Scottish Atlas of Variation
User Guide
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Introduction

This document has been created as a quick guide on how to use the Scottish Atlas of Variation to help users access and understand the information available.

The Scottish Atlas of Variation provides a range of indicator based maps presented at a Health Board of Residence and Local Authority level. The Atlas aims to highlight any geographical variation that exists in the provision of health services and associated health outcomes. It is designed to facilitate discussion and raise questions about why differences occur and promote improvement through this conversation.

Accessing the Atlas of Variation

The Scottish Atlas of Variation dashboard can be accessed via the ISD Scotland website under the products & services section here: www.isdscotland.org/Products-and-Services/Scottish-Atlas-of-Variation/
Dashboard

View the Atlas

On accessing the Scottish Atlas of Variation website, users will find the aims of the Atlas, links to Realistic Medicine, supporting documentation and the latest project updates from the pages available (Figure 1).

The interactive dashboards are located within the View the Atlas tile. Users navigate to maps by selecting a theme (Figure 2).

The indicators are reported at both Health Board of Residence and Local Authority level for Scotland. Further detail can be found in the Introduction page or FAQ section of the Atlas web pages: www.isdscotland.org/Products-and-Services/Scottish-Atlas-of-Variation/.

Figure 1

Scottish Atlas of Healthcare Variation Beta
Exploring geographical variation in the health & care system in Scotland

Changes to View the Atlas navigation are in preparation for moving to a new website in 2020. This creates opportunities for the Atlas to be flexible to further developments and protects against performance issues as the number of maps increases.
Figure 2

Scottish Atlas of Healthcare Variation Beta
Exploring geographical variation in the health & care system in Scotland

View the Atlas

The Scottish Atlas of Healthcare Variation aims to highlight geographical variation that exists in the provision of health services and associated health outcomes.

The tool is designed to highlight variation and no judgement on the performance or inferences on quality of care of one geographical area against another should be concluded.
Drop-down menus

On each interactive dashboard the user is presented with drop-down menus to select the year and the map they wish to view, and a toggle to change the geography level from Local Authority of Residence to Health Board of Residence (Figure 3). Click on the arrows and the radio button to update the selection. The map, charts and text will update automatically when the selection is changed.

Figure 3

![Rate of tonsillectomy procedures per 100,000 population by Local Authority; 2017/18](image)

Explore icon

This icon, located in the top-right of the dashboard, provides useful links where further information can be found including the following documents: User Guide, Methodology, Metadata, and Data File. It also links to the Atlas web pages.

Information icons

When the cursor hovers over the information icons located at the top right-hand corners of the map and charts, a text box will appear which provides the user with information about how to interpret the visualisation.

Reference icons

This icon provides links to external sites referenced in the narrative e.g. NHS Inform or the Scottish Burden of Disease.
Tooltips

A tooltip will appear when the cursor is positioned over data points on all of the maps and charts in the dashboard. The tooltip contains relevant information for the highlighted Health Board or Local Authority including: the standardised rate per 100,000 population and the significance of the difference from Scotland; or the crude percentage rate depending on the map selected. The tooltip will disappear when the cursor is moved away.

Context, Variation and Actions

The information contained in the above text boxes will update depending on the map selected. The accompanying clinical narrative under the headings of Context and Actions has been provided by clinical specialists in the specialty area selected. The narrative provides background information on the particular selection and outlines actions that are currently being undertaken to reduce the variation within the healthcare system in Scotland.

In the Variation text box, there is commentary on the observed variation for the current procedure and geography selection. The ‘fold-variation’ value, referenced in the narrative, identifies the difference between the highest and lowest standardised rates for the procedure and geography level selected. For example, if the highest rate of procedures per 100,000 population was 400 and the lowest rate was 200, this would be a 2-fold variation.
Statistical Significance Map

The map of Scotland (Figure 4) highlights each Health Board of Residence or Local Authority in a colour indicating how significantly different its indicator value is from the Scotland value, and in which direction. Please refer to the Methodology document on the Atlas of Variation Supporting Documentation web page for details on how this is calculated.

The legend, positioned alongside the map, identifies the five colours used to indicate significance higher or lower than Scotland at the 95% and 99.8% levels. The dark and light orange has been used to colour areas where the indicator value is higher than Scotland, and the light and dark blue has been used to colour areas where the indicator value is significantly lower than Scotland. The light grey colour indicates that the indicator value is not significantly different from Scotland.

Click on a region on the map to highlight the location on all charts. The user needs to unclick the selection on the map to remove the highlighting.

Figure 4: Map of Scotland with Local Authorities shaded by significance of the difference from Scotland.
Crude % Range Map

The map of Scotland (Figure 5) highlights each Health Board of Residence or Local Authority in a colour indicating the range of % rates from lowest to highest. Please refer to the Methodology document on the Atlas of Variation Supporting Documentation web page for details on how this is calculated.

The legend, positioned alongside the map, identifies the five colours used to indicate the % same day surgery rate. The categories are shaded from dark purple (lowest % rate achieved) to light blue (highest % rate achieved).

Click on a region on the map to highlight the location on all charts. The user needs to unclick the selection on the map to remove the highlighting.

Figure 5: Map of Scotland with Local Authorities shaded by % rate.
Dot plot with 95% confidence intervals

The dot plot with 95% confidence intervals (Figure 6) shows the directly standardised rates for each Health Board or Local Authority in sequence from highest to lowest. The colour of each dot corresponds to the significance-based classification as shown on the map. The Scotland value is displayed as a horizontal grey line across the chart.

A vertical line through each data point visualises the 95% confidence limits of the value. Please refer to the Methodology document for details on how this is calculated.

Hover over the data points to reveal a tooltip with information about the indicator, time period, location, population, significance of difference from Scotland and data sources.

Figure 6
Crude % rate dot plot

The % rate dot plot (Figure 7) shows the % rate for each Health Board or Local Authority in sequence from highest to lowest. The colour of each dot corresponds to the same % classification as shown on the map. The Scotland value is displayed as a horizontal grey line across the chart.

Hover over the data points to reveal a tooltip with information about the indicator, time period, location, number of same day surgery procedures, total number of procedures and data sources.

Figure 7

% Same Day Surgery Rates; 2017/18
Funnel plot

A funnel plot (Figure 8) provides an alternative visualisation to the dot plot by plotting the directly standardised rates for each Health Board or Local Authority, against their populations on the x-axis.

Lines on the plot illustrate the 95% ('warning') and 99.8% ('control') limits – the light grey lines are the ‘warning’ limits and the dark grey lines are the ‘control limits’. Please refer to the Methodology document for more detail on these. They allow us to see how well the variation appears to be controlled overall by the factors accounted for in the standardisation (age and sex). The use of warning and control limits corresponds conceptually to the significance of difference from Scotland, but the results do not correspond exactly. The limits can potentially highlight areas where substantial deviation from the national average may warrant further examination.

Hover over a data point to reveal a tooltip with information about the indicator, time period, location, population, indicator value and significance of difference from Scotland.

Figure 8
Trend over time

**Figure 9**

Time series analysis is provided by a simple line chart (Figure 9) which plots the indicator value for the past five financial years. The user can select a location from the drop-down to add to the chart to compare with Scotland. The blue line is the selected location (Health Board or Local Authority) and the grey line is the indicator value for Scotland.

**Figure 10**

The box and whisker plot (Figure 10) plots the standardised rates or the crude % rate for the Health Boards or Local Authorities (depending on the selection) in sequence from lowest to highest, for each financial year. A central ‘box’ indicates the inter-quartile range; that is, it extends from the 25th to the 75th percentiles (the middle 50% of data values), with the median indicated by a line. The ‘whiskers’ extend out to the minimum and maximum values.

If the selected map includes standardised rates, the fold-value is also shown under the financial year to allow a quick comparison across the time period.

By looking at the maximum and minimum extent of the data we are able to see the change in the spread of values (or the variation) over the past five financial years.
Table

There is a table (Figure 11) located at the end of the dashboard which gives the key data from the visualisations in a tabular format and will update depending on the procedure and year selections.

The surgical procedure, heart failure, stroke, colorectal cancer incidence, colorectal cancer mortality and colonoscopy tables present the crude rates, standardised rates, and the upper and lower 95% confidence intervals for the geography level selected.

The % same day surgery (BADS) and bowel cancer screening % uptake tables present the number of procedures/tests, relevant denominator, crude % rate and the aspirational goal/target.

The ‘Triple Whammy’ and ‘Statins’ tables present the % prescribed crude rates, % prescribed standardised rates, and the upper and lower 95% confidence intervals for the geography level selected.

The Scotland value is given in the first row of the table. The scroll bar on the right hand side of the table can be used to view the locations that are not immediately visible in the table.

Figure 11

<table>
<thead>
<tr>
<th>Crude and standardised rates by Local Authority: 2016/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude rate per 100k population</td>
</tr>
<tr>
<td>---------------------------------</td>
</tr>
<tr>
<td>Scotland</td>
</tr>
<tr>
<td>Aberdeen City</td>
</tr>
<tr>
<td>Aberdeenshire</td>
</tr>
<tr>
<td>Angus</td>
</tr>
<tr>
<td>Argyll &amp; Bute</td>
</tr>
<tr>
<td>City of Edinburgh</td>
</tr>
<tr>
<td>Clackmannashire</td>
</tr>
</tbody>
</table>
Deprivation analysis

The Scottish Index of Multiple Deprivation (SIMD) is the Scottish Government's official tool for identifying areas in Scotland concentrations of deprivation by incorporating several different aspects of deprivation (multiple-deprivations) and combining them into a single index.

Concentrations of deprivation are identified in SIMD at Data Zone level and can be analysed using this small geographical unit. The use of data for such small areas helps to identify 'pockets' (or concentrations) of deprivation that may be missed in analyses based on larger areas such as council wards or local authorities.

By identifying small areas where there are concentrations of multiple deprivation, the SIMD can be used to target policies and resources at the places with greatest need. The SIMD identifies deprived areas, not deprived individuals.

Within-Scotland population-weighted quintiles are used in this analysis and are calculated by ranking all Data Zones in Scotland from most to least deprived and then splitting this into 5 deprivation quintiles with approximately 20% of the Scotland population in each quintile.

Some parts of the country will not be represented across the deprivation spectrum. In SIMD 2016, Orkney and Shetland NHS Boards had no Data Zones in the most deprived quintile (quintile 1) when calculated on the within-Scotland basis. Also in SIMD 2016, Western Isles NHS Board fell within quintiles 2, 3 and 4 when calculated on the within-Scotland basis; there were no Data Zones in quintiles 1 and 5.

More information available at: https://www2.gov.scot/Topics/Statistics/SIMD

SIMD national profile

The map of Scotland (Figure 12) highlights each Data Zone in a colour indicating the SIMD quintile.

Hover over an area of the map to reveal a tooltip with information about the NHS Board/Local Authority, Data Zone code and SIMD quintile status.

Scottish rate by SIMD quintile

The bar chart positioned alongside the map (Figure 12), identifies the five colours used to indicate the SIMD quintile. The categories are shaded from dark blue (1 - most deprived) to light blue (5 – least deprived). The age – sex standardised rates in the bar chart are specific to the selected map.

Hover over a bar on the bar chart to highlight the corresponding Data Zones in the SIMD national profile map.
Distribution of rates by SIMD quintile

The bubble chart of age-standardised rates by SIMD quintile (Figure 13) shows the range of rates, fold value and Scotland value within each SIMD quintile.

Hover over an area of the map to reveal a tooltip with information about the NHS Board/Local Authority, SIMD quintile and Atlas rate.

A multi-select dropdown is provided for users to choose areas for comparison.

Clicking a bubble will filter the national SIMD profile map (Figure 12) to show only the concentrations of Data Zones in that geographical area.
Figure 13

How does the COPD - 1-3 emergency admissions by deprivation quintile compare between areas?

View by:
- Local Authority of Residence
- NHS Board of Residence

Select Year:
2018/19

Select to compare one or more locations:
- (All)

How to use chart:
- Hover to highlight area deprivation
- Click a circle to filter location on Scotland deprivation
The download button is located at the very end of the dashboard as you scroll down the page.

<table>
<thead>
<tr>
<th>Select your file format.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td></td>
</tr>
<tr>
<td>Crosstab</td>
<td></td>
</tr>
<tr>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>Tableau Workbook</td>
<td></td>
</tr>
</tbody>
</table>

The image option will generate a .PNG of the entire page. For the PDF options, we recommend portrait and the following two options:

- **Paper Size:** A4 | Scaling: **60%** | Contents: This Story
- **Paper Size:** A3 | Scaling: **100%** | Contents: This Story
## Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Board of Residence</td>
<td>NHS Board area in Scotland in which the patient usually resides (at the time of admission to hospital).</td>
</tr>
<tr>
<td>Local Authority</td>
<td>The local government area in which the patient usually resides (at the time of admission to hospital).</td>
</tr>
<tr>
<td>Fold-variation</td>
<td>The ‘fold-variation’ value identifies the difference between the highest and lowest standardised rates for the procedure and geography level selected.</td>
</tr>
<tr>
<td>Crude rate</td>
<td>The crude rate is defined as the total events (in this case, number of procedures) divided by the mid-year total population of the selected geography, and multiplied by 100,000.</td>
</tr>
<tr>
<td>Standardisation</td>
<td>A standardised rate is calculated by adjusting the crude rate to take into account underlying differences in the structure (such as age and sex) of a study population (the population of interest, e.g. Health Board or Local Authority) relative to a ‘reference’ or standard population (European standard population).</td>
</tr>
<tr>
<td>Standard error</td>
<td>The standard error is the variability of a set of means. It is used to construct confidence intervals around estimates of population means and in significance testing.</td>
</tr>
<tr>
<td>Confidence interval</td>
<td>The confidence interval indicates a range of values which is likely to include the ‘true’ value for the population (for example, Health Board of Residence or Local Authority). Wider confidence intervals indicate that there is a lack of certainty due to a smaller sample size (or population). A narrow confidence interval means that the value is likely to be more accurate due to a larger sample size. The 95% confidence interval means that the range of values has a 95 in 100 chance of including the ‘true’ value.</td>
</tr>
<tr>
<td>Poisson</td>
<td>A discrete frequency distribution which gives the probability of a number of independent events occurring in a fixed time with equal mean and variance.</td>
</tr>
<tr>
<td>Byar's approximation</td>
<td>A computationally simple approximation that gives very accurate approximations to the exact Poisson probabilities even for small counts.</td>
</tr>
<tr>
<td>British Association of Day Surgery (BADS)</td>
<td>The British Association of Day Surgery (BADS) regularly updates the <strong>BADS Directory of recommended Day and Short stay surgical procedures</strong> which provides a focus for clinicians and managers involved in the planning and provision of short stay elective and emergency surgery.</td>
</tr>
<tr>
<td>SIMD quintile</td>
<td>Within-Scotland population-weighted quintiles are used in this analysis and are calculated by ranking all Data Zones in Scotland from most to least deprived and then splitting this into 5 deprivation quintiles with approximately 20% of the Scotland population in each quintile. <a href="https://www2.gov.scot/Topics/Statistics/SIMD">https://www2.gov.scot/Topics/Statistics/SIMD</a></td>
</tr>
</tbody>
</table>
Contact

Please contact us if you have any questions, comments or suggestions regarding the Scottish Atlas of Variation by sending an email to:

nss.scottishatlasofvariation@nhs.net

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