccocontrol-2016-053466 [published Online First: 21 October 2016].
- 10 Thomson G, Edwards R, Wilson N, *et al*. What are the elements of the tobacco
endgame? *Tob Control* 2012;*21*:293-5 doi: 10.1136/tc.2010.040881 [published Online
First: 16 February 2012].
- 11 Fernández E, López MJ, Gallus S, *et al*. Tackling second-hand exposure to tobacco
smoke and aerosols of electronic cigarettes: the TackSHS project protocol. *Gac Sanit*
2020;*34*:77-82. doi:10.1016/j.gaceta.2019.07.002 [published Online First: 23
September 2019].
- 12 Gallus S, Lugo A, Liu X, *et al*. Who Smokes in Europe? Data From 12 European
Countries in the TackSHS Survey (2017-2018). *J Epidemiol* 2021;*31*:145-51.
doi:10.2188/jea.JE20190344 [published Online First: 05 February 2021].
- 13 Joossens L, Raw M. The tobacco control scale 2016 in Europe. 2017. Available:
<https://www.tobaccocontrolscale.org/2016-edition/> [accessed 11 Mar 2021].
- 14 Gallus S, Lugo A, Fernandez E, *et al*. Support for a tobacco endgame strategy in 18
European countries. *Prev Med (Baltim)* 2014;*67*:255-8.
doi:<https://doi.org/10.1016/j.ypmed.2014.08.001> [published Online First: 10 August
2014].
- 15 World Health Organization. European tobacco use: Trends report 2019. *Geneva WHO*
2019. Available:
[https://www.euro.who.int/__data/assets/pdf_file/0009/402777/Tobacco-Trends-
Report-ENG-WEB.pdf](https://www.euro.who.int/__data/assets/pdf_file/0009/402777/Tobacco-Trends-Report-ENG-WEB.pdf) [accessed 11 Mar 2021].

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52
53
54
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57
58
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- 16 Guignard R, Andler R, Richard J-B, *et al.* Effectiveness of ‘Mois sans tabac 2016’: A French social marketing campaign against smoking. *Tob Induc Dis* 2021;**19**:1–13. doi:10.18332/tid/139028 [published Online First: 13 November 2019].
- 17 Wu YS, Wang MP, Ho SY, *et al.* Positive perceptions of electronic cigarettes relative to combustible cigarettes are associated with weaker support for endgame policies on combustible cigarettes: A population-based cross-sectional study in Hong Kong. *Tob Induc Dis* 2019;**17**. doi: 10.18332/tid/110697 [published Online First: 28 August 2019].
- 18 Nogueira SO, Driezen P, Fu M, *et al.* Beyond the European Union Tobacco Products Directive: smokers’ and recent quitters’ support for further tobacco control measures (2016–2018). *Tob Control* 2021. doi:10.1136/tobaccocontrol-2020-056177 [published Online First: 16 March 2021].
- 19 Toxværd CG, Pisinger C, Lykke MB, *et al.* Making smoking history: temporal changes in support for a future smoking ban and increasing taxes in the general population of Denmark. *Tob Control* 2021. doi: 10.1136/tobaccocontrol-2020-056067 [published Online First: 11 June 2021].
- 20 Palladino R, Hone T, Filippidis FT, *et al.* Changes in support for bans of illicit drugs, tobacco, and alcohol among adolescents and young adults in Europe, 2008–2014. *Int J Public Health* 2018;**63**:23–31. doi: 10.1007/s00038-017-1025-y [published Online First: 09 August 2017].
- 21 Joossens L, Feliu A, Fernandez E. The Tobacco Control Scale 2019 in Europe. Brussels: 2020. Available: <http://www.tobaccocontrolscale.org/TCS2019.pdf> [accessed 14 Mar 2021].
- 22 van der Eijk Y. Development of an integrated tobacco endgame strategy. *Tob Control* 2015;**24**:336 LP – 340. doi:10.1136/tobaccocontrol-2013-051211 [published Online

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First: 04 November 2013].

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PART SIX
DISCUSSION

The main topic throughout this thesis was the evaluation of the public opinion around several tobacco control policies in a set of European Union countries. One specific aim was to assess possible factors associated with public support. Following this structure, this section aims to highlight the main findings, the critical relationships between them, and put them into perspective, considering the current tobacco control atmosphere in the European Union. Finally, this section included a discussion of the limitations and strengths of this thesis and what questions it leaves unanswered, which could be further explored.

Interpretation of the results

From near-universal to controversial: the case of smoke-free policies

The first two papers of this thesis are related to smoke-free legislation. In the first, we have evaluated support among smokers in 6 European countries for legislation to ban smoking inside cars when others (children and non-smokers) are present. In the second, we evaluated the levels of support for smoke-free legislation in several indoor and outdoor settings among the general population and the correlates to such support.

Historically, the demand for and implementation of smoke-free legislation was associated with evidence of the harms caused

by SHS exposure and non-smokers' rights for clear airs.[102] Given that most of the literature was related to enclosed spaces, the first wave of smoke-free legislation enacted covered indoor public settings.[103] This first wave of smoke-free policies in Europe started in Ireland in 2004 and several other countries followed in the subsequent years, in accordance with the WHO FCTC. The legislation in this period was almost exclusively focused on restricting or banning smoking in indoor areas. Additionally, several of these smoke-free regulations were not comprehensive, meaning they opened room for exceptions, such as smoking rooms. Currently, all EU countries have implemented smoke-free legislation with varying coverage levels of indoor and outdoor settings.

It is crucial to notice that almost the totality of the smoke-free policies in EU countries restricts smoking in indoor public settings, although they still diverge in the strictness of such restrictions. Our results show that the majority of the population support a total smoking ban in all indoor public settings we evaluated. That is to say that they are supportive of more

restrictive legislation than the current ones. Additionally, the public is supportive of the total bans already in place.[102] At this point it is important to mention that evidence recently published has shown that there is still SHS exposure in the settings evaluated in our study; the same study has also shown that the stricter the smoke-free legislation in place the lower the SHS exposure levels were in those settings (see annex 2 for the entire paper).[104] Taken together, our results of high support for smoke-free legislation and the findings of the current existent SHS exposure, are great ingredients to enact reformulations on the legislation regarding smoking in the countries and settings.

Regarding smoking bans in outdoor public places, the general population has shown variable levels of support, with around half of the people supporting bans in almost all outdoor places. However, the support was higher in the cases of involvement of children and healthcare facilities, reaching as high as 70% of support for smoking bans in children's playgrounds. As mentioned before, although there is evidence pointing out that the exposure to SHS in outdoor places is not negligible, such

evidence is mainly restricted to hospitality settings and the entrance of places covered by a smoking ban.[105–107] Therefore, it is plausible that the levels of support for smoke-free legislation in public outdoor places are lower than in public indoor places, as even among the scientific community, this topic has proven controversial,[108,109] and a recent review has still found few studies regarding this topic.[110]

Another dichotomy related to banning smoking is the private versus public sphere. It has been suggested that people would be less supportive of having smoking regulated in their personal environments, as it is believed that the state should not regulate private places.[111] In two of our studies we evaluated support for a smoking ban in private cars. In one of them, we found that 70% of smokers who owned a car reported having any voluntary smoke-free rules on smoking in the presence of children, meaning 30% of them smoke in cars while carrying children. Regarding support, in our study in 12 European countries, six out of ten people would agree supporting bans on cars. However, when asked if they would support a ban on cars carrying minors, this number went up to

seven out of ten people. If we consider the differences in support among smokers for regulating smoking in cars versus regulating smoking in cars when carrying minors, the growth in support is even bigger, from four to six out of ten people. Furthermore, the results of our study with smokers in 6 European countries shows that the support for banning smoking in cars in the presence of children and non-smokers was almost universal and nevertheless increased between 2016 and 2018. These results indicate the public opinion is less supportive of banning smoking in private settings; however, they also suggest that this support could be increased by linking or framing the regulation to the protection of others (non-smokers and children), as some other publications have suggested.[95]

It is important to notice that although smoke-free legislation has been mostly pinned on the protection of non-smokers from the health harms of SHS, the current COVID-19 pandemic has ignited a new wave of smoke-free legislation in several countries as SHS increases the risk of transmission through the inhalation of emitted smoke and tiny droplets in it. Therefore,

our results might be relevant for the implementation of smoke-free settings connected to this pandemic, although they might be an underestimation of the current support.[112]

Smokers' support for more comprehensive regulation of tobacco products

As previously mentioned, the definition of 'comprehensive' tobacco control policies shifts as scientific evidence evolves and changes in the tobacco-products market happen.[45] In the results section, we have evaluated population's support for more comprehensive tobacco control policies than those currently in place. Apart from smoke-free legislation (discussed in the previous section), we have also assessed smokers' support for more products regulation, support for plain packaging, ban on slim cigarettes and ban on display of cigarettes in shops. Overall, smokers reported rates of support lower than 50% for all these policies, which is predictable, as these policies would interfere and restrict their ability to access

the products they regularly consume. However, it is essential to mention that in the total sample of this study (the six countries together), 51% of smokers were in favour that “tobacco companies should take responsibility for the harm caused by smoking”, and 49% supported that “tobacco products should be subject to more rules and regulations”. These findings suggest that smokers could be receptive to innovative and more comprehensive policies related to these contexts, such as investing the financial resources from taxing the profits of tobacco companies into the healthcare system or regulating the content of cigarettes to make them less addictive.

One interesting finding is the case of support for restricting purchase location. Although the levels of support among smokers to this policy did not reach the majority, Hungary had the highest support (37%) for this policy among the six countries included in our study. The country has adopted a licensing system in 2003, limiting the sales of tobacco products to only licensed outlets. [113] That suggests, similarly to other studies related to tobacco control policies, [79,95]

that implementing a policy usually leads to increased support for it in a so-called virtuous cycle.

Connected to this idea of a virtuous cycle, we aimed to evaluate the changes in support for plain packaging before and after the implementation of the 2014 EU TPD. As a result of the TPD, in 2016, new and enlarged graphic warning labels were introduced in tobacco products, and it was our interest to test if there would be an increase in support for further changes in tobacco products packs, more specifically for plain packaging between 2016 and 2018. Our results have shown that that was only the case for smokers in Spain, where there was an increase of 13% in support for plain packaging, while support levels remained unchanged in the other countries. It is crucial to mention here that the pre-post evaluations were only two years apart, which may not have been enough time for changes in support. Additionally, in each country evaluated the warning labels had different sizes and, in some countries, the changes incorporated might not have been significant enough to promote changes in public opinion.[114,115]

Public opinion about the future of tobacco control: a lesson on how to present policy to the public

As previously mentioned, several European countries have established their aim to reach a tobacco endgame, a future in which the smoking prevalence is close to zero. As the tobacco endgame has gained momentum in recent years, it is still a matter of debate and there is no consensus on the policies that should be a part of the approaches countries should have to reach the end of the tobacco epidemic. Approaches are currently being discussed among researchers and advocates, and little is known about what the levels of support are for the possible endgame policies among the public opinion.

One of the policies being widely discussed is phasing out cigarette sales.[116,117] Our results have shown that the general population in the 12 European countries included is sceptical about the efficacy of implementing prohibitions on smoking or cigarette sales, with the majority of them not supporting the policy. In the countries evaluated in which tobacco control is more evolved and the smoking prevalence is lower, the population supports banning smoking or the sales of cigarettes significantly more; however, this support is still restricted to around 40% of the population in these countries. These were expected results as is a relatively new and is considered a *radical* measure even among those who have proposed it.[117]

Interestingly, within our EUREST-PLUS study, we have also assessed the levels of support for phasing out the sales of cigarettes among smokers from 6 European countries and, surprisingly, the level of support for it was very similar to the ones mentioned above in the TackSHS survey for the countries included in both studies (Germany, Greece, Poland, Romania, and Spain). However, there were two main differences: (1) in the EUREST-PLUS study, the support was measured among

smokers only while in the TACKSHS survey, among the general population; and (2) there were crucial differences in the phrasing of the questions: we asked smokers: “would you support a total ban on cigarettes and other smoked tobacco within 10 years, if the government provided assistance such as cessation clinics to help smokers quit?”. Whereas the question made to the general population was as follows: “How useful do you assess the following: making smoking or cigarette sales illegal”.

Put simply, the levels of support for banning cigarette sales were similar among the general population and smokers only, which is not expected as it has been demonstrated consistently that smokers support tobacco control policies considerably less as compared to the general population. This contrast suggests that public opinion would be more supportive of a total ban on cigarette sales if the policies would be implemented jointly with cessation aids and if there was a future (and specific) timeframe for this policy implementation.

Who supports tobacco control in European countries? The psychosocial and country-level aspects

Our findings add to the body of literature that indicates that non-smokers are generally more supportive of tobacco control policies than smokers, as it is expected that people generally support legislation that agrees with their self-interest.[118] However, it is interesting to notice that in our results, a considerable percentage of smokers supported smoking bans; in some instances, the majority of smokers did so. This pattern was not restricted to smoke-free legislation, as the majority of smokers also supported that tobacco products should be further regulated. Another result along the same lines was that recent quitters had significantly higher odds of supporting all tobacco control policies than smokers in our EUREST-PLUS study assessing further regulation. Taken together, these results suggest that these smokers might have an interest in

quitting or reducing their smoking consumption and that these policies could be of their interest as they could assist their reduction/quit attempts. Another hypothesis might be the growing “softening” of smokers in the European Union[48] and the fact that these smokers do not really consider themselves as smokers and therefore do not see these policies would necessarily conflict with their self-interests.

Regarding smokers, their levels of knowledge about the harms caused to non-smokers, their levels of smoking socio-denormalisation and their negative attitudes about smoking were associated with higher support for tobacco control policies. These findings suggest that introducing new measures to inform the population of the smoking harms and enhance denormalisation might enhance the support of tobacco control measures. Furthermore, the understanding of such characteristics could improve the communication of future tobacco control measures to smokers.

Apart from smoking status, our results have not shown any other individual-level correlate to supporting tobacco control measures, which might indicate that the levels of support are shared across gender and social gradients. Regarding the

country-specific correlates evaluated, the country-level SHS exposure and smoking in each setting were inversely associated with supporting smoke-free legislation in those settings, and the stronger the tobacco control policies a country had, the higher the support for ending the sales of cigarettes among the general population.

Limitations and strengths

The findings of the studies that compose this thesis are subjected to some limitations. First, all our findings are based on self-reported data collected in face-to-face interviews, which might have implications for the results, as social desirability may be a source of bias, overestimating the support for the tobacco control measures assessed. We also acknowledge that question wording might have influenced respondents' answers, as there are several ways to address support for a specific policy, and framing might bias the responses. Along the same lines, it has been argued that measures of agreement to policy in surveys may narrow and obscure the complexity of the public responses to these policies.[119] Especially in cases of emerging policy options such as the endgame ones, qualitative research represents a valuable approach to investigating public attitudes. Such

studies can be designed from the results obtained in this thesis and should contribute not only a better understanding of the population wishes, fears and expectative but also to design strategies and guide interventions at the population level. However, we believe that survey studies like ours provide clear public opinion indicators, useful for public health planning and advocacy.[120] Additionally, our data were collected between 2016 and 2018 in both surveys, and therefore the level of support might have fluctuated in that period and also since that period, especially as society has been undergoing a major public health crisis with the COVID-19 pandemic, which might have had impacts on attitudes towards smoking and tobacco control policies in the present. Finally, as the nature of cross-sectional analysis precludes any inference on causation, it was not our objective to evaluate mediational path or make inferences about the direction of causality between the variables associated with support, which however would be valuable knowledge to design public health campaigns and develop readiness on the population around the implementation of tobacco control policies. These interesting aspects could be addressed after further follow-up of the

EUREST-Plus cohorts, as it has recently been completed in Spain, with new wave of the cohort finished in July 2021 but still pending of analysis.

Despite these limitations, our studies are based on representative samples of the adult population of the 12 countries studied or representative samples of smokers in 6 countries. The data were collected using a standardised questionnaire across all countries in each survey, making cross-country comparisons possible. To the best of our knowledge, the studies that compose this thesis are the most comprehensive in terms of the number of policies evaluating the support for tobacco control policies in several European countries in recent years and, therefore, it can be a relevant tool in informing researchers, policymakers and advocates the pathway to future public health decisions in this context.

Implications for policy

Any explanation of the making and implementation of a tobacco control policy is likely to be a multi-factor one. Furthermore, as we discussed before, the support for tobacco control policies is just one of the motors for tobacco control. Therefore, the results of this thesis are only one piece of the puzzle for advancing tobacco control.

An important finding that is influential, especially in smoke-free indoor places regulation, is that the governments' inaction cannot be justified in terms of opposition from the population. On the contrary, the general population **and smokers** would support total bans in public indoor settings, private cars and outdoor settings around healthcare facilities and where children may be exposed to SHS. Action is needed, in some countries more ungently than others, as more people are being exposed to SHS.

Regarding the European Union countries' scenarios, our results are especially relevant as the European Commission will start revising the EU TPD in 2021. This will be the third version of this TPD, the first in 2001 and the second in 2014. The last revision of the TPD, considered “the most lobbied dossier in the history of the EU institutions”, [44] kept out the inclusion of the plain packaging and the bans on advertising on the point of sales. [43] As our results show, in three of the European countries we evaluated, the support for plain packaging reached almost half of the smokers. As our results also indicate, the support of non-smokers (almost 70% of the adult population, this is, most of the European population) tends to be considerably higher than among smokers, which would mean that this policy would be well received by most of the population. Furthermore, smokers and probably the general population would be receptive to more regulations on tobacco products. THE TPD, however, does not legislate about smoke-free places, but the ongoing Second Joint Action on Tobacco Control prompted by the European Commission include a specific work package on smoke-free legislation to share best practices among EU members states and promote them.

Finally, our results related to the endgame highlight that there is scepticism related to the endgame policy of banning smoking and the sales of cigarettes in the countries evaluated and that there is still arduous and country-specific progress to make into denormalising smoking and informing the general population about the feasibility and the benefits that this policy could bring. Moreover, as none of the countries has reached a smoking prevalence of less than 10% or high levels of support for phasing out cigarette sales, it would be premature to pursue the implementation of this policy in the short-term, although our results should not be considered as evidence against its future feasibility.

PART SEVEN
CONCLUSIONS

Conclusions

The conclusions are presented as response to each of the four hypotheses enumerated at the beginning of this thesis.

Hypothesis 1: There are differences in support for smoke-free public settings across European countries and this support is correlated to SHS presence and smoking behaviour.

- The majority of the population supported smoke-free legislation for indoor public settings, whereas the levels of support for outdoor public settings was variable.

Hypothesis 2: The majority of smoker's are supportive of smoke-free legislation inside cars to protect non-smokers' and children.

- Smokers' almost unanimous supported for smoking bans inside cars in the presence of children or non-smokers.
-

Hypothesis 3: The level of smokers' support for tobacco control policies correlates with smoking-related psychosocial factors.

- Knowledge of SHS exposure harms to non-smokers and the degree to which smokers' perceived smoking as denormalised was associated with higher support for tobacco control policies.

Hypothesis 4: The general population in countries with lower smoking prevalence will be significantly more supportive of ending smoking or cigarette sales than those in countries with higher smoking prevalence.

- The levels of support for ending smoking or the sales of cigarettes was higher in countries in which the smoking prevalence was lower than 20%; however there was no

significant trend in the association between smoking prevalence and support for such policy.

PART EIGHT
REFERENCES

- 1 Pollard T. The pleasures and perils of smoking in early modern
England. *Smoke A Glob Hist Smok* 2004:38–45.
- 2 Proctor RN. The global smoking epidemic: a history and status report.
Clin Lung Cancer 2004;**5**:371–6. doi:10.3816/CLC.2004.n.016
- 3 Islami F, Stoklosa M, Drope J, *et al*. Global and Regional Patterns of
Tobacco Smoking and Tobacco Control Policies. *Eur Urol Focus*
2015;**1**:3–16. doi:10.1016/j.euf.2014.10.001
- 4 Witschi H. A Short History of Lung Cancer. *Toxicol Sci* 2001;**4**:4–6.
doi:10.1093/toxsci/64.1.4
- 5 Lickint F. Tabak und Tabakrauch als ätiologischer Faktor des
Carcinoms. *Z Krebsforsch* 1930;**30**:349–65.
doi:10.1007/BF01636077
- 6 Hammond EC, Horn D. The relationship between human smoking
habits and death rates: a follow-up study of 187,766 men. *J Am Med
Assoc* 1954;**155**:1316–28. doi:10.1001/jama.1954.03690330020006
- 7 Doll R, Hill AB. The mortality of doctors in relation to their smoking
habits. *Br Med J* 1954;**1**:1451.
- 8 Wynder EL, Graham EA. Tobacco smoking as a possible etiologic
factor in bronchiogenic carcinoma: a study of six hundred and
eighty-four proved cases. *J Am Med Assoc* 1950;**143**:329–36.
- 9 Wynder EL, Graham EA, Croninger AB. Experimental production of
carcinoma with cigarette tar. *Cancer Res* 1953;**13**:855–64.
- 10 Auerbach O, Petrick TG, Stout AP, *et al*. The anatomical approach to
the study of smoking and bronchogenic carcinoma; a preliminary
report of forty-one cases. *Cancer* 1956;**9**:76–83. doi:10.1002/1097-
0142(195601/02)9:1<76::aid-cnrcr2820090106>3.0.co;2-d
- 11 Royal College of Physicians. Smoking and Health. London: 1962.
- 12 History of the Surgeon General’s Report on Smoking and Health |
CDC. Available:
https://www.cdc.gov/tobacco/data_statistics/sgr/history/index.htm
(accessed 6 Apr 2021).
- 13 European Commission. Special Eurobarometer 458: Attitudes of
Europeans towards tobacco and electronic cigarettes. 2017.
Available:
[https://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/Res
ultDoc/download/DocumentKy/79002](https://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/ResultDoc/download/DocumentKy/79002) (accessed 29 May 2018).
- 14 James SL, Abate D, Abate KH, *et al*. Global, regional, and national
incidence, prevalence, and years lived with disability for 354 diseases

- and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet* 2018;**392**:1789–858. doi:10.1016/S0140-6736(18)32279-7
- 15 World Health Organization. WHO Report on the Global Tobacco Epidemic, 2008. Geneva: : World Health Organization 2011. Available: https://www.who.int/tobacco/mpower/gtcr_download/en/#.XPknlXPiOas.mendeley (accessed 6 Jun 2019).
- 16 Collaborators GBD, Årnlöv J. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet* 2020;**396**:1223–49.
- 17 Lopez AD, Collishaw NE, Piha T. A descriptive model of the cigarette epidemic in developed countries. *Tob Control* 1994;**3**:242–7. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1759359/>
- 18 Thun M, Peto R, Boreham J, *et al*. Stages of the cigarette epidemic on entering its second century. *Tob Control* 2012;**21**:96–101. doi: 10.1136/tobaccocontrol-2011-050294
- 19 Peruga A, López MJ, Martínez C, *et al*. Tobacco control policies in the 21st century: achievements and open challenges. *Mol Oncol* 2021;**15**:744–52. doi: 10.1002/1878-0261.12918
- 20 Goodchild M, Nargis N, Tursan d’Espaignet E. Global economic cost of smoking-attributable diseases. *Tob Control* 2018;**27**:58–64. doi:10.1136/tobaccocontrol-2016-053305
- 21 Carreras G, Lugo A, Gallus S, *et al*. Burden of disease attributable to second-hand smoke exposure: A systematic review. *Prev Med (Baltim)* 2019;**129**:105833. doi:10.1016/j.ypmed.2019.105833
- 22 World Health Organization. Tobacco and its environmental impact: an overview. *World Health Organization* 2017.
- 23 US Public Health Service. Smoking and health programs around the world. American Tobacco Records, Bates No. 968012023–968012038. 1970.
- 24 National Clearinghouse for Smoking and Health. Smoking and health programs in other countries. Philip Morris Records, Bates No. 2016003319–2016003331. 1969. Available: <http://legacy.library.ucsf.edu/tid/jdh68e00> (accessed 6 Jun 2019).
- 25 Berridge V. Tobacco control in the WHO European Region. *Cancer*;6:7. *World Health Organization* 2020.
- 26 Organization WH. Smoking and its effects on health : report of a WHO

- expert committee [meeting held in Geneva from 9 to 14 December 1974].1975. Available: <https://apps.who.int/iris/handle/10665/41157> (accessed 6 Dec 2020).
- 27 US Department of Health and Human Services. The health consequences of smoking—50 years of progress: a report of the Surgeon General. 2014.
- 28 Musk AW, de Klerk NH. History of tobacco and health. *Respirology* 2003;**8**:286–90. doi:10.1046/j.1440–1843.2003.00483.x
- 29 World Health Organization. European strategy for tobacco control. Copenhagen: WHO Regional Office for Europe 2002.
- 30 Goodman J. *Tobacco in history: The cultures of dependence*. Routledge 2005.
- 31 Willemssen MC. *Tobacco control policy in the Netherlands: between economy, public health, and ideology*. Springer Nature 2018.
- 32 Reubi D, Berridge V. The Internationalisation of Tobacco Control, 1950–2010. *Med Hist* 2016;**60**:453–72. doi:10.1017/mdh.2016.97
- 33 World Health Organization. *WHO Framework Convention on Tobacco Control*. 2003. Available: <http://www.who.int/fctc/en> (accessed 6 Dec 2018).
- 34 United Nations. Chapter IX Health, 4. WHO Framework Convention on Tobacco Control. 2020. Available: https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IX-4&chapter=9&clang=_en (accessed 30 Aug 2021).
- 35 World Health Organization (WHO). Building blocks for tobacco control: a handbook. 2004.
- 36 World Health Organization. WHO Framework Convention on Tobacco Control. 2003. Available: <http://www.who.int/fctc/en> (accessed 21 Feb 2018).
- 37 Bank W. Curbing the epidemic: governments and the economics of tobacco control. *Tob Control* 1999;**8**:196–201.
- 38 Kaleta D, Kozieł A, Miśkiewicz P. [MPOWER—strategy for fighting the global tobacco epidemic]. *Med Pr* 2009;**60**:145–9.
- 39 Gravely S, Giovino GA, Craig L, *et al*. Implementation of key demand-reduction measures of the WHO Framework Convention on Tobacco Control and change in smoking prevalence in 126 countries: an association study. *Lancet Public Heal* 2017;**2**:e166–74. doi:10.1016/S2468–2667(17)30045–2

- 40 Feliu A, Filippidis FT, Joossens L, *et al.* Impact of tobacco control policies on smoking prevalence and quit ratios in 27 European Union countries from 2006 to 2014. *Tob Control* 2019;**28**:101–9. doi:10.1136/tobaccocontrol-2017-054119
- 41 Consortium A. Tobacco or health in the European Union: Past, present and future. *Luxemb Off Off Publ Eur Communities* 2004.
- 42 The European Commission. Revision of the tobacco products directive 2014. Available: <https://ec.europa.eu/health/tobacco/products/revision/> (accessed 24 May 2018).
- 43 Costa H, Gilmore AB, Peeters S, *et al.* Quantifying the influence of the tobacco industry on EU governance: automated content analysis of the EU Tobacco Products Directive. *Tob Control* 2014;**23**:473–8. doi: 10.1136/tobaccocontrol-2014-051822
- 44 Peeters S, Costa H, Stuckler D, *et al.* The revision of the 2014 European tobacco products directive: an analysis of the tobacco industry’s attempts to ‘break the health silo’. *Tob Control* 2016;**25**:108–17. doi: 10.1136/tobaccocontrol-2014-051919
- 45 Studlar DT, Christensen K, Sitasari A. Tobacco control in the EU–15: the role of member states and the European Union. *J Eur Public Policy* 2011;**18**:728–45.
- 46 Bertollini R, Ribeiro S, Mauer–Stender K, *et al.* Tobacco control in Europe: a policy review. *Eur Respir Rev* 2016;**25**:151–7. doi: 10.1183/16000617.0021-2016
- 47 Joossens L, Feliu A, Fernández E. The Tobacco Control Scale 2019 in Europe. Association of European Cancer Leagues, Institut Català d’Oncologia: 2019. Available: <http://www.tobaccocontrolscale.org/TCS2019.pdf> (accessed 24 May 2018).
- 48 Feliu A, Fernandez E, Martinez C, *et al.* Are smokers “hardening” or rather “softening”? An ecological and multilevel analysis across 28 European Union countries. *Eur Respir J* 2019;**54**. doi: 10.1183/13993003.00596-2019
- 49 He Y, Shang C, Huang J, *et al.* Global evidence on the effect of point-of-sale display bans on smoking prevalence. *Tob Control* 2018;**27**:e98–104. doi: 10.1136/tobaccocontrol-2017-053996
- 50 Smoke Free Partnership. Smoke-free map. 2020. Available: <https://www.smokefreepartnership.eu/smokefree-map> (accessed

- 30 Jul 2021).
- 51 World Health Organization. *Bibione. Breathe by the sea: the story of a smoke-free beach in Italy*. World Health Organization. Regional Office for Europe 2014.
- 52 Kurzer P, Cooper A. The Dog That Didn't Bark: Explaining Change in Germany's Tobacco Control Policy at Home and in the EU. *Ger Polit* 2016;**25**:541–60.
- 53 Studlar DT, Alm LR. Tobacco control: comparative politics in the United States and Canada. *Am Rev Can Stud* 2004;**34**:169.
- 54 Cairney P, Studlar D, Mamudu H. *Global tobacco control: power, policy, governance and transfer*. Springer 2011.
- 55 KE W. An endgame for tobacco? *Tob Control* 2013;**22**:i3–5. doi: 10.1136/tobaccocontrol-2013-050989
- 56 Thomson G, Edwards R, Wilson N, *et al*. What are the elements of the tobacco endgame? *Tob Control* 2012;**21**:293–5. doi: 10.1136/tc.2010.040881.
- 57 McDaniel PA, Smith EA, Malone RE. The tobacco endgame: a qualitative review and synthesis. *Tob Control* 2016;**25**:594 LP – 604. doi:10.1136/tobaccocontrol-2015-052356
- 58 Finish Ministry of Social Affairs and Health. Roadmap to a Tobacco-free Finland: Action Plan on Tobacco Control. 2014. Available: https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/70305/URN_ISBN_978-952-00-3513-6.pdf?sequence=1 (accessed 30 Jul 2021)
- 59 Mooney T. Towards a tobacco free society: report of the tobacco free policy review group. *Dublin, Dep Heal Child* 2000. Available: https://www.drugsandalcohol.ie/5337/1/DOHC_towards_tobacco_free_society.pdf (accessed 20 Aug 2021)
- 60 Reid G, Rennick L, Laird Y, *et al*. Review of 'Creating a tobacco-free generation: A Tobacco Control Strategy for Scotland'. *Edinburgh NHS Heal Scotl* 2017. Available: <http://www.healthscotland.scot/media/1545/review-of-creating-a-tobacco-free-generation-a-tobacco-control-policy-for-scotland.pdf> (accessed 20 Aug 2021)
- 61 Preventieakkoord N. Naar een gezonder Nederland. *Den Haag Minist van Volksgezond Welz en Sport* 2018.
- 62 France 24. Calling for 'tobacco-free generation', Macron boosts cancer research funds. 2021. Available:

- <https://www.france24.com/en/france/20210204-calling-for-tobacco-free-generation-macron-boosts-cancer-research-funds> (accessed 21 Jul 2021).
- 63 The European Commission. World No Tobacco Day 2021: Statement by Health and Food Safety Commissioner Stella Kyriakides. 2021. Available: https://ec.europa.eu/commission/presscorner/detail/en/statement_21_2761 (accessed 21 Jul 2021).
- 64 Laugesen M, Glover M, Fraser T, *et al.* Four policies to end the sale of cigarettes and smoking tobacco in New Zealand by 2020. *NZ Med J* 2010;**123**:55–65.
- 65 Thomson G, Wilson N, Blakely T, *et al.* Ending appreciable tobacco use in a nation: using a sinking lid on supply. *Tob Control* 2010;**19**:431–5. doi: 10.1136/tc.2010.036681
- 66 Cohen JE, Anglin L. Outlet density: a new frontier for tobacco control. 2009. doi: 10.1111/j.1360-0443.2008.02389.x
- 67 Chapman S, Freeman B. Regulating the tobacco retail environment: beyond reducing sales to minors. 2009;**18**:496–501. doi: 10.1136/tc.2009.031724
- 68 Chapman S. The case for a smoker’s license. *PLoS Med* 2012;**9**:e1001342. doi: 10.1371/journal.pmed.1001342
- 69 Callard CD, Collishaw NE. Supply-side options for an endgame for the tobacco industry. *Tob Control* 2013;**22**:i10–3. doi: 10.1136/tobaccocontrol-2012-050863
- 70 Borland R. A strategy for controlling the marketing of tobacco products: a regulated market model. *Tob Control* 2003;**12**:374–82. doi: 10.1136/tc.12.4.374
- 71 Walsh RA, Paul CL, Tzelepis F, *et al.* Is government action out-of-step with public opinion on tobacco control? Results of a New South Wales population survey. *Aust N Z J Public Health* 2008;**32**:482–8. doi:10.1111/j.1753-6405.2008.00284.x
- 72 Walker N, Fraser T, Howe C, *et al.* Abrupt nicotine reduction as an endgame policy: a randomised trial. *Tob Control* 2015;**24**:e251–7. doi: 10.1136/tobaccocontrol-2014-051801
- 73 Gilbert A, Cornuz J. Which are the most effective and cost-effective interventions for tobacco control? WHO Regional Office for Europe 2003.
- 74 Best A. *Greater than the sum: systems thinking in tobacco control.*

- National Cancer Institute, US Department of Health and Human Services 2007.
- 75 Von Bertalanffy L. The history and status of general systems theory. *Acad Manag J* 1972;**15**:407–26.
- 76 Pacheco J. The Social Contagion Model: Exploring the Role of Public Opinion on the Diffusion of Antismoking Legislation across the American States. *J Polit* 2012;**74**:187–202. doi:10.1017/S0022381611001241
- 77 Warner KE, Tam J. The impact of tobacco control research on policy: 20 years of progress. *Tob Control* 2012;**21**:103–9. doi: 10.1136/tobaccocontrol-2011-050396
- 78 Flynn BS, Goldstein AO, Solomon LJ, *et al.* Predictors of state legislators' intentions to vote for cigarette tax increases. *Prev Med (Baltim)* 1998;**27**:157–65. doi:10.1006/pmed.1998.0308
- 79 Fong GT, Hyland A, Borland R, *et al.* Reductions in tobacco smoke pollution and increases in support for smoke-free public places following the implementation of comprehensive smoke-free workplace legislation in the Republic of Ireland: findings from the ITC Ireland/UK Survey. *Tob Control* 2006;**15** Suppl 3:iii51–8. doi:10.1136/tc.2005.013649
- 80 World Health Organization. Building blocks for tobacco control: a handbook. 2004.
- 81 Willemssen MC, Walters BH, Kotz D, *et al.* Recommendations on how to achieve tobacco-free nations in Europe. *Tob Prev Cessat* 2019;**5**. doi: 10.18332/tpc/110587
- 82 European Commission. Survey: Europeans and the prevention of cancer. A working document of the services of the European Commission. Brussels: 1988.
- 83 Commission of the European Communities. Europe Against Cancer. Survey: Europeans and the prevention of Cancer. European Commission. Brussels: 1987.
- 84 European Commission. Special Eurobarometer 458: Attitudes of Europeans towards tobacco and electronic cigarettes. 2021.
- 85 Nagelhout GE, de Vries H, Fong GT, *et al.* Pathways of change explaining the effect of smoke-free legislation on smoking cessation in The Netherlands. An application of the international tobacco control conceptual model. *Nicotine Tob Res Off J Soc Res Nicotine Tob* 2012;**14**:1474–82. doi:10.1093/ntr/nts081

- 86 Fong GT, Craig L V, Guignard R, *et al.* Evaluating the Effectiveness of France’s Indoor Smoke-Free Law 1 Year and 5 Years after Implementation: Findings from the ITC France Survey. *PLoS One* 2013;**8**:e66692. doi:10.1371/journal.pone.0066692
- 87 Mons U, Nagelhout GE, Guignard R, *et al.* Comprehensive smoke-free policies attract more support from smokers in Europe than partial policies. *Eur J Public Health* 2012;**22**:10–6. doi:10.1093/eurpub/ckr202
- 88 Fu M, Castellano Y, Tigova O, *et al.* Correlates of the support for smoke-free policies among smokers: A cross-sectional study in six European countries of the EUREST-PLUS ITC EUROPE SURVEYS. *Tob Induc Dis* 2018;**16**. doi:10.18332/tid/103918
- 89 Filippidis FT, Agaku IT, Vardavas CI, *et al.* The association between economic recession and public support for increased tobacco taxation in 27 European countries. *Scand J Public Health* 2014;**42**:589–92. doi: 10.1177/1403494814542264
- 90 Lidón-Moyano C, Sampedro-Vida M, Matilla-Santander N, *et al.* Attitudes towards tobacco product regulations and their relationship with the tobacco control policies. *Prev Med (Baltim)* 2018;**111**:67–72. doi: 10.1016/j.ypmed.2018.02.019
- 91 Nuyts PAW, Kuipers MAG, Willemsen MC, *et al.* An Increase in the Tobacco Age-of-Sale to 21: For Debate in Europe. *Nicotine Tob Res* 2020;**22**:1247–9. doi:10.1093/ntr/ntz135
- 92 Boeckmann M, Kotz D, Shahab L, *et al.* German Public Support for Tobacco Control Policy Measures: Results from the German Study on Tobacco Use (DEBRA), a Representative National Survey. *Int J Environ Res Public Health* 2018;**15**:696. doi:10.3390/ijerph15040696
- 93 Palladino R, Hone T, Filippidis FT, *et al.* Changes in support for bans of illicit drugs, tobacco, and alcohol among adolescents and young adults in Europe, 2008–2014. *Int J Public Health* 2018;**63**:23–31. doi: 10.1007/s00038-017-1025-y
- 94 Gallus S, Lugo A, Fernandez E, *et al.* Support for a tobacco endgame strategy in 18 European countries. *Prev Med (Baltim)* 2014;**67**:255–8. doi:https://doi.org/10.1016/j.ypmed.2014.08.001
- 95 Kuijpers TG, Willemsen MC, Kunst AE. Public support for tobacco control policies: The role of the protection of children against tobacco. *Health Policy (New York)* 2018;**122**:929–35. doi:https://doi.org/10.1016/j.healthpol.2018.05.004

- 96 Vardavas CI, Bécuwe N, Demjén T, *et al.* Study Protocol of European Regulatory Science on Tobacco (EUREST-PLUS): Policy implementation to reduce lung disease. *Tob Induc Dis* 2018;**16**. doi:10.18332/tid/93305
- 97 Thompson ME, Driezen P, Boudreau C, *et al.* Methods of the International Tobacco Control (ITC) EUREST-PLUS ITC Europe Surveys. *Eur J Public Health* Published Online First: 13 February 2020. doi:10.1093/eurpub/ckz212
- 98 ITC Project. ITC 6 European Country Wave 1 (2016) Technical Report. University of Waterloo, Waterloo, Ontario, Canada, and European Network on Smoking and Tobacco Prevention, Brussels, Belgium: 2017.
- 99 ITC Project. ITC 6 European Country Wave 2 (2018p) Technical Report. University of Waterloo, Waterloo, Ontario, Canada, and European Network on Smoking and Tobacco Prevention, Brussels, Belgium: 2019.
- 100 Fernández E, López MJ, Gallus S, *et al.* Tackling second-hand exposure to tobacco smoke and aerosols of electronic cigarettes: the TackSHS project protocol. *Gac Sanit* 2020;**34**:77–82. doi:10.1016/j.gaceta.2019.07.002
- 101 Gallus S, Lugo A, Liu X, *et al.* Who Smokes in Europe? Data From 12 European Countries in the TackSHS Survey (2017–2018). *J Epidemiol* 2021;**31**:145–51. doi:10.2188/jea.JE20190344
- 102 Hyland A, Barnoya J, Corral JE. Smoke-free air policies: past, present and future. *Tob Control* 2012;**21**:154 LP – 161. doi:10.1136/tobaccocontrol-2011-050389
- 103 IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. Tobacco smoke and involuntary smoking. *IARC Monogr Eval Carcinog risks to humans* 2004;**83**:1–1438. <https://pubmed.ncbi.nlm.nih.gov/15285078>
- 104 Nogueira SO, Fernández E, Driezen P, *et al.* Secondhand smoke exposure in European countries with different smoke-free legislation. Findings from the EUREST-PLUS ITC Europe Surveys. *Nicotine Tob Res* Published Online First: 13 August 2021. doi:10.1093/ntr/ntab157
- 105 Sureda X, Fernández E, López MJ, *et al.* Secondhand tobacco smoke exposure in open and semi-open settings: a systematic review. *Environ Health Perspect* 2013;**121**:766–73. doi:10.1289/ehp.1205806
- 106 Sureda X, Martínez-Sánchez JM, López MJ, *et al.* Secondhand

- smoke levels in public building main entrances: outdoor and indoor PM2.5 assessment. *Tob Control* 2012;**21**:543–8. doi:10.1136/tobaccocontrol-2011-050040
- 107 Sureda X, Bilal U, Fernández E, *et al.* Second-hand smoke exposure in outdoor hospitality venues: Smoking visibility and assessment of airborne markers. *Environ Res* 2018;**165**:220–7. doi:10.1016/j.envres.2018.04.024
- 108 BBC news by Smitha Mundasad. Experts debate smoking ban in outdoor public spaces. 2015. Available: <https://www.bbc.com/news/health-31602414> (accessed 30 Aug 2021).
- 109 Chapman S. Banning smoking outdoors is seldom ethically justifiable. *Tob Control* 2000;**9**:95–7. doi: 10.1136/tc.9.1.95
- 110 Radó MK, Möhlenberg FJM, Westenberg LEH, *et al.* Effect of smoke-free policies in outdoor areas and private places on children's tobacco smoke exposure and respiratory health: a systematic review and meta-analysis. *Lancet Public Heal* 2021;**6**:e566–e578. doi: 10.1016/S2468-2667(21)00097-9
- 111 Rouch G, Thomson G, Wilson N, *et al.* Public, private and personal: Qualitative research on policymakers' opinions on smokefree interventions to protect children in 'private' spaces. *BMC Public Health* 2010;**10**:797. doi:10.1186/1471-2458-10-797
- 112 World Health Organization (WHO) regional office for the Eastern Mediterranean. Tobacco Free initiative: COVID-19 and beyond: banning tobacco and e-cigarettes in public places is a public health must. 2020. Available: <http://www.emro.who.int/tfi/know-the-truth/post-covid-19-banning-tobacco-and-e-cigarettes-in-public-places-is-a-public-health-must.html> (accessed 30 Aug 2021).
- 113 Caceres L, Chaiton M. Hungary: state licensing for tobacco outlets. *Tob Control* 2013;**22**:292–3. doi: 10.1136/tobaccocontrol-2020-055910
- 114 Kyriakos CN, Driezen P, Girvalaki C, *et al.* Awareness and correlates of noticing changes to cigarette packaging design after implementation of the European Tobacco Products Directive: findings from the EUREST-PLUS ITC Europe Surveys. *Eur J Public Health* 2020;**30**:iii98–107. doi: 10.1093/eurpub/ckaa057
- 115 Kahnert S, Driezen P, Balmford J, *et al.* Effectiveness of tobacco

- warning labels before and after implementation of the European Tobacco Products Directive—findings from the longitudinal EUREST-PLUS ITC Europe surveys. *Eur J Public Health* 2020;**30**:iii84–90. doi: 10.1093/eurpub/ckaa039
- 116 Malone RE. The race to a tobacco endgame. *Tob Control* 2016;25:607–608. doi: 10.1136/tobaccocontrol-2016-053466
- 117 Smith EA, Malone RE. An argument for phasing out sales of cigarettes. *Tob Control* 2020;**29**:703–8. doi: 10.1136/tobaccocontrol-2019-055079
- 118 Clawson RA, Oxley ZM. *Public opinion: Democratic ideals, democratic practice*. CQ Press 2020.
- 119 Carter SM, Chapman S. Smokers and non-smokers talk about regulatory options in tobacco control. *Tob Control* 2006;**15**:398–404. doi: 10.1136/tc.2006.015818
- 120 Walsh RA, Paul CL, Tzelepis F, *et al*. Is government action out-of-step with public opinion on tobacco control? Results of a New South Wales population survey. *Aust N Z J Public Health* 2008;**32**:482–8. doi: 10.1111/j.1753-6405.2008.00284.x

PART NINE

ANNEXES

Annex 1. Ethical approvals



APPROVAL BY THE CLINICAL RESEARCH ETHICS COMMITTEE FOR RESEARCH PROJECTS

Dr Enric Sospedra Martínez, Secretary of the Clinical Research Ethics Committee of Bellvitge University Hospital,

CERTIFIES

That the Clinical Research Ethics Committee of the Bellvitge University Hospital, in the meeting of April 21st 2016 (Act 08/16), after reviewing all the documentation concerning the research project with our ref. **PR100/16**, entitled:

“EUROPEAN REGULATORY SCIENCE ON TOBACCO: POLICY IMPLEMENTATION TO REDUCE LUNG DISEASES.”

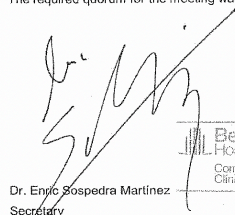
Presented by Principal Investigator Dr Esteve Fernández Muñoz from the Tobacco Control Unit (UCT) of the Catalan Institute of Oncology - IDIBELL, has definitively approved the project.

That the current composition of the Clinical Research Ethics Committee is as follows:

President	Dr Francesc Esteve Urbano	MD-Intensive Care
Vice president	Dr Pilar Hereu Boher	MD-Clinical Pharmacology
Secretary	Dr Enric Sospedra Martínez	Pharmacist-Hospital Pharmacy
Members-at-large	Dr Josep M ^o Arnau de Bolós	MD-Clinical Pharmacology
	Dr Maria Berdasco Mendéndez	Biologist
	Dr Enric Condom Mundo	MD-Pathology
	Dr Xavier Corbella Virós	MD-Internal Medicine
	Mrs. Consol Felp Ferrás	Administrative
	Dr José Luis Ferreiro Gutiérrez	MD-Cardiology
	Dr Ana María Ferrer Artola	Pharmacist
	Dr Xavier Fulladosa Oliveras	MD-Nephrology
	Dr Margarita García Martín	MD-Medical Oncology
	Dr Laura Liadó Garriga	MD-General and Digestive Surgery
	Mrs. Sonia López Ortega	Social Graduate
	Mrs. Gemma Martínez Estalella	Nurse
	Dr Sergio Morchón Ramos	MD-Preventive Medicine
	Dr Joan Josep Queralt Jiménez	Lawyer
	Dr Ricard Ramos Izquierdo	MD-Thoracic Surgery
	Dr Gemma Rodríguez Palomar	Pharmacist
	Dr Nuria Sela Serra	Biologist
	Dr Petru Cristian Simon	MD-Clinical Pharmacology

This Committee is organized and operates in compliance with applicable regulatory requirements and ICH GCP (International Conference on Harmonization Guidelines on Good Clinical Practice).

The required quorum for the meeting was achieved.



 **Bellvitge**
Hospital
Comitè Ètic d'Investigació
Clínica

Dr. Enric Sospedra Martínez
Secretari

L'Hospitalet de Llobregat, April 21st, 2016

**APPROVAL BY THE CLINICAL RESEARCH ETHICS COMMITTEE FOR
RESEARCH PROJECTS**

The Clinical Research Ethics Committee of the Bellvitge University Hospital, in the meeting of January 21st 2016 (Act 02/16), has revised all the documentation concerning the research project with our ref. **PR341/15**, entitled:

**“TACKLING SECONDHAND TOBACCO SMOKE AND E-CIGARETTE EMISSIONS:
EXPOSURE ASSESSMENT, NOVEL INTERVENTIONS, IMPACT ON LUNG
DISEASES AND ECONOMIC BURDEN IN DIVERSE EUROPEAN POPULATIONS.
THE TACKSHS PROJECT. - TACKSHS”**

Presented as main applicant by Dr Esteve Fernández Muñoz of the Tobacco Control Unit (UCT) from the Institut Català d'Oncologia - IDIBELL, the Committee has decided the definitive approval of the project.

This project is submitted as a proposal for the call:
H2020-HCO-2015


 **Bellvitge**
Hospital
Comitè Ètic d'Investigació
Clínica

Dr Enric Sospedra Martínez
Secretary

L'Hospitalet de Llobregat, January 21st, 2016

Annex 2. Paper entitled: Secondhand smoke exposure in European countries with different smoke-free legislation.

Nicotine & Tobacco Research, 2021, 1–8

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Original Investigation

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SRNT

OXFORD

Original Investigation

Secondhand Smoke Exposure in European Countries With Different Smoke-Free Legislation: Findings From the EUREST-PLUS ITC Europe Surveys

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 Pete Driezen, PhD^{5,6,*}, Marcela Fu PhD^{1,2,3,4,*}, Olena Tigova MSc^{1,2,3,4},
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 PhD^{14,15}, Krzysztof Przewoźniak MA^{9,16,17}, Paraskevi A. Katsaounou PhD¹⁸,
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 the EUREST-PLUS Consortium

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Abstract

Introduction: 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 behavior 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 behavior.

Aims and Methods: The EUREST-PLUS ITC Europe Surveys were conducted among adult smokers in Germany, Greece, Hungary, Poland, Romania, and Spain in 2016 (Wave 1, $n = 6011$) and 2018

(Wave 2, $n = 6027$). We used generalized 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 several 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 Wave 2), restaurants (13.2% in Wave 2) and discos/nightclubs (34.0% in W2). SHS exposure in public places was significantly less likely (adjusted odds ratio = 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.

Implications: 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; and 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. Exposure to secondhand smoke (SHS) has serious and extensive health and economic-related consequences to European society and worldwide.^{1,2} 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. 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.^{3,6}

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 (1) SHS exposure and (2) 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 countries: 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 urbanization. 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. 6011 individuals were interviewed across the six countries in 2016 and 6027 in 2018 (2832 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 behavior 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

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) ^a	T (2012) ^a	P (2010) ^f	T (2016) ^g	T (2006)
Restaurants (indoors)	P (2007–2008) ^a	T (2003) ^a	T (2012)	P (2010) ^f	T (2016)	T (2011)
Restaurants (outdoors)	None	None	None	None	None	P (2011) ^h
Pubs/bars (indoors)	P (2007–2008) ^{a,b}	P (2003) ^{a,d}	T (2012)	P (2010) ^f	T (2016)	T (2011)
Pubs/bars (outdoors)	None	None	None	None	T (2016)	P (2011) ^h
Discos/nightclubs (indoors)	P (2007–2008) ^{a,b}	P (2003) ^{a,d}	T (2012)	P (2010) ^f	T (2016)	T (2011)
Discos/nightclubs (outdoors)	None	None	None	None	T (2016)	P (2011) ^h

^aSmoke-free legislation at workplaces (except hospitality sector) is regulated at the national level. Separate, enclosed smoking rooms are allowed.

^bSmoke-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.

^cIndoor areas mean also a patio or space with sliding or removable ceiling, or any space with a cover and simultaneously closed in any way perimetricaly.

^dSmoking is allowed in entertainment centers >300 m² with live music and in casinos.

^eSmoking rooms are allowed under certain conditions in certain types of workplaces with increased risk of fire and/or explosion.

^fTotal 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 nonsmoking rooms; otherwise, these places have to be smoke-free.

^gSmoking is forbidden in all enclosed public spaces which are considered those with a roof/ceiling and at least two walls.

^hSmoking is forbidden in terraces with a roof or ceiling and more than two walls.

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. Those places/countries with no legislation restricting or banning smoking were classified as having no smoking ban.

The sociodemographic variables analyzed were country, age group (18–24, 25–39, 40–54, and ≥55), gender (female and male), degree of urbanization (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, nondaily smoker, and recent quitter). 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 generalized estimating equations (GEE) to test the overall change in prevalence of SHS exposure and self-reported 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 urbanization, 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 6011 participants recruited in Wave 1, 53.2% were re-interviewed and 2832 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, and 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 versus 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

Table 2. Prevalence^a and prevalence difference (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	Discos/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; 30.7)
	Wave 2	14.0 (10.5; 18.5)	6.8 (4.2; 10.7)	13.4 (9.1; 19.3)	15.8 (9.2; 25.2)
	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)

Results in bold portray statistically significant changes.

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

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 (<i>n</i> = 5265) ^a			Self-reported smoking (<i>n</i> = 4605) ^b		
	aOR ^c	(95% CI)	FDR <i>p</i>	aOR ^d	(95% CI)	FDR <i>p</i>
Greece: total vs. partial	0.13	(0.09; 0.20)	<.001	0.32	(0.24; 0.43)	<.001
Total vs partial, averaged over all venues; excludes Greece	0.35	(0.26; 0.47)	<.001	0.17	(0.11; 0.28)	<.001
Hungary (total bans) vs. Germany (partial bans), averaged over all venues	0.16	(0.09; 0.28)	<.001	0.08	(0.03; 0.20)	<.001
Romania (total bans) vs. Germany (partial bans), averaged over all venues	0.36	(0.24; 0.53)	<.001	0.25	(0.12; 0.49)	<.001
Spain (total bans) vs. Germany (partial bans), averaged over all venues	0.28	(0.19; 0.42)	<.001	0.09	(0.04; 0.18)	<.001
Hungary (total bans) vs. Poland (partial bans), averaged over all venues	0.31	(0.18; 0.54)	<.001	0.17	(0.07; 0.43)	<.001
Romania (total bans) vs. Poland (partial bans), averaged over all venues	0.68	(0.45; 1.03)	.066	0.51	(0.25; 1.05)	.066
Spain (total bans) vs. Poland (partial bans), averaged over all venues	0.54	(0.34; 0.85)	.008	0.18	(0.08; 0.40)	<.001
Workplaces, total (Hungary, Romania, Spain) vs. partial (Germany, Poland), excludes Greece	0.51	(0.38; 0.69)	<.001	—	—	—
Bars/pubs, total (Hungary, Romania, Spain) vs. partial (Germany, Poland), excludes Greece	0.25	(0.17; 0.37)	<.001	0.12	(0.07; 0.22)	<.001
Restaurants, total (Hungary, Romania, Spain) vs. partial (Germany, Poland), excludes Greece	0.41	(0.26; 0.67)	<.001	0.25	(0.13; 0.50)	<.001
Discos/nightclubs, total (Hungary, Romania, Spain) vs. partial (Germany, Poland), excludes Greece	0.22	(0.14; 0.35)	<.001	0.17	(0.09; 0.32)	<.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 urbanization, time-in-sample, sex, age group at time of recruitment, income, education, smoking status. 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.

^aBased on a GEE model including respondents from all six countries: *n* = 12 892 observations from 5265 respondents.

^bBased on a GEE model including respondents from all six countries: *n* = 9285 observations from 4605 respondents.

^caOR = adjusted odds ratio estimating the odds of noticing other people smoking in a venue for venues/countries having total bans vs. partial bans only.

^daOR = adjusted odds ratio estimating the odds of reporting smoking inside a venue for venues/countries having total bans vs. partial bans only.

^eParticipants were not asked about smoking in workplaces. Each respondent could therefore have up to four 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.

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/night-clubs 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/pubs, 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 in 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 smoking 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 nonsmokers 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.⁸

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 While our results 6 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.

Table 4. Prevalence* and prevalence difference (and 95% Confidence Interval, CI) of Self-reported Smoking* in Public Places in Six European Countries According to the Location (Inside/Outside). EURESTPLUS 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 (33.8; 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 (22.7; 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)

Results in bold portray statistically significant changes.

*Estimated prevalence from a GEE model to test the overall change between Wave 1 and Wave 2. Percentages are adjusted for country, degree of urbanization, 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.

Self-reported smoking in public places remained stable in all places and countries, apart from an increase inside bars/pubs 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/nightclubs in Spain seems to be consistent with the decrease also observed in outdoor areas in this country as discos/nightclubs 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/nightclubs in 13 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 m². 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.¹⁹ 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.^{14,17}

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 attrition 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 generalize 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 nonsmokers.^{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, for example, 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 behavior.

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.⁷ 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.

Supplementary Material

A Contributorship Form detailing each author's specific involvement with this content, as well as any supplementary data, are available online at <https://academic.oup.com/ntr>.

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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 Fakultät 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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Declaration of Interests

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.

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>).

References

- World Health Organization. *Who Report on the Global Tobacco Epidemic, 2019: Offer Help to Quit Tobacco Use*. 2019. <https://apps.who.int/tris/bitstream/handle/10665/326043/9789241516204-eng.pdf?ua=1>. Accessed May 29 2020.
- Oberg M, Jaakkola MS, Woodward A, Peruga A, Prüss-Ustün A. Worldwide burden of disease from exposure to second-hand smoke: a retrospective analysis of data from 192 countries. *Lancet*. 2011;377(9760):139–146.
- Carreras G, Lugo A, Gallus S, et al.; TackSHS Project Investigators. Burden of disease attributable to second-hand smoke exposure: a systematic review. *Prev Med*. 2019;129:105833.
- Hoffman SJ, Tan C. Overview of systematic reviews on the health-related effects of government tobacco control policies. *BMC Public Health*. 2015;15:744.
- Zhou X, Nonnemaker J, Sherrill B, Gilensan AW, Coste F, West R. Attempts to quit smoking and relapse: factors associated with success or failure from the ATTEMPT cohort study. *Addict Behav*. 2009;34(4):365–373.
- Stevenson JG, Oliver JA, Hallyburton MB, Sweitzer MM, Conklin CA, McClernon FJ. Smoking environment cues reduce ability to resist smoking as measured by a delay to smoking task. *Addict Behav*. 2017;67:49–52.
- World Health Organisation. *Who Framework Convention on Tobacco Control. Guidelines for Implementation Article 8*. Geneva, Switzerland: World Health Organisation; 2014. https://www.who.int/ctcc/cop4art%208%20guidelines_english.pdf?ua=1. Accessed May 29 2020.
- Vardavas CI, Bécuwe N, Demjén T, et al.; EUREST-PLUS consortium. Study Protocol of European Regulatory Science on Tobacco (EUREST-PLUS): policy implementation to reduce lung disease. *Tob Induc Dis*. 2018;16:A2.
- Thompson ME, Driezen B, Boudreau C, et al. Methods of the International Tobacco Control (ITC) EUREST-PLUS ITC Europe Surveys. *Eur J Public Health*. 2020;Suppl 3:iii4–iii9. doi:10.1093/eurpub/ckz212
- Fong GT, Thompson ME, Boudreau C, et al. The conceptual model and methods of Wave 1 (2016) of the EUREST-PLUS ITC 6 European Countries Survey. *Tob Induc Dis*. 2018;16:A3. doi:10.18332/tid/99881
- Schneider NK, Schrié EM, Fernández E. The so-called “Spanish model” – tobacco industry strategies and its impact in Europe and Latin America. *BMC Public Health*. 2011;11:1907.
- Filippidis FT, Agaku IT, Giralvaki C, et al.; Tobacco Control Committee of the European Respiratory Society. Relationship of secondhand smoke exposure with sociodemographic factors and smoke-free legislation in the European Union. *Eur J Public Health*. 2016;26(2):344–349.
- GBD 2017 Risk Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018;392:1789–858.
- Fong GT, Hyland A, Borland R, et al. Reductions in tobacco smoke pollution and increases in support for smoke-free public places following the implementation of comprehensive smoke-free workplace legislation in the Republic of Ireland: findings from the ITC Ireland/UK Survey. *Tob Control*. 2006;15(suppl 3):iii51–iii58.

15. Fong GT, Craig LV, Guignard R, et al. Evaluating the effectiveness of France's Indoor Smoke-Free Law 1 Year and 5 Years after implementation: findings from the ITC France Survey. *PLoS One*. 2013;8(6):e66692.
16. ITC Project. *ITC 6 European Country Wave 2 (2018p) Technical Report*. Waterloo, ON, Canada/Brussels, Belgium: University of Waterloo/European Network on Smoking and Tobacco Prevention; 2019.
17. Bradley BP, Mogg K, Wright T, Field M. Attentional bias in drug dependence: vigilance for cigarette-related cues in smokers. *Psychol Addict Behav*. 2003;17(1):66–72.
18. Ehrman RN, Robbins SJ, Bromwell MA, Lankford ME, Monterosso JR, O'Brien CP. Comparing attentional bias to smoking cues in current smokers, former smokers, and non-smokers using a dot-probe task. *Drug Alcohol Depend*. 2002;67(2):185–191.

Curriculum vitae

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List of publications

Nogueira SO, Fernández E, Driezen P, Fu M, Tigova O, Castellano Y, Mons U, Herbeć A, Kyriakos CN, Demjén T, Trofor AC, Przewoźniak K, Katsaounou PA, Vardavas CI, Fong GT. Secondhand smoke exposure in European countries with different smoke-free legislation. Findings from the EUREST-PLUS ITC Europe Surveys, *Nicotine & Tobacco Research*. 2021. ntab157.

la Peña-Arteaga D, **Nogueira SO**, Lynskey M, Hines LA. The relationship between childhood physical and sexual abuse and adolescent cannabis use: a systematic review. *Frontiers in psychiatry*. 2021 May 26;12:777.

Feliu A, Martínez C, Peruga A, Joossens L, Bianco E, Cornejo M, **Nogueira SO**, Fernández E. Tool to monitor tobacco control policy implementation: the Tobacco Control Scale in Latin America. Adaptation process and pilot study. *Tobacco Control*. 2021 May 18.

Nogueira SO, Driezen P, Fu M, Hitchman SC, Tigova O, Castellano Y, Kyriakos CN, Zatoński MZ, Mons U, Quah AC, Demjén T. Beyond the European Union Tobacco Products Directive: smokers' and recent quitters' support for further tobacco control measures (2016-

2018). *Tobacco control*. 2021 Mar 16.

Kahnert S, Driezen P, Balmford J, Kyriakos CN, Aleyan S, Hitchman SC, **Nogueira SO**, Demjén T, Fernández E, Katsaounou PA, Trofor AC. Effectiveness of tobacco warning labels before and after implementation of the European Tobacco Products Directive—findings from the longitudinal EUREST–PLUS ITC Europe surveys. *European Journal of Public Health*. 2020 Jul 1;30(Supplement_3):iii84–90.

Nogueira SO, Tigova O, Driezen P, Fu M, Kyriakos CN, Zatoński M, Mons U, Quah AC, Demjén T, Trofor AC, Przewoźniak K. Do smokers want to protect non–smokers from the harms of second–hand smoke in cars? Findings from the EUREST–PLUS ITC Europe Surveys. *European Journal of Public Health*. 2020 Jul 1;30(Supplement_3):iii108–12.

Nogueira SO, Tigova O, Castellano Y, Mons U, Kyriakos CN, McNeill A, Trofor AC, Zatoński WA, Przewoźniak K, Demjén T, Tountas Y. Cigarette brand loyalty among smokers in six European countries: Findings from the EUREST–PLUS ITC Europe Surveys. *Tobacco induced diseases*. 2018;16.

Tigova O, Amalia B, Castellano Y, Fu M, **Nogueira SO**, Kyriakos CN, Mons U, Trofor AC, Zatoński WA, Przewoźniak K, Demjén T. Secondhand exposure to e–cigarette aerosols among smokers: A cross–sectional study in six European countries of the EUREST–PLUS ITC Europe Surveys. *Tobacco induced diseases*. 2018;16.

Nogueira SO, McNeill A, Fu M, Kyriakos CN, Mons U, Fernández E, Zatoński WA, Trofor AC, Demjen T, Tountas Y, Przewoźniak K. Impact of anti-smoking advertising on health-risk knowledge and quit attempts across 6 European countries from the EUREST-PLUS ITC Europe Survey. *Tobacco induced diseases*. 2018;16.

Trofor AC, Papadakis S, Lotrean LM, Radu-Loghin C, Eremia M, Mihaltan F, Driezen P, Kyriakos CN, Mons U, Demjén T, **Nogueira SO**. Knowledge of the health risks of smoking and impact of cigarette warning labels among tobacco users in six European countries: Findings from the EUREST-PLUS ITC Europe Surveys. *Tobacco induced diseases*. 2018;16.

Nogueira SO, Tigova O, Castellano Y, Mons U, Kyriakos CN, McNeill A, Trofor AC, Zatoński WA, Przewoźniak K, Demjén T, Tountas Y. Cigarette brand loyalty among smokers in six European countries: Findings from the EUREST-PLUS ITC Europe Surveys. *Tobacco induced diseases*. 2018;16.

Leite RT, **Nogueira SO**, Nascimento JP, Lima LS, Nóbrega TB, Virgínio MD, Moreno LM, Sampaio BH. The use of cannabis as a predictor of early onset of bipolar disorder and suicide attempts. *Neural plasticity*. 2015 May 13;2015.



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