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# Secondhand smoke: facts and lies

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## Abstract

Mexico ratified the Framework Convention for Tobacco Control in 2004 and is obligated to move forward with implementing its provisions, including Article 8 (Protection from exposure to tobacco smoke). The country has already faced opposition from the tobacco industry. This paper addresses industry tactics against tobacco control, describing the general strategies that have been pursued and the evidence relevant to combating these strategies. The approaches taken by the industry in an effort to discredit the scientific foundation for promoting smokefree environments, the efforts by the industry to propose ventilation of indoor spaces and separation of smokers from nonsmokers as an effective alternative to smokefree places, and finally, the strategy of raising fear of economic losses on the part of the hospitality industry and thereby gaining this sector as an ally in campaigning against smokefree policies are considered. As reviewed in this article: 1) There is scientific consensus on the adverse effects of inhaling SHS; 2) Only smokefree places fully protect nonsmokers from inhaling SHS; and 3) Smokefree policies do not bring economic harm to the hospitality industry.

Key words: secondhand smoke; tobacco control; scientific evidence; smokefree policies

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## Resumen

En 2004 México ratificó el Convenio Marco para el Control del Tabaco y está obligado a implementar sus disposiciones, incluidas el Artículo 8 (Protección contra la exposición al humo de tabaco); esto ha generado oposición de la industria tabacalera. En este artículo se describen las tácticas de la industria para contrarrestar el control del tabaco, sus principales estrategias, y también se presentan las evidencias relevantes para combatirlas. Además, se describen las acciones emprendidas por la industria en el esfuerzo por desacreditar el fundamento científico de la promoción de ambientes libres de humo de tabaco, y su propuesta de usar sistemas de ventilación en espacios interiores y la de separación de áreas para fumadores y no fumadores, como alternativas efectivas a la creación de ambientes libres de humo de tabaco. Por último, las tabacaleras también han creado temor a las pérdidas económicas para la industria restaurantera, ello con el objetivo de hacer de este sector un aliado en la lucha contra las políticas de ambientes libres de humo de tabaco. Este artículo concluye que: 1) existe un consenso científico sobre los efectos adversos para la salud causado por la exposición al humo de tabaco; 2) los ambientes libres de humo de tabaco son la única forma de proteger a los no fumadores de la exposición a humo de tabaco; 3) las políticas de ambientes libres de humo de tabaco no afectan económicamente a la industria restaurantera.

Palabras clave: humo de segunda mano; control del tabaco; evidencia científica; políticas de ambientes libres de humo de tabaco

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Mexico, like many other countries, is at a critical juncture in its effort to control tobacco use. Mexico ratified the Framework Convention for Tobacco Control in 2004 and is obligated to move forward with implementing its provisions, including Article 8 (Protection from exposure to tobacco smoke).<sup>1,2</sup> At the most recent Conference of the Parties of the ratifying nations, guidelines were adopted for moving forward with implementation of Article 8.<sup>3</sup> The Guidelines give Mexico five years from ratification to implement Article 8.

As it moves forward to implement Article 8, Mexico has already faced opposition from the tobacco industry. For decades, the multinational tobacco companies have followed aggressive agendas to oppose smokefree initiatives. These tactics have changed over time. Initially, beginning in the 1980s, the focus was on attempting to discredit the scientific evidence linking secondhand smoke (SHS) to increased risk for diseases, such as lung cancer, and other adverse health effects, such as reduced lung function in children.<sup>4,5</sup> As the evidence mounted and smokefree regulations were widely promulgated in the United States and elsewhere, the industry proposed that healthy indoor air could be achieved with ventilation of spaces where smoking was taking place. They also advanced campaigns based in the concept that smokers and nonsmokers could be comfortably accommodated within the same air space. In opposing smokefree legislation and policies, the industry has repeatedly allied itself with the hospitality industry around the claim that smoking bans lead to reduced revenue for bars and restaurants.<sup>6,7</sup>

This paper addresses these industry tactics, describing the general strategies that have been pursued and the evidence relevant to combating these strategies. In choosing the title, *Secondhand Smoke: Facts and Lies*, language is based in the decision by Judge Gladys Kessler in the case against the tobacco companies brought by the United States Department of Justice (*US vs. Philip Morris*)<sup>8</sup> and in the many reviews of the tobacco industry's own documents that document campaigns of fraud and deception.<sup>9-11</sup> With regard to the tobacco industry, Judge Kessler commented that the companies "marketed and sold their lethal product with zeal, with deception, with a single-minded focus on their financial success and without regard for the human tragedy or social costs that success exacted." The tactics involved sustained "lies" about the facts with regard to the health effects of tobacco smoke, misleading information on ventilation and separation of smokers from nonsmokers, and deceptive reports on the economic consequences of smokefree policies. Judge Kessler further commented: "*Philip Morris, BATCo, B&W, Lorillard, and RJR all deny in this lawsuit and in public statements that ETS causes disease in nonsmokers,*

*contrary to the definitive scientific evidence and their own internal acknowledgements...Absent Court intervention, such denials and distortions of material health information and scientific evidence on ETS are, at a minimum, likely to continue.*"<sup>8</sup>

This paper begins with an overview of the current state of the evidence with regard to the health effects of inhaling SHS, based largely on recent reviews, including the 2004 monograph of the International Agency for Research on Cancer (IARC) of the World Health Organization,<sup>12</sup> the 2005 report of the California Environmental Protection Agency,<sup>13</sup> and the 2006 report of the U.S. Surgeon General.<sup>14</sup> Subsequently, the approaches taken by the industry in an effort to discredit the scientific foundation for promoting smokefree environments, the efforts by the industry to propose ventilation of indoor spaces and separation of smokers from nonsmokers as an effective alternative to smokefree places, and finally, the strategy of raising fear of economic losses on the part of the hospitality industry and thereby gaining this sector as an ally in campaigning against smokefree policies are considered.

### **Consensus has been reached on the dangers of secondhand smoke**

Formal epidemiological research on secondhand smoke dates to the 1960s when exposure to SHS was examined as a risk factor for respiratory morbidity and allergy in children and adults.<sup>15</sup> The first wave of studies on SHS continued to focus on respiratory morbidity, particularly in children; the initial evidence came from cross-sectional studies on respiratory symptoms and illnesses and on lung function in children as well as cohort studies of acute respiratory illness in infants and young children. Studies carried out during the later 1970s showed the strength of smoking in indoor places as a source of respirable particles, particles sufficiently small to reach the small airways and alveoli (air sacs) of the lung.<sup>14</sup>

In terms of motivating smokefree policies, the evidence on SHS and risk for lung cancer in never smokers has had the greatest traction. The first major studies on this association were published in 1981: the cohort study in Japan carried out by Hirayama<sup>16</sup> and the case-control study in Athens reported by Trichopoulos and colleagues.<sup>17</sup> Other studies soon followed and by 1986 the U.S. Surgeon General,<sup>18</sup> the International Agency for Research on Cancer (IARC) of the World Health Organization,<sup>19</sup> and the U.S. National Research Council<sup>20</sup> had concluded that SHS was a cause of lung cancer in never smokers. This conclusion was based not only in the epidemiological findings on SHS but also on

the by-then extensive epidemiological studies of active smokers and understanding of mechanisms of tobacco smoke carcinogenesis. The Surgeon General's report and the National Research Council report also offered conclusions on the adverse effects of SHS exposure on infants and children.

Since then, the evidence on adverse effects of SHS exposure has grown substantially, supporting ever stronger and broader causal conclusions (table I). Multiple meta-analyses have been performed, providing summary estimates of the quantitative risks associated with SHS exposure. Consideration has been given to confounding factors that might plausibly explain the associations and confounding has been set aside as a plausible alternative to a causal association. In releasing the 2006 report on SHS, U.S. Surgeon General Richard Carmona commented that a "scientific consensus" had now been achieved on the adverse effects of SHS exposure. The conclusions of his 2006 report are clear with regard to the short- and long-term consequences of exposure to SHS (table II).<sup>14</sup>

### The epidemiological findings reflect causal association

The epidemiological evidence on the health effects of SHS has had a key role in policy formulation. The epi-

demiological studies have provided evidence on health risks for the exposures experienced by the population in their workplaces, homes, and other places. The tobacco industry, recognizing the implications of this evidence, mounted an aggressive campaign to attempt to counter the findings of epidemiological studies. Several review articles cover aspects of this campaign, which is also well described in Brandt's recent book, *The Cigarette Century*,<sup>4</sup> and in Judge Kessler's 1 700 page decision in *U.S. vs. Philip Morris*.<sup>8</sup> One thrust of the campaign was to discredit epidemiological research in general while the other involved critical attacks on specific studies or bodies of evidence. These attacks were typically carried out by industry consultants, whose links to the tobacco industry were hidden in some instances.<sup>21</sup>

Because of the central role of epidemiological evidence, the tobacco industry attempted to broadly discredit the findings of epidemiological research by smearing such studies as "junk science".<sup>22,23</sup> The attack resembled early efforts by the tobacco industry to dismiss the powerful findings of studies of active smoking and health as only indicating hypotheses. This effort reached broadly and much of it was covert so that the influence of the tobacco industry could not be discerned. In this campaign, "sound science" was proposed as the opposite of "junk science", and a destructive attempt was made to establish "evidence bars" that could not

Table I  
ADVERSE EFFECTS FROM EXPOSURE TO TOBACCO SMOKE

Health effect	SG 1984	SG 1986	EPA 1992	CalEPA 1997	UK 1998	WHO 1999	IARC 2004	CalEPA 2005*	SG 2006
Increased prevalence of chronic respiratory symptoms	Yes/a	Yes/a	Yes/c	Yes/c	Yes/c	Yes/c		Yes/c	Yes/c
Decrement in pulmonary function	Yes/a	Yes/a	Yes/a	Yes/a		Yes/c		Yes/a	Yes/c
Increased occurrence of acute respiratory illnesses	Yes/a	Yes/a	Yes/a	Yes/c		Yes/c		Yes/c	Yes/c
Increased occurrence of middle ear disease		Yes/a	Yes/c	Yes/c	Yes/c	Yes/c		Yes/c	Yes/c
Increased severity of asthma episodes and symptoms			Yes/c	Yes/c		Yes/c		Yes/c	Yes/c
Risk factor for new asthma			Yes/a	Yes/c				Yes/c	Yes/c
Risk factor for SIDS				Yes/c	Yes/a	Yes/c		Yes/c	Yes/c
Risk factor for lung cancer in adults		Yes/c	Yes/c	Yes/c	Yes/c		Yes/c	Yes/c	Yes/c
Risk factor for breast cancer for younger, primary premenopausal women								Yes/c	
Risk factor for nasal sinus cancer								Yes/c	
Risk factor for heart disease in adults				Yes/c	Yes/c			Yes/c	Yes/c

Yes/a= association

Yes/c= cause

\* Only effects causally associated with SHS exposure are included  
Modified from: Samet JM, Wang SS.<sup>15</sup>

**Table II**  
**MAJOR CONCLUSIONS OF THE 2006 US SURGEON**  
**GENERAL'S REPORT ON THE HEALTH EFFECTS**  
**OF INVOLUNTARY EXPOSURE TO TOBACCO SMOKE<sup>14</sup>**

- Secondhand smoke causes premature death and disease in children and in adults who do not smoke.
- Children exposed to secondhand smoke are at increased risk for sudden infant death syndrome (SIDS), acute respiratory infections, ear problems, and more severe asthma. Smoking by parents causes respiratory symptoms and slows lung growth in their children.
- Exposure of adults to secondhand smoke has immediate adverse effects on the cardiovascular system and causes coronary heart disease and lung cancer.
- The scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke.
- Many millions of Americans, both children and adults, are still exposed to secondhand smoke in their homes and workplaces despite substantial progress in tobacco control.
- Eliminating smoking in indoor spaces fully protects nonsmokers from exposure to secondhand smoke. Separating smokers from nonsmokers, cleaning the air, and ventilating buildings cannot eliminate exposure of nonsmokers to secondhand smoke.

be readily met. Fortunately, many of the details of this campaign have now been revealed through access to the industry's documents and disclosures in litigation.<sup>24</sup>

The industry also attacked the findings of individual studies, particularly those with great import, in an effort to limit the policy implications of their findings. Hirayama's landmark 1981 report in the *British Medical Journal* was followed by numerous letters, many from industry consultants, offering points of criticism—see, for example reference 25. The attacks on epidemiological studies have been based in well known principles in the interpretation of epidemiological data, principles that are taught in basic courses in epidemiology.

Associations found in epidemiological research may reflect the play of chance, the consequences of bias, or a true causal effect.<sup>26</sup> Determining the existence of a causal effect is one goal of epidemiological research, along with quantification of the magnitude of the effect as an indicator of the risk posed to public health by a disease-causing agent. The role of chance is assessed with the methods of statistical inference; commonly, a *p* value of 0.05 is considered sufficiently stringent to exclude chance as leading to the association, particularly when findings are consistent with replication. Bias refers to a systematic error in estimating the effect that arises

from the way that information is collected (information bias), from the way that study participants are selected (selection bias), and from the effects of other risk factors that are associated with the exposure under study (confounding).

The criticisms of the findings of individual studies by the industry and its consultants have been primarily based in proposing that information bias in the reporting of active and passive smoking may have inflated estimates of the risk of SHS exposure and that confounding by uncontrolled risk factors led to non-causal associations. For lung cancer and SHS exposure, the argument was made that misclassification of true active smokers as passively exposed never smokers could lead to sufficient positive bias to explain the observed association in never smokers. This bias was postulated for the studies using marriage to a smoker as the index of SHS exposure;<sup>27</sup> since smoking habits of spouses tend to be concordant, mis-reporting of active smoking would be differential by spouse smoking status and potentially introduce a positive bias. This possibility has been addressed quantitatively and set aside.<sup>14,28,29</sup>

For lung cancer, coronary heart disease, and the adverse respiratory effects of SHS exposure on children, confounding by various factors was proposed as leading to the observed associations. Industry consultants developed lengthy lists of "confounders" and then claimed that without control of all of the factors, residual confounding could not be dismissed as explaining observed associations.<sup>30,31</sup> This tactic was also used in legal proceedings by industry experts.<sup>32</sup> Epidemiologists have given careful consideration to this possibility in interpreting individual studies and the various reports have also addressed the potential for confounding to have resulted in the observed associations. Both quantitative and qualitative analyses allow confounding to be set aside as the source of the associations of disease risk with SHS exposure. Additionally, there is a strong foundation of experimental and toxicological evidence on SHS that further supports causality.

### **Only smokefree policies protect nonsmokers against SHS exposure**

Indoors, the concentration of SHS depends on the number of smokers and their smoking patterns, the rate at which air inside the room is exchanged with air from outdoors (the ventilation rate), air cleaning by mechanical filtration or other means, and the natural processes of absorption of gases and impaction of particles.<sup>14</sup> The interplay of these factors is represented by the mass-balance model, represented below in a very simple form.



# Mass Balance Model

$$\text{Concentration} = \frac{\text{Source Strength}}{\text{Ventilation} + \text{Cleaning}}$$

The Mass Balance Model provides a useful framework that illustrates how varying conditions of operation of a building will affect SHS concentrations. SHS concentration depends on the ratio of the rate at which SHS is produced to the rate at which it is removed.<sup>33</sup> The strength of the source depends on both the number of people smoking and how much they are smoking.<sup>14</sup> The cigarette is well characterized as to its emissions; a burning cigarette is a strong source of both small particles that move rapidly throughout a room and have a substantial residence time in the air and of gases. These particles and gases move throughout a room due to the natural movement of air as well as the movement of air via mechanical systems (HVAC systems or heating, ventilating and air conditioning systems).

The mass-balance model implies that doubling the rate at which SHS is produced (source strength) doubles concentration; however, doubling the rate at which SHS is removed (ventilation + cleaning) only halves the concentration level. An eight-fold increase in the effective ventilation reduces concentration to one-eighth, but no amount of ventilation can eliminate all SHS. Thus, there is no practical level of ventilation that can effectively protect against SHS exposure and air cleaners cannot remove SHS sufficiently from the air.<sup>14</sup> For this reason, the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), which develops ventilation standards for buildings, has concluded that ventilation cannot provide healthy indoor air in the presence of smoking.<sup>34</sup> The movement of smoke throughout a single air space also implies that separating smokers and nonsmokers within the same airspace cannot protect the nonsmokers from exposure to SHS, a conclusion reached in the 1986 report of the U.S. Surgeon General.<sup>18</sup>

The tobacco industry, notwithstanding the physical principles that establish that neither ventilation of a room or separation of smokers and nonsmokers within the same air space are effective, has long proposed strategies that call for either ventilation or separation. They have developed campaigns of "accommodation" and "courtesy" based in the proposition that smokers and nonsmokers can be in the same airspace if certain principles of behavior are followed.<sup>6,35,36</sup> Materials have been made available to the hospitality industry for implementing these campaigns. Of course, this approach cannot work as it leaves nonsmokers exposed to

SHS in "non-smoking" sections and workers exposed to SHS in "smoking" sections. In a study carried out nearly two decades ago, we measured levels of airborne nicotine, a highly specific marker of SHS, in smoking and non-smoking sections of restaurants; nicotine levels in nonsmoking sections in some restaurants were higher than level in smoking sections in other restaurants.<sup>37</sup>

The industry has also aggressively proposed that ventilation can be effective in controlling SHS concentrations. In the United States, the industry attempted to influence ventilation standards for indoor air developed by the ASHRAE with the purpose of assuring that smoking would be permitted if ventilation were at a level that was deemed sufficient to achieve health indoor air quality.<sup>38</sup> This strategy ultimately failed and ASHRAE has taken the position that healthy indoor air quality cannot be achieved in the presence of smoking. Nonetheless, the industry continues to call for ventilation as a means for controlling SHS concentrations. It has also introduced cigarette-like products that have been designed to provide nicotine without open combustion so that emissions are lower than from conventional cigarettes.

In spite of the industry's countering propositions, environments with the acceptable level of SHS, i.e., none, can only be achieved by banning smoking indoors. In theory, an isolated room for smoking could be designed and constructed, likely at great cost.<sup>34</sup> However, in practice, such rooms are not a practical alternative to smoke-free policies and if used in the hospitality industry, they would not protect workers from being exposed.

## Smokefree policies do not harm the hospitality sector

As smokefree policies were implemented, concerns were quickly raised with regard to the economic implications for the hospitality industry, including such businesses as restaurants, bars, discos, gambling establishments, and others. Because of the behavioral ties of smoking to eating and alcohol consumption, the argument was made that smokers would be less likely to go to these venues and that revenues would fall. For the two decades of the move towards smokefree environments, the tobacco industry has repeatedly used the argument of economic loss as a lever against smokefree policies and as a way to engage the hospitality industry as an ally against smokefree policies. Even though empirical data accumulated from the many places where smokefree policies document that revenues do not fall and may grow. Nonetheless, the tobacco industry continues to use this tactic, within and outside of the United States.

Some of the first economic studies were carried out in the State of California, one of the first jurisdictions with a substantial number of smokefree municipalities, and the first state in the United States to become completely smokefree. In a pioneering study, Glantz and Smith<sup>39</sup> examined the consequences of smokefree restaurant ordinances in municipalities in California and Colorado over the period 1985-1992. They did not find indication of adverse economic impact in these communities. Subsequently, there have been many further studies, all with similar findings.<sup>14,40</sup> Notably, in New York City the hospitality sector continued to grow after the citywide smokefree law was implemented and tourism did not decline, as predicted by some opponents at the hearings in support of the ordinance.<sup>41</sup>

The tobacco industry has carried out its own studies on the economic consequences of smokefree policies. Not surprisingly, studies supported by the tobacco industry, largely not published in the peer-reviewed journals, are likely to find a negative economic impact.<sup>42</sup> This finding is divergent from the larger body of studies in the peer-reviewed literature<sup>14</sup> and from increasing experience as more and more jurisdictions have become smokefree. In regard to Latin America, the first data from Uruguay, following the nation-wide ban, do not show adverse consequences for the hospitality industry.

Unfortunately, the tobacco industry's arguments about economic impact still hold sway with owners in the hospitality sector and trade organizations have been widely recruited by the tobacco industry to oppose smokefree legislation. Fortunately, objective economic data are increasingly available to counter the arguments of the tobacco industry.<sup>40</sup> Additionally, there is repeated confirmation that smokefree regulations benefit the health of workers in the hospitality industry.<sup>43,44</sup>

## Conclusions

The scientific evidence is now convincing: SHS causes premature death and disease. Recognizing this avoidable threat to public health, the majority of the world's countries, including Mexico, are taking steps to reduce exposure to SHS as they implement measures to meet the goals of Article 8 of the FCTC. While the tobacco industry continues to oppose these measures, the arguments given in support of this opposition are fallacious. As reviewed in this article: 1) There is scientific consensus on the adverse effects of inhaling SHS; 2) Only smokefree places fully protect nonsmokers from inhaling SHS; and 3) Smokefree policies do not bring economic harm to the hospitality industry.

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