Smoking prevalence in a north-west town following the introduction of Smoke-free England

P. J. Elton, P. Campbell
Bury Primary Care Trust, Unit 3, Elms Square, Bury New Road, Whitefield, Manchester M45 7TA, UK
Address correspondence to P. J. Elton, E-mail: peter.elton@burypct.nhs.uk

ABSTRACT

Background In July 2007, legislation banning smoking in public places was introduced in England. This study investigates the impact of this legislation on smoking in Bury.

Methods A postal survey was undertaken before the implementation of the legislation. The survey was repeated 3 months after the smoking ban. Smoking prevalence was then compared. Participants were randomly selected using the PCT database of people registered with general practitioners. In the baseline and second survey, 3500 questionnaires were sent to participants. In the baseline survey 59.5% responded. In the second survey 56.3% responded.

Results Results were standardized to age and gender bands from Bury’s population. The baseline survey found that the standardized prevalence of smoking before the ban was 22.4% and after it was 22.6%. The proportion of smokers reporting that on average they smoked 20 cigarettes a day or greater fell from 27.6 to 21.8% ($P = 0.044$).

Conclusions The study found that in Bury the smoking ban did not have a substantial impact on smoking prevalence but had an impact on the proportion of heavy smokers. The measurement of smoking prevalence before the change in legislation can be used to assess its long-term impact on smoking habits in Bury.

Keywords tobacco

Introduction

Second-hand smoke has been defined by the Chief Medical Officer as ‘a mixture of side stream smoke from the burning tip of the lit cigarette, and mainstream smoke exhaled by the smoker’. The inhalation of this smoke by non-smokers is injurious to health. In 2002, the WHO International Agency for Research on Cancer reported that second-hand smoke includes over 50 carcinogenic agents. Second-hand smoke increases the risk of lung cancer by 20–30%, and the risk of coronary heart disease by 25–35%. The BMAs Board of Science and Education estimated 1000 deaths per year in the UK are due to second-hand smoking. The report also concluded that no safe level of exposure to tobacco smoke exists.

Prior to 2006, tobacco legislation had concentrated on reducing active tobacco use and there was little effective legislation relating to the effects of second-hand smoke. The primary purpose of the Health Act 2006, which led to the implementation of a ban on smoking in the workplace, was to protect the workers from the dangers of second-hand smoking. It might also have had the fortunate side-effect of reducing smoking prevalence. Following on from the Health Act, on 1 July 2007, legislation banning smoking in public places was introduced in England.

The introduction of smoke-free work places encourages smokers to give up. A review covering smoke-free workplaces in Australia, Canada, Germany and the USA estimated a resulting reduction of 4% in smokers. Other bans in the work place have been shown to bring a 10% decrease in smoking prevalence. The combination of well-developed stop smoking services and a smoking ban in public places in England would be expected to lead to a reduction in smoking. To enable progress to be monitored, we undertook a survey prior to the introduction of the smoking ban to
establish baseline smoking prevalence. A second survey was undertaken 3 months after the ban had begun.

**Methods**

It was expected that in Bury ~60% of people respond to health questionnaires. The sample size for the survey was based on a pragmatic decision which considered both statistical power and the practicalities of running very large surveys. A total of 3500 questionnaires were sent out and 2100 were expected to be returned, which would be sufficient to detect an absolute future decline in smoking prevalence from the baseline survey value of 3.5% with 80% power at the 0.05 significance level.

A random sample of 3500 people was taken from the Exeter database of people registered with GPs in Bury. For each person identified a questionnaire was sent with a covering letter and a return envelope. Respondents were identified via an ID number on the back of the return envelope. Two reminders were sent to non-responders. The first of these was sent approximately 7–10 days after the first questionnaire and a second reminder sent if no response was gained after another 7–10 days. The reminders included a postcard, another copy of the questionnaire, the covering letter and a return envelope.

The baseline survey took place in March and April 2007, prior to the introduction of the smoking ban. The first questionnaires were posted on 19th March, and the last reminders on 13th April.

Reply envelopes, still sealed to ensure confidentiality, were sent to a data input company who supplied an Excel table of the data. Some duplicate records were found because some respondents that were sent a reminder completed two questionnaires. This small number of duplicates was removed from the dataset before analysis.

Because of inaccuracies in the PCT Exeter database, some questionnaires were sent to the wrong address. These forms were either returned by the Post Office, or the respondent reported this to the public health department.

The questionnaire contained 24 questions. In addition to smoking, the survey covered body weight, crime, general health and physical activity. A section of demographics included employment, age, sex, education, ethnicity and religion. A section was also included for general comments.

The questions relating to smoking prevalence and the amounts of cigarettes smoked came from the Health Survey for England, and were as follows:

- Have you ever smoked a cigarette, a cigar or other tobacco product?
- Do you smoke at all nowadays?
- About how many cigarettes a day do you usually smoke on weekdays?
- About how many cigarettes a day do you usually smoke at weekends?

To calculate smoking prevalence, current smokers were identified as respondents who replied that they smoke now. Ex-smokers were identified as smokers who say that they have smoked previously but do not smoke now.

People smoking over 20 cigarettes a day were identified by using the average daily rate derived from smoking during the week and weekend.

A second survey using the same method was undertaken in October and November 2007, ~3 months after the introduction of the smoking ban in public places. In this survey, the first questionnaires were sent out on 1st October, and the last reminders on 1st November.

Although the samples were random, it was expected that the response rate would vary by age and gender. Therefore, to gain a more accurate estimate of smoking prevalence in the Bury population as a whole the prevalence in each of seven age and gender bands from the surveys were applied to the Bury population for those age bands as recorded at the 2001 census.

To establish if there had been a significant reduction in smoking prevalence between the two surveys 95% confidence intervals were constructed around the proportion of current smokers in the baseline and second surveys using standard methods. If the prevalence of smoking in the second survey was found to be outside the lower 95% confidence limit then Fisher’s exact test was to be used to investigate the null hypothesis of no fall in smoking prevalence. The one-tailed test was used because it was assumed that the smoking legislation would lead to a reduction in smoking.

To establish if there had been a significant reduction in the proportion of heavy smokers between the two surveys 95% confidence intervals were constructed around the proportion of current smokers that smoked on average 20 cigarettes or more in the baseline and second surveys using standard methods. If the prevalence of heavy smoking in the second survey was found to be outside the lower 95% confidence limit of the baseline survey then a one-tailed Fisher’s exact test was used to investigate the null hypothesis of no fall in heavy smoking from the smoking legislation.

**Results**

Of the 3500 questionnaires sent out for the baseline survey, 49 envelopes were returned unopened. Of the remaining
3451 questionnaires, there were 2054 (59.5%) usable responses. In the second survey 56 envelopes were returned unopened and of the remaining 3444 there were 1938 (56.3%) usable responses. The lower response rate in the second survey may be due to the postal workers strike, which took place during the period of the survey.

There were no important differences between the populations that responded to the baseline survey and the second survey. In the baseline survey 36 (1.8%) and in the second survey 16 (0.8%) of respondents did not record their age or gender on the questionnaire. In the baseline survey, 89.1% described themselves as white British, and in the second survey, this was 89.8%. Bury has three wards classified by the index of multiple deprivation as being in the top 15% most deprived in England.16 An analysis of the response rate showed little variation for any of the wards in Bury between the two samples. The age and gender distribution of respondents is shown in Table 1. Although there are no major differences between the two population samples, neither mirrors the age distribution of the Bury population.

In the baseline survey, smoking status could be established for 1978 (96%) respondents. For the second survey, smoking status could be established for 1878 (96%) respondents. The proportion of current smokers was similar in both surveys and clearly not significantly different (Table 2).

In the baseline survey, two people those were current smokers did not fill in their age and gender and were excluded from the calculation of the age-specific smoking prevalence presented in Table 3.

The standardized prevalence of smoking adjusted to the age and gender population of Bury was similar in the baseline and second surveys. In the baseline survey, it was 22.4%, and in the second survey, it was 22.6%.

In the baseline survey, 48 current smokers failed to fill in details about the number of cigarettes they smoked. Of the remaining 370 current smokers, 102 (27.6%; 95% confidence interval 23.3–32.3%) reported that over a week they smoked on average 20 cigarettes or more a day. In the second survey, 40 current smokers failed to fill in details about the number of cigarettes they smoked and one person clearly misinterpreted the question. Of the remaining 353 current smokers, 77 (21.8%; 95% confidence interval 17.7–26.6%) reported that over a week they smoked on average 20 cigarettes or more a day. The one-tailed Fisher’s exact test for the proportion of current smokers that smoked more than 20 a day across the two surveys had a P-value of 0.0439, which was statistically significant at the 0.05 level.

### Table 1 A comparison of the age and gender distribution of the respondents to the baseline and second surveys with the Bury population

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age band</th>
<th>Bury population n (%)</th>
<th>Baseline survey n (%)</th>
<th>Second survey n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>18–24</td>
<td>6452 (4.6)</td>
<td>58 (2.9)</td>
<td>46 (2.4)</td>
</tr>
<tr>
<td></td>
<td>25–34</td>
<td>12 400 (8.8)</td>
<td>81 (4.0)</td>
<td>97 (5.0)</td>
</tr>
<tr>
<td></td>
<td>35–44</td>
<td>14 000 (9.9)</td>
<td>148 (7.3)</td>
<td>145 (7.5)</td>
</tr>
<tr>
<td></td>
<td>45–54</td>
<td>12 400 (8.8)</td>
<td>176 (8.7)</td>
<td>148 (7.6)</td>
</tr>
<tr>
<td></td>
<td>55–64</td>
<td>9900 (7.0)</td>
<td>202 (10.0)</td>
<td>179 (9.2)</td>
</tr>
<tr>
<td></td>
<td>65–74</td>
<td>7300 (5.2)</td>
<td>137 (6.8)</td>
<td>123 (6.3)</td>
</tr>
<tr>
<td></td>
<td>75+</td>
<td>7100 (5.0)</td>
<td>96 (4.8)</td>
<td>107 (5.5)</td>
</tr>
<tr>
<td>Females</td>
<td>18–24</td>
<td>6348 (4.5)</td>
<td>73 (3.6)</td>
<td>69 (3.6)</td>
</tr>
<tr>
<td></td>
<td>25–34</td>
<td>12 900 (9.1)</td>
<td>165 (8.2)</td>
<td>130 (6.7)</td>
</tr>
<tr>
<td></td>
<td>35–44</td>
<td>14 100 (10.0)</td>
<td>182 (9.0)</td>
<td>204 (10.5)</td>
</tr>
<tr>
<td></td>
<td>45–54</td>
<td>12 500 (8.9)</td>
<td>189 (9.4)</td>
<td>171 (8.8)</td>
</tr>
<tr>
<td></td>
<td>55–64</td>
<td>9900 (7.0)</td>
<td>196 (9.7)</td>
<td>225 (11.6)</td>
</tr>
<tr>
<td></td>
<td>65–74</td>
<td>7700 (5.5)</td>
<td>148 (7.3)</td>
<td>150 (7.7)</td>
</tr>
<tr>
<td></td>
<td>75+</td>
<td>8000 (5.7)</td>
<td>166 (8.2)</td>
<td>144 (7.4)</td>
</tr>
</tbody>
</table>

### Table 2 Smoking status in the in the baseline and second survey

<table>
<thead>
<tr>
<th>Smoking status</th>
<th>Baseline survey n (%)</th>
<th>(95% CI)</th>
<th>Second survey n (%)</th>
<th>(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current smokers</td>
<td>418 (21.1) (19.4–23.0)</td>
<td>394 (21.0) (19.2–22.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex smokers</td>
<td>733 (37.1) (34.9–39.2)</td>
<td>687 (36.6) (34.4–38.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never smoked</td>
<td>827 (41.8) (39.7–44.0)</td>
<td>797 (42.4) (40.2–44.7)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3 The number and proportion of current smokers by age and gender in the baseline and second surveys

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age band</th>
<th>Baseline survey n (%)</th>
<th>Second survey n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>18–24</td>
<td>18 (31.6)</td>
<td>16 (35.6)</td>
</tr>
<tr>
<td></td>
<td>25–34</td>
<td>30 (38.5)</td>
<td>29 (31.2)</td>
</tr>
<tr>
<td></td>
<td>35–44</td>
<td>33 (22.4)</td>
<td>29 (21.2)</td>
</tr>
<tr>
<td></td>
<td>45–54</td>
<td>48 (28.2)</td>
<td>38 (26.4)</td>
</tr>
<tr>
<td></td>
<td>55–64</td>
<td>48 (24.1)</td>
<td>41 (23.8)</td>
</tr>
<tr>
<td></td>
<td>65–74</td>
<td>20 (14.8)</td>
<td>18 (15.1)</td>
</tr>
<tr>
<td></td>
<td>75+</td>
<td>6 (6.6)</td>
<td>7 (6.9)</td>
</tr>
<tr>
<td>Females</td>
<td>18–24</td>
<td>18 (25.4)</td>
<td>16 (25.0)</td>
</tr>
<tr>
<td></td>
<td>25–34</td>
<td>36 (21.8)</td>
<td>35 (27.1)</td>
</tr>
<tr>
<td></td>
<td>35–44</td>
<td>28 (15.6)</td>
<td>54 (26.9)</td>
</tr>
<tr>
<td></td>
<td>45–54</td>
<td>50 (27.2)</td>
<td>43 (25.9)</td>
</tr>
<tr>
<td></td>
<td>55–64</td>
<td>52 (26.9)</td>
<td>37 (16.6)</td>
</tr>
<tr>
<td></td>
<td>65–74</td>
<td>17 (12.1)</td>
<td>21 (14.7)</td>
</tr>
<tr>
<td></td>
<td>75+</td>
<td>12 (7.7)</td>
<td>10 (7.2)</td>
</tr>
</tbody>
</table>
Discussion

Main findings and limitations of the Study

This study allowed estimates to be made of smoking habits in Bury before and after the introduction of legislation banning smoking in public places. The baseline survey found that the prevalence of smoking standardized to the age and gender distribution of the Bury population before the ban was 22.4% and after the ban it was 22.6%. Although the ban did not lead to an immediate large fall in the prevalence of smoking in Bury, it did appear to have an impact on the number of cigarettes smoked. The study found that the proportion of current smokers reporting that they smoked on average 20 cigarettes or more a day fell significantly from 27.6 to 21.8%.

It is important to measure the independent impact of the smoking ban in different populations, as the findings from local population surveys are limited for a number of reasons. First, to demonstrate a small change in smoking prevalence requires a series of large surveys, which may not be feasible at a local level. Secondly, the age and gender mix of respondents to surveys tend not to mirror the population and therefore the crude findings require adjustment. Thirdly, the extent that responses from an individual survey reflect actual smoking habits is not known. These limitations mean that it is advisable to consider the findings of local surveys in the context of other evidence.

Previous health surveys in Bury indicate a downward trend in smoking prevalence (from 29.2% in 2002 to 24.0% in 2005). Results of these surveys support this downward trend. Similarly, national figures indicate that substantial progress is being made. Cigarettes sales show a year on year decline. Figures from the Tobacco Manufacturers Association show a decline from 81.5 billion cigarettes smoked in the UK in 2000 to 64.5 billion in 2007. Reports on cigarette sales following the ban have also shown a significant drop. Retail figures for England have shown a drop of 7.3% in July and August 2007, compared with the same period in 2006. In addition, the volume of year on year sales in England dropped by 6.3% in the third-quarter and 6.7% in the last quarter of 2007. A drop in the amount smoked was also shown in a Scottish survey in March 2008. This reported 27% of respondents smoking less since the introduction of smoke-free legislation in March 2006.

Although it is disappointing that the smoking ban in public places did not bring about a dramatic fall in the prevalence of smoking in Bury, it is not because it was not enforced. Between July 2007 and March 2008 Bury’s Environmental Health Department carried out 2172 visits to the premises to ensure compliance with the smoke-free legislation. During this period, only one fixed penalty notice was served. However, it may be that a period longer than 3 months may be needed to see a large change in smoking habits. It is also possible that having to go outside for a smoke in the summer was not much of a deterrent and the ban may have a greater effect in the winter months.

Although the impact of the smoking ban on prevalence remains unclear, there is evidence from the fall in cigarette sales that the ban has had a marked impact on the number of cigarettes smoked. The findings from these surveys provide evidence that this is the result of smokers smoking fewer cigarettes rather than a substantial proportion quitting. Perhaps with the cultural shift away from smoking, the smoking ban will over time also reduce prevalence. It is also worth remembering that the ban has had a very positive impact on exposure to second-hand smoke.

What is already known on this topic

The Finnish Tobacco Control Amendment Act of 1995, which prohibited smoking in the workplace except in designated areas, led to a reduction in the prevalence of smoking, which was not seen amongst those who were economically inactive. There was a small reduction in smoking prevalence in Italy following the smoking ban in enclosed public spaces which came into force in January 2005. In New Zealand, the legislation prohibiting smoking in public places was implemented in December 2004 and was accompanied by a reduction in smoking prevalence from 23.4% in 2002–3 to 18.7% in 2006–7.

There has been disappointment about the reduction in prevalence in Ireland following the introduction of their smoke-free legislation in March 2004. After an initial reduction in prevalence from 25.5% in March 2004 to 23.5% in March 2005, it climbed back to 25% in April 2006 although the latest data for March 2008 shows that the prevalence has fallen again to 23.5%.

A Cancer Research UK survey of smoking prevalence in England indicated prevalence falling by 0.61% per month following the ban, compared with 0.18% prior to the ban. However, the largest reduction occurred after the second survey in Bury had been completed. It may be that the main influence of the legislation on smoking in public places was to give a fillip to the reduction in smoking associated with people giving up at the start of a new year.

What this study adds

The results, showing no substantial early reduction in smoking prevalence in Bury following the introduction of a smoking ban in public places is in line with the small reductions seen
in Italy and Ireland. However, there is evidence that the legislation led to a fall in the number of cigarettes smoked by Bury smokers. This suggests that the smoking ban has had a positive impact but should not be relied upon to drive down smoking prevalence. Instead we should continue to pursue a comprehensive tobacco control programme.28

Acknowledgements

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Competing interests

All authors declare that the answers to the questions on your competing interest form are all ‘no’ and therefore have nothing to declare. Ethics approval was given by the Oldham Local Research Ethics Committee.

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