

The Impact of Banning Smoking in Workplaces: What are the Early Effects?

Shane Allwright, BA Mod., MSPH, PhD, FFPH, FTCD

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Corresponding author:

Shane Allwright

Department of Public Health and Primary Care

Trinity College Dublin

Trinity College Centre for Health Sciences

Adelaide & Meath Hospital incorporating the National Children's Hospital

Tallaght, Dublin 24,

Republic of Ireland

Tel: + 353 1 8961087 / 8961582

Fax: + 353 1 4031211 / 4031212

Email: shane.allwright@tcd.ie

Abstract

Smoke-free workplace legislation reduces the exposure to second-hand smoke of both the general public and the workforce without evidence of increased exposure of children in the home. The reductions in exposure are linked to improved respiratory health in previously heavily exposed occupational groups such as bar, restaurant and casino staff. From some countries there is evidence suggesting that smoking bans have led to declines in hospital admissions for myocardial infarction. There is general agreement that smoking bans, if associated with other tobacco control measures such as tax increases, together with provision of cessation supports, lead to a reduction in the numbers of cigarettes smoked and probably lower smoking rates. And most cities, regions and countries report neutral or positive economic impacts.

Introduction

Cultural change starts slowly but a tipping point^a may be reached whereby the momentum for change becomes unstoppable. During the long slow build-up towards smoke-free workplaces, the concept that smoke-free environments should also include bars and restaurants seemed almost fanciful. However, the tipping point for smoke-free workplaces, including bars and restaurants, may now have been reached. Although increasing numbers of local ordinances restricting smoking in public places, workplaces and restaurants had been enacted by individual US cities and towns since the early 1980s, as recently as 1998 California was a lone pioneer with regard to its state-wide ban. Ten years later (1 April 2008), 27 states plus Washington DC are smoke free, with almost half of the US population covered by local and state laws.¹ In 2003, no countries were smoke-free. On 29 March 2004, the Republic of Ireland became the first country to ban smoking in all indoor workplaces, including in restaurants and bars. Since then, Scotland, England, Northern Ireland, Wales, Norway, France, British Virgin Islands, New Zealand, Bermuda, Commonwealth of Puerto Rico, Uruguay, Hong Kong, Iran and Bhutan, along with all of Canada except the Yukon, and all Australian states except the Northern Territory have enacted comprehensive smoke-free workplace legislation, including smoke-free restaurants and bars.² An excellent summary of smoke-free legislation around the world is available through an interactive world map on the Scottish Government 'Clearing the Air' website.³

Dramatic as progress has been in high income regions such as North America, Australia, New Zealand and Europe, progress has been slower in countries with low incomes and large populations. It is sobering to reflect that the countries with comprehensive smoke-free laws represent only 5% of the world's population.⁴

This article sets out to assess the acceptability of smoke-free legislation in terms of compliance and public support; and to describe the effects of smoke-free legislation on

^a In sociology, a **tipping point** is the event of a previously rare phenomenon becoming rapidly and dramatically more common; the moment of critical mass.

exposure to second-hand smoke (SHS)^b, on health, and on smoking behaviour. A brief overview of economic impacts is also provided.

It is important to stress that health and safety at work was the primary purpose of establishing smoke-free workplaces: specifically to protect workers from adverse health effects due to exposure to SHS at work. As business owners are obligated to provide a safe workplace for their employees, they bear the bulk of the responsibility for ensuring that their establishments remain smoke free. Framing the debate as a worker safety issue helps build support for such legislation and avoids the “nanny state” argument. Smoke-free workplace legislation is not designed to protect the general public nor to reduce smoking, although those working in tobacco control were hopeful that both of these would happen, as well as sending a clear message that smoking in public places is not socially acceptable.

There are various degrees of smoke-free legislation. Comprehensive smoke-free legislation is generally taken to mean that indoor smoking is not permitted anywhere in any workplace or public building (without size exemptions). Some regions do permit smoking rooms with strict rules about either physical separation and/or negative pressure, (e.g. Italy). Requirements for non-smoking areas are not considered to be smoke-free legislation. As stated in the WHO MPOWER Report on the Global Tobacco Control Epidemic, 2008⁴ “Only completely smoke-free places, without any indoor smoking areas and with effective enforcement, can protect workers and the public and also encourage smokers to quit. Exceptions make enforcement difficult and negate the effectiveness of smoke-free laws.”

The Framework Convention on Tobacco Control (FCTC),⁵ the international tobacco control treaty, now ratified by more than 150 countries, is absolutely clear about what governments must do. The FCTC guidelines on Article 8⁶ state that effective smoke-free laws must be introduced by 2012 and that smoke-free laws must make all indoor public

^b SHS is sometimes referred to as passive smoke or environmental tobacco smoke.

places, workplaces and public transport completely smoke free at all times; and must not allow designated smoking rooms, or exempt premises, or exempt certain people.

Compliance

In the build-up to the ban in each state or country, widespread civil disobedience was forecast and much attention focused on anticipated difficulties in policing the ban. It was suggested that large numbers of ‘smoke police’ would be required. Yet compliance rates have invariably been extremely high both in the immediate aftermath and in the months and years following implementation. For example, in the Republic of Ireland, one year after the ban was introduced on 29 March 2004, 94% of premises inspected were compliant in respect of the smoking prohibition. Average compliance rates were 89%, 94% and 98% for licensed premises, hotels and restaurants respectively.⁷ In 2007, overall compliance rates remained high at 95% (87%, 93%, and 98% in licensed premises, hotels and restaurants respectively).⁸ In Scotland, from the first month after the ban was introduced on 26 March 2006 to the end of 2007, overall compliance has consistently remained at around 96% with the highest compliance rates found in hotels, restaurants and licensed premises.⁹ Similarly high compliance rates in bars and pubs have been reported from other countries and cities, including for example, Boston,¹⁰ Italy¹¹ and New Zealand.¹² It is to be hoped that the success of the legislation in hospitality venues will show that if smoking is not acceptable in places such as bars, with their tradition of smoking while drinking, then it is not acceptable anywhere and will thus help towards denormalising smoking.

These high compliance rates are not surprising given that in countries attempting to introduce smoke-free laws, the majority of the population are non-smokers. And most people, including smokers, are law abiding. Smoke-free laws have been largely self policing.

In the Republic of Ireland, the extensive period of debate between when the ban was announced in January 2003 and its implementation in March 2004 meant that the majority of the population was aware of when the ban was to start, what premises it would affect,¹³ and the reasons for it, namely, health and safety at work. Working with the media, particularly at grassroots level, was critical to building acceptance by the community. Considerable preparatory work had been done with employers to ensure that they understood the implications of the legislation and were provided with appropriate 'No Smoking' signage. The workplace for which the greatest resistance was anticipated was pubs and bars. However, bar managers are well used to dealing with difficult and dis-inhibited customers and seemed to have little difficulty encouraging their customers to comply with the law. Surveys showed that in the lead-up to the ban there were high levels of support for the ban among the general public, including among smokers. After implementation, the levels of support were higher still, even among smokers. For example, a telephone survey of adult smokers in the Republic of Ireland (n=769) found that support for smoking legislation in workplaces increased from 43% pre-implementation to 67% post-implementation.¹⁴ In New Zealand public support rose from 56% to 69% after implementation.¹⁵ As stated in the recently published WHO MPOWER report,⁴ "Surveys in countries and regions that have banned smoking in dining and drinking establishments consistently show that these laws are extremely popular and that the vast majority of people would not want to return to an era of smoke-filled restaurants and bars."

In the Republic of Ireland, initially 60% of bar workers supported the legislation, rising to 77% post-implementation; among bar workers who were smokers, the proportion rose significantly ($p < 0.001$) from 40% to 67%. Post-implementation, over 90% agreed that legislation was needed to protect workers' health; this view persisted even among those who held negative economic perceptions.¹⁶ Levels of support for smoke-free legislation were even higher among Scottish bar workers both initially and post-implementation¹⁷ and in New Zealand, bar managers who approved of smoke-free bars increased from 44% to 60%.¹⁵

Despite this popularity, a common theme has been for pub, restaurant and hotel owners to refer to the need for a level playing field. Once there is any degree of voluntary adoption, hospitality premises are almost forced to follow one another into allowing smoking on the premises, even those who did not wish to do so. This has been highlighted in Spain where large bars and restaurants must construct a separate area for smokers but smaller establishments may choose whether or not to allow smoking; one after another, bars and restaurants have put up signs saying that smoking is permitted. In Minnesota, theatrical productions are exempt. Needless to say, bars across the state started taking to the boards.

SHS exposure

SHS exposure may be measured in a number of different ways, including: biomarkers in biological specimens (usually cotinine but also selected tobacco-specific carcinogens), self-reported exposure, and air quality (measurement of the concentration of components of SHS in the air).

Cotinine, the principal proximal metabolite of nicotine, is preferred to nicotine as a biomarker of smoke intake as it has a longer half life (16-20 hours versus 2 hours for nicotine in blood), which makes it a good indicator of integrated SHS exposure over the previous two to three days.¹⁸ It is highly specific and sensitive and is the most commonly used biomarker. Previously, blood or urine samples were required but now that it can be assessed reliably from saliva, cotinine measurement has become more practical for field surveys. Measurement of tobacco-specific carcinogens requires blood or urine samples. Self report is the easiest method but is subjective. However, when self reported exposure has been compared to cotinine concentrations in the same individuals, it has been shown to be reasonably accurate. The best way to estimate SHS exposure is probably combined use of appropriately worded self-reported questionnaires plus cotinine values.¹⁹

The other approach is to measure indoor air quality. A common method is to measure the concentration of airborne particles in the respirable size range (usually fine (1-2.5 μm) or

ultrafine particles (0.02-1.0 µm). However, these may reflect sources other than smoking, such as cooking. Ultrafine particles (0.02-1.0 µm) deposit with higher efficiency in the bronchial region of the respiratory tract but are technically more difficult to measure. Nicotine, present in the vapour phase in SHS, is highly specific and may be measured using active or passive sampling methods. Carbon monoxide and benzene levels have also been used as indicators of SHS.

While biomarkers are the best measure of personal exposure, they necessarily reflect exposures from both workplace and domestic settings. To be sure that smoke-free legislation has had an impact in the workplace *per se*, air measurements are needed to corroborate the observed decreases in biomarkers.

Exposure in the workplace

Some of the highest and most sustained occupational exposures to SHS occur(ed) in bar staff, with non-smoking areas providing only limited protection.²⁰ There are now many studies showing substantial improvements after implementation of smoke-free legislation in: indoor air quality;²¹⁻³⁰ self-reported exposure to SHS among bar workers;^{22, 27, 31} and cotinine levels, with declines of about 80% in non-smokers.^{22, 25, 27, 31} For example, salivary cotinine concentrations in non-smoking bar staff in Irish pubs dropped from a median of 29.0 nmol/l (95% confidence interval (CI) 18.2 to 43.2 nmol/l) to 5.1 nmol/l (95% CI 2.8 to 13.1 nmol/l).³¹ These declines have brought average exposures in bar workers down to the levels experienced by workers in offices, which in many countries have long been smoke-free environments. Declines in exposure (cotinine) have also been demonstrated in those visiting pubs.¹²

As smoking rates are still highest in blue collar workers and groups such as cleaners and construction workers,³² it is not surprising that the highest SHS exposures tended to occur in workplaces with employees from mid to lower socio-economic status. For example, higher exposure to SHS was found among Maori and blue collar workers prior to the introduction in 2004 of New Zealand's strengthened workplace legislation.¹² Workplace

smoking bans are therefore likely to have greater impact on improving the health of low income groups, thereby contributing to decreasing health inequalities.

Exposure in the general population

Comprehensive smoke-free laws prohibit smoking in enclosed public places as well as in workplaces. Serum cotinine levels from the 1999-2002 National Health and Nutrition Examination Survey, a cross-sectional survey designed to monitor the health and nutritional status of the US population, were used to investigate the relationship between smoke-free law coverage and SHS exposure in the US non-smoking adult population. Adjusting for confounders, men and women residing in counties with extensive coverage had respectively 0.10 (95% CI 0.06 to 0.16) and 0.19 (95% CI 0.11 to 0.34) times the odds of SHS exposure compared to those residing in counties without a smoke-free law.³³ This suggests that smoke-free laws are an effective strategy for reducing SHS exposure in the general population. In Scotland, using a repeat cross-sectional design, around 1800 adults were surveyed in the home and provided saliva samples for cotinine determination. Overall, geometric mean cotinine concentrations in adult non-smokers fell by 39% (95% CI 29% to 47%), from 0.43 ng/ml at baseline to 0.26 ng/ml after legislation ($P < 0.001$). Reductions were greatest in non-smokers living in non-smoking households. However, non-smokers living in smoking households continued to have high levels of exposure to SHS.³⁴

One of the worries about banning smoking from hospitality venues was that this would lead to displacement of smoking to the home, impacting negatively on children. In Scotland, Haw et al. found no evidence of displacement of smoking from public places into the home.³⁴ After the ban a 39% reduction in salivary cotinine ($p < 0.001$) was found in Scottish children,³⁵ similar to the decline seen in Scottish adults. As with the adults, the declines were greatest in those living in non-smoking households. Levels remained high (1.23 and 1.74 ng/ml respectively) in children living with a mother figure who smoked or with two parents who smoked, although they did actually decline slightly post-implementation (by about 10%).³⁵ Although air measurements in the various private and public settings attended by children are required for corroboration, there is a growing

body of indirect evidence that smoking bans do not lead to displacement to the home.^{14, 31, 36} Rather, workplace smoking bans are associated with an increase in the proportions of homes introducing home smoking bans and restrictions.³⁷⁻³⁹ It is hardly surprising that parents who have become aware of the need to protect colleagues from SHS would want to provide the same protection for their nearest and dearest.

Nevertheless, the raised exposures still experienced by many children living with smokers, both in the home and in cars, particularly among low-income families, raises the issue of needing to continue to raise consciousness on this issue. The internal environment of a car is a site for significant potential SHS exposure,^{40, 41} with concentrations of respirable suspended particles reaching levels found in smokey bars.⁴¹ The states of California, Arkansas and Louisiana, as well as several US municipalities, the Australian states of Tasmania and South Australia, and Puerto Rico, are among a growing number of jurisdictions that have recognized the harm associated with exposure to SHS in confined spaces such as automobiles and have moved to protect children from this risk by passing laws that ban adult smoking in cars when youngsters are present.

In summary, there is clear and consistent evidence from around the world that, following implementation of comprehensive smoke-free workplace laws, there are reductions in all indicators of SHS exposure, both in workplaces and among the general population; and without evidence of increased exposure in the home.

Health outcomes linked to SHS exposure

SHS contributes to a range of diseases including lung and other cancers, respiratory illness including asthma, and heart disease, and has adverse reproductive effects including low birth weight. Acute effects of SHS have been shown at extremely low levels ($2 \mu\text{g}/\text{m}^3$ total particulate matter).⁴² The adverse health effects are considerably greater than would be anticipated based on the comparatively low dose of tobacco smoke (relative to active smoking) inhaled by passive smokers because, ‘weight for weight’, SHS is more toxic than the smoke inhaled by smoking.⁴² However, demonstrating the

impact of smoke-free workplace legislation on health outcomes can be problematic. Reasons for this include: the long latent phase for some conditions (e.g. lung cancer); the multi-factorial aetiology of many conditions linked to SHS exposure; the often limited attributable risk from SHS exposure (in comparison to active smoking); and the fact that smoke-free legislation commonly addresses only smoking in the workplace and public places, whereas SHS exposure also occurs in the home and other private settings. Furthermore, in smokers, changes in SHS exposure levels and in health effects of SHS will be swamped by the effects of active smoking. For example, serum cotinine levels in regular smokers range from around 50 to 700 ng/ml, compared to levels ranging from 2 to 15 ng/ml in heavily exposed non-smokers, and less than 1 ng/ml in non-smoking office workers.

One approach to circumventing these difficulties is to focus on heavily exposed groups such as bar staff or casino workers. It had been shown that workers in the hospitality industry had considerably higher exposures to SHS than, for example, office workers; and hospitality workers in premises permitting customer smoking reported higher prevalence of respiratory and sensory symptoms than hospitality and other workers in smoke-free workplaces.^{20, 43-46} Shortly after California's ground breaking state-wide smoking ban was introduced in 1998, Eisner et al.⁴⁷ showed a statistically significant reduction in self-reported SHS exposure, in self-reported respiratory and sensory symptoms, and significant improvements in lung function among non-smoking California bar workers. Several studies have subsequently found similar post-ban improvements in symptomatology and/or in lung function in hospitality staff.^{24, 31, 48, 49} Menzies and colleagues⁴⁸ showed that bar workers with pre-existing asthma or rhinitis had the largest gains in health and additionally experienced reduced airway inflammation and improved quality of life. One of the first published of these studies, by including a comparison group of similar bar staff from a neighbouring jurisdiction without this legislative protection but exposed to similar media debate, was able to demonstrate that exposure and symptom improvements were indeed attributable to the smoke-free legislation rather than to unrelated secular trends.³¹ Media discussion of the harmful effects of SHS may

bias reporting but the reported decreased in symptoms has been supported by objective improvements in lung function.^{24, 47-49}

Although reductions in SHS exposure in the general population have been shown to follow smoke-free legislation, for the reasons outlined above it is not easy to show health improvements in the general population. A reduction in the incidence of lung cancer in non-smokers may occur after some decades but any impact of reduced workplace SHS exposure is unlikely to be distinguishable from other social and environmental changes over such a long period of time. There is substantial evidence for effects of small changes in fine particulate matter in outdoor air pollution on cardiovascular^{50, 51} and respiratory⁵²⁻⁵⁴ morbidity and mortality so it is feasible that decreases in appropriately adjusted rates of incidence, hospital admission or mortality may be detected in non-smokers for other conditions related to SHS exposure, such as stroke, myocardial infarction, unstable angina, severe asthma attacks in adults and in children, upper and lower respiratory tract infections and sudden infant death. So far, reduced admission rates have been reported for acute coronary events.

Heart disease

It is now widely accepted that SHS causes heart disease with the risk being considerably higher than originally anticipated based on the concentration of smoke inhaled. The effects of SHS on platelets, the endothelium and inflammation occur rapidly (within 30 minutes) and are nearly as large as smoking.⁵⁵⁻⁵⁸ Nevertheless, it was surprising when a study from Helena, Montana, showed a significant drop in hospital admission rates for myocardial infarction (ICD-9 code 410) after a local ordinance introduced a smoke-free law banning smoking in public places and workplaces.⁵⁹ No change was noted in the surrounding area not covered by the ordinance. The rates went back up after the ordinance in Montana was rescinded. The study was criticised on a number of grounds e.g. lack of power due to small numbers of admissions, “before and after” study design using historical controls, the unexpectedly large drop in admissions (40%), limited control of confounding, and lack of information on SHS exposure and on smoking history. Nevertheless, since then, declines in hospital admissions for myocardial

infarctions of between 8% and 40% have been reported from Colorado,⁶⁰ Ohio,⁶¹ New York State,⁶² Italy,^{63, 64} and Scotland.⁶⁵ These studies addressed some, if not all, of the methodological criticisms. However, in New Zealand, although there was some evidence of a reduction in hospitalisation rates for acute asthma, acute stroke, unstable angina, and exacerbations of COPD in the 12 months after implementation of their extended smoke-free law (2003) relative to the preceding 12 months, this was not confirmed in a more rigorous analysis that adjusted for long-term trends and other potential influences on hospitalisation rates.⁶⁶

It is possible that some or all of the observed declines reported may be due to a decline in smoking rates or fewer cigarettes smoked by continuing smokers, rather than to reduced exposure to SHS *per se*. Either way, such declines may be an important effect of smoke-free legislation, irrespective of whether direct or indirect.

Smoking

Although the primary aim of smoke-free workplace legislation is to protect workers' health, such legislation may additionally influence the smoking habits of employees. A systematic review based on 26 studies on the effects of smoke-free workplaces in the US, Australia, Canada, and Germany showed that totally smoke-free workplaces are associated with reductions in prevalence of smoking among employees of 3.8% (95% CI 2.8% to 4.7%) and with 3.1 (2.4 to 3.8) fewer cigarettes smoked per day per continuing smoker.⁶⁷

In Finland, a survey of employees from eight workplaces reported that respondents' daily smoking prevalence and tobacco consumption diminished one year after the enforcement of legislation from 30% to 25%, and remained at 25% three years later. Long-term reduction in smoking was confined to men.⁶⁸ A reduction in smoking prevalence of 3.6% ($p < 0.005$) was recorded for a national sample of food service workers in Norway four months after their national ban was introduced, together with a reduction in the number

of cigarettes smoked (-1.55, $p < 0.001$). This reduction was maintained almost a year later.⁶⁹ Bar workers in Scotland who were smokers showed reductions of 2.5 (95% CI 1.1 to 4.0) cigarettes per day twelve months post-ban.²⁷ A random sample of bar workers from one area in the All Ireland Bar Study smoked fewer cigarettes per day (-4, $p < 0.001$) after the ban; the proportion who smoked decreased but not significantly, although the power to detect this was low (unpublished observations). Interestingly, the Irish and Scottish bar workers were less likely, post-legislation, to believe that the ban supports people in quitting.^{16, 17}

Gallus et al. reported that smoking prevalence in general population samples in Italy declined by 7.4% after the implementation of smoke-free legislation (from 27.0% in 2003-2004 to 25.0% in 2005-2006, $p < 0.05$), compared to a non-significant decline of 2.9% in the previous two years (2003-2004 vs 20001-2002).⁷⁰ And in Fayette County, Kentucky, there was a 31.9% decline in adult smoking after the introduction of a comprehensive smoke-free ordinance compared to a 0.8% decline in 30 similar control counties without smoke-free laws.⁷¹ However, in New Zealand, although calls to the smoking cessation quitline increased, there was no discernible effect of the legislation on smoking prevalence.¹² And in the Republic of Ireland, smoking prevalence declined from 25.5% to 23.5% in the year after the ban but the following year rose almost to the pre-ban level; in 2007 levels started to decline again and at March 2008 had dropped to 23.6%.⁷²

Generally speaking, the greatest declines in smoking prevalence have been seen where comprehensive tobacco control programmes, including tax increases, have been initiated in addition to comprehensive smoke-free legislation, for example in California, New York City, Massachusetts and Australia. As a ten per cent increase in price results in a four per cent reduction in demand (price elasticity of -0.4),⁷³ it is not surprising that tax increases remain an important component of tobacco control.

An additional and very important benefit may be a reduction in smoking among adolescents. Youths living in towns in Massachusetts with strong smoking regulations (complete restaurant smoking bans) had less than half the odds of progression to

established smoking of youths living in towns with weak regulations.⁷⁴ Data from two large national US population-based surveys showed that adolescents who worked in smoke-free workplaces were only 68% (95% CI, 51% to 90%) as likely to be smokers as adolescents who worked in a workplace with no smoking restrictions.⁷⁵

Smoking restrictions may change social norms regarding the acceptability of smoking with the result that smokers may become more motivated to quit or, most importantly of all, may not initiate smoking in the first place.

Economic impacts

As the aim of smoke-free workplace legislation is to protect workers and the public, the focus of this article has been the health impacts. However, as tobacco companies have worked hard to create perceptions of large economic losses,^{76, 77} the economic issue needs to be addressed, but with particular attention paid to objective data.

The uneven spread of smoke-free policies in the US has provided natural experiments which have allowed researchers to assess the economic impact of these policies on the hospitality industry.⁷⁸ Studies across the US have compared bar and restaurant sales tax revenues, bar and restaurant employment figures, numbers of licensed restaurants and bars and their economic value, and hotel revenues and employment figures before and after smoke-free laws. Some studies have used as controls the trends in similar jurisdictions with no policy change. Eriksen and Chaloupka concluded that, based on their review of US studies using objective data, “the vast majority of studies find that there is no negative economic impact of clean indoor air policies” on restaurants, bars or tourism, “with many finding that there may be some positive effects on local businesses.” There is less evidence as yet from gaming establishments as these are usually exempted; the evidence so far is more mixed.⁷⁸

Many questionnaire surveys also support the findings from studies based on objective data in spite of what Glantz refers to as the ‘negative placebo effect’ i.e. the impact on

perceptions of the negative publicity about claims of economic ruin driven by the tobacco industry (but working through third parties such as hospitality associations).⁷⁷

Luk, Ferrence and Gmel used an interrupted time series design to evaluate the effects of a 2001 smoke-free bylaw in Ottawa. Although restaurant and bar sales were declining before the bylaw went into effect, their analysis demonstrated that the bylaw did not have a significant impact.⁷⁹ In New Zealand, Thomson and Wilson¹⁵ reported little change (0.6% increase) in seasonally adjusted sales in bars and clubs, with café and restaurant sales increasing by 9%, while Edwards et al. reported that available data from New Zealand suggest a broadly neutral economic impact.¹²

Patterns from Europe appear broadly similar although it is a little early to tell. Gallus et al.⁷⁰ concluded that in Italy smoke-free legislation did not seem to unfavourably affect restaurant and café business. Bar sales in Ireland have been declining since 2001, three years prior to the Irish ban. This decline is believed due to high prices and lifestyle factors such as stricter enforcement of drink driving laws leading to more people drinking at home, rather than the smoke-free legislation. Similar factors may affect bar sales in other European countries.^{80, 81} A phone survey of pubs in Scotland and northern England (control area) suggested that the Scottish smoking ban had had a negative economic impact on pubs, at least in the short run.⁸² However, as pointed out above, subjective reports, particularly within the first year, are likely to be negatively biased.⁷⁷ Indeed, among the 97 economic impact studies of smoke-free laws reviewed by Scollo et al.,⁸³ studies that used subjective measures of impact (such as bar staff perceptions) were four times as likely to conclude that there was a negative economic effect as studies that used objective measures (such as tax receipts to government) ($p=0.007$). They also found that the studies concluding a negative economic impact were far less likely to have been peer reviewed and had all been supported by the tobacco industry.

On the other side of the economic equation are the considerable cost savings due to a healthier work environment and reduced smoking.^{80, 84} For employers, smoke-free workplaces are associated with enhanced productivity due to lower absenteeism and

removal of smoking breaks; reduced fire risk and lower building maintenance costs; and less risk of litigation by employees with smoke related illness. For the health service, given the health impacts described above, fewer visits to GPs, fewer hospital admissions and eventually fewer deaths are likely.

Conclusions

Most studies of the impact of smoking bans are based on before and after comparisons at one or two time points. Such evaluations may be confounded by secular trends. However the findings are consistent across the many populations studied and are supported by a small number of studies with comparison control groups, together providing strong evidence in favour of positive impacts of smoke-free workplace legislation.

Long term effects, such as any impact on lung cancer rates, will be difficult to ascertain as confounding by other social trends will increase over time. Nevertheless it will be of interest to monitor national and regional lung cancer rates and to correlate these with the presence or absence of smoke-free legislation. Monitoring smoking prevalence, smoking density and, in particular, smoking initiation in young people will also be very important, together with ongoing surveys of public attitudes to tobacco, again, especially in the young.

In spite of anxieties about possible negative impacts on the hospitality and tourism industries, expressed in almost all jurisdictions prior to the introduction of smoke-free legislation, the forecast economic disasters have not happened.

In conclusion, smoke-free workplace legislation reduces the exposure of both the general public and the workforce without evidence of increased exposure of children in the home. The reductions in exposure are linked to improved respiratory health in previously heavily exposed occupational groups such as bar, restaurant and casino staff. There is evidence from some countries suggesting that smoking bans have led to declines in

hospital admissions for myocardial infarction. And there is general agreement that smoking bans, if associated with other tobacco control measures such as tax increases, together with provision of cessation supports, lead to a reduction in the numbers of cigarettes smoked and probably lower smoking rates.

What next?

Smoke-free legislation in many countries still exempts a small number of workplaces, usually on the basis that these workplaces are also homes e.g. prisons, nursing homes, long-term psychiatric institutions and hotel bedrooms. Nevertheless, increasing numbers of prisons, in spite of high smoking rates among both staff and inmates, have made the transition, with varying degrees of success,⁸⁵ to smoke-free environments (e.g. all US federal prisons and the correctional facilities of 28 states⁸⁶), suggesting that, with consultation and careful planning, other currently exempted workplaces should be able to similarly protect their staff and residents.

The impact of outdoor smoking areas requires further consideration due to the potential for infiltration of tobacco smoke into indoor areas.²² Indeed, these popular and highly visible entertainment areas run the risk of becoming the new “nicotine classrooms” for the young.⁸⁷

It is likely that in the future increasing numbers of western countries and regions will implement smoke-free workplace legislation, motivated, if not by altruism, by fear of litigation under worker protection laws. Poorer countries need to act fast to counteract the increasing focus on the poor world by tobacco companies.

And finally, with increasing proportions of workers protected in the workplace in a growing number of countries, we need to tackle the thorny issue of protecting society’s most valued and valuable asset, who are also the most vulnerable and defenceless: children. Interfering in the privacy of the home is difficult but there is a need for smokers

to balance their right to self determination with the duty not to harm others. To breathe clean air is a human right.

Practical implications /educational message

Smoke-free laws are popular, are enforceable, reduce exposure to SHS, can support smokers who want to quit and, most importantly of all, improve health.

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