

# Prevalence of second-hand smoke exposure after introduction of the Italian smoking ban: the Florence and Belluno survey

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## ABSTRACT

**Aims and background.** A law banning smoking in enclosed public places was implemented in Italy on January 10, 2005. The aim of this paper is to present a cross-sectional survey on two representative samples of non-smokers of two Italian towns (Florence and Belluno), conducted one year after the introduction of the ban, in order to assess prevalence of second-hand smoke exposure, to record the attitudes towards the ban, and the perception about its compliance in a representative sample of non-smokers.

**Methods.** Computer-assisted telephone interviews were carried out in March 2006, from a random sample of households from telephone registries. Respondents were 402 non-smokers from Belluno and 1,073 from Florence.

**Results.** About 12% of Florentines and 7% of Belluno respondents were exposed at home; 39% and 19%, respectively, at work; 10% and 5% in hospitality venues; 20% and 10% in cars. The smoke-free law was almost universally supported (about 98%) even if a smaller proportion of people (about 90%) had the perception that the ban was observed.

**Conclusions.** Second-hand smoke exposure at home and in hospitality premises has dropped to  $\leq 10\%$ , whereas exposure at work remained higher. These results suggest the need for more controls in workplaces other than hospitality venues.

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## Introduction

Second-hand smoke (SHS) has represented a growing matter of concern in public health in recent years, and there is scientific evidence on the causal link between SHS exposure and several adverse health effects<sup>1-3</sup>. In order to protect non-smokers from this health hazard, a law banning smoking in enclosed public places entered into force in Italy on January 10, 2005<sup>4</sup>. The law bans smoking in indoor spaces including hospitality venues, offices and factories, unless they have a separate room with tight standards on air quality, forced ventilation and negative pressure<sup>5</sup>. Italy has become the third European country to introduce a smoking ban, following Ireland and Norway, and has been followed by other countries (Malta, Sweden, Spain, United Kingdom, Belgium, and France).

European nation-wide smoking bans and US state-wide or city-wide bans have shown a positive impact on reducing SHS exposure (assessed using available markers) in the hospitality sector<sup>6-12</sup> and on improving hospitality workers' respiratory health<sup>6,12,13</sup>.

In contrast, fewer studies have been conducted in order to evaluate the prevalence of SHS exposure in a general population after the implementation of a nation-wide

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smoking ban, at least in Europe. The Irish smoking ban, implemented in 2004, led to dramatic declines in reported smoking in workplaces (from 62% before the ban to 14% afterwards), in bar/pubs (from 98% to 5%), and in restaurants (from 85% to 3%)<sup>9</sup>. Finland in 1995 restricted smoking at work with the Tobacco Control Act, and in 2000, 14% of non-smokers aged 15-64 years were exposed to SHS either at work or at home<sup>14</sup>. In the USA in the 1999-2002 National Health and Nutrition Examination Survey, among non-smoking adults living in 12 counties with extensive smoke-free law coverage, 12.5% had serum cotinine levels  $\geq 0.05$  ng/ml so were exposed to SHS, compared with 35.1% in 5 counties with limited smoke-free law coverage, and 45.9% in 40 counties with no smoke-free law coverage at the state, county, or city level<sup>15</sup>. As a result of the implementation of the California Tobacco Control Program, which developed in 1994 a statewide workplace smoke-free policy, in 2002 only 11.9% of indoor Californian workers reported that they had been exposed to SHS in their work area in the last 2 weeks, a decline by a factor of 59.0% from the level reported in 1990 (29.0%)<sup>16</sup>.

The aim of this paper is to present results of a cross-sectional survey carried out in two Italian towns (Florence and Belluno) one year after the introduction of the smoking ban, in order to assess the prevalence of SHS exposure at home, at work, in hospitality premises, and in cars, in a representative sample of non-smokers, and to record the attitudes towards the ban and the perception about its compliance.

## Methods

A survey on two representative samples of non-smokers of two Italian towns was conducted (*Florence*, Central Italy, 356,118 inhabitants, 2001 Census; non-smokers, 77.9%; *Belluno*, Northern Italy, 35,050 inhabitants, 2001 Census; non-smokers, 80.4%<sup>17</sup>). Interviews were carried out by a service of computer-assisted telephone interviews from March 14-22, 2006, generating a simple random sample of households from telephone registries of each city. Households were considered eligible if a non-smoker aged 18 years or over was at home. This survey was part of a larger survey on SHS exposure in a representative sample of non-smokers in seven European countries<sup>18</sup>.

Firstly, participants were asked about social-demographic characteristics (sex, age, educational level, number of people in the household). Then, people answered about their SHS exposure at home (exposed/not exposed, number of smokers in the household, if and where smoking was allowed), at work or school (exposed/not exposed, presence of smoking areas), in hospitality venues and in cars (exposed/not exposed during last week). Finally, participants reported their own opinion about law compliance and if they supported the ban (yes/no).

In order to match the population distribution in each city<sup>19</sup>, respondents were post-stratified by sex and age (18-39 years, 40-59, 60 and over). Analyses were computed using STATA 8<sup>20</sup>.

## Results

A total of 2,073 households in Florence and 892 in Belluno were contacted. In 2,093 (70.6%), an adult non-smoker was available. Response rate in the eligible sample was 76.1% (1,592 respondents: 1,163 in Florence, 79.3%; 429 in Belluno, 68.5%). Fifty-seven persons (3.6%) were excluded because interviews were interrupted and another 60 (3.8%) because participants refused to give information about their ages. Thus, respondents included in the analysis were 402 non-smokers from Belluno and 1,073 from Florence. Thirty-six percent were men in both towns. Respondents aged 40-59 years were 45.8% in Belluno and 32.0% in Florence, whereas respondents aged 60 years and over were 43.3% in Belluno and 51.1% in Florence. About 40% of respondents had a diploma and about 18-20% a university degree for both towns.

The results from the telephone survey are summarized in Table 1. The proportion of non-smokers who reported to live with one or more smokers was 22% in Florence and 20% in Belluno. Fifty-three percent among Florentine respondents and 77% in Belluno banned smoking everywhere in the home. Current SHS exposure at home, work, hospitality venues and/or in cars was 44% in Florence and 28% in Belluno. Prevalence of current exposure is higher in men (49% in Florence and 34% in Belluno) and in young people (68% in Florence and 40% in Belluno). Only 12% of Florentines and 7% of Belluno non-smokers were exposed at home. About 39% of respondents in Florence and 19% in Belluno reported to be exposed at work, even though the smoking ban had already been implemented. In Florence, 18% of respondents, and 10% in Belluno, reported to work in buildings with smoking areas. Exposure in hospitality venues was reported by 10% of Florentine respondents and 5% of those from Belluno. About 20% of non-smokers in Florence and 10% in Belluno were exposed to SHS in cars.

The smoke-free law was almost universally supported by non-smokers (97% in Florence and 99% in Belluno), even though a smaller proportion of people (88% in Florence and 94% in Belluno) believed that the ban was observed.

## Discussion

### *Main findings*

One out of five non-smokers interviewed lived with at least one smoker. Smoking is totally banned in half of

**Table 1 - Prevalence of smoking at home, prevalence of second-hand smoke (SHS) exposure by setting (anywhere, at work, at home, in hospitality venues, in cars), prevalence of workplaces with smoking areas, attitudes towards the Italian smoking ban, and perception about its compliance, by town (Florence respondents, 1,073; Belluno respondents, 402), with 95% confidence intervals (95% CI). Telephone survey was conducted in March 2006**

	Florence No. = 1,073		Belluno No. = 402	
	%	95% CI	%	95% CI
Smokers in household				
0	78.1	75.3-80.9	79.7	74.8-84.6
1	18.1	15.5-20.7	17.6	13.0-22.3
≥2	3.8	2.4-5.2	2.7	0.6-4.7
Smoking behavior at home				
Anywhere banned	53.9	50.7-57.2	77.0	72.0-81.9
Allowed in some areas	29.4	26.4-32.5	17.7	13.1-22.4
Anywhere allowed	16.6	14.2-19.1	5.3	3.2-7.4
Currently exposed to SHS (anywhere)	44.3	41.3-47.4	28.0	22.4-33.6
Gender				
Male	48.8	43.8-53.9	33.6	24.0-43.1
Female	40.5	36.9-44.2	23.2	16.9-29.6
Age (yr)				
18-29	67.7	60.8-74.7	40.0	24.5-53.5
30-59	48.0	42.6-53.5	27.1	20.5-33.6
≥60	22.1	18.6-25.6	18.3	12.4-24.1
Exposed at home	11.5	9.3-13.7	6.7	3.9-9.5
Exposed at work	39.2	33.5-45.2	18.7	12.5-26.9
Workplaces with smoking areas	17.7	13.4-22.0	11.5	5.1-17.9
Exposed in hospitality venues	10.3	8.2-12.4	5.0	2.4-7.7
Exposed in cars	19.7	17.0-22.4	9.8	5.8-13.8
People thinking the ban is respected	88.0	85.8-90.2	93.7	91.1-96.3
People supporting the ban	97.1	96.0-98.3	98.5	97.5-99.5

Florentine houses and in three out of four Belluno houses of respondents. SHS exposure occurred more frequently at work (39% in Florence, 19% in Belluno) and among young people (68% in Florence, 40% in Belluno). At home and in hospitality venues, proportions of exposure were significantly lower (about 10% in Florence and 5% in Belluno). SHS exposure in cars was 20% in Florence and 10% in Belluno. More than 85% of respondents had the perception that the ban was observed, and more than 95% supported the smoking ban.

#### Comparison with other studies

One out of five non-smokers interviewed lived with at least one smoker in Florence and Belluno, a smaller proportion than that (26.5%) recorded in the 1999-2000 survey on a representative sample of the Italian population<sup>21</sup>. The number of houses where smoking is totally banned is very high, and it is an indirect measure of the social acceptability of smoking. Similar results were

recorded in another survey conducted in the same period (March-April 2006) by DOXA, the Italian branch of the Gallup International Association, on a representative sample of the Italian population aged 15 years or over, where 54.6% of interviewed households reported that smoking hosts were invited to smoke outdoors<sup>22</sup>.

Prevalence of SHS exposure at work recorded in the survey of Florence and Belluno was still very high despite the introduction of the smoking ban (39% in Florence, 19% in Belluno). It is similar to the proportion of 70% of a representative sample of the Italian population interviewed in the 2005 DOXA Survey after the introduction of the smoking ban, which reported the smoking ban was observed in the workplaces, including small workplaces<sup>23</sup>.

In contrast, prevalence of exposure in hospitality venues was lower (10% in Florence, 5% in Belluno) than that reported in work places but 2-3 times higher than that recorded after the smoking ban in Ireland, where reported smoking in bars/pubs and restaurants went from 98% to 3% and from 85% to 3%, respectively<sup>9</sup>. In the survey conducted in 2005 among the owners of 1,641 Italian hospitality premises<sup>24</sup>, 92% reported that all customers respected the ban and 11% asked some customers to stop smoking.

Thus, introduction of the smoking ban seems to have achieved good results in the hospitality industry, whereas there is still room for improvement in workplaces, such as offices, and factories. Anyway, the decrease of SHS exposure in hospitality premises and workplaces after the introduction of the smoking ban has been quantified in two studies conducted in Florence and Belluno before and after the Italian smoking ban, measuring vapor-phase nicotine concentration. In 28 hospitality premises, a 99% reduction in nicotine concentration was recorded (from 8.86 g/m<sup>3</sup> before the smoking ban to 0.01 g/m<sup>3</sup> afterwards)<sup>25</sup>, whereas in 10 factories a 42.5% reduction (from 0.40 before the ban to 0.23 g/m<sup>3</sup> afterwards) and in 10 public offices a 76.6% reduction (from 0.47 before the ban to 0.11 g/m<sup>3</sup> afterwards) were recorded<sup>26</sup>.

Occurrences of SHS exposure are still frequent for people aged 18-29 years (68% in Florence, 40% in Belluno). Many hospitality premises built, in winter 2005-2006, covered outdoor places with a roof, three transparent plastic or glass walls and a heating system. In these outdoor areas, customers can smoke while drinking and eating<sup>27</sup>. We collected six measurements of vapor-phase nicotine in three outdoor smoking areas belonging to three hospitality premises in Florence (e.g., two samplings per premise)<sup>25</sup>. The median nicotine concentration was 8.28 g/m<sup>3</sup>, similar to that recorded before the smoking ban in indoor areas of hospitality premises. Presumably, young people are more likely to frequent outdoor smoking areas in hospitality premises. Thus, the high prevalence of SHS exposure in young people could be partly attributable to exposure in outdoor smoking areas in the hospitality industry.

The proportion of people who reported to work in buildings with smoking areas (18% in Florence, 12% in Belluno) was higher than that recorded in a survey conducted in January-April 2005 among 1,641 Italian hospitality premises, where less than 1% reported to have built smoking areas in their premises<sup>24</sup> because of the high cost required to provide them with forced ventilation and negative pressure. It seems that a larger proportion of smoking areas have been built in offices and factories than in hospitality premises.

It is noteworthy that between 2003-2004 and 2005-2006, smoking prevalence in Italy significantly declined by 7.4% (from 27.0% to 25.0%), compared to a non-significant decline of 2.9% between 2001-2002 and 2003-2004<sup>28</sup>. The 2005-2006 drop is attributed, at least in part, to the smoking ban.

SHS exposure in cars was about 20% in Florence and 10% in Belluno. Levels of concentration of SHS exposure that occur inside a car are usually very high, even though the duration may vary. In a study on SHS exposure markers in cars, the highest mean level of respirable suspended particles <2.5  $\mu$  in diameter (PM 2.5) was 271  $\mu\text{g}/\text{m}^3$ , which is unsafe, particularly for children<sup>29</sup>. PM 2.5 and carbon monoxide increased significantly from baseline after smoking. For adults, the effects of even brief (minutes to hours) SHS exposure on the cardiovascular system are often as severe (averaging 80% to 90%) as those from chronic active smoking<sup>30</sup>. The smoking ban does not apply to cars, except for taxis.

Eighty-eight percent of Florence and 94% of Belluno non-smokers had the perception that the ban was observed. Almost 90% of people interviewed in the 2005 DOXA survey reported that the smoking ban was observed in bars and restaurants and 70% in the workplaces, including small workplaces<sup>23</sup>.

More than 95% of respondents supported the smoking ban, in Florence and Belluno. The 2001 DOXA survey on a representative sample of the Italian population aged 15 years or over showed that 83% were favorable for a smoking ban in public places<sup>31</sup>. Two similar post-ban DOXA surveys on two representative samples of the Italian population conducted in 2005 and in 2006 showed that 90% and 94%, respectively, were in favor of the smoking ban in hospitality premises<sup>21,23</sup>. Also in Ireland, support for a total ban increased after implementation of the ban<sup>9</sup>.

#### *Limitations of the study*

The results of this study should be interpreted with some limitations in mind. First, we did not collect data before the smoking ban, and no surveys are available on SHS exposure in a representative sample of the Italian population before the smoking ban. Thus, we could not evaluate the impact of the smoking ban in terms of decline of SHS exposure before and after the smoking ban. Second, we did not consider duration and intensity of

exposure, even though reporting SHS exposure by means of a simple set of questions may provide a sufficiently valid estimation of exposure in the absence of biomarkers<sup>9,14,16</sup>. In the Florence and Belluno survey, questions on SHS exposure were of the type "SHS exposed/not exposed", without further specifications. Introduction of the smoking ban probably contributed to a commensurate decrease in the tolerance level towards SHS exposure. Thus, non-smokers after the smoking ban may have been more likely to report exposure to SHS, even though duration of exposure after the smoking ban may have been shorter and intensity of exposure less severe than before the smoking ban.

#### *Strengths of the study*

The current study had several strengths. The random selection of contacted people, interviews performed to non-smokers only, the large number of interviewed people, and also the very simple and short questionnaires are all elements that guaranteed a sufficient reliability of the results of the survey.

#### **Conclusions**

The Florence and Belluno survey showed that reported SHS exposure at home and in hospitality premises dropped to about 10% after the smoking ban, whereas reported SHS exposure at work remained at a level of 20-40%. These results suggest the need for more controls of local health authorities on the compliance of the smoking ban, in particular in workplaces other than hospitality venues (e.g., offices, plants). The smoke-free law was almost universally supported (by about 97%), even though a smaller proportion of people (about 90%) believed that the ban was observed.

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