**APPENDIX C**

**Informing decisions on investment to reduce health inequalities (III) in Scotland: user guide**

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ScotPHO
Public Health Information for Scotland

The
Scottish Public Health Observatory
*"Working to improve Scotland's health and reduce health inequalities"*

# CONTENTS

## 1.    Introduction

The 'Informing decisions on investment to reduce health inequalities' (III) project seeks to assist decision-makers by quantifying the likely impacts of a range of feasible interventions on health outcomes and health inequalities.

The III tool comprises seven Excel spread sheets which use the best available data and evidence to model the potential impact of selected interventions on years of life lost, all-cause hospitalisations and health inequalities on outcomes for defined populations at 2-, 10- and 20-year intervals.

This user guide is part of a suite of outputs. It is advised that users read the following materials in advance of using the intervention tools in order to fully understand the limitations of the work and the assumptions behind each of the models. This is necessary to facilitate the appropriate interpretation of modelled results.

1. User guide
2. III Commentary (which provides illustrative results and discusses the interpretation of findings in the context of the health inequalities challenge facing Scotland)
3. The 'notes' worksheet of the model in question

For more detailed information, please see the technical report available at: www.scotpho.org.uk/.

## 2.    What the tools cover

There are seven tools in all, published as Excel spreadsheets, which model the impact of the following interventions:

- Changes in income distribution
- An increase in the price of tobacco products as a result of tobacco taxation
- NHS smoking cessation services
- Alcohol brief interventions (ABIs)
- 'Counterweight' weight-management service
- Changes in levels of employment
- Changes in the extent of active travel (walking and cycling) among commuters

The income tool allows users to look at the impact of five different income interventions (all of which change the income distribution of the Scottish population):

- 1p on the Scottish rate of income tax
- A 10% rise in Council Tax
- A 10% increase in the value of Jobseeker's Allowance and Income Support
- A 10% increase in basic and 30-hour Working Tax Credits
- Introduction of a 'living wage'

## 3.    How to use the tools

It is recommended that users download and save the tools they are interested in to allow them to work offline.

| Please note: Macros need to be enabled for the tools to work properly. |
| --- |

## 3.1    Users inputs

When users open a tool, they are presented with the interface (III Tool Overview). Figure 1 on page 6 shows an example of a user interface (using the smoking cessation tool as an example).

By altering inputs in the pale yellow box at the top of the screen, users can:

- Select the **geographical area of interest** from the drop-down menu. Users have the option of modelling for Scotland, NHS Boards or local authorities. The default is Scotland.
- Enter the **number of people users wish to target with the intervention** (for all tools except tobacco tax and income), by typing into this field. Income interventions are assumed to affect the whole population; tobacco tax is assumed to affect 80% of adult smokers (evenly across all quintiles).
- Choose a **targeting strategy** (for all tools except tobacco tax and income) from the drop-down menu.

There are four (simple) targeting strategy options available:

- **Even distribution** (interventions are divided evenly across the five Scottish Index of Multiple Deprivation (SIMD) quintiles).
- **Targeting to Quintile 1** (all the interventions are targeted at the most deprived quintile).
- **Targeting to Quintile 1/Quintile 2** (all the interventions are targeted at the most deprived two quintiles).
- **Proportionate to need** (the interventions are distributed according to the distribution of the population eligible for the intervention across the five SIMD quintiles).

Orkney, Shetland and the Western Isles have none of their population resident in the most deprived quintile. Therefore the tools are unable to model outcomes for the most deprived quintile or to calculate meaningful measures of inequality for these areas.

Table 1 (below) illustrates how the targeting function works in practice, using 100,000 smoking cessation interventions as an example.

**Table 1: Distribution of 100,000 smoking cessation interventions by SIMD quintile, four targeting strategies ('000s)**

|  | Even | Target to Q1 | Target to Q1 and Q2 | Proportionate to need |
|---|---|---|---|---|
| Q1 – most deprived | 20 | 100 | 50 | 31 |
| Q2 | 20 | 0 | 50 | 25 |
| Q3 | 20 | 0 | 0 | 19 |
| Q4 | 20 | 0 | 0 | 16 |
| Q5 – least deprived | 20 | 0 | 0 | 9 |

Targeting strategies can be changed using the drop-down menu for all tools except **tobacco tax** and **income**. This is because it is assumed that the tobacco tax affects 80% of smokers[1], while changes to the income distribution are assumed to affect 100% of the population.

While this approach is evidence-informed, it should be noted the success or otherwise of targeting will depend on the intervention, the population, and the strategy used, and it may not be possible to achieve 'perfect' targeting. For example, delivering interventions through a GP practice in a deprived area will be only partially successful in targeting the most deprived quintile, since not all patients will actually be in this group.

**Please note: there may be a short delay when a change is made to a tool to allow Excel to recalculate the result. This is especially noticeable for the income tool.**

### 3.2    Baseline information

For each model, users are presented with key information to inform them when using the tool. For all models, we have assumed that the baseline year is 2012.

The section includes the age group of interest for the intervention (adults aged 15+, adults aged 15–64, or the whole population).

For all models, except income, figures are presented on:

- The **total number of people 'at risk' in the population** (e.g. number of smokers, people with a BMI of 30+, people with hazardous/harmful alcohol consumption, people not in employment).
- An estimate of the **theoretical maximum number of people** who might benefit from an intervention. This is based on population survey data on the proportion of people in the at-risk group who would like to change that characteristic.
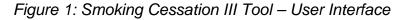
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[1] Although the tax will nominally affect all smokers, it is assumed that 20% will be able to avoid/evade it by switching to low or untaxed tobacco.

- For alcohol brief interventions and smoking cessation, estimates of the total number of annual interventions delivered are also presented.

Users can use this information to help plan decisions on the number of interventions that are feasible in their geography of interest.

For tools where it is possible to amend the number of interventions, if users enter a number of interventions that is greater than the theoretical maximum that might benefit, they will be presented with an error message, '**Too high – please check & re-enter**'.

For all sub-national geographies, models are based on the application of national rates (e.g. mortality) to local populations. This is considered sufficient for modelling purposes but means that the data within the model will only approximate actual local figures and will not reflect geographical variations. The primary purpose of this approach is to avoid any issues of disclosure. Similarly, for hospital admissions, local data on the overall number is used, but the number in each population sub-group is modelled based on national distributions; for this reason the baseline number of admissions in the most deprived quintile is not presented.

*Figure 1: Smoking Cessation III Tool – User Interface*



Users can change the geography of interest, the number of people to 'treat' with the intervention (except for tobacco tax and income, where these are "given") and the targeting strategy **here**.

This pale blue section shows **outcomes** from the model, including years of life gained, hospitalisations prevented and comparative health inequalities. It also estimates the direct financial savings from the intervention.

Baseline information on the number of people 'at risk', the plausible maximum who might actually benefit from the intervention, and other summary information is displayed **here**.

Content of the tool screenshot:

**Informing Investment to tackle health Inequalities in Scotland (III) - Smoking Cessation**

What is the nature of the intervention? Scotland's national smoking cessation programme, which delivers universal smoking cessation services across all NHS Boards. The model assumes that the maximum number of who could be reached is 74% (all those smokers who want to quit) *(Source: Knowledge Attitudes and Motivations to health module of the Scottish Health Survey, 2008-2011)*.

1. Choose geography
2. Enter number treated
3. Choose targeting strategy

| Geography | Scotland |
|---|---|
| Intervention name | Smoking cessation |
| Additional number of people treated | 50000 |
| Targeting strategy | Proportionate to need |
| Total direct cost of intervention (£m, 2012 prices) | 5.000 |

Interventions target the pop. distribution of smokers

| Baseline Information: Smoking Cessation | |
|---|---|
| Baseline year | 2012 |
| Age group | 16+ |
| Estimated no. of smokers (2012) | 992425 |
| Of which, Q1 only: | 298435 |
| Of which, Q1 & Q2: | 539482 |
| Estimated no. smokers who want to quit | 734394 |
| Of which, Q1 only: | 220842 |
| Of which, Q1 & Q2: | 399216 |
| ual continuous inpatient stays (2012) | 1082362 |
| Of which, Q1 only: | 270251 |
| Of which, Q1 & Q2: | 508745 |
| ual cessation service quit attempts: (2008-12) | 87400 |
| Of which, Q1 only: | 32503 |
| Of which, Q1 & Q2: | 54269 |
| ct financial costs of intervention | |
| Cost per intervention (£, 2012 prices) | 100 |

| Model Outcomes (whole population) | 2 years | 10 years | 20 years |
|---|---|---|---|
| Years of life gained | 320 | 2490 | 4519 |
| Continuous inpatient stays prevented | 191 | 1535 | 2845 |

| Model Outcomes (Most deprived SIMD quintile) | 2 years | 10 years | 20 years |
|---|---|---|---|
| Years of life gained | 129 | 947 | 1638 |
| Continuous inpatient stays prevented | 69 | 528 | |

| Model Outcomes (comparative health inequalities) | 2 years | 10 years | 20 ye |
|---|---|---|---|
| RII: Years of life lost (without intervention) | 1.210 | | |
| RII: Years of life lost (with intervention) | 1.210 | 1.093 | |
| RII: years of life lost (difference) | -0.0002 | -0.0002 | |
| RII: continuous inpatient stays (without intervention) | 0.6988 | 0.5870 | |
| RII: continuous inpatient stays (with intervention) | 0.6986 | 0.5868 | |
| RII: continuous inpatient stays (difference) | -0.0002 | -0.0002 | |

| Direct financial savings | 2 years | 10 years | 20 ye |
|---|---|---|---|
| Reduced continuous inpatient stays (£m) - all | 0.5 | 3.8 | 7.0 |
| Reduced continuous inpatient stays (£m) - MDQ | 0.2 | 1.3 | 2.3 |

How are costs and financial savings estimated?
The cost per smoking cessation intervention was estimated at £98 in 2011, based on Evaluation of quit4u, NHS Health Scotland 2012 (available http://www.healthscotland.com/documents/5827.aspx). This has been adjusted to 2012 prices. Geue et al. (2012) estimated the cost of a con inpatient stay at £2113 in 2006/07 - this has been adjusted to 2012/13 prices.

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Where do I get more information?
The "Notes" tab describes the purpose of each worksheet.
For more details, including a commentary, user guide and technical report please see: http://www.scotpho.org.uk/

### 3.3 Model outcomes

Each tool reports outcomes, at 2, 5 and 20 years. Results are cumulative.

**Mortality**

- Years of life gained, for the whole population
- Years of life gained, for the most deprived SIMD quintile

The results are based on projecting 'years of life lost' (YLL) (a measure of premature mortality which gives greater weight to deaths in younger age groups, and lower weight to older age groups).

**Hospitalisations**

- Continuous inpatient stays prevented, for the whole population
- Continuous inpatient stays prevented, for the most deprived SIMD quintile

> **Please note: it was not possible to model the impact of active travel on continuous inpatient stays, since no studies to date have quantified the effect of physical activity on 'all-cause' hospitalisations.**

**Health inequalities**

The measure of health inequalities used is the Relative Index of Inequality (RII). The RII is a summary measure of inequality which measures the relative effect on health of moving from the most deprived SIMD quintile to the least deprived SIMD quintile. It takes into account differences across the whole gradient, not just the gap between the most and least deprived.

- The Relative Index of Inequality (RII) for years of life lost – without the intervention, with the intervention and the difference between the two
- The Relative Index of Inequality (RII) for continuous inpatient stays – without the intervention, with the intervention and the difference between the two. More information on the RII can be found at: www.scotpho.org.uk/publications/reports-and-papers/494-measuring-socio-economic-inequalities-in-health-a-practical-guide-

**Direct costs of the intervention**

Indicative direct costs of delivering the interventions are presented for all models except income and active travel. Please note that although these are based on the best available information, they may not capture the full costs of delivering the intervention, including the opportunity cost. Results are presented in 2012 prices.

**Note that the estimated costs of the employment model are recurring, whereas smoking cessation, ABI and counterweight are considered as one-off costs.**

**Direct financial savings**

Only the direct savings to the NHS of preventing continuous inpatient stays have been modelled. No attempt has been made to quantify wider cost savings that may arise from successful interventions e.g. reduced prescription costs, reduced spending on tax credits and out-of-work benefits.

## 3.4    Interpreting results

**Mortality**

Positive numbers in the 'years of life gained' rows mean that the intervention is increasing 'years of life gained', and therefore reducing premature mortality. Negative numbers mean that the intervention is reducing 'years of life gained' and therefore increasing premature mortality.

**Hospitalisations**

Positive numbers in the 'continuous inpatient stays prevented' rows mean that the intervention is preventing more hospitalisations. Negative numbers mean that the intervention is increasing the number of hospitalisations.

**Health inequalities**

If the differences in the RII: years of life lost (difference) and RII: hospital admissions (difference) rows are negative, the intervention is reducing inequalities. If it is positive, inequalities are increasing.

## 3.5    User modification of the tools

The current set of tools model results by drawing on a range of data and assumptions. If users feel that some of these assumptions are unrealistic, they can be modified. A list of the data sources used is shown in appendix 1. More detail about the assumptions that underpin the models is available in the technical report and commentary.

The simplest example is the assumptions made about the **prevalence** of the population 'at risk' (from the effects of smoking, hazardous or harmful drinking, unemployment etc.). If users have preferred data (for example, from their own local surveys) broken down by age band, sex and SIMD, they can amend the relevant column in the 'Prevalence' worksheet of the relevant tool, and the model will produce revised outputs accordingly.

## Appendix 1: III Tool – data sources

| Model | Definition | Time period | Source | Notes |
|---|---|---|---|---|
| **Prevalence** | | | | |
| Smoking cessation; tobacco tax | Proportion of adults aged 16+ who smoke cigarettes by age band, gender and SIMD (2012) quintile | 2012 | Scottish Household Survey | Age bands were 16–24, 25–34…75+. We applied 10-year prevalence rates to 5-year bands and applied 75+ smoking rates to all age band aged 75+. |
| Alcohol brief interventions | Proportion of adults aged 16+ drinking at hazardous/harmful levels (based on self-reported weekly alcohol consumption) by age band, gender and SIMD (2009) quintile | 2008–2011 | Scottish Health Survey | Age bands were 16–24, 25–34…75+. We applied 10-year prevalence rates to 5-year bands and applied 75+ hazardous/harmful rates to all age band aged 75+. |
| Counterweight | Proportion of adults aged 16+ with a measured BMI of 30+ (obese) by age band, gender and SIMD (2009) quintile | 2008–2011 | Scottish Health Survey | Age bands were 16-24, 25–34…75+. We applied 10-year prevalence rates to 5-year bands and applied 75+ obesity rates to all age band aged 75+. |
| Employment | Proportions of those not in employment (aged 25–69) or employment, education or training (aged 15–24) by age band, gender and SIMD (2012) quintile | 2012 | Annual Population Survey | Age bands were 16–19, 25–29…65+. We applied 65+ rates to the 65–69 age band. |

| Active commuting | Proportions of those in employment by age band, gender and SIMD (2012) quintile | 2012 | Annual Population Survey | Age bands were 16–19, 25–29…65+. We applied 65+ rates to the 65–69 age band. |
|---|---|---|---|---|
| Active commuting | Proportion of employed adults aged 16+ who do not work from home, by age band, gender and SIMD (2012) quintile | 2008–2012 | Scottish Household Survey | Age bands were 16–24, 25–34…65+. We applied 10-year prevalence rates to 5-year bands and applied 65+ smoking rates to all age band aged 65+. |
| Active commuting | Proportion of adults aged 16+ who travel to work (as a driver or passenger) by car or van, by age band, gender and SIMD (2012) quintile | 2008–2012 | Scottish Household Survey | Age bands were 16-24, 25–34…65+. We applied 10-year prevalence rates to 5-year bands and applied 65+ smoking rates to all age band aged 65+. |
| Active commuting | Proportion of adults (excluding full-time students) who travel to work by car or van less than 3 miles | 2001 | 2001 Census of Population | Census data recorded distance travelled in km. 35% travelled less than 5km=less than 3.1 miles. This was adjusted downwards to 33% to reflect both this and increased commuting distances since 2001. We assumed this was uniform by age, sex and SIMD quintile. |

| **Income distribution** | | | | |
|---|---|---|---|---|
| Income | Equivalised mean weekly income AHC, Scotland (£) | 2008/09–2010/11 | Family Resources Survey | |
| **Baseline data** | | | | |
| All | Number of continuous inpatient stays (Scottish residents only) by NHS Board (2014), local authority and SIMD (2012) quintile (population-weighted) | 2012 | Information Services Division, NHS National Services | Age bands are 16+ for smoking cessation, tobacco tax, counterweight and ABIs, 15–64 for active commuting, 15–69 for employment and all ages for income. |
| All | Mid-year population estimates, by age band, gender, NHS Board (2014), local authority and SIMD (2012) quintile (population-weighted) | 2012 | National Records for Scotland | Prevalence data are applied to these figures to estimate the 'at risk' group; e.g. number of smokers or people not in employment. |
| Smoking cessation | Proportion of smokers aged 16+ in contemplation/preparation/action or maintenance category | 2008–2011 | Scottish Health Survey – Knowledge, Attitudes and Motivations Module | This was assumed to be invariant across sex, age band and SIMD quintile. It was combined with the 'at risk' figure to estimate the number of smokers who want to quit. |
| Smoking Cessation | Number of annualised quit attempts by NHS Board (2014)*, local authority | 2008–2012 | Information Services Division, NHS National Services | Data were collated using revisions after each calendar year has been produced. |

| | | | | However, the Smoking Cessation Database is a dynamic database, incorporating ongoing corrections, so the information provided here is accurate only as at the time of collection. Subsequent publications covering the same time periods may therefore vary from this publication. |
|---|---|---|---|---|
| Alcohol brief interventions | Proportion of hazardous/harmful drinkers aged 16+ in contemplation/preparation/action or maintenance category | 2008–2011 | Scottish Health Survey – Knowledge, Attitudes and Motivations Module | This was assumed to be invariant across sex, age band and SIMD quintile. It was combined with the 'at risk' figure to estimate the number of hazardous/harmful drinkers who want to quit. |
| Alcohol brief interventions | Number of alcohol brief interventions delivered in a primary care setting only, NHS Board (2014) | 2013/14 | Information Services Division, NHS National Services | |
| Counterweight | Proportion of adults aged 16+ with a BMI of 30+ in contemplation/preparation/action or maintenance category | 2008–2011 | Scottish Health Survey – Knowledge, Attitudes and Motivations Module | This was assumed to be invariant across sex, age band and SIMD quintile. It was combined with the 'at risk' figure to estimate |

| | | | | the number of obese adults who want to control their weight. |
|---|---|---|---|---|
| **Excel tool** | | | | |
| All | All-cause deaths in Scotland (Scottish residents only) by sex, age band. NHS Board (2014), local authority and SIMD (2012) quintile (population-weighted) | 2007–2011 (pooled data) | National Records for Scotland | Used to provide baseline information on mortality rates by age, sex and SIMD |
| All | All cause continuous inpatient stays (Scottish residents only) in Scotland by sex, age band, NHS Board (2014), local authority and SIMD quintile (population-weighted) | 2007–2011 (pooled data) | Information Services Division, NHS National Services | Used to provide baseline information on hospitalisation rates by age, sex and SIMD |
| All | Mid-year population estimates by sex, age band, NHS Board (2014), local authority and SIMD quintile (population-weighted) | 2007–2011 (pooled data) | National Records for Scotland | Used to provide baseline information on mortality and hospitalisation rates by age, sex and SIMD |
| Income | Scotland (1977-based) European age–sex standardised mortality rates (Scottish Residents only) (EASRs per 100,000) : All ages | 2011 | Information Services Division, NHS National Services | Used to provide baseline information on mortality rates by age, sex and SIMD |
| Income | Scotland (1977-based) European age–sex standardised Continuous Inpatients Stay (CIS) rates (EASRs per 100,000): All ages by SIMD (2012) Income quintile | 2011 | Information Services Division, NHS National Services | Used to provide baseline information on hospitalisation rates by age, sex and SIMD |
| **Model data** | | | | |
| All | All-cause deaths (Scottish residents only) in Scotland by sex, age band, NHS Board (2014), local authority and SIMD quintile (population-weighted) | 2001–2012 | National Records for Scotland | Used by the logistic regression model to predict trends in mortality |
| All | All cause continuous inpatient stays (Scottish residents only) in Scotland by sex, age band, | 2001–2012 | Information Services Division, NHS National | Used by the logistic regression model to |

| | | | | |
|---|---|---|---|---|
| | NHS Board (2014), local authority and SIMD quintile (population-weighted) | | Services | predict trends in hospitalisations |
| All | Mid-year population estimates, by age band, gender, NHS Board (2014), local authority and SIMD quintile (population-weighted) | 2001–2012 | National Records for Scotland | Used by the logistic regression model to predict trends in mortality and hospitalisations |
| All | Mid-year population projection estimates (2010-based), by age and gender, NHS Board (2014), local authority | 2010–2035 | National Records for Scotland | Used by the logistic regression model to predict trends in mortality and hospitalisations |
| All | Mid-year projected death estimates (2010-based), by age and gender, NHS Board (2014), local authority | 2010–2035 | National Records for Scotland | Used by the logistic regression model to predict trends in mortality |

* In order to establish the new geography allocation for the Health Boards, a match using a lookup table by datazones was made. A small proportion of datazones were blank, or not matched using the lookup table. This has been assessed and determined that the matched proportion was statistically representative of the whole population.