Smoking prevalence trends in Scotland: simple projections to 2010

June 2010

Summary

Projections are not a reliable guide to the future. Their core assumption – that the past is a guide to the future – is invariably wrong to a greater or lesser extent.

We present here simple linear projections of smoking trends for the lifetime of the current smoking prevalence target for NHS Boards. This provides an indication of the scale of change required to achieve the target. The core assumption in the projections is that past prevalence trends and levels of cessation activity continue unchanged from the baseline period (1999 to 2008).

The projections suggest that the Scottish smoking prevalence rate could be around 24.2% in 2010 against a target of 22%. (The published rate for 2008 is 25.2%.) At Board level, Lothian, Shetland and Orkney are projected to meet their 2010 smoking targets.

We repeat - projections are not a reliable guide to the future. But they do illustrate the scale of change required if aspirations are to become reality.

Introduction

Smoking is a major contributor to poor health and to inequalities in health and hence a major concern for national public health action.[1,2,3] With sustained effort over several decades, adult cigarette smoking prevalence in Britain has been reduced from more than half of the population in the 1950s[2] to 21% in 2008.[4] (Over the same period pipe and cigar smoking has dropped from nearly one fifth of men to almost none.) In Scotland, the prevalence of adults smoking cigarettes daily has dropped from 47% in 1972 (the first available consistent data from the General Household Survey) to 24% in 2008.[4] Trends are very similar across different surveys. The Scottish Household Survey (SHoS) – the nationally agreed source for smoking prevalence – shows a decrease from 31% in 1999 to 25% in 2008.[5]

The purpose of this paper is to show, using very simple modelling, the smoking prevalence that might be expected for Scotland and NHS board areas by 2010 if the trend from 1999 to 2008 is maintained.

Author and contact details:
Martin Taulbut, Project Officer,
David Gordon, formerly Head of Public Health Observatory Division
For further information contact: nhs.HealthScotland-PHO@nhs.net

National and local targets

NHS boards have both a population prevalence target and a smoking cessation target. This paper considers only the prevalence target. The HEAT cessation target is measured through the national smoking cessation database and ISD Scotland, which runs the database, will report separately on local trends in smoking cessation relative to the target.[1] (There are also other smoking prevalence targets, for pregnancy and inequality, which are not covered here.)

The prevalence target, set in January 2006[6], is to reduce the smoking rate for adults (age 16+) by 17% from 26.5% in 2004 to 22.0% in 2010. Achievement is measured through the annual Scottish Household Survey (SHoS). Each Board was set its own target in 2006. Amended targets, taking account of the dissolution of Argyll & Clyde Health Board and revised sample weights in SHoS, were obtained from the Scottish Government. These were applied to each Board's projected 2010 adult population to give a target number of smokers for that year. Target prevalence rates and numbers are shown in Table 1.

Table 1 Scottish adult smoking prevalence targets for 2010

	Prevalence (%) target	Target applied to GROS projected population for 2010 to give target number of smokers
Ayrshire & Arran	23.5	71,136
Borders	20.0	18,588
Dumfries & Galloway	19.5	24,078
Fife	22.2	67,097
Forth Valley	20.8	49,660
Grampian	20.8	93,479
Greater Glasgow & Clyde	22.9	225,690
Highland	21.2	54,949
Lanarkshire	24.0	110,490
Lothian	21.4	147,815
Orkney	18.8	3,183
Shetland	19.7	3,447
Tayside	20.9	68,978
Western Isles	21.9	4,759
Scotland	**22.0**	**943,350**

Approach

A very simple approach was adopted of applying the smoking prevalence 'straight-line' trend from 1999 to 2008 (SHoS) to population projections up to 2011. A fuller technical description is given in Appendix A. Two projection methods were used. In the main body of the text we present the results from the prevalence-based method. Results from the stock-based method are given in Appendix B.

To improve the stability of trends, most calculations were based on two-year averages. A dash is used to show that multiple years are combined (e.g. 2005-06 means 2005 and 2006 calendar years combined). Financial years are shown as 2005/6. Projected figures are shaded in the tables. Tables may not sum exactly because of independent rounding of figures.

[1] The smoking cessation HEAT target requires each Board to support 8% of its smoking population (2006 SHoS) to quit smoking for one month through smoking cessation services over the period 2008/09 to 2010/11. This requires NHS Scotland to deliver 83,978 successful quit attempts (at 1 month post quit) over the three years.

Interpreting projections

Simple projections of the kind made here rely on the assumption that past trends will continue into the future: in reality, this assumption may well be violated. The projections take no account of any possible impact on smoking rates of external factors such as the recession or local or national actions from 2008 onwards. Projections provide a guide to what *might* happen under certain conditions, not a forecast of what *will* happen. They merely provide an indication of the scale of change required.

Results

The prevalence-based and stock-based projections produced very similar estimates, with the prevalence-based method giving slightly more conservative results – a slower rate of reduction in smoking – than the stock method. For simplicity, we present only the prevalence-based projections since recent trends suggest that the more conservative approach may be the more realistic. Matching tables for the stock-based projections are given in Appendix B. In all tables, projections are shaded.

Local and national smoking trends over time

Table 2 shows adult smoking rates for the period 1999-2000 to 2010-2011. Smoking prevalence is projected to decline in all NHS Boards. The steepest declines in smoking rates are projected for Shetland, Tayside and Lothian. The smallest reductions are projected for Borders, Dumfries and Galloway, Orkney and the Western Isles. Other Boards have projected reductions close to the national average.

Table 2 Local and national smoking rates for Scottish adults (aged 16+): two-year averages, 1999-00 to 2010-11

	Two-year averages					Projected rolling two-year averages		
	1999-00	2001-02	2003-04	2005-06	2007-08	2008-09	2009-10	2010-11
Ayrshire & Arran	30.3	25.3	29.9	26.8	26.0	25.6	25.2	24.9
Borders	23.7	21.4	24.4	24.7	21.9	21.7	21.6	21.4
Dumfries & Galloway	29.1	30.5	24.8	25.6	26.9	26.7	26.5	26.3
Fife	31.0	30.2	29.2	28.9	26.4	25.9	25.4	24.9
Forth Valley	30.4	29.2	27.3	26.7	28.1	27.8	27.6	27.3
Grampian	27.5	25.3	25.4	22.3	23.0	22.5	22.1	21.6
Greater Glasgow & Clyde	31.2	31.3	28.8	27.4	27.3	26.9	26.4	26.0
Highland	26.0	26.4	26.7	24.9	22.3	21.9	21.5	21.1
Lanarkshire	33.6	29.5	29.7	29.3	28.9	28.4	27.9	27.4
Lothian	29.0	28.1	25.8	23.4	22.7	22.0	21.4	20.8
Orkney	19.6	22.2	22.7	20.2	18.9	18.9	18.8	18.8
Shetland	25.0	23.1	24.2	19.5	17.2	16.5	15.8	15.1
Tayside	31.5	29.8	25.7	26.0	24.3	23.6	22.8	22.1
Western Isles	24.7	28.9	27.0	24.0	24.0	24.0	24.0	23.9
Scotland	**30.0**	**29.3**	**27.5**	**26.0**	**25.4**	**24.9**	**24.5**	**24.0**

Progress towards 2010 targets

These projections suggest Scottish smoking rates will be 24.2% in 2010 (Table 3). The national target (22%) is thus unlikely to be met if past trends continue. Lothian, Shetland and Orkney are the only Boards projected to meet their 2010 smoking targets.

Table 3 Adult smoking prevalence target and projected prevalence for 2010[a]

	Target	Projection[a]	Projected difference from target	Number of smokers difference represents
Ayrshire & Arran	23.5	25.1	+1.6	4,730
Borders	20.0	21.5	+1.5	1,400
Dumfries & Galloway	19.5	26.4	+6.9	8,562
Fife	22.2	25.1	+2.9	8,872
Forth Valley	20.8	27.5	+6.7	15,887
Grampian	20.8	21.8	+1.0	4,592
Greater Glasgow & Clyde	22.9	26.2	+3.3	32,623
Highland	21.2	21.3	+0.1	268
Lanarkshire	24.0	27.6	+3.6	16,723
Lothian	21.4	21.1	-0.3	-2305
Orkney	18.8	18.8	0.0	-2
Shetland	19.7	15.4	-4.3	-747
Tayside	20.9	22.5	+1.6	5,224
Western Isles	21.9	23.9	+2.0	445
Scotland	**22.0**	**24.2**	**+2.2**	**96,272**

[a] Average of projections for 2009-10 and 2010-11 used to give single year figure for 2010.

Our projection of 24.2% is similar to an estimate of “around 24%” made for Scotland in 2010 in the latest SHoS report.[7] (Our less conservative stock-based method gives a projected prevalence for 2010 of 24.0 .% (see Appendix B).) A glance at the published Scotland figures shows that since 2001 there have been very different levels of reduction from one year to another (Table 4). Our projections are influenced, statistically, by the standstill in prevalence from 2006 to 2008. If a more typical pattern reasserts itself for 2009 and 2010, then a reduction to “around 24%” by 2010 is entirely plausible. However, on the basis of the historical record, a reduction to the target level of 22% now appears very unlikely.

Table 4 Adult smoking prevalence, Scotland, 1999 to 2008[8]

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
30.7	29.3	28.8	28.4	28.1	26.9	26.7	25.4	25.7	25.2

As a test for sensitivity we assessed, at a Scotland level only, the impact on prevalence of the HEAT target being achieved. Based on past experience (i.e. that about one in five of those quit at one month remain non-smokers at 12 months), we concluded that it remained very unlikely that the 22% target would be reached. Nevertheless, achievement of the HEAT target will result in nearly 18,000 smokers still quit after 12 months over the target period, with the significant personal, health, societal and economic benefits that brings.

Conclusion

Simple projections are based on an assumption of the past being a reliable guide to the future. It is not. However, projections can be a useful guide to the scale of change required from the *status quo* to achieve a goal.

The scale of change required to achieve Scotland's adult smoking prevalence target of 22% by 2010 is substantial and, from these projections, it is unlikely to be achieved.

Gradual progress towards a tobacco-free country is one of Scotland's health improvement successes. Nonetheless, a sizeable minority of the population remain smokers, and substantial numbers of young people continue to be added each year. There is a continuing challenge both to build on proven methods and to develop new ways to change a seriously harmful behaviour that is, to quote a recent study of young smokers, "embedded in participants' social lives and networks".[9] Smoking prevention, cessation and wider tobacco control measures will continue to have a crucial role in maintaining momentum towards a tobacco-free country.

Appendix A: Method

Establishing the smoking baseline trend

Mid-year estimates and projected populations for Scotland and the 14 Health Boards were obtained from GROS for the years 1999 to 2011. Two-year rolling averages were calculated for the years 1999-00 to 2010-11. Smoking prevalence rates were calculated from the SHoS for 1999-00, 2001-02, 2003-04, 2005-06 and 2007-08 for each Board, using the revised weights issued by SHoS in 2009. These smoking rates were applied to the population data to produce estimates of the stock of adult smokers for these five time points.

To ensure internal consistency, Scotland was calculated as the sum of the Board estimates. These estimates for Scotland were compared against directly calculated Scotland-level estimates to provide a check on accuracy. Differences were negligible.

Smoking projections

Two methods were used to project smoking estimates forward from 2007-08. One was based on trends in prevalence rates (prevalence-based), the other on trends in smoker numbers (stock-based). We used both methods for all projections to provide a consistency and sensitivity check for the calculations. The results were, as expected, similar between the two methods but not identical. For simplicity, we present only the prevalence-based estimates in the main text. Results from the stock-based method are given in Appendix B.

All calculations were done for the 14 local NHS Boards, with Scotland then calculated as the sum of the Boards.

Prevalence-based projection

This method calculated the percentage reduction in prevalence over the period 1999 to 2008 and used that to project future rates. Note that this method calculates the proportionate reduction not the percentage point reduction. For example, if prevalence reduces from 25% to 24% that is a 0.04 (i.e. 1/25) reduction, not a 1 percentage point reduction.

The proportionate reduction in smoking rates between each successive period (from 1999-00 to 2001-02, from 2001-02 to 2003-04, and so on) was calculated for each Board. The mean of the four reductions was then taken and divided by two to produce an average annual proportionate change in smoking rates. This annual change rate was then applied to rolling two-year periods to project smoking prevalence rates for 2008-09 to 2010-11.

Stock-based projection

With the stock method, the average annual reduction in the number of smokers (the stock) for each NHS Board over the period 1999-00 to 2007-08 was calculated and this was expressed as a percentage of the average annual smoking stock for the same period. These percentage reductions were then applied to the 2007-08 stock to estimate the reduction in smoking stock for each board between 2007-08 and 2008-09. This reduction was then subtracted from the smoking stock for 2007-08 to estimate the new smoking stock for 2008-09. The annual percentage reduction in smoking stock was then applied to this new stock to estimate the reduction in smoking stock between 2008-09 and 2009-10, and so on to 2010-11.

Appendix B Stock-based projection results

The following tables present results for the stock-based projections, using matching numbering to the tables in the main text.

Table A2 Local and national smoking rates for Scottish adults (aged 16+): two-year averages, 1999-00 to 2010-11

	Two-year averages					Projected rolling two-year averages		
	1999-00	2001-02	2003-04	2005-06	2007-08	2008-09	2009-10	2010-11
Ayrshire & Arran	30.3	25.3	29.9	26.8	24.2	25.5	25.0	24.4
Borders	23.7	21.4	24.4	24.7	20.9	21.7	21.6	21.4
Dumfries & Galloway	29.1	28.1	24.8	25.6	30.5	26.7	26.5	26.2
Fife	31.0	29.1	29.2	28.9	26.6	25.8	25.2	24.7
Forth Valley	30.4	29.7	27.3	26.7	27.7	27.8	27.5	27.2
Grampian	27.5	25.1	25.4	22.3	22.1	22.4	21.8	21.2
Greater Glasgow & Clyde	31.2	31.1	28.8	27.4	27.2	26.8	26.4	26.0
Highland	26.0	25.7	26.7	24.9	23.3	21.9	21.4	21.0
Lanarkshire	33.6	29.8	29.7	29.3	31.3	28.2	27.6	27.0
Lothian	29.0	27.3	25.8	23.4	22.0	21.9	21.2	20.5
Orkney	19.6	21.3	22.7	20.2	16.0	18.7	18.5	18.4
Shetland	25.0	22.7	24.2	19.5	16.1	16.4	15.7	14.9
Tayside	31.5	28.9	25.7	26.0	27.4	23.4	22.5	21.7
Western Isles	24.7	27.7	27.0	24.0	22.5	23.9	23.7	23.6
Scotland	**30.0**	**28.3**	**27.5**	**26.0**	**25.6**	**24.8**	**24.3**	**23.8**

Table A3 Adult smoking prevalence target and projected prevalence for 2010[a]

	Target	Projection[a]	Difference	Number of smokers difference represents
Ayrshire & Arran	23.5	24.7	+1.2	3,655
Borders	20.0	21.5	+1.5	1,426
Dumfries & Galloway	19.5	26.4	+6.9	8,471
Fife	22.2	25.0	+2.8	8,370
Forth Valley	20.8	27.4	+6.6	15,724
Grampian	20.8	21.5	+0.7	3,156
Greater Glasgow & Clyde	22.9	26.2	+3.3	32,243
Highland	21.2	21.2	0.0	17
Lanarkshire	24.0	27.3	+3.3	15,007
Lothian	21.4	20.8	-0.6	-4,066
Orkney	18.8	18.4	-0.4	-65
Shetland	19.7	15.3	-4.4	-772
Tayside	20.9	22.1	1.2	4,022
Western Isles	21.9	23.7	1.8	386
Scotland	**22.0**	**24.0**	**+2.0**	**87,573**

[a] Average of projections for 2009-10 and 2010-11 used to give single year figure for 2010.

References

[1] Allender S, Balakrishnan R et al. The burden of smoking-related ill health in the UK. *Tobacco Control* 2009; 18: 262-267.
[2] Taulbut M, Gordon D. *Tobacco smoking in Scotland : an epidemiology briefing.* Glasgow: NHS Health Scotland; 2008.
[3] *Scotland's Future is Smoke-free: A Smoking Prevention Action Plan*. Edinburgh: Scottish Government; 2008.
[4] Robinson, S, Bugler, C. *General Lifestyle Survey 2008: Smoking and drinking among adults, 2008*. Newport: ONS; 2010
[5] *Scotland's People: Annual Report: results from 2007/2008 Scottish Household Survey.* Edinburgh: Scottish Government; 2009.
[6] Scottish Executive. Delivery of tobacco control and smoking cessation services by the NHSiS: managing performance and sharing success. Letter from Minister for Health and Community Care to NHS Boards, 17 January 2006.
[7] Reference 5, page 105.
[8] Reference 5, Figure 10.1 www.scotland.gov.uk/Publications/2009/09/01114213/12
[9] Borland T, Amos A. An exploratory study of the perceived impact of raising the age of cigarette purchase on young smokers in Scotland. *Public Health* 2009; 123: 673-679.