ScotPHO Local Tobacco Profiles 2013

Technical Report
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Introduction

The Scottish Tobacco Control Profiles 2013 include: (1) an overview report summarising the Scotland trends, providing spine charts and commentaries on all 14 NHS Boards, and a Definitions and Sources table, and (2) access to spine charts, rank charts, time trends and the raw data for NHS Boards and CHPs through the ScotPHO online profiling tool. These have been produced to support the reduction in tobacco use in Scotland by providing information about tobacco use, cessation and the health effects. The aim of the profiles is to help service providers, planners, policy makers and the public make informed decisions.

This document provides technical information on the 34 indicators, their derivation, descriptions of statistics and methods, and caveats about the information.

1. Interpreting the spine charts

Spine charts are commonly used in public health profiles to illustrate graphically a range of complex information in a way which it is intended will be quickly and easily understood. To aid comparison, in the overview report all the indicators are shown against the Scottish mean value (red line) as a reference. Within the online tool the user can select other comparator populations. A modified ‘traffic light’ system has been applied to identify areas which are statistically significantly ‘better’ (blue) or ‘worse’ (red) than the comparator population, or not significantly different from the comparator population (white).

To take some examples: in some cases (such as prevalence) a higher level is clearly ‘worse’ (red) and a lower level ‘better’ (blue), while in other cases (such as quit rates in cessation) a higher level is clearly ‘better’ (blue) and a lower level ‘worse’ (red).

The 95% confidence interval for an indicator value for an area was used to compare that area against the comparator value. The comparator value was treated as an exact reference value, allowing the confidence interval for an indicator value to be used to test whether the value was statistically significantly different to the comparator value. If the interval did not include the comparator value, the area was assessed as being statistically significantly different from the comparator population (perhaps ‘better’ or ‘worse’, depending on the indicator); if the interval included the comparator value, the area was assessed as being not statistically significantly different from comparator.

The 5th, 25th, 75th and 95th percentiles are also included in the spine charts to show the distribution of the indicators for the geography being analysed.

Different indicators have different lengths of bars representing the distribution, depending on the variability inherent in the data. Note that in some profiles, the illustration of the distribution may exceed the space allowed for the bar, and is therefore truncated. When the distribution is skewed, the light grey bar will be
longer on one side of the dark gray bar than the other. For example, in the case of smoking during pregnancy in the most deprived quintile, the percentages are much more widely spaced at the higher ('better') end than the lower ('worse') end.

Each indicator is based on the most recent of the time periods given in the Definition and Sources table in Appendix 1 of the overview paper. These time periods were the most recent for which data were available at a Scotland level in June 2013. Wherever possible we include data up to the end of 2012.

2. Measures used in the profiles

The measures generally follow the statistics and methods recommended by the Association of Public Health Observatories (APHO). The definitions given below are adapted from the APHO paper.

- **Proportions** are statistics where the denominator is the count of a ‘closed’ population, and the numerator is the count of members of this population that have a specified characteristic. If \( O \) is the observed number of individuals in the sample or population having the specified characteristic and \( n \) is the total number of individuals in the sample or population, then the estimated proportion is given by \( p = O/n \). In these profiles, proportions have been multiplied by 100 to obtain **percentages** for presentation purposes.

- **Directly age-sex standardised rates** have been calculated for most of the hospital patient and mortality indicators because the overall rate may vary with the age-sex structure of the populations. The direct standardisation method was used, with the age-sex specific rates of the local population applied to the age-sex structure of a standard population (in this case the original European standard population). This gives the overall rate that would have occurred in the local population if it had the same age-sex profile as the standard population. It allows valid comparisons to be made between local areas with differing population age-sex structures. In the profiles, age-sex standardised rates are expressed per 100,000 population per year.

3. Confidence intervals

A confidence interval is a range of values that is normally used to describe the uncertainty around a point estimate of a quantity, for example a mortality rate. In the case of indicators based on a sample of the population, uncertainty arises from random differences between the sample and the population itself. The stated value should therefore be considered as only an estimate of the true or

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‘underlying’ value. Confidence intervals quantify the uncertainty in this estimate and, generally speaking, describe how different the point estimate could have been if the underlying conditions stayed the same, but chance had led to a different set of data. The wider the confidence interval, the greater the uncertainty in the estimate.

Confidence intervals are given with a stated probability level. In these Profiles this is 95%, and so there is a 95% probability (ie a 19 in 20 chance) that the confidence interval includes the ‘true’ value of the indicator. The use of 95% is arbitrary, but is conventional practice in medical and public health statistics.

Appendix 1 comprises a table of the methods used to calculate confidence intervals for the different measures used in these profiles, following APHO recommendations where available.

Confidence intervals have also been used to make comparisons with the comparators as described in Section 1.

4. Geographies and populations

Where possible, raw data for the profiles was collected for exact NHS Boards and exact CHPs (Community Health Partnerships). The latter are referred to here as CHPs for simplicity, although in some areas they are called Community Health and Care Partnerships (CHCPs) or Community Health and Social Care Partnerships (CHSCP or CHaSCP) or Health and Social Care Partnerships.

We have presented the data using the 2012 configuration of a total of 34 CHPs. In this configuration the three CHPs previously within Highland Council (North Highland, Mid Highland, South East Highland) have merged into the single Highland Health and Social Care Partnership which is coterminous with the council area. Currently we have only been able to present information for the Glasgow City CHP, but because of its large size it is intended to provide data for the three sectors within the CHP - Glasgow North East, Glasgow North West and Glasgow South - in a future update.

The 34 CHP areas used in these Profiles nest within 32 councils (local authorities) in Scotland. In all but one case, the CHP and council area are almost coterminous, Fife Council being the exception which subdivides into 3 CHPs (Dumfermline & W Fife, Kirkcaldy & Levenmouth, Glenrothes & NE Fife).

All of the population estimates for the CHPs presented in the profiles are aggregations of data zone level populations provided by National Records of Scotland (NRS). Where we have used exact NHS Board indicator numerators, we have used corresponding exact published population figures as denominators in the calculation of rates. Where we have used data zone aggregations to get best fit NHS Board we have used the corresponding data zone aggregated population for the denominator.

The areas covered by ADPs (Alcohol and Drug Partnerships) are almost coterminous with CHPs, apart from the three Fife CHPs, which are aggregated
into a single ADP. For the 2010 SALSUS (Scottish Schools Adolescent Lifestyle and Substance Use Survey) data, we have used ADP geographies and therefore had to present the overall Fife ADP results for each of the three Fife CHPs. For the 2006 SALSUS data, we used local authority level data, which is identical to 32 ADPs in 2010, apart from Clackmannanshire, which is included in Forth Valley.

5. Further details on specific indicators

Please note that most of the data presented in the Tobacco Profiles 2013 are based on the individual’s place of residence, to aid public health interpretation. Percentages and rates are based on a patient’s home address (rather than the location of the hospital or antenatal booking clinic for example). However, cessation data at NHS Board level only is presented by NHS Board of service (see section on cessation indicators for more detail) to maintain consistency with other published smoking cessation information.

The raw data used to produce the indicators came from a variety of sources (see Definitions and Sources table online and in the briefing report). The aim was to obtain information from 2002 to the latest year for which data were available at Scotland level wherever possible.

Where necessary, indicators are based on more than one year of data. This is because numbers for a single year may be too small to give robust figures for the CHPs and small NHS Board areas. Combining years allows more reliable figures to be produced.

Indicators 1 to 7 – Smoking prevalence

The most appropriate indicator for smoking prevalence at small areas uses the Scottish Household Survey (SHoS), as this has a sufficiently robust sample size. The number of current smokers was obtained by a 'yes' response to the question ‘Do you smoke cigarettes nowadays?’ in adults aged 16 and over. The Scottish Health Survey contained more information on smoking, including smoking patterns of former smokers, but the sample size was too small for data to be available at CHP level.

Data was collected from SHoS for the years 2005 to 2010. Because of small sample numbers in the CHPs, data was amalgamated into three 2 year samples: 2005-2006, 2007-2008, and 2009-10.

The percentages are calculated using weighted survey estimates, with the base denoting the achieved sample size for each particular indicator. This weight takes account of the disproportionate sampling between local areas, the differential response between these areas, and any residual mismatch between the profile of responding households/adults and the profile of the population. It
is because of the degree of estimation that the numerators (i.e. the number column in the spine charts) are not shown.

Smoking prevalence was also available by gender and selected age groups. The base sample was not large enough to look at young smokers (ages 16 to 24), so we include the age groups 16-39, 40-64, and 65 and over, along with 16-64 years.

These figures were provided by the Scottish Household Survey team at the Scottish Government and the confidence intervals are calculated using the standard SHoS methodology.

**Indicators 8 to 17 – Cessation**

The primary source of data for the quit attempt and successful quit statistics is the National Smoking Cessation Database which was established by ISD Scotland to capture data recorded on the agreed national minimum dataset for NHS smoking cessation services in Scotland. The 2012 extract was taken on 9th April 2013. The second source, in the case of Greater Glasgow and Clyde NHS Board, is local information systems as recorded on 13th March 2013. Information is presented by calendar year for 2009 to 2012 inclusive. Further information on the minimum dataset and the database is available in the NHS Smoking Cessation Service Statistics (Scotland) Annual Report (2013).

It is important to note that the data in the tobacco profiles is presented by NHS Board of service, not NHS Board of residence, for consistency with national reporting. However, the CHP data is by CHP of residence of the client, not CHP of service (note: the CHP area of the client may differ from the area in which they receive cessation support).

The denominator for indicators 8 and 9 uses the Scottish Household Survey (SHoS) estimate of adult smokers aged 16 and over and NRS population estimates for the most recent or relevant year available. So, for example the 2012 cessation data uses the estimate of the adult smoking population based on 2009/2010 SHoS data and 2011 NRS population data. Additionally, we should emphasise that while the numerator uses NHS Board of service, the denominator uses NHS Board of residence. Confidence intervals have been calculated using the standard methods for proportions, without trying to take into account the sample element of the denominator.

There are differences in the types of services provided in different areas. For some areas the majority of records are from specialist smoking cessation services. For others the majority of records are from pharmacies (larger numbers of people seen, but less intensive support).

For indicators 10-12, self-reported quit outcomes based on client follow-up at different intervals after the quit date were calculated using the National Smoking Cessation Database. Quit outcomes at 12 month follow-up were calculated for years 2009 – 2011 only, as the figures for 2012 will not become available until the end of 2013. As the denominator for these indicators is total quit dates
set, this means that where there are large numbers of cases ‘lost to follow-up/smoking status unknown’ this will greatly lower the calculated percentage quit rate. There are some NHS Boards in Scotland with particularly high numbers ‘lost to follow-up/smoking status unknown’, and therefore care should be taken in comparing areas. This is particularly the case at 12 month follow-up, and Figure 1.9 below, extracted from the National Smoking Cessation Report 2013, illustrates for Scotland overall the increase in percentage of lost cases with increasing time from the quit date.

**Figure 1.9: Cumulative quit outcomes at 1, 3 and 12 months (Scotland, 2011)**

![Cumulative quit outcomes chart](chart)

In addition, quit outcomes are likely to be influenced by differences in the types of services provided (e.g. support provided by pharmacies is less intensive than that offered by specialist services), so for NHS Boards where a large number of quit attempts take place in pharmacies the overall percentage quit rates may be lower.

For indicators 13-16, the percentage of quit attempts with a successful outcome (self-reported) at one month follow-up was also calculated by deprivation quintile, as the percentage of quit attempts where the client lives in the 20%, 21%-40%, 41%-60%, 61%-80%, and 81%-100% most deprived populations in Scotland. These quintiles are based on within NHS Board/CHP Scottish Index of Multiple Deprivation (SIMD 2012). For example, the most deprived quintile in NHS Shetland represents the most deprived 20% of the population ‘within Shetland’ whilst the most deprived quintile in NHS Greater Glasgow & Clyde represents the most deprived population ‘within Greater Glasgow & Clyde’. ISD’s policy of population-weighting the quintiles means that the data zones in each quintile will differ slightly to those shown in Scottish Government releases.

Note that the definition of indicators 13-17 is different from that in the national smoking cessation annual report which gives the proportion of successful quits
in each quintile. In these profiles the denominator is quit attempts in the area overall.

Finally, the figures for the smoking cessation indicators may differ from those previously published, because the national smoking cessation database is a dynamic database.

**Indicators 18 to 24 – Pregnancy**

These indicators measure the number of women who were recorded as a current smoker at the time of their first antenatal booking appointment. The denominator was the number of women at the antenatal booking appointment with a known smoking status (those with an unknown status have been removed from the calculation to avoid possible bias resulting from large numbers with unknown status).

There is considerable pressure on women not to smoke during pregnancy, and there is evidence of under-reporting by women of their smoking behaviour at the booking clinic (see the latest ISD births report for further information).

The data was taken from the SMR02 system from 2002 to 2010. As data in the profiles tool is presented by calendar year, 2010 was the most recent year available. In order to make the data more robust, especially for smaller areas, 3 year percentages were calculated using 3 year rolling combined totals 2002-04, 2003-05, 2004-06, 2005-07, 2006-08, 2007-09, and 2008-10.

The figures were also calculated for each SIMD 2012 (Scottish Index of Multiple Deprivation 2012) quintile, where SIMD1 includes the women living in the 20% most deprived population in Scotland, and SIMD5 includes the women living in the 20% least deprived population in Scotland (indicators 19-23).

For these indicators, the within-Scotland SIMD 2012 was used for all areas (rather than the “within area” SIMD which was used for the cessation indicators).

For some of the small NHS Boards and CHPs, there are no individuals in some of the SIMD quintiles, and these will appear as n/a in the spine charts.

As the allocation across SIMD quintiles is based on the total population of Scotland, this result in different distributions across the SIMD quintiles when looking at the data at NHS Board/CHP level. Some areas, e.g. Grampian and Lanarkshire NHS Boards, which have a SIMD profile that differs significantly from that of the Scottish population as a whole, have overall results that appear inconsistent with their individual SIMD quintile results. For example, the Grampian overall result for indicator 18 appears overly favourable when comparing with the results for the deprivation quintiles. Providing SIMD-standardised results (along the same lines as age standardising) would have eliminated these apparent inconsistencies, and will be considered for future releases of the data.
Indicator 24 is based on women smoking during pregnancy as the denominator, and the number of quit attempts made with an NHS smoking cessation service by pregnant women (from the National Smoking Cessation Database) as the numerator, in order to calculate the percentage of quit attempts made by women in pregnancy. Quit attempts were available for 2009-2012, however data on pregnant smokers was only available up to 2010, so two years of data are shown for this indicator (2009 and 2010).

**Indicator 25 - Smoking attributable deaths**

This indicator has been provided by Dr J Boreham from Oxford University.

The following text is adapted from 'Mortality from tobacco in developed countries: indirect estimation from national vital statistics.' Peto R, Lopez AD, Boreham J, Thun M and Heath Jr C. Lancet 1992; 339:1268-78.

The methodology is based on the premise that in developed countries, age-sex-specific mortality rates for lung cancer, vascular disease and various other categories of disease can be used to indicate the approximate numbers and proportions of deaths due to tobacco. Thus, in the absence of direct information on smoking histories, national mortality from tobacco use can still be estimated approximately. For a particular country/sub-area in a particular year, the national mortality rates from various categories of disease are taken and certain proportions of deaths from those disease categories are attributed to tobacco use. These attributable proportions vary from one category to another, being largest for lung cancer, upper aerodigestive cancer and chronic obstructive pulmonary disease (COPD), and intermediate for vascular disease. They also vary with age, sex and CHP, being largest in populations where lung cancer is common.

**Data used in Scottish calculations:**
- smoking status and mortality data from the ACS CPS-II study\(^3\)
- Scottish mortality data from National Records of Scotland (NRS) for 2002-04, 2007-09 and 2009-11\(^4\), by sex, by 5-year age group, and by nine major cause-of-death categories: lung cancer, upper aerodigestive cancer (mouth, pharynx, larynx, oesophagus), other cancer, COPD, other respiratory disease, vascular disease, cirrhosis, other medical causes, and non-medical causes
- NRS mid-year population estimates.

**Description of calculations:** All calculations are age- and sex-specific.

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\(^2\) The combined organs and tissues of the respiratory tract and the upper part of the digestive tract.

\(^3\) The American Cancer Society’s second Cancer Prevention Study (ACS CPS-II) is a prospective study of smoking and death among more than one million Americans aged 30 or older when they completed a questionnaire in 1982.

\(^4\) The 2002-04 analysis was undertaken in 2007 as part of a larger project estimating smoking prevalence. The 2007-09 analysis was undertaken specifically for 2010 Scottish Health and Wellbeing Profiles and uses a 3-year time period to tie in with the other mortality-based indicators in those Profiles. The 2009-11 analysis was undertaken specifically for the Tobacco Profiles 2013.
1. For lung cancer, directly compare the CHP death rate with the rate in CPSII non-smokers, and attribute the excess deaths to tobacco.

2. The ratio of the absolute excess lung cancer deaths in the CHP (from 1. above) to the absolute excess in CPS-II smokers (as estimated by the ASC CPS-II study) can be regarded as an indication of the proportion of smokers in the CHP population.

3. The ratio from 2. above is applied to the CPS-II smoker excess mortality ratios (SMRs) for six separate disease categories (upper aerodigestive cancer, other cancer, COPD, other pulmonary disease, vascular disease and other medical causes) to estimate the excess mortality ratio for these diseases in the CHP as a whole (smokers plus non-smokers). Then these excess mortality ratios are halved to obtain a conservative estimate of the proportions of such deaths to attribute to tobacco. (This is because the relationship between the absolute excess of lung cancer and the proportional excess of other diseases can only be approximate, and we are guarding against overestimating the effect of tobacco on diseases other than lung cancer).

4. The excess mortality ratios are then applied to the observed deaths in the CHP for the separate disease categories, to give an attributable number of deaths that can be summed over all the categories.

There are uncertainties over the extent to which deaths from certain causes could be associated with smoking. These causes include: external causes (including fires, suicides, and accidents), neonatal deaths (including stillbirths), all other deaths under 35 years, and deaths from cirrhosis of the liver. Therefore, none of these deaths was attributed to tobacco, even though some of these deaths would have been due to smoking. Where the number of lung cancer deaths within a CHP was less than 100 (for either sex), we have included the result but it will be shown as not significant.

For 2009-11, the excess mortality ratios or smoking attributable fractions were only calculated by NHS board area, and for the smaller NHS Boards the results should be interpreted with caution. The final numbers were expressed as a percentage of all deaths which were attributed to smoking.

**Indicator 28 – Smoking attributable admissions**

Smoking attributable admissions were calculated from hospital discharge data, where diseases wholly or partially attributable to smoking were identified. The method used the ICD10 Codes and Attributable Fractions published by the Royal College of Physicians in 2000, and were applied to the hospital discharge data in specific disease groupings. Further details are available in the ScotPHO Smoking Ready Reckoner – 2011 Edition (see Appendix 1, page 8).

These numbers were expressed as three-year total and three-year average

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directly age-sex standardised truncated rates per 100,000 population aged 16 and over.

**Indicators 26, 27, 29, 30 - Lung cancer and Chronic Obstructive Pulmonary Disease (COPD)**

Both lung cancer and Chronic Obstructive Pulmonary Disease (COPD) are strongly associated with a history of smoking.

Indicators 26 and 27 (lung cancer and COPD deaths) are based on underlying cause of death as recorded by National Records of Scotland (NRS).

Indicator 29 is the number of registrations with a primary diagnosis of lung cancer, taken from the Scottish National Cancer Registry.

Indicator 30, COPD incidence, uses a proxy measure of incidence: the number of patients discharged from hospital with COPD recorded in the main diagnosis field during that hospital stay, who had not had a COPD hospital stay in the 5 years prior to the stay of interest.

Lung cancer uses ICD10 codes C33-C34. COPD uses ICD10 codes J40-J44 and J47.


The confidence intervals were calculated using the Dobson method (see Appendix 1).

**Indicators 31 to 34 – School children**

The figures for indicators 31-34 were taken from the Scottish Schools Adolescent Lifestyle and Substance Use Surveys (SALSUS) of 2006 and 2010. Data from the 2008 SALSUS survey was excluded, as the target sample size was too small (9,500 school children in 2008, compared to 34,000 in 2006 and 35,000 in 2010).

The surveys were based on S2 and S4 pupils (mainly 13 and 15 years old respectively, at the time of the survey) across Scotland. NHS Board and CHP geography was taken from the SALSUS files provided by Ipsos Mori (note: the figures do not directly agree with the numbers published in the 2006 and 2010 SALSUS reports).

The indicators used were the smoking prevalence for S2 and S4 pupils (both sexes), as well as the smoking prevalence for boys in S2 and S4 combined and girls in S2 and S4 combined.
The SALSUS data have complex design effects. This relates to the fact that entire classes rather than individual pupils were sampled and therefore there is clustering. It is possible for Ipsos Mori to calculate the precise design effects for every indicator, however this would be very time consuming. The simpler and more common approach used is to work out an average design effect (based on the handful of specific design effects Ipsos Mori have already worked out) and apply this to the rest of the analysis. The average design effect in the SALSUS analysis was 1.2, so we divided the base sizes (denominators) by that number and then calculated confidence intervals using the Wilson Score method (see Appendix 1). This had the effect of widening the confidence intervals compared to a simple analysis of the confidence intervals.

Appendix 1: Methods used to calculate confidence intervals

<table>
<thead>
<tr>
<th>For indicator presented as:</th>
<th>Method</th>
<th>Comments/ Assumption</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proportions and Percentages</strong></td>
<td>Wilson Score method</td>
<td>Wilson Score performs well when the numerator and/or denominator is small.</td>
<td>Wilson EB. Probable inference, the law of succession, and statistical inference. <em>J Am Stat Assoc</em> 1927;22:209-12.</td>
</tr>
<tr>
<td><strong>SHoS percentages</strong></td>
<td>Standard approach</td>
<td>Incorporates an atypical design factor of 1.2 to adjust the calculation to reflect the fact that the survey does not use a simple random sample. CIs are approximate.</td>
<td>Chapter 8 of the SHS 2011 Technical Report - <a href="http://www.scotland.gov.uk/Resource/0041/00417897.pdf">http://www.scotland.gov.uk/Resource/0041/00417897.pdf</a></td>
</tr>
<tr>
<td><strong>SALSUS percentages</strong></td>
<td>Standard approach after dividing base size by 1.2</td>
<td>The SALSUS data have complex design effects. This relates to the fact that entire classes rather than individual pupils are sampled and therefore, there is clustering. It is possible to calculate the precise design effects for every indicator, Email from Lorraine Murray at IPSOS MORI</td>
<td></td>
</tr>
</tbody>
</table>
however, this would be time consuming and therefore costly. The simpler and more common approach that tends to be used is to work out an average design effect (based on the handful of specific design effects already worked out) and apply this to the rest of the analysis. The average design effect in the SALSUS analysis was 1.2, so we divided the base sizes by that number. This had the effect of widening the confidence intervals by the appropriate amount.