

Comprehensive smoke-free policies attract more support from smokers in Europe than partial policies

Citation for published version (APA):

Mons, U., Nagelhout, G. E., Guignard, R., Mcneill, A., Van den Putte, B., Willemsen, M. C., Brenner, H., Poetschke-Langer, M., & Breitling, L. P. (2012). Comprehensive smoke-free policies attract more support from smokers in Europe than partial policies. *European Journal of Public Health*, 22, 10-16. <https://doi.org/10.1093/eurpub/ckr202>

Document status and date:

Published: 01/02/2012

DOI:

[10.1093/eurpub/ckr202](https://doi.org/10.1093/eurpub/ckr202)

Document Version:

Publisher's PDF, also known as Version of record

Document license:

Taverne

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.umlib.nl/taverne-license

Take down policy

If you believe that this document breaches copyright please contact us at:

repository@maastrichtuniversity.nl

providing details and we will investigate your claim.

Comprehensive smoke-free policies attract more support from smokers in Europe than partial policies

Ute Mons^{1,2}, Gera E. Nagelhout^{3,4}, Romain Guignard⁵, Ann McNeill⁶, Bas van den Putte⁷, Marc C. Willemsen^{3,4}, Hermann Brenner², Martina Pötschke-Langer¹, Lutz P. Breitling²

1 Unit Cancer Prevention and WHO Collaborating Centre for Tobacco Control, German Cancer Research Center (DKFZ), Heidelberg, Germany

2 Division of Clinical Epidemiology and Aging Research, German Cancer Research Center (DKFZ), Heidelberg, Germany

3 Maastricht University/CAPHRI School for Public Health and Primary Care, Maastricht, the Netherlands

4 STIVORO for a smoke-free future, The Hague, the Netherlands

5 French Institute for Health Promotion and Health Education (INPES), Saint-Denis, France

6 UK Centre for Tobacco Control Studies, Division of Epidemiology and Public Health, University of Nottingham, UK

7 Amsterdam School of Communication Research, University of Amsterdam, Amsterdam, the Netherlands

Correspondence: Ute Mons, M.A., German Cancer Research Center, Unit Cancer Prevention and WHO Collaborating Centre for Tobacco Control, Im Neuenheimer Feld 280, 69120 Heidelberg, Tel: +49-6221-423012, Fax: +49-6221-423020, e-mail: u.mons@dkfz.de

Background: Support for smoke-free policies increases over time and particularly after implementation of the policy. In this study we examined whether the comprehensiveness of such policies moderates the effect on support among smokers. **Methods:** We analysed two waves (pre- and post-smoke-free legislation) of the International Tobacco Control (ITC) surveys in France, Germany, and the Netherlands, and two pre-legislation waves of the ITC surveys in UK as control. Of 6,903 baseline smokers, 4,945 (71.6%) could be followed up and were included in the analyses. Generalised Estimating Equations (GEE) were used to compare changes in support from pre- to post-legislation to the secular trend in the control country. Multiple logistic regression models were employed to identify predictors of individual change in support. **Findings:** In France, the comprehensive smoking ban was associated with sharp increases in support for a total smoking ban in drinking establishments and restaurants that were above secular trends. In Germany and the Netherlands, where smoke-free policies and compliance are especially deficient in drinking establishments, only support for a total smoking ban in restaurants increased above the secular trend. Notable prospective predictors of becoming supportive of smoking bans in these countries were higher awareness of cigarette smoke being dangerous to others and weekly visiting of restaurants. **Conclusions:** Our findings suggest that smoke-free policies have the potential to improve support once the policy is in place. This effect seems to be most pronounced with comprehensive smoking bans, which thus might be the most valid option for policy-makers despite their potential for creating controversy and resistance in the beginning.

Introduction

Despite tobacco smoke pollution (TSP) being a confirmed risk factor for several severe chronic diseases and acute symptoms,^{1,2} and a large body of evidence supporting the effectiveness of smoke-free policies in protecting non-smokers from TSP,³ the implementation of smoking bans in the hospitality sector has been the subject of substantial public controversy in various countries in the past few years.

Public attitudes towards smoke-free policies are considered to be a key variable in the process of their adoption and with regards to compliance with the regulations.⁴ Before the enactment of smoke-free policies, supportive public attitudes are helpful in the process of passing the legislation. After implementation, increasing support might reflect changes in smoking-related norms. It is assumed that policies banning smoking reduce the visibility and perceived social acceptability of smoking,^{5–7} and that once people experience them, public support increases.⁸ Most importantly, smokers being supportive of smoke-free policies are more likely to comply with the regulations.⁹

Previous cross-sectional and longitudinal studies have shown that among non-smokers and smokers, support for smoking bans generally follows a rising trend,^{4,8,10,11} and increases particularly sharply after implementation of smoke-free policies, even if these are comprehensive and rigid and pre-legislation policy support had been low.^{12–23}

Some of these studies also investigated country differences in patterns of change in policy support: these multiple-country studies either employed a quasi-experimental design comparing countries with national smoke-free legislation with countries

without such legislation,^{7,15,16} or used respondents' self-reported information about local public smoking bans.⁸ The quasi-experimental studies support a positive causal effect of comprehensive smoke-free legislation on policy support.^{7,15,16} The findings of a study on the effect of self-reported local smoking restrictions implied a “dose-response relationship”, with smokers reporting smoking bans at several locations and/or for several years being more likely to support smoking bans than smokers who reported no or only few smoking restrictions.⁸ These findings suggest that comprehensiveness of smoke-free policies is a relevant factor, but an alternative explanation could be that people supporting such policies are just more aware of the existence of smoking restrictions. To examine the question of causality, this study explored the impact of smoke-free legislation on policy support among smokers in three European countries with differential comprehensiveness of smoke-free legislation, using longitudinal pre- and post-legislation data from the prospective International Tobacco Control (ITC) Policy Evaluation Europe Surveys. The examined countries were France, Germany, and the Netherlands. While the French bar and restaurant smoking ban is nearly comprehensive, the Netherlands and Germany allow for several exemptions. In France, smoking is allowed in smoking rooms, but the technical requirements for smoking rooms are so strict that they are actually a rarity. In the Netherlands and Germany, at the time of the post-legislation survey, smoking was allowed in smoking rooms in drinking establishments and restaurants. In Germany, smoking was furthermore allowed in designated smoking venues, i.e. drinking establishments of a size less than 75m², which chose to operate as smoking venue. More information about the different legislations can be found elsewhere.⁹

Table 1 Implementation dates and characterization of smoke-free legislation, fieldwork periods, sample sizes of smoker samples and follow-up rates

Country	Implementation date of smoke-free legislation in the hospitality sector	Characterization of smoke-free legislation in the hospitality sector	Baseline survey		Follow-up survey		Follow-up rate %
			Fieldwork period	N	Fieldwork period	N	
UK (w/o Scotland)	April 2007 (Wales and Northern Ireland), July 2007 (England)	Total smoking ban	October 2005 – January 2006 (pre-legislation survey 1)	1,581	October 2006 – February 2007 (pre-legislation survey 2)	1,080	68.3
France	January 2008	Smoking rooms allowed under strict conditions, but very rare	December 2006–February 2007 (pre-legislation survey)	1,735	September 2008–December 2008 (post-legislation survey)	1,231	71.0
Germany	August 2007 – July 2008 (depending on state)	Smoking allowed in smoking rooms in drinking establishments and restaurants, as well as in small smoking bars and pubs	July 2007–November 2007 (pre-legislation survey)	1,515	July 2009–October 2009 (post-legislation survey)	1,002	66.1
Netherlands	July 2008	Smoking allowed in smoking rooms in drinking establishments and restaurants	March 2008–April 2008 (pre-legislation survey)	2,072 (CATI: 404, CAWI: 1,668)	March 2009–May 2009 (post-legislation survey)	1,632 (CATI: 296, CAWI: 1,336)	78.8 (CATI: 73.3, CAWI: 80.0)
Overall				6,903		4,945	71.6%

Consequently, the difference in comprehensiveness of the regulations is reflected in the frequency of smoking in hospitality venues. While smoking in bars was almost eliminated post-legislation in France (proportion of smokers who noticed smoking at their last visit: 4%), it was still rather common in the Netherlands (36%) and Germany (50%). For restaurants, the policies were more effective: the proportion of smokers noticing smoking was slightly higher in the Netherlands (5%) than in France (2%), but considerably higher in Germany (29%).²⁴ These implications are also supported by other studies using different indicators.^{9,25}

In addition to examining the impact of smoke-free legislation on policy support among smokers in these three countries, the multi-country approach was combined with a quasi-experimental design, using data from two pre-legislation ITC survey waves from the UK serving as control. As public support for smoking bans tends to increase even when no bans are in place, using a control allowed us to disentangle the contribution of secular trends and of the smoke-free legislation to changes in public support in the countries where such legislation was implemented.

Data and methods

Study and sampling design

The prospective ITC Surveys are part of the ITC Project (<http://www.itcproject.org>), which is committed to evaluating the psychosocial and behavioural effects of national tobacco control policies. The surveys are based on the same conceptual framework and methods, and use standardised survey questionnaires.²⁶

The surveys covered probability samples of current smokers aged 18 years and older, with smokers being defined as having smoked at least 100 cigarettes in their lifetime and currently smoking at least monthly. In France, Germany and UK, respondents were recruited and interviewed using random digit dialling (RDD) and computer-assisted telephone interviews (CATI). In the Netherlands, the sample consisted of a small RDD CATI sample and a larger computer-assisted web interview sample (CAWI), which was drawn from a large probability-based internet panel. Whereas the two Dutch samples showed small differences in socio-demographics and smoking behaviour,²⁷ there were no significant differences with regard to pre-legislation support for a

total smoking ban in bars (crude OR CAWI vs. CATI=1.48, 95% CI=0.92–2.39) or restaurants (0.77, 0.57–1.05). The samples were thus pooled for the analyses.

For all countries but the UK, respondents were first interviewed before implementation of the national smoke-free legislation and re-interviewed after implementation. As UK was used as control country, data were drawn from two pre-legislation waves. In order to have a pre-legislation observation period as close as possible to the pre- to post-legislation period in the other countries, we used waves 4 and 5 of the ITC UK survey. Because Scotland had implemented smoke-free legislation between these two waves, we excluded respondents from Scotland from all analyses. The timing of the surveys and the different regulations of the smoke-free policies are summarised in table 1.

The analyses presented here were based on the longitudinal samples, i.e. respondents who had been surveyed both at baseline and follow-up. Of 6,903 baseline smokers, 4,945 (71.6%) could be followed up (table 1).

Measures and outcomes

The pre- and post-legislation questionnaires included relevant socio-demographic variables, such as gender, age, and education. Smoking-related questions of particular relevance to the present analyses were the heaviness of smoking index²⁸ and intention to quit smoking. Awareness of the harm of TSP, a potential confounder, was measured by reported agreement with the statement “Cigarette smoke is dangerous to non-smokers”. The frequency of bar and restaurant visits was used to assess to what extent respondents would be exposed to the smoking restrictions in hospitality venues.

Support for smoke-free policies was assessed by asking whether “smoking should be allowed in all indoor areas, in some indoor areas, or not allowed indoors at all”, separately for “restaurants” and “drinking establishments: bars and pubs”. For each of these two venues, those who stated that smoking should not be allowed indoors at all were categorised as supporting a total smoking ban, those who stated that smoking should be allowed in some indoor areas were categorised as supporting a partial smoking ban, and those who stated that smoking should be allowed in all indoor areas were categorised as supporting no smoking restrictions.

Both variables were dichotomised for the multivariate analyses in the form of: supporting a total smoking ban versus not supporting a total smoking ban.

Statistical analyses

For the descriptive analyses, percentages for country-specific estimates of support for smoke-free policies were reported.

To evaluate changes in support for smoking bans, separate Generalised Estimating Equations (GEE) models^{29,30} were computed for Germany, France, and the Netherlands, with UK as control in each of these models. Separate models were computed with supporting a total smoking ban in drinking establishments, and supporting a total smoking ban in restaurants as dependent variables (binomial distribution, logit link, exchangeable correlation structure). Estimates were adjusted for time-invariant covariates reported at baseline (country, age, gender, education) as well as for time-varying covariates reported at each survey (wave, frequency of visiting the respective hospitality venue, TSP harm awareness). Country x wave-interaction terms were included to account for the pattern of change in the outcome variables over time and to test for differences from UK as control country.

In order to identify prospective predictors of individual change in policy support (i.e. transition from not supporting a total smoking ban to supporting a total smoking ban) in the countries where smoke-free legislation was implemented, multiple logistic regression models were computed, separately for support for smoking bans in drinking establishments and in restaurants. These models included socio-demographic and smoking-related variables, frequency of visiting hospitality venues and TSP harm awareness as independent covariates measured at baseline, and used pooled data. In additional models, we tested for country differences in prospective predictors of change in policy support by adding by-country-interaction terms for each of the covariates.³¹ These models included UK as control country, which was chosen as reference category for all by-country-interactions. That way we could examine for each covariate, whether predictors of change in policy support in the countries that implemented smoke-free legislation between baseline and follow-up were different to the control country UK, which did not have smoke-free legislation at any measurement.

The statistical package SAS 9.2 was used for all analyses.

Results

Pre- and post-legislation levels of support for a total smoking ban

In all four countries examined and at both measurements, a substantially higher proportion of smokers supported a total smoking ban in restaurants than in drinking establishments (table 2). Nevertheless, for both types of venues support for a total smoking ban increased from baseline to follow-up measurement.

For support for a total smoking ban in drinking establishments, the relative increase was sharpest in France (+183.1%), and ranged from 66.2% to 69.5% in the other three countries. The proportion of smokers supporting no smoking restrictions in drinking establishments decreased in all countries except the Netherlands.

For support for a total smoking ban in restaurants, the greatest relative increase was found in the Netherlands (+122.8%), where baseline support had been lowest, and the smallest in UK (+35.7%), where baseline support had been highest. In France and Germany, support increased by 70.0% and 82.7%, respectively.

Changes in support for total smoking bans after implementation of smoke-free legislation

In both the countries with a smoke-free legislation and in the control country, there was a statistically significant increase in support for smoking bans in drinking establishments from baseline to follow-up (table 3). Only in France, the country x wave-interaction proved to be statistically significant, indicating that smokers in France were more likely to become supporters of a total smoking ban in drinking establishments after implementation of a smoke-free legislation than smokers from UK in a period without such legislation. The increase in support in Germany and the Netherlands was not statistically different from that in the UK, indicating that support did not increase above the secular trend.

For support for smoking bans in restaurants, there also was a significant increase in all countries examined. Additionally, all country x wave-interactions were statistically significant. This implies that in all three countries that implemented smoke-free legislation, support increased to a greater extent than in the control country.

Prospective predictors of change in policy support: supporting total smoking bans after implementation of smoke-free legislation

Of smokers who did not support a total smoking ban in drinking establishments pre-legislation, those being older, less educated, those being less heavy smokers, those having baseline quit intentions, and those with higher TSP harm awareness, were more likely to support a total smoking ban post-legislation (table 4). Smokers from Germany and the Netherlands were less likely to become supporters of a smoking ban in drinking establishments than smokers from France, with German smokers having the lowest odds.

In comparison, prospective predictors of transition to support for a total smoking ban in restaurants post-legislation were generally similar. Notable differences were that higher age and lower education did not predict support, and that there was a borderline significant ($p=0.054$) positive association with visiting restaurants at least weekly.

Table 2 Baseline and follow-up levels of support for smoking bans in drinking establishments and restaurants by country

Measure	Categories	UK		France		Germany		Netherlands	
		Pre-ban 1	Pre-ban 2	Pre-ban	Post-ban	Pre-ban	Post-ban	Pre-ban	Post-ban
Support for a smoking ban in drinking establishments	N	1,063		1,224		985		1,566	
	% total smoking ban	11.6	20.9	15.4	43.6	7.1	11.8	9.5	16.1
	% partial smoking ban	73.1	65.4	62.2	48.6	52.1	63.4	60.6	54.7
	% no smoking restrictions	15.3	13.7	22.5	7.8	40.8	24.9	29.9	29.3
Support for a smoking ban in restaurants	N	1,064		1,231		994		1,587	
	% total smoking ban	46.7	55.3	41.3	70.2	30.7	56.1	19.3	43.0
	% partial smoking ban	49.9	41.5	56.6	29.0	62.3	42.2	72.8	54.0
	% no smoking restrictions	3.4	3.3	2.1	0.8	7.0	1.7	7.8	3.0

Table 3 Results of pair-wise GEE models for support for a total smoking ban in drinking establishments and in restaurants

Model	Pattern of change	Support for a total smoking ban in drinking establishments ^a OR (95% CI)	Support for a total smoking ban in restaurants ^a OR (95% CI)
Germany vs. UK	Follow-up vs. baseline		
	Germany	1.78 (1.37–2.30)	3.03 (2.59–3.54)
	UK	2.17 (1.76–2.68)	1.42 (1.23–1.62)
Netherlands vs. UK	<i>Germany x wave-interaction</i>	0.82 (0.58–1.14)	2.14 (1.74–2.63)
	Follow-up vs. baseline		
	Netherlands	1.77 (1.46–2.15)	3.29 (2.86–3.78)
France vs. UK	UK	2.16 (1.75–2.67)	1.41 (1.23–1.62)
	<i>Netherlands x wave-interaction</i>	0.82 (0.62–1.09)	2.33 (1.91–2.84)
	Follow-up vs. baseline		
	France	4.58 (3.85–5.44)	3.54 (3.09–4.06)
	UK	2.18 (1.77–2.69)	1.41 (1.23–1.62)
	<i>France x wave-interaction</i>	2.10 (1.61–2.75)	2.51 (2.06–3.04)

a: Models were adjusted for time-invariant covariates reported at baseline (country, gender, age, education) and time-varying covariates (wave, frequency of visiting the respective venue, TSP harm awareness) and included country x wave-interaction terms. The odds ratios reported for each country estimate the change in odds of supporting a smoking ban between the two waves. The interaction odds ratios are the ratios of these estimates and were used to assess if the change in the respective country with a smoke-free legislation was statistically significantly different from the change in the no-legislation control country (UK). In this table, an interaction OR > 1 indicates that the change was greater in the country where a smoke-free legislation was implemented compared to the control country, an OR < 1 indicates that it was smaller

Table 4 Prospective predictors of supporting a total smoking ban at follow-up in countries which implemented smoke-free legislation between baseline and follow-up (restricted to respondents who did not support a total smoking ban at baseline), results of multiple logistic regression models

Predictor variable ^a	Support for a total smoking ban in drinking establishments ^a France, Germany and the Netherlands pooled N = 3,282; Events = 636 OR (95% CI)	Support for a total smoking ban in restaurants ^a France, Germany and the Netherlands pooled N = 2,566; Events = 1,127 OR (95% CI)
Gender		
Male (vs. female)	1.19 (0.99–1.44)	1.18 (1.00–1.39)
Age (in years)	1.02 (1.02–1.03)	1.01 (0.99–1.01)
Education		
Low (vs. high)	1.29 (0.99–1.66)	1.02 (0.82–1.28)
Moderate (vs. high)	1.29 (1.01–1.65)	1.15 (0.94–1.41)
Heaviness of smoking index (HSI) ^b	0.86 (0.81–0.92)	0.82 (0.78–0.87)
Intention to quit within next 6 months (vs. no intention)	1.27 (1.04–1.55)	1.45 (1.20–1.76)
Frequency of visiting the respective hospitality venue (restaurants / drinking establishments): visiting at least weekly (vs. less than weekly)	0.97 (0.79–1.20)	1.24 (0.99–1.55)
Agreement with statement "Cigarette smoke is dangerous to others" (TSP harm awareness) ^c	1.40 (1.23–1.60)	1.31 (1.18–1.44)
Country		
Germany (vs. France)	0.17 (0.13–0.23)	0.78 (0.62–0.99)
Netherlands (vs. France)	0.36 (0.28–0.46)	0.65 (0.52–0.81)

a: Covariates refer to baseline. Models included all variables in the table together

b: The index ranges from 0 to 6, with higher values indicating higher addiction/heavier smoking

c: Five-point scale ranging from strongly disagree (1) to strongly agree (5)

Prospective predictors of change in policy support: country differences

With regards to prospective predictors of becoming a supporter of a total smoking ban in drinking establishments and in restaurants, respectively, several country differences were observed (table 5). Notable country differences to the UK sample were the significant negative association of heaviness of smoking with supporting a smoking ban in drinking establishments in the Dutch sample and the positive associations of lower education in the Dutch and the German sample. Furthermore, there were interesting significant country differences regarding the associations of frequently visiting hospitality venues with supporting a total smoking ban in restaurants: while weekly restaurant visitors in

the UK were less likely to support a smoking ban in restaurants at follow-up compared to non-weekly restaurant visitors, the effect was of opposite direction in the Netherlands and France, where visiting restaurants weekly predicted support for a restaurant smoking ban after the implementation of smoke-free legislation.

Discussion

To our knowledge, this is the first longitudinal multiple-country study to compare patterns of change in policy support among smokers in countries with differential comprehensiveness of national smoke-free legislation. We examined data from the ITC

Table 5 Country-specific prospective predictors of supporting a total smoking ban at follow-up (restricted to those who did not support a total smoking ban at baseline), results of multiple logistic regression by-country interaction models

Predictor variable ^a	Support for a total smoking ban in drinking establishments ^a				Support for a total smoking ban in restaurants ^a							
	N = 4,205; Events = 792		N = 3,114; Events = 1,322		France		Germany		Netherlands		UK	
	France OR (95% CI)	Germany OR (95% CI)	Netherlands OR (95% CI)	UK OR (95% CI)	France OR (95% CI)	Germany OR (95% CI)	Netherlands OR (95% CI)	UK OR (95% CI)	France OR (95% CI)	Germany OR (95% CI)	Netherlands OR (95% CI)	UK OR (95% CI)
Gender												
Male (vs. female)	1.12 (0.86–1.47)	1.17 (0.70–1.93)	1.33 (0.96–1.84)	1.22 (0.85–1.76)	1.35 (0.98–1.85)	1.25 (0.91–1.73)	1.07 (0.84–1.38) [†]	1.97 (1.36–2.86)	1.02 (1.01–1.03)	1.01 (0.99–1.02)	1.00 (0.99–1.01)	1.01 (0.99–1.03)
Age (in years)	1.03 (1.02–1.04) [†]	1.04 (1.02–1.06) [†]	1.01 (1.00–1.02)	1.01 (0.99–1.02)								
Education												
Low (vs. high)	1.22 (0.86–1.74)	0.93 (0.47–1.87)	1.65 (0.99–2.74) [†]	0.69 (0.42–1.13)	1.09 (0.72–1.66)	1.26 (0.82–1.93)	0.89 (0.62–1.27)	1.45 (0.84–2.48)				
Moderate (vs. high)	1.04 (0.72–1.49)	1.57 (0.90–2.75) [†]	1.75 (1.11–2.76) [†]	0.69 (0.40–1.20)	1.08 (0.72–1.64)	1.47 (1.03–2.10)	1.06 (0.77–1.45)	1.02 (0.56–1.85)				
Heaviness of smoking index (HSI) ^b	0.89 (0.81–0.97)	0.93 (0.79–1.10)	0.79 (0.71–0.88) [†]	1.03 (0.91–1.17)	0.87 (0.79–0.97)	0.84 (0.75–0.93)	0.78 (0.71–0.85)	0.80 (0.70–0.91)				
Intention to quit within 6 months (vs. no intention)	1.23 (0.94–1.61)	1.22 (0.71–2.08)	1.33 (0.92–1.94)	1.68 (1.17–2.42)	1.25 (0.90–1.74)	1.41 (0.97–2.06)	1.52 (1.12–2.05)	1.22 (0.81–1.83)				
Frequency of visiting the respective hospitality venue (drinking establishments / restaurants): visiting at least weekly (vs. less than weekly)	1.11 (0.84–1.46)	0.81 (0.45–1.46)	0.82 (0.55–1.23)	0.71 (0.48–1.06)	1.38 (0.92–2.07) [†]	0.94 (0.66–1.35)	1.70 (1.13–2.55) [†]	0.61 (0.39–0.96)				
Agreement with statement "Cigarette smoke is dangerous to others" (TSP harm awareness) ^c	1.47 (1.18–1.83)	1.36 (0.95–1.93)	1.35 (1.12–1.63)	1.25 (0.99–1.55)	1.42 (1.15–1.77)	1.09 (0.90–1.32)	1.38 (1.20–1.59)	1.38 (1.11–1.73)				

a: Covariates refer to baseline. The basic model used UK as reference and included all variables in the table together and additional by-country interaction terms for each of the predictor variables. Estimates presented are the main effects of the predictor of interest for each country, which were derived by redefining the reference group and rerunning the model for each of the countries where a smoke-free legislation was implemented. To keep the table simple and non-redundant, the main effects of country and all by-country interaction effects were not reported, but significant interaction effects in the basic model (with UK as reference) were marked with a [†]

b: The index ranges from 0 to 6, with higher values indicating higher addiction/heavier smoking

c: Five-point scale ranging from strongly disagree (1) to strongly agree (5)

[†]Statistically significant (p < 0.05) interaction effect between the predictor of interest and country, indicating significant country differences to UK

Surveys in France, Germany, and the Netherlands. These countries vary substantially with regards to the comprehensiveness of their smoke-free policy in the hospitality sector: While France has the most comprehensive policy, the Netherlands and Germany have partial policies that are especially weak in the case of drinking establishments and also experience problems with enforcement. We found that the comprehensive legislation in France was associated with a marked increase in support for total smoking bans in drinking establishments and in restaurants, which was found to be above the secular trend. In the Netherlands and Germany, we also observed increasing support for total smoking bans, but only for a smoking ban in restaurants was the increase in support above the secular trend.

Thus, our findings are in line with previous studies showing a positive impact of smoke-free legislation on smokers' support for smoking bans.^{12–23} In addition, our findings suggest that comprehensive smoking bans have a stronger effect on policy support than partial smoking bans. This might be unexpected given the high level of opposition among smokers and the low support that many countries have experienced in the process of debating and implementing smoke-free policies. But, as others have also suggested,⁸ smoke-free legislation seems to have the potential to change attitudes, and acceptance increases once smokers experience the legislation and its benefits. In contrast, we assume that in countries with only partial smoking restrictions, initial concerns among smokers persist, possibly due to ongoing debates about proportionality and fairness of the regulations. This is reflected in our findings of low pre-legislation support levels and the only slight increase in support levels for smoking bans in drinking establishments in Germany and the Netherlands, where the partial smoking bans are especially deficient in bars and pubs due to exemptions and problems with compliance.^{9,25} Germany's smoke-free policy is even less effective than that of the Netherlands,^{9,25} which might explain why German smokers had even lower odds of becoming supporters of a smoking ban in drinking establishments than Dutch smokers. Opposition among smokers generally seems to be more prevalent in the case of smoking bans in drinking establishments, which had the lowest pre-legislation support levels. This was also found in other studies.^{13,15} Possible explanations could be a stronger association of bars and pubs with (social) smoking compared to other types of hospitality venues, and tobacco industry efforts to preserve the "last bastion of socially acceptable smoking".³²

An alternative interpretation of the observed changes in support following the smoking bans would be that these changes were induced by campaigns and media reports related to the smoking bans. While campaigns were run prior to the implementation of the legislation in France and the Netherlands, there were no campaigns in Germany. However, the finding that frequency of visiting restaurants – and thus the frequency of being directly exposed to and affected by the smoking ban – seems to play a significant role in the transition to supporting smoking bans suggests that at least part of the effect is caused by the policy itself. A relevant mediator might be TSP harm awareness, which was a significant predictor of post-legislation support. As TSP-related health knowledge can be reinforced by media reports³³ and social marketing campaigns,³⁴ this could indeed be an important driving factor in the process of normative changes that occur after implementation of the legislation. However, we could not further examine the role of campaigns and media reports as detailed information about exposure among respondents was lacking.

Limitations of this study include differences in the timing of the surveys and the loss of nearly 30% of respondents to follow-up. Because the smoke-free legislation was implemented at different dates in the examined countries, the pre- and post-legislation surveys were conducted at different times, and also the follow-up time and time between implementation of the legislation and post-legislation varied. As secular trends influence the level of policy support, the differences in timing of the survey might explain

pre-legislation country-differences in levels of support, but the patterns of change should be largely unaffected by survey timing. In order to assess secular changes we used the UK (without Scotland) as a control country. Comparable baseline support rates implied that UK was an appropriate choice for this purpose. However, it is possible that with associated publicity around the enactment of the smoke-free legislation in Scotland, the secular increase in the rest of UK might have been an overestimate. This would make our estimate of the secular trend more conservative.

Loss to follow-up is a common problem in longitudinal studies and can lead to attrition bias. Non-responder analyses showed that smokers of younger age (OR = 0.985, 95% CI = 0.981–0.989), those with a pre-legislation intention to quit (1.15, 1.03–1.29), and weekly visitors of drinking establishments (1.13, 1.01–1.27) or restaurants (1.27, 1.11–1.46) were somewhat more likely to be lost to follow-up. However, these odds ratios suggest only limited potential for bias in the results reported in table 2.

The relevance of the interviewing modes in the Dutch surveys was explored in sensitivity analyses running the GEE and the logistic regression models separately for CAWI- and CATI-respondents, which yielded consistent results (details not shown).

Finally, our findings were consistent with results from ITC studies from Ireland, UK, USA, Canada, and Australia,^{7,8,15,16} which is in line with a broad generalisability of our findings for Western industrial nations.

Our study of smokers from four EU-countries demonstrates that smoking bans have the potential to create and improve support once the policy is in place. This effect is stronger the more comprehensive the policy, but might not be valid for partial smoking bans with many exemptions, as these could be cause for ongoing debates about fairness and proportionality of the regulations. The findings imply that compliance problems that often occur with partial smoking bans might lessen with more comprehensive regulations and increasing support. Most importantly, policy-makers should not waver from implementing comprehensive smoke-free legislation because of low public acceptance rates, as it seems that despite potential controversy and resistance in the beginning, comprehensive regulations attract support from smokers once implemented.

Acknowledgements

Several members of the ITC Project team at the University of Waterloo, Ontario, Canada have assisted in all stages of conducting the ITC Europe surveys, which we gratefully acknowledge. In particular, we thank Lorraine Craig, Project Manager of the ITC Europe surveys and the Data Management Core of the ITC Project, both at the University of Waterloo.

Funding

ITC France: French Institute for Health Promotion and Health Education (INPES), French National Cancer Institute (INCa), French Monitoring Centre for Drugs and Drug Addiction (OFDT). ITC Netherlands: The Netherlands Organisation for Health Research and Development (ZonMw). ITC Germany: German Ministry of Health, German Cancer Research Center, Dieter-Mennekes-Umweltstiftung. ITC UK: U.S. National Cancer Institute (RO1 CA100362 and P50 CA111236), Canadian Institutes of Health Research (57897), Cancer Research UK (C312/A6465). Survey development, management, and data management, ITC Project, University of Waterloo: U.S. National Cancer Institute (P50 CA111236; P01 CA138389); Canadian Institutes of Health Research (57897; 79551); Ontario Institute of Cancer Research. Ute Mons is financially supported by Klaus Tschira Foundation gGmbH.

Conflicts of interest: None declared.

Key points

- This is the first longitudinal multi-country study to examine whether the comprehensiveness of national smoke-free policies moderates the effect of such policies on support for smoking bans among smokers.
- The comprehensive French smoking ban was associated with sharp increases in support for smoking bans in drinking establishments as well as in restaurants. The partial smoking bans in Germany and in the Netherlands only led to increases of support for smoking bans in restaurants, where the ban was more effectively implemented and more comprehensive than in drinking establishments.
- Our study suggests that smoke-free policies have the potential to create and improve support after their implementation, even when there is low pre-legislation support among smokers. The findings suggest that this effect is more pronounced with comprehensive smoking bans compared to partial smoking bans.
- Thus, despite their potential for controversy and resistance in the process of implementation, comprehensive smoke-free legislation might be the most valid option for policy-makers.

References

- 1 International Agency for Research on Cancer. IARC Monographs on the evaluation of carcinogenic risks to humans, Vol. 83: Tobacco smoke and involuntary smoking. Lyon: World Health Organization, International Agency for Research on Cancer, 2004.
- 2 U.S. Department of Health and Human Services. The health consequences of involuntary exposure to tobacco smoke. A report of the Surgeon General. Atlanta: Public Health Service, Office of the Surgeon General, 2006.
- 3 Callinan JE, Clarke A, Doherty K, Kelleher C. Legislative smoking bans for reducing secondhand smoke exposure, smoking prevalence and tobacco consumption. *Cochrane Database Syst Rev* 2010;4:CD005992.
- 4 International Agency for Research on Cancer. IARC Handbooks of cancer prevention, Vol. 13: Evaluating the Effectiveness of Smoke-free Policies. Lyon: World Health Organization, International Agency for Research on Cancer, 2009.
- 5 Albers AB, Siegel M, Cheng DM, Biener L, Rigotti NA. Relation between local restaurant smoking regulations and attitudes towards the prevalence and social acceptability of smoking: a study of youths and adults who eat out predominantly at restaurants in their town. *Tob Control* 2004;13:347–55.
- 6 Alesci NL, Forster JL, Blaine T. Smoking visibility, perceived acceptability, and frequency in various locations among youth and adults. *Prev Med* 2003;36:272–81.
- 7 Brown A, Moodie C, Hastings G. A longitudinal study of policy effect (smoke-free legislation) on smoking norms: ITC Scotland/United Kingdom. *Nicotine Tob Res* 2009;11:924–32.
- 8 Hyland A, Higbee C, Borland R, Travers M, Hastings G, Fong GT, et al. 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* 2009;11:642–9.
- 9 Nagelhout GE, Mons U, Allwright S, Guignard R, Beck F, Fong GT, et al. Prevalence and predictors of smoking in “smoke-free” bars. Findings from the International Tobacco Control (ITC) Europe Surveys. *Soc Sci Med* 2011;72:1643–51.
- 10 Brooks DR, Mucci LA. Support for smoke-free restaurants among Massachusetts adults, 1992–1999. *Am J Public Health* 2001;91:300–3.
- 11 Osypuk TL, Acevedo-Garcia D. Support for smoke-free policies: a nationwide analysis of immigrants, US-born, and other demographic groups, 1995–2002. *Am J Public Health* 2010;100:171–81.
- 12 Braverman MT, Aaro LE, Bontempo DE, Hetland J. Bar and restaurant workers' attitudes towards Norway's comprehensive smoking ban: a growth curve analysis. *Tob Control* 2010;19:240–7.
- 13 Cooper J, Borland R, Yong HH, Hyland A. Compliance and support for bans on smoking in licensed venues in Australia: findings from the International Tobacco Control Four-Country Survey. *Aust N Z J Public Health* 2010;34:379–85.
- 14 Edwards R, Thomson G, Wilson N, Waa A, Bullen C, O'Dea D, et al. After the smoke has cleared: evaluation of the impact of a new national smoke-free law in New Zealand. *Tob Control* 2008;17:e2.
- 15 Hyland A, Hassan LM, Higbee C, Boudreau C, Fong GT, Borland R, et al. The impact of smokefree legislation in Scotland: results from the Scottish ITC: Scotland/UK longitudinal surveys. *Eur J Public Health* 2009;19:198–205.
- 16 Fong GT, Hyland A, Borland R, Hammond D, Hastings G, McNeill A, 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.
- 17 Larsson M, Boethius G, Axelsson S, Montgomery SM. Exposure to environmental tobacco smoke and health effects among hospitality workers in Sweden – before and after the implementation of a smoke-free law. *Scand J Work Environ Health* 2008;34:267–77.
- 18 Lund KE. The introduction of smoke-free hospitality venues in Norway. Impact on revenues, frequency of patronage, satisfaction and compliance. Oslo: The Norwegian Institute for Alcohol and Drugs Research, 2006.
- 19 Palmersheim KA, Remington PL, Gundersen DF. The impact of a smoke-free ordinance on the health and attitudes of bartenders. Madison, USA: Tobacco Surveillance and Evaluation Program, University of Wisconsin Comprehensive Center, 2006.
- 20 Pursell L, Allwright S, O'Donovan D, Paul G, Kelly A, Mullally BJ, et al. Before and after study of bar workers' perceptions of the impact of smoke-free workplace legislation in the Republic of Ireland. *BMC Public Health* 2007;7:131.
- 21 Rayens MK, Hahn EJ, Langley RE, Hedgecock S, Butler KM, Greathouse-Maggio L. Public opinion and smoke-free laws. *Policy Polit Nurs Pract* 2007;8:262–70.
- 22 Tang H, Cowling DW, Lloyd JC, Rogers T, Koumjian KL, Stevens CM, et al. Changes of attitudes and patronage behaviors in response to a smoke-free bar law. *Am J Public Health* 2003;93:611–7.
- 23 Tang H, Cowling DW, Stevens CM, Lloyd JC. Changes of knowledge, attitudes, beliefs, and preference of bar owner and staff in response to a smoke-free bar law. *Tob Control* 2004;13:87–9.
- 24 ITC Project. ITC Germany National Report. Waterloo, Ontario, Canada and Heidelberg, Germany: University of Waterloo and DKFZ, 2010.
- 25 Gleich F, Mons U, Pötschke-Langer M. Air Contamination Due to Smoking in German Restaurants, Bars, and Other Venues—Before and After the Implementation of a Partial Smoking Ban. *Nicotine Tob Res* 2011;13:1155–60.
- 26 Thompson ME, Fong GT, Hammond D, Boudreau C, Driezen P, Hyland A, et al. Methods of the International Tobacco Control (ITC) Four Country Survey. *Tob Control* 2006;15(Suppl 3):iii12–8.
- 27 Nagelhout GE, Willemsen MC, Thompson ME, Fong GT, van den Putte B, de Vries H. Is web interviewing a good alternative to telephone interviewing? Findings from the international tobacco control (ITC) Netherlands survey. *BMC Public Health* 2010;10:351.
- 28 Heatherton TF, Kozlowski LT, Frecker RC, Rickert W, Robinson J. Measuring the heaviness of smoking: using self-reported time to the first cigarette of the day and number of cigarettes smoked per day. *Br J Addict* 1989;84:791–9.
- 29 Hanley JA, Negassa A, Edwards MD, Forrester JE. Statistical analysis of correlated data using generalized estimating equations: an orientation. *Am J Epidemiol* 2003;157:364–75.
- 30 Zeger SL, Liang KY. Longitudinal data analysis for discrete and continuous outcomes. *Biometrics* 1986;42:121–30.
- 31 Jaccard J. Interaction Effects in Logistic Regression. Sage University Papers Series on Quantitative Applications in the Social Sciences, series no. 07–135. Thousand Oaks, CA: Sage, 2001.
- 32 Magzamen S, Glantz SA. The new battleground: California's experience with smoke-free bars. *Am J Public Health* 2001;91:245–52.
- 33 Nagelhout GE, van den Putte B, de Vries H, Crone M, Fong GT, Willemsen MC. The influence of newspaper coverage and a media campaign on smokers' support for smoke-free bars and restaurants and on secondhand smoke harm awareness: findings from the International Tobacco Control (ITC) Netherlands Survey. *Tob Control* 2012;21:24–9.
- 34 Thrasher JF, Huang L, Perez-Hernandez R, Niederdeppe J, Arillo-Santillan E, Alday J. Evaluation of a social marketing campaign to support Mexico City's comprehensive smoke-free law. *Am J Public Health* 2011;101:328–35.