



**QUEEN'S  
UNIVERSITY  
BELFAST**

## **Greater gains from smoke-free legislation for non-smoking bar staff in Belfast**

Bannon, F., Devlin, A., McElwee, G., & Gavin, A. (2009). Greater gains from smoke-free legislation for non-smoking bar staff in Belfast. *European Journal of Public Health*, 19(6), 638-643.

**Published in:**  
European Journal of Public Health

**Queen's University Belfast - Research Portal:**  
[Link to publication record in Queen's University Belfast Research Portal](#)

### **General rights**

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

### **Take down policy**

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact [openaccess@qub.ac.uk](mailto:openaccess@qub.ac.uk).

## Greater gains from smoke-free legislation for non-smoking bar staff in Belfast

Finian Bannon<sup>1</sup>, Anne Devlin<sup>2</sup>, Gerry McElwee<sup>2</sup>, Anna Gavin<sup>1</sup>

**Background:** In April 2007, smoke-free legislation was enacted in workplaces throughout N. Ireland. The effects of this legislation on bar workers' health and their exposure to second-hand smoke at home, work and social environment, and their attitudes to the legislation before and after its implementation remain to be documented. **Methods:** A self-completed questionnaire of bar staff in 35 Belfast bars, before (March 2007,  $n=110$ ) and after the legislation (July 2007,  $n=110$ ). **Results:** Smokers (excluding 'social smokers') made up 41.6% of respondents. After the introduction of the smoke-free legislation, the reductions in the proportion of bar workers reporting various respiratory symptoms ranged from 1.3% to 18.6% for smokers and from 21.9% to 33.2% for non-smokers. Likewise, the reductions for various sensory symptoms ranged from 7.3% to 17.7% for smokers and from 29.6% to 46.8% for non-smokers. Reduction in wheeze, cough and throat symptoms after the legislation were much greater for non-smokers than smokers. The proportion of bar staff who reported satisfaction with the legislation remained unchanged across the surveys. Decreases in perceived exposure to second-hand smoke occurred at work, home and in social settings. After the legislation's enactment, a majority of bar workers felt the workplace was healthier (98%). **Conclusion:** These first findings show reduced reported symptoms among bar workers, both smokers and non-smokers, after the introduction of smoke-free legislation in N. Ireland, though greater among non-smokers. There was also a reported fall in the hours of second-hand smoke exposure in the home for this group of workers which has a high prevalence of smokers.

**Keywords:** bar staff, respiratory symptoms, second-hand smoke, smoke-free legislation, sensory symptoms.

### Introduction

In April 2007 in Northern Ireland, smoke-free legislation was enacted in workplaces, including bars, to protect workers and the public from the serious health effects of second hand smoke (SHS).<sup>1</sup> Before the legislation, there were concerns about its possible impact on the bar trade with the possibility of job losses, the level of public compliance that could be achieved<sup>2</sup> and the risk of increased smoking at home.<sup>3</sup> A survey<sup>4</sup> in 2004 found that 10.5% of smokers and 50.5% of non-smokers supported a completely smoke-free environment in bars in N. Ireland.

While it is too early to measure the impact of the legislation on cancer, strokes and heart disease, the first signs of reduction in SHS on health are on reported respiratory and sensory symptoms.<sup>5-7</sup> The objectives of this study were to assess, before and after the introduction of the smoke-free legislation, bar workers' self-reported (1) levels of respiratory and sensory irritation symptoms, (2) exposure levels to SHS in the workplace, social environment and at home, and (3) attitudes to the legislation.

### Methods

#### Participants

The Belfast bars in the study consisted of 10 bars (out of a possible 11) belonging to Botanic Inns Limited and 25 bars selected from ~40-50 bars on the official Belfast tourism

website (<http://www.gotoBelfast.com>); these bars were more likely to be busy bars. In 2007, there were 232 bars in Belfast.

#### Data collection

A short self-completing questionnaire designed by A.D. was similar to that used by Allwright *et al.*<sup>5</sup> It sought self-reported information on bar workers' (1) demographics and smoking consumption; (2) hours of SHS exposure per week at work, home and in social settings; (3) experience in the past 2 weeks of respiratory and sensory irritation symptoms and (4) attitudes towards the legislation. The same information was sought pre-and post-legislation facilitating a before and after comparison. The questionnaires are available at <http://www.ulstercancer.org/smoke-free-survey>.

Two surveys were conducted, one in March 2007, a month prior to the introduction of the legislation in April 2007, the second afterwards in July 2007. A.D. visited bars and asked staff present to self-complete a questionnaire; extra forms were left with senior staff to be completed by absent bar workers with an agreed date for collection. No personal or workplace names were requested. As the same bars were visited before and after the legislation, there is likely to be a sizeable overlap of participants who completed the form on both occasions.

#### Data analyses

The statistical analysis was performed in Stata (Version 9) and SPSS (Version 15.0).<sup>8</sup> The independence of categorical variables was tested using a Pearson's  $\chi^2$  or a Fisher's Exact test. The Wilcoxon Signed Rank Test (WSRT) was used to compare variables that had non-normal distributions.

Binomial responses to questions were analysed using logistic regression; the question asked to the staff whether they were glad of the legislation was recoded 'glad' = 1; 'unsure' or 'not glad' = 0, and the question regarding business effects of legislation was recoded 'decreased' = 1; 'nochange', 'unsure' or 'increase' = 0. The logistic models fitted consisted of two

1 Northern Ireland Cancer Registry, Queen's University Belfast, Belfast, Northern Ireland, UK

2 Ulster Cancer Foundation, Belfast, Northern Ireland, UK

Correspondence: Finian Bannon, Northern Ireland Cancer Registry, Queen's University Belfast, Grosvenor Road, Belfast, BT12 6BJ, Northern Ireland, UK, tel: +44 28 90632571, fax: +44 28 90248017, e-mail: [fj.bannon@qub.ac.uk](mailto:fj.bannon@qub.ac.uk)

independent variables, 'smoking/non-smoking status' (S) and 'pre/post legislation' (L) and testing their interaction (SxL). Estimates of percentage differences and their 95% confidence intervals (CI) were obtained using the 'nlcom' command in Stata. The following potential confounders were tested by adding all of them to the S, L and SxL variables in the logistic models: sex, age ( $\leq$  or  $>25$  years old), shifts (day, evening or both), hours worked per week ( $\leq 30$ , 31-40 or  $>40$ ) and years employed ( $<$  or  $\geq 5$ ). A potential confounder is reported here if its *p*-value was  $<0.10$  (Wald test) when it was sequentially entered last in the model (Type III analysis); this analysis was carried out using SPSS.

### Results

One hundred and ten questionnaires were collected in each of the pre- and post-legislation surveys. Smokers made up 51.2% (41.6% daily smokers [ $n_{\text{before}}=46$ ;  $n_{\text{after}}=45$ ], 9.6% occasional smokers [ $n_{\text{before}}=12$ ;  $n_{\text{after}}=9$ ]) of respondents in both surveys combined. There was a non-significant ( $P=0.59$ ) decline in the proportion of occasional smokers (of all smokers) from 20.7% ( $n=12$ ) pre-legislation to 16.7% ( $n=9$ ) post-legislation. To focus on daily smokers and non-smokers, the occasional smokers from the pre- and post-legislation survey were removed from the study analysis.

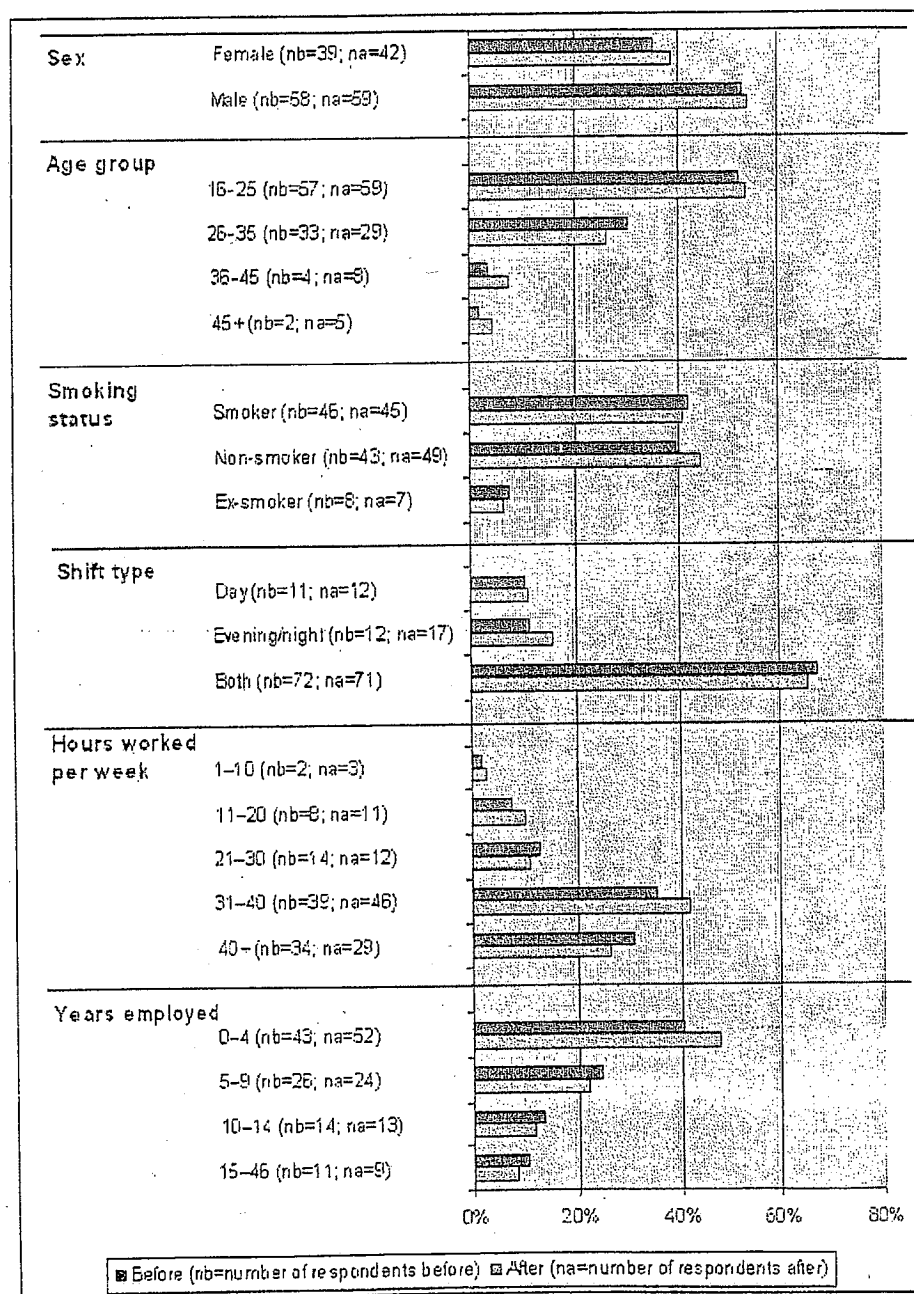


Figure 1 The demography, smoking status and work-related information of the bar workers who participated in the surveys before and after the introduction of smoke-free legislation

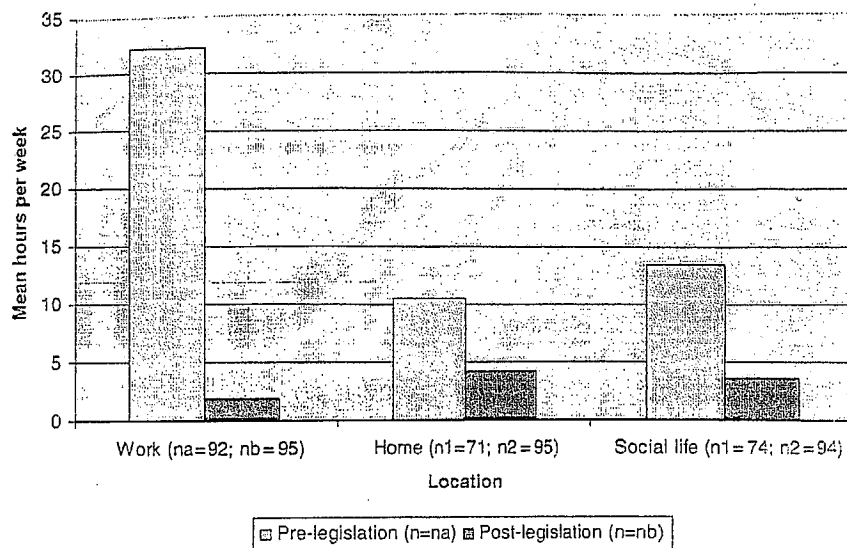


Figure 2 Self-reported weekly hours of second-hand smoke exposure before and after introduction of smoke-free workplaces. The median hours of reported exposure to SHS before the legislation was 35 h for work, 2 h for home and 10 h for social life environment; after the legislation it was zero hours for all environments

In addition, a further questionnaire was excluded where the respondent did not declare their smoking status; this left 97 and 101 participants in the study, pre- and post-legislation. The distribution of the following categorical variables did not differ significantly before and after the smoke-free legislation was introduced ( $P$ -values in brackets): sex ( $P=0.84$ ), age ( $P=0.43$ ), smoking status ( $P=0.82$ ), type of shifts worked ( $P=0.67$ ), weekly hours worked ( $P=0.79$ ) and years employed ( $P=0.78$ ), (see figure 1 for raw data).

A majority of smokers (63.5%) lived with other smokers, in comparison with 42.6% for non-smokers ( $P=0.004$ ). There was a non-significant ( $P=0.41$ ; WRST) change in the reported daily number of cigarettes smoked by smokers from prior to smoke-free legislation (mean 13.5; median 11) to after (mean 16.6; median 15). There was a non-significant ( $P=0.69$ ) decline in the proportion of daily smokers after the smoke-free legislation's introduction from 47.4% to 44.6%.

The reported hours of exposure to SHS decreased significantly ( $P<0.001$ ; WRST) after the smoke-free legislation in all locations: at work, home and in the social environment (figure 2). The difference in the hours of exposure to SHS at home before and after the legislation was analysed separately for the following scenarios: (a) bar worker who smokes living with a smoker [ $n_{\text{before}}=25$ ,  $n_{\text{after}}=25$ ], (b) bar worker who smokes not living with a smoker [ $n_{\text{before}}=8$ ,  $n_{\text{after}}=16$ ], (c) bar worker who does not smoke living with a smoker [ $n_{\text{before}}=17$ ,  $n_{\text{after}}=22$ ] and (d) bar worker who does not smoke not living with a smoker [ $n_{\text{before}}=20$ ,  $n_{\text{after}}=29$ ]. There was a significant decline in reported hours of exposure for households in which the bar worker had a different smoking status to the other residents, i.e. scenarios (b) with  $P=0.04$  (WRST) [2/8 reported  $>0$  h exposure before versus 0/16 after] and (c) median hours of exposure per week from 6 to 0 hours ( $P=0.005$  [WRST]) and mean hours from 11 to 6 hours. There was some evidence that scenario (a) also experienced a reduction in the hours exposure to SHS at home; median hours declined from 10 to 6 (WRST  $P$ -value = 0.13) and mean hours from 22.7 to 9.4 before and after the legislation, respectively.

For the symptom and attitude response variables in Tables 1 and 3, respectively, all potential confounders were added to the

S, L, & SxL model, and those whose Type III  $p$ -values (Wald test) were  $<0.10$  were retained to adjust the odds ratios in Table 2; these confounders are described below. Bar workers who either worked longer hours ( $P=0.039$ ) (in particular 31–40 h per week) or the night/evening shift ( $P=0.078$ ) were more likely to report at least one respiratory symptom. Wheeze was more likely to be reported by male ( $P=0.043$ ) staff and those who worked longer hours ( $P=0.031$ ) (in particular 31–40 h per week). Younger bar workers were more likely to report at least one sensory irritation symptom ( $P=0.04$ ). Nose irritation symptoms were more likely to be reported by bar staff who worked long hours ( $P=0.018$ ) or the evening/night shift ( $P=0.026$ ). Older ( $P=0.035$ ) bar staff was more anxious about the effect of second-hand smoke on health. Bar staff who worked long hours ( $P=0.08$ ) and male ( $P=0.024$ ) staff believed more strongly that the legislation would decrease business.

After the legislation, the proportion of bar workers reporting at least one respiratory symptom declined by 18.1% (CI 6.8–29.4%;  $P=0.002$ ) for smokers and 25.1% (CI 10.4–39.8%;  $P<0.01$ ) for non-smokers (table 1). The level of wheezing among non-smokers declined significantly by 26.9% (CI 12.1–41.6%;  $P=0.001$ ) but not among smokers (5.9%,  $P=0.58$ ); this type of interaction, SxL, occurred also in 'cough first thing in the morning' and 'cough in day or night' (table 1). Smokers had greater odds of reporting 'shortness of breath' than non-smokers (odds ratio 2.02, CI 1.08–3.77,  $P=0.027$ , table 2); likewise, there was greater odds of reporting this symptom before the legislation (odds ratio 2.62 CI 1.4–4.92,  $P=0.003$ ).

The proportion of bar workers reporting 'at least one sensory symptom' declined by 36% (CI 19.7–52.2%,  $P=0.001$ ) for non-smokers, but not significantly for smokers (5.2%,  $P=0.54$ ) (table 1). Irrespective of smoking status, there was greater odds of reporting running nose before the legislation than after (adjusted odds ratio 2.38, CI 1.29–4.42,  $P=0.005$ , table 2). For the level of 'sore or scratching throat', there was a significant SxL interaction ( $P=0.006$ ); after the legislation, its level declined among non-smokers by 41.5% (CI 25.2–57.8%,  $P<0.001$ ), but only by 7.2% ( $P=0.50$ ) for smokers (table 1). For non-smokers, the odds of reported eye irritation

Table 1 The predicted prevalence (%) of reported respiratory and sensory irritation symptoms among bar workers by smoking status (S) and pre-/post-legislation (L) with observed proportions and *P*-values for the effects in the full interaction model (S, L, SxL)

Symptoms	Predicted prevalence, % ( <i>n</i> <sub>observed</sub> / <i>n</i> <sub>total</sub> )				Type I analysis <i>p</i> -values (Wald test) of the effects in logistic model <sup>a</sup>		
	Smoker		Non-smoker		S	L	S × L
	Pre-legislation	Post-legislation	Pre-legislation	Post-legislation			
<b>Respiratory symptoms</b>							
Wheeze/whistling in the chest last 2 weeks	45.5 (20/44)	39.5 (17/43)	34.0 (17/50)	7.1 (4/56)	<0.001	0.003	0.025
Shortness of breath	53.5 (22/43)	30.4 (14/43)	36.1 (19/50)	17.7 (9/56)	0.019	0.002	0.547
Cough first thing in the morning	43.2 (19/44)	41.9 (18/43)	30.0 (15/50)	7.1 (4/56)	<0.001	0.012	0.025
Cough in day or night	59.1 (26/44)	51.2 (22/43)	46.0 (23/50)	12.7 (7/55)	<0.001	0.001	0.028
At least one respiratory symptom	84.8 (35/44)	66.7 (31/43)	61.4 (33/50)	36.3 (18/56)	<0.001	0.002	0.125
<b>Sensory symptoms</b>							
Red or irritated eyes	40.9 (18/44)	23.3 (10/43)	70.0 (35/50)	23.2 (13/56)	0.093	<0.001	0.06
Runny nose, sneezing or nose irritation	64.9 (26/44)	45.2 (22/43)	60.1 (32/49)	40.3 (20/56)	0.445	0.006	0.131
Sore or scratchy throat	47.7 (21/41)	40.5 (17/42)	54.0 (27/50)	12.5 (7/56)	0.031	<0.001	0.006
At least one sensory symptom	72.7 (32/44)	67.4 (29/43)	86.0 (43/50)	50.0 (28/56)	0.99	0.001	0.021

a: Terms with a *P*-value <0.10, including main effects if interaction was significant, were used to estimate the predicted prevalence (%)

Table 2 The adjusted ORs (with 95% confidence intervals) for the prevalence of respiratory and sensory irritation symptoms, and of affirmative responses to attitude questions of bar workers comparing (a) pre- to post-introduction of smoke-free legislation separately for smokers and non-smokers and (b) smokers to non-smokers separately for before and after the smoke-free legislation<sup>a</sup>

Response variables (confounders adjusted for)	OR (95% CI) of pre- to post-legislation		OR (95% CI) of smokers to non-smokers	
	Smokers	Non-smokers	Pre-legislation	Post-legislation
<b>Respiratory symptoms</b>				
Wheeze/whistling in the chest last 2 weeks (sex, hours)	1.18 (0.48–2.90)	7.80 (2.35–25.95)	1.66 (0.69–3.99)	10.99 (3.21–37.66)
Shortness of breath	2.62 (1.40–4.92)	2.62 (1.40–4.92)	2.02 (1.08–3.77)	2.02 (1.08–3.77)
Cough first thing in the morning	1.05 (0.45–2.47)	5.57 (1.71–18.19)	1.77 (0.76–4.15)	9.36 (2.87–30.58)
Cough in day or night	1.38 (0.59–3.22)	5.84 (2.22–15.39)	1.7 (0.75–3.85)	7.18 (2.66–19.39)
At least one respiratory symptom (shifts and hours)	1.59 (0.57–4.20)	1.59 (0.57–4.20)	1.80 (0.69–4.78)	1.80 (0.69–4.78)
<b>Sensory symptoms</b>				
Red or irritated eyes	2.28 (0.90–5.78)	7.72 (3.25–18.36)	0.30 (0.13–0.70)	1.00 (0.39–2.57)
Runny nose, sneezing or nose irritation (shifts, hours)	2.38 (1.29–4.42)	2.38 (1.29–4.42)	1.08 (0.59–1.99)	1.08 (0.59–1.99)
Sore or scratchy throat	1.34 (0.57–3.15)	8.21 (3.12–21.63)	0.78 (0.35–1.75)	4.76 (1.75–12.98)
At least one sensory symptom (age)	1.29 (0.51–3.29)	6.18 (2.34–16.32)	0.41 (0.14–1.18)	1.97 (0.85–4.58)
<b>Attitude questions</b>				
Are you anxious about the effects of second-hand smoke on your health? (age)	2.13 (1.07–4.24)	2.13 (1.07–4.24)	0.14 (0.07–0.28)	0.14 (0.07–0.28)
Will (has) the smoke-free legislation reduce [d] business? (sex, hours)	1.84 (0.95–3.55)	1.84 (0.95–3.55)	2.29 (1.18–4.46)	2.29 (1.18–4.46)

a: The ORs calculated above were adjusted for SxL interaction and/or confounders that had a *P*-value <0.10; if the 95% CI does not contain 1 then it is said to be significant at 5% level. An interaction term has been fitted in the model when the OR of having a symptom before and after the legislation differs between smokers and non-smokers; similarly, when the OR of smoker to non-smoker differs between pre- and post-legislation

was greater before the legislation than after (odds ratio 7.72 CI 3.25–18.36, *P*<0.001); there was evidence of a similar phenomenon for smokers (odds ratio 2.28 CI 0.90–5.78, *P*=0.08, table 2).

Across both pre- and post-legislation surveys, smokers had lower odds of reporting anxiety about the effects of second-hand smoke than non-smokers (adjusted odds ratio 0.14, CI 0.07–0.27, *P*<0.001, table 2). After the legislation, smokers' level of reported anxiety about second-hand smoke declined by 17.8% (CI 1.9–33.8%, *P*=0.028) and among non-smokers the decline was 10.0% (CI 3.0–19.3%, *P*=0.03) (table 3).

The proportion of bar staff who were satisfied or 'glad' of the smoke-free legislation remained unchanged pre-/post-legislation; however, the predicted difference, given no pre-/post-legislation effect, between non-smokers (91.3%) and smokers (73.6%) was 17.7% (CI 7.0–28.5%, *P*=0.002)

(table 3). Smokers had a greater odds of believing that the smoke-free legislation would reduce business (adjusted odds ratio 2.29 CI 1.18–4.46, *P*=0.015, table 2) after the introduction of the legislation. There was some evidence that before the legislation there was greater odds of bar staff believing that business would decline because of the legislation (odds ratio 1.84, CI 0.95–3.55, *P*=0.07, table 2). After the legislation's enactment, a large majority of bar workers believed that their workplace was subsequently healthier (98%, Table 3).

## Discussion

### Main findings of this study

There was a high proportion of smokers (51%, including social smokers) present among the recruited bar workers, which is

Table 3 The predicted proportion (%) of positive responses to questions regarding the health and trade benefits of, and satisfaction with, the legislation among bar workers, by smoking status (S) and pre-/post-legislation (L) with observed proportions and *P*-values for the effects (S, L) included in the model<sup>a</sup>

Questions	Predicted proportion, % ( <i>n</i> <sub>observed</sub> / <i>n</i> <sub>total</sub> )				Type I Wald test <i>P</i> -values of effects in logistic model	
	Smoker		Non-smoker		S	L
	Pre-legislation	Post-legislation	Pre-legislation	Post-legislation		
Percentage answering positively						
Are you anxious about the effects of second-hand smoke on your health?	50.7 (21/43)	32.9 (15/43)	88.3 (45/50)	78.3 (43/56)	<0.001	0.032
Are you glad/satisfied with the smoker-free legislation?	73.6 (36/45)	73.6 (28/42)	91.3 (47/51)	91.3 (48/53)	0.189	0.001
Will [has] the smoke-free legislation reduce[d] business?	44.6 (20/45)	30.8 (13/42)	27.3 (14/51)	17.1 (9/53)	0.019	0.070
Is workplace healthier because of legislation?	-	95.2 (40/42)	-	100 (55/55)	-	-

a: Terms with a *P*-value < 0.10 were used to estimate the predicted proportion (%); for the questions in this table, there were no significant (*P* < 0.10) interactions for the response variables in this table

more than twice the overall smoking prevalence for N. Ireland at 25% in 2006/7.<sup>9</sup> High self-reported prevalence of smoking, 54%, occurred among bar workers in Cork, Ireland<sup>10</sup> in 2004. As well as protecting customers from high levels of second-hand smoke, the smoke-free legislation in N. Ireland will directly affect an occupational group with high smoking prevalence.

The study demonstrates that there were substantial declines in self-reported respiratory irritation symptoms in the wake of the smoke-free legislation ranging from 1.3% to 18.6% for smokers, and from 21.9% to 33.2% for non-smokers; likewise sensory symptoms declined ranging from 7.3% to 17.7% for smokers and from 29.6% to 46.8% for non-smokers. Similar results have occurred elsewhere, particularly for non-smoking bar staff.<sup>5-7,11</sup>

The present study highlights that bar staff who smoked daily had reduced respiratory and sensory symptoms after the smoke-free legislation similar to but lower than the findings of Eisner *et al.*<sup>12</sup> who showed 63% and 80% no longer reporting respiratory and sensory symptoms, respectively. The study also indicates that reductions in wheeze, cough and throat symptoms after the legislation were much greater among non-smokers than smokers; a phenomenon confirmed by significant interaction terms in the logistic regression. The decline in symptoms for non-smoking bar staff is a possible indication of the effect of second-hand smoke on these symptoms of the non-smoking patrons in the bar. The most consistent confounders that increased symptom prevalence were shift and hours worked; bar staff who worked >30 h or on the evening/night shift had greater odds of having a nose irritation symptom or at least one respiratory symptom.

The self-reported hours of exposure to SHS decreased at work, home and social life. This study contributes positive evidence of a reported reduction in the hours of SHS exposure in the home as a result of the legislation in situations where either (1) the bar worker was the only smoker in the home, or (2) the bar worker was not a smoker but lived with a smoker. Before the legislation, it was feared that the legislation would displace smoking in the bar to the home<sup>3</sup>; viewed in this perspective, the present results are consistent with two studies in Scotland<sup>13,14</sup> that showed no evidence of an increase in SHS exposure in the home, and other studies showing reductions in the prevalence of smoking or SHS in the home.<sup>15,16</sup>

The proportion of bar staff, who were satisfied with the legislation, remained unchanged across the surveys, though

at different levels for smokers (75%) and non-smokers (91%). Other studies<sup>17-19</sup> reported an increase in satisfaction with the legislation on it becoming law; perhaps there was a higher prior acceptance of the legislation in N. Ireland due to the positive experience of smoke-free legislation elsewhere. It is possible also that measuring change in attitudes may require a longer follow-up period than was employed in this study. The number of bar staff who felt the legislation would reduce business did decline after the legislation's enactment by 12%—similar to a finding in Scotland,<sup>17</sup> but different to the Republic of Ireland where the proportion of bar workers who believed business would decline increased from 51% to 63%.<sup>18</sup>

Both pre- and post-legislation questionnaires had less than 30 questions; this ease in completing may have enhanced the response rate. The lack of change in the two samples of bar workers' profile (age and sex), working history and current shift arrangements from before to after the smoke-free legislation suggests that there was a considerable overlap in both the pre- and post-legislation surveys. In spite of the inability to pair the data before and after the study, enough significant results emerged from the study to suggest that the statistical power was adequate, particularly for the non-smokers. The selected sample of bars is more likely to represent successful and busy bars in the city of Belfast and hence should be borne in mind when generalizing to all bars in N. Ireland. The compliance with the legislation among licensed bars and clubs was high across N. Ireland at 93.6%;<sup>20</sup> suggesting that the effects reported here in Belfast may have occurred across N. Ireland.

The study relied solely on a self-reporting questionnaire. Similar studies have been enhanced with objective parallel measurements of air quality, salivary cotinine and pulmonary function.<sup>5-7,21</sup> By not collecting personal information, we may have encouraged sincerity in self-reporting or about the establishment that one works in. The bar staff that completed the questionnaires were not a random, but a haphazard sample dependant on circumstances; this could have allowed some unknown biases to enter the study.

### Acknowledgements

We thank Professor Shane Allwright for reviewing and amending the questionnaires prior to the study. We would also like to acknowledge the second reviewer whose diligent reading of the paper and many suggestions have improved the paper markedly. The Northern Ireland Cancer Registry is

funded by the Department of Health, Social Services & Public Safety Northern Ireland (DHSSPSNI). The authors and the Ulster Cancer Foundation wish to thank the bar owners for their cooperation, the bar staff who participated in this study, and the ASH (N. Ireland) Committee for their support and encouragement.

*Conflicts of interest:* None declared.

### Key points

- Bar workers in Belfast reported reductions in both respiratory and sensory irritation symptoms linked with the introduction of the smoke-free legislation.
- This study highlights a greater improvement among non-smokers in reported wheeze, cough, and throat symptoms after the legislation than among the smokers.
- After the legislation, a group of workers with a high prevalence of smokers reported a fall in the hours of exposure to second-hand smoke in work, home and social environment.
- The study indicates that smoke-free legislation appears to promote a healthier working environment, and rather than adversely affecting the environment at home, it may improve it.

### References

- 1 Health Promotion Agency for Northern Ireland. *Space to breathe for Northern Ireland*. Accessed at: <http://www.spacetobreathe.org.uk/default.asp>, 2007 (12 January 2009, date last accessed).
- 2 McKee M. A failure of leadership? Why Northern Ireland must introduce a total ban on workplace smoking. *Ulster Med J* 2005;74:78-80.
- 3 Reid J (The Secretary of State for Health, England). *The Government's public health white paper (CM6374): minutes of evidence*. London: UK Parliament House of Commons Health Committee. Available at: <http://www.parliament.the-stationery-office.co.uk/jpa/em200405/cmselect/cmhealth/358/5022301.htm>, 2005 (12 January 2009, date last accessed).
- 4 *Smoking in public places: what the public thinks. Survey report*. Belfast: Health Promotion Agency for Northern Ireland, 2004. Available at: <http://www.healthpromotionagency.org.uk> (12 January 2009, date last accessed).
- 5 Allwright S, Paul G, Greiner B, et al. Legislation for smoke-free workplaces and health of bar workers in Ireland: before and after study. *Br Med J* 2005;331:1117.
- 6 Goodman P, Agnew M, McCaffrey M, et al. Effects of the Irish smoking ban on respiratory health of bar workers and air quality in Dublin pubs. *Am J Respir Crit Care Med* 2007;175:840-5.
- 7 Menzies D, Nair A, Williamson PA, et al. Respiratory symptoms, pulmonary function, and markers of inflammation among bar workers before and after a legislative ban on smoking in public places. *JAMA* 2006;296:1742.
- 8 StataCorp. *Stata statistical software: release 9*. 2005.
- 9 Northern Ireland Statistics and Research Agency. *Continuous household survey*. Accessed at: [http://www.csu.nisra.gov.uk/Prevalence\\_of\\_cigarette\\_smoking\\_by\\_sex\\_Trend.xls](http://www.csu.nisra.gov.uk/Prevalence_of_cigarette_smoking_by_sex_Trend.xls), 2008 (12 January 2009, date last accessed).
- 10 Mullally J, Greiner BA, Allwright S, et al. Prevalence of smoking among bar workers prior to the Republic of Ireland smokefree workplace legislation. *Ir J Med Sci* 2008;177:309-16.
- 11 Farrelly MC, Nonnemaker JM, Chou R, et al. Changes in hospitality workers' exposure to secondhand smoke following the implementation of New York's smoke-free law. *Tob Control* 2005;14:236-41.
- 12 Eisner MD, Smith AK, Blanc PD. Bartenders' respiratory health after establishment of smoke-free bars and taverns. *JAMA* 1998;280:1909-14.
- 13 Phillips R, Amos A, Ritchie D, et al. Smoking in the home after the smoke-free legislation in Scotland: qualitative study. *Br Med J* 2007;335:553.
- 14 Haw SJ, Gruer L. Changes in exposure of adult non-smokers to secondhand smoke after implementation of smoke-free legislation in Scotland: national cross sectional survey. *Br Med J* 2007;335:549.
- 15 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;15:51-8.
- 16 Edwards R, Thomson G, Wilson N, 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.
- 17 Hilton S, Semple S, Miller BG, et al. Expectations and changing attitudes of bar workers before and after the implementation of smoke-free legislation in Scotland. *BMC Public Health* 2007;7:206.
- 18 Pursell L, Allwright S, O'Donovan D, 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.
- 19 Heloma A, Jaakkola MS. Four-year follow-up of smoke exposure, attitudes and smoking behaviour following enactment of Finland's national smoke-free work-place law. *Addiction* 2003;98:1111-17.
- 20 *Smoke-free legislation in Northern Ireland. One year review report*. Belfast: Department of Health, Social Services, and Public Safety, 2009.
- 21 Mulcahy M, Evans DS, Hammond SK, et al. Secondhand smoke exposure and risk following the Irish smoking ban: an assessment of salivary cotinine concentrations in hotel workers and air nicotine levels in bars. *Tob Control* 2005;14:384-8.

Received 12 January 2009, accepted 20 May 2009