

**Institution: University of Aberdeen**

**Unit of Assessment: 2 - Public Health, Health Services and Primary Care**

**Title of case study: Improved public health through the impact of research underpinning the introduction of Smokefree Legislation in Scotland**

### 1. Summary of the impact

University of Aberdeen research had impact on public policy as it was instrumental in the introduction of legislation in Scotland to restrict smoking in public places. The implementation of the legislation has impacted on the health of the public and benefited the economy through reduced use of health services.

Exposure to environmental tobacco smoke (ETS) - passive smoking - had been estimated to cause more than 1,000 deaths per year in Scotland and significant morbidity. International evidence was used to model the health and economic impacts of potential legislation to eliminate smoking in public places in Scotland, under a range of scenarios. The net present value of all the benefits and costs over 30 years was demonstrated to be positive under all the scenarios examined, with a central estimate of +£4.6 billion (ranging from +£0.056 billion to +£7.4 billion).

The research results provided convincing evidence to support the passage of legislation. Following the implementation of smokefree public places in Scotland, evidence of the resulting health benefits have been accruing from 2008. These include significant reductions in admissions for acute coronary syndrome and for childhood asthma, reductions in complications of pregnancy (pre-term delivery and small for gestational age) and improvements in bar workers' health.

The claimed impact, as defined by REF guidance, therefore includes: *public health and welfare have improved; public behaviour and the control of disease has changed.*

### 2. Underpinning research

The University of Aberdeen research, led by Professor Anne Ludbrook, was commissioned by NHS Health Scotland on behalf of the Scottish Executive to inform a decision to be taken by Scottish Ministers on whether or not to introduce smokefree legislation to the Scottish Parliament.

Passive smoking was recognised to be an important component of tobacco related health harms in the Scottish Executive's tobacco control action plan, *Clearing the Air*. Deaths from passive smoking in Scotland had been estimated to be in the region of 1000 to 1200 per year, which is about 10% of the total deaths from smoking related diseases.

Passive smoking was known to increase risk of lung cancer and ischaemic heart disease, with growing evidence of a causal effect for other diseases. Passive smoking was also known to aggravate respiratory diseases, such as asthma and chronic bronchitis. The costs of treating smoking related diseases in Scotland was estimated at £200 million in 2004; if the cost attributable to passive smoking were pro rata to the share in mortality then this would be approximately £20 million per year. The Aberdeen team was approached because of its reputation for high quality evidence reviews and economic modelling. The Scottish Executive required a robust evidence base to underpin their decision-making. There was particular controversy about the potential impact of smokefree legislation on the hospitality sector (bars, restaurants and hotels), with the industry claiming that there would be a significant negative effect on this area of the Scottish economy. Despite the evidence from studies of smoking restrictions in other jurisdictions, it was important to provide results relevant to Scotland through the modelling process.

Systematic reviews were undertaken of evidence relating to the health effects of exposure to ETS, the impact of restrictions on exposure levels and on tobacco use behaviours and the economic impacts of restrictions on workplaces, in general, and on the hospitality sector in particular. Effect sizes from the reviews were used in the modelling. Specific health, health service and economic information relating to the Scottish context was also collected to assist in the modelling of impacts.

The model combined information relating to the main health and economic impacts of smoking in

public places and was estimated to show the impact of moving from the existing situation, under a voluntary code of practice, to a complete ban. The model provided a framework in which to compare the expected benefits of smokefree legislation with the potential costs, estimated on the basis of the best available evidence and using expert judgement where evidence did not exist or was unclear. The model was estimated across a range of assumptions to test its robustness and demonstrated a positive net benefit under all assumptions. Key findings [1,2] included:

- an annual reduction in deaths from lung cancer and CHD of 219, with a possible additional reduction in deaths from stroke and respiratory diseases of 187;
- complete smoking bans were associated with greater reductions in exposure to ETS and greater reductions in active smoking than other forms of restrictions;
- the annual effect on the hospitality sector (bars, restaurants and hotels) in Scotland was estimated to lie in the range -£104m to +£299m with a central estimate of +£97m; and
- the net present value of all the benefits and costs over 30 years was positive under all the scenarios examined, with a central estimate of +£4.6 billion (range: +£0.056 to +£7.4).

This research built on a strong but contested evidence base.

The researchers adopted a deliberately conservative approach in estimating the benefits for Scotland to ensure the robustness of the conclusions. In particular, the research included a wide range of estimates relating to the impact on the hospitality sector. Although previous studies using robust methods had found no significant effect, the model scenarios included possible negative economic effects, using confidence intervals from this literature. The research could then demonstrate that, in the worst-case scenario, the scale of any negative economic impact was outweighed by the value of the health benefits. This provided a strong basis on which to counter criticisms of the research during the legislative process, including the provision of a written response to the Finance Committee of the Scottish Parliament. The quality and robustness of the research contributed to the successful passage of the legislation and the public health benefits which have accrued thereafter.

All of the researchers on the project were from the University of Aberdeen:

- Anne Ludbrook, Senior Research Fellow and Principal Investigator, Health Economics Research Unit
- Edwin van Teijlingen, Senior Lecturer, Department of Public Health (now Professor of Reproductive Health Research at Bournemouth University)
- Sheona Bird, Research Assistant, Health Economics Research Unit

All of the research was undertaken between April 2004 and October 2004 and all researchers were in post at the University of Aberdeen for the whole period.

### 3. References to the research

- [1] Ludbrook, A, Bird, S and van Teijlingen, E. (2005). International review of the health and economic impact of the regulation of smoking in public places. Edinburgh. NHS Health Scotland. <http://www.healthscotland.com/documents/451.aspx> (*This report was submitted to rigorous peer review by four independent international experts prior to publication*)
- [2] Ludbrook, A, Cohen, D, Bird, S and van Teijlingen, E. International review of the health and economic impact of the regulation of smoking in public places. *Report submitted to the Committee on Smoking in Public Places*. National Assembly for Wales 2005

#### Grant funding for this research:

Ludbrook A, van Teijlingen E. *International Review of the Health and Economic Impact of the Regulation of Smoking in Public Places*. NHS Health Scotland on behalf of the Scottish Executive Health Department. April 2004 - October 2004 £46,873.

Ludbrook A, Cohen D. (University of Glamorgan) *International review of the health and economic impact of the regulation of smoking in public places – extension to Wales*. NHS Health Scotland

on behalf of the Welsh Assembly Government. £16,167

#### 4. Details of the impact

The results of the research were submitted to the Scottish Cabinet in early November 2004 and the main finding - a net economic benefit to Scotland from banning smoking in public places - was cited in the First Minister's speech to the Scottish Parliament on 10<sup>th</sup> November 2004 announcing the proposal to introduce the legislation [a].

The research underpinned the Regulatory Impact Assessment produced by civil servants for the Committee stages of the Bill and the researchers were able to defend their findings against evidence submissions made by opponents of the proposed legislation [b].

The importance of the research in supporting the passage of the Smokefree legislation has also been demonstrated by independent stakeholder evidence from an independent review of the performance of the Health Economics Research Unit for the Chief Scientist Office [c]. The research was described as "*enormously influential*" and "*the most important piece of work of all*" in relation to the Bill." The legislation was passed by the Scottish Parliament and implemented in March 2006.

The legislation has resulted in significant health improvements for the Scottish population, which would not have been achieved otherwise. Specific improvements in public health have started to accrue from 2008 onwards, including:

- reductions in admissions for acute coronary syndrome were reported in 2008 [d];
- reductions in admissions for childhood asthma were reported in 2010 [e];
- reductions in complications of pregnancy were reported in 2012 [f]; and
- health improvements for occupational groups previously exposed to high levels of environmental tobacco smoke (bar workers) have also been noted, with a first report in 2009 [g].

These health benefits have been evidenced in post implementation studies conducted by other research teams and are the result of the legislation having been passed. Admissions for acute coronary syndrome fell by 17%, compared with a previous mean annual decrease of 3%. The scale of reduction in admissions for childhood asthma was similar at 18.2%. Reduced use of health services, as a consequence of better health, also provides an economic benefit.

The evidence review and the modelling methodology were also used by the Welsh Assembly Government in deciding to introduce Smokefree legislation in Wales.

The claimed impact, as defined by REF guidance, therefore includes: *public health and well-being* has improved; *disease prevention* has been enhanced by research; *public behaviour* has changed and *awareness of a health risk* has been raised; costs of treatment and healthcare have improved and *policy debate* has been stimulated by research.

#### 5. Sources to corroborate the impact

##### References to confirm the impact of the research on the passage of legislation:

- [a] Scottish Parliament Official Report 10 November 2004 – *demonstrates the results of the research being used to support the introduction of the legislation*  
<http://www.scottish.parliament.uk/Apps2/business/orsearch/ReportView.aspx?r=4540>
- [b] Finance Committee papers - *include the rebuttal of criticisms of the research and further evidence the role of the research in supporting the legislative decision-making.*  
<http://archive.scottish.parliament.uk/business/committees/finance/reports-05/fir05-smokingFMreport-00.htm>
- [c] Review of Health Economics Research Unit. Report of Stakeholder Interviews 2005. *This report provides independent views from stakeholders on the contribution of the research to the passage of the legislation*

## Impact case study (REF3b)

**References relating to the health impacts achieved:**

- [d] Pell JP, Haw SJ, Cobbe S et al. (2008). Smoke-free legislation and hospitalizations for acute coronary syndrome. *New England Journal of Medicine*, 359: 482-91.
- [e] Mackay D, Haw S, Ayres JG, et al. (2010). Smoke-free Legislation and Hospitalizations for Childhood Asthma. *New England Journal of Medicine*, 363:1139-1145.
- [f] Mackay DF, Nelson SM, Haw SJ, Pell JP. (2012). Impact of Scotland's Smoke-Free Legislation on Pregnancy Complications: Retrospective Cohort Study. *PLoS Med*, 9(3): e1001175.
- [g] Ayres JG, Semple S, MacCalman L et al. (2009). Bar workers' Health and Environmental Tobacco Smoke Exposure (BHETSE): Symptomatic improvement in bar staff following smoke-free legislation in Scotland. *Occupational and Environmental Medicine*, 66, 339-46.
- [h] Testimonial from Head of the Evaluation Unit, NHS Health Scotland which confirms the commissioning and peer review process for the research and corroborates the use of the research findings and the health impacts which have followed.
- [i] Testimonial from a former MSP and member of the Scottish Government in 2004, which corroborates the importance of the research findings for the decision-making process within the Scottish Government.