

## A levels approach to suppression of COVID-19

### Updated 28 October 2020

#### **Purpose**

1. This short paper has two parts. The first part sets out our initial approach to creating a basket of indicators to inform decision-making. It is about applying measures grouped as Levels 0 to 4 in *Scotland's Strategic Framework* across Scottish local authority areas. The aim is to suppress the virus down to the lowest possible levels (reducing infections, hospitalisations and deaths) and protect NHS capacity to ensure high levels of care are maintained. The second part describes the “four harms” done by COVID-19, and sets out data supporting four harms assessments at local authority level.

#### **I – INDICATORS, SIGNALS AND LEVELS**

##### **Background to levels**

2. As set out in *Scotland's Strategic Framework*, Ministers intend to implement a strategic approach to outbreak management based on levels of protection, each with graduated packages of measures to reduce transmission of the virus, that can be applied nationally or to different areas of the country according to the evolving patterns of infection and transmission.
3. This approach aims to provide a more easily understood framework for managing outbreaks and allow rapid but proportionate responses to be taken – either locally or nationally - using a transparent range of options. This will aid decision-making, communication and implementation of protective measures. It will also allow individuals, families, businesses and services to better understand, anticipate, and prepare for the measures that might be introduced. As we have throughout the pandemic, we have sought to work closely across the four nations, aligning action where necessary but recognising that specific circumstances for Scotland may mean we need to do some things differently to best suppress the virus. The middle three levels set out in *Scotland's Strategic Framework* are intended to correspond broadly to the three tiers of the UK Government's approach. For this reason, the Scottish levels are numbered from Level 0 to Level 4. Levels 1-3 thus have the same numbering as the UK Government's tiers.
4. The levels set out in *Scotland's Strategic Framework* are intended to replace measures currently in place in Scotland to suppress the virus. Level 3 in the strategic framework is broadly equivalent to the measures currently in place in the central belt of Scotland. Level 2 is broadly equivalent to the measures in place elsewhere.
5. The Scottish Government intend to use local authority areas as the basic unit of geography for the initial application of the levels. It would be possible to introduce measures on a smaller level, such as a town or island community - or indeed regionally or nationally, if that is deemed justified, necessary and proportionate. This paper, however, assumes that each local authority area, in its entirety, will be allocated to one of the five levels.

6. Table A below sets out an approach to using the indicators specified in *Scotland's Strategic Framework* to inform consideration of which level from *Scotland's Strategic Framework* to apply in each local authority areas. The table should be read alongside the commentary here. The methodology for producing the table is then described. These indicators and the analysis are likely to be developed further to inform decisions at future points.
7. The table is based on data that will change each day before decisions on implementation of *Scotland's Strategic Framework*. In addition, further work is under way to calibrate and test the sensitivity of the ranges underlying the presentation in this table, and further consideration is being given, by the National Incident Management Team and others, to public health advice on the application of levels and to the development of potential additional indicators for future use'. To an extent therefore, this remains, a work in progress.
8. Ranges have been applied to the underlying data to produce a "signal", for each indicator and area, of the level which might be considered based on that indicator alone. These ranges are given later in this paper. The signals for each local authority under each indicator are based on data drawn on 27 October (with 3 day lag for case and positivity rate indicators).
9. On implementation of the levels-based approach, the Scottish Government will publish a document explaining the reasons for the initial allocation of areas to levels. This will draw on further iterations of the analysis presented here. It is the Scottish Government's intention to publish all the indicators referred to in the strategic framework. Many of these are already published. In particular, data on case numbers is available at the [Public Health Scotland data portal](#), where it can be viewed in several formats and disaggregated by both local authority and health board areas.
10. Returning to the remaining columns of Table A, the "Present level" treats the measures in place until 2 November in the central belt as broadly equivalent to Level 3 in Scotland's Strategic Framework, and those in place elsewhere as broadly equivalent to Level 2.
11. All decisions under the levels based approach will be made by Scottish Ministers, in exercise of their statutory powers in relation to public health, and implemented through regulations. It is important to note that the level appropriate for a given area at a given time may not be the same as the signal given by the indicators. Wider considerations apply, including the prevalence of infection elsewhere, including in neighbouring areas, trends in the data and the effectiveness of public health measures.

## Summary table – Indicators, signals and levels

| Local authority**     | Cases / 100k | Test Positivity | Cases / 100k forecast | Hospital forecast | ICU forecast | Present Level* | Level from 2/11 |
|-----------------------|--------------|-----------------|-----------------------|-------------------|--------------|----------------|-----------------|
| East Ayrshire         | 3            | 3               | 4                     | 3                 | 4            | 3              | 3               |
| North Ayrshire        | 3            | 3               | 4                     | 3                 | 4            | 3              | 3               |
| South Ayrshire        | 3            | 3               | 3                     | 3                 | 4            | 3              | 3               |
| Scottish Borders      | 1            | 1               | 0                     | 0                 | 0            | 2              | 2               |
| Dumfries and Galloway | 1            | 2               | 2                     | 0                 | 0            | 2              | 2               |
| Fife                  | 2            | 3               | 2                     | 0                 | 0            | 2              | 2               |
| Clackmannanshire      | 2            | 3               | 3                     | 1                 | 1            | 3              | 3               |
| Falkirk               | 2            | 3               | 2                     | 1                 | 1            | 3              | 3               |
| Stirling              | 2            | 2               | 2                     | 1                 | 1            | 3              | 3               |
| Moray                 | 0            | 0               | 0                     | 0                 | 0            | 2              | 1               |
| Aberdeen City         | 1            | 1               | 0                     | 0                 | 0            | 2              | 2               |
| Aberdeenshire         | 1            | 1               | 0                     | 0                 | 0            | 2              | 2               |
| East Renfrewshire     | 3            | 4               | 4                     | 1                 | 2            | 3              | 3               |
| Inverclyde            | 1            | 2               | 2                     | 1                 | 2            | 3              | 3               |
| Renfrewshire          | 3            | 3               | 3                     | 1                 | 2            | 3              | 3               |
| West Dunbartonshire   | 3            | 3               | 2                     | 1                 | 2            | 3              | 3               |
| East Dunbartonshire   | 3            | 4               | 4                     | 1                 | 2            | 3              | 3               |
| Glasgow City          | 4            | 4               | 3                     | 1                 | 2            | 3              | 3               |
| Highland              | 0            | 0               | 0                     | 0                 | 0            | 2              | 1               |
| Argyll and Bute       | 1            | 1               | 1                     | 0                 | 0            | 2              | 2               |
| South Lanarkshire     | 4            | 4               | 4                     | 4                 | 4            | 3              | 3               |
| North Lanarkshire     | 4            | 4               | 4                     | 4                 | 4            | 3              | 3               |
| East Lothian          | 2            | 3               | 2                     | 0                 | 0            | 3              | 3               |
| Midlothian            | 2            | 3               | 2                     | 0                 | 0            | 3              | 3               |
| City of Edinburgh     | 2            | 3               | 0                     | 0                 | 0            | 3              | 3               |
| West Lothian          | 3            | 4               | 4                     | 0                 | 0            | 3              | 3               |
| Orkney Islands        | 1            | 1               | 0                     | 0                 | 0            | 2              | 1               |
| Shetland Islands      | 0            | 0               | 0                     | 0                 | 0            | 2              | 1               |
| Angus                 | 1            | 1               | 1                     | 1                 | 0            | 2              | 2               |
| Dundee City           | 3            | 3               | 3                     | 1                 | 0            | 2              | 3               |
| Perth and Kinross     | 1            | 2               | 1                     | 1                 | 0            | 2              | 2               |
| Na h-Eileanan Siar    | 1            | 0               | 0                     | 0                 | 0            | 2              | 1               |

\*Equivalent level to measures in place from 9 October to 2 November,

\*\*Ordered by health board

### Indicators: general principles

12. In terms of what indicators form the basket based on both levels of infection and transmission as well as hospital capacity, the following are set out in *Scotland's Strategic Framework* (see page 23).

- The number of cases per 100,000 people, including for particular age groups, using both the latest actual data (indicator a) and a two week forecast (indicator c).

- Positivity rates for testing (indicator b). This would be based on actual data.
- Forecast of number of people needing to be hospitalised (indicator d) or in intensive care units (ICU) (indicator e) against NHS bed use and capacity. This would be based on up to a 6 week forecast.

22. We describe each indicator below. The ranges applied to the indicators to generate the signals in Table A are then given.

#### Indicator a) - Weekly new positive cases per 100,000 people

23. This indicator is defined as the number of people with a first positive test result, measured over a week, relative to population size. The new positive cases number is based on the date the test specimen was taken. There is a reporting delay in testing results so data is drawn with a 3 day lag to allow for results to be available.

24. Since the first iteration of this work we have changed to a 3 day rather than a 2 day lag. The 7 day running total rate is underestimated by about 8% using a 2 day lag but only by 3% with a 3 day lag.

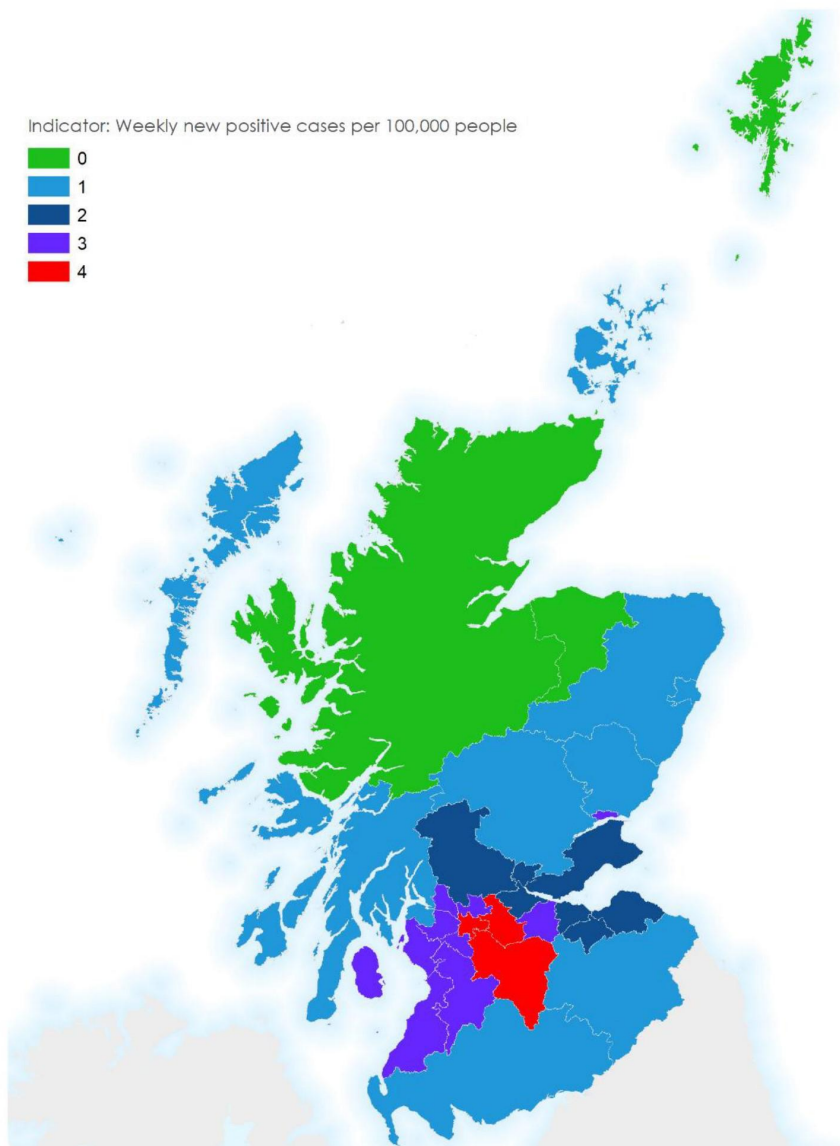
25. This indicator provides a valuable indication of the actual current spread of the epidemic. This figure is most helpful when used as complementary to the forecast case rate. The weekly total proposed aligns with the figures published on the PHS dashboard neighbourhoods site with a 3-day lag to allow for results to be available.

#### Indicator (a) table – Data and signal

|                       | New cases over past week, per 100k people | Signal |
|-----------------------|---|--------|
| Aberdeen City         | 43  | 1      |
| Aberdeenshire         | 31  | 1      |
| Angus                 | 52  | 1      |
| Argyll and Bute       | 48  | 1      |
| City of Edinburgh     | 90  | 2      |
| Clackmannanshire      | 142                                       | 2      |
| Dumfries and Galloway | 71  | 1      |
| Dundee City           | 185                                       | 3      |
| East Ayrshire         | 229                                       | 3      |
| East Dunbartonshire   | 267                                       | 3      |
| East Lothian          | 82  | 2      |
| East Renfrewshire     | 263                                       | 3      |
| Falkirk               | 108                                       | 2      |
| Fife                  | 84  | 2      |
| Glasgow City          | 322                                       | 4      |
| Highland              | 18  | 0      |
| Inverclyde            | 68  | 1      |
| Midlothian            | 107                                       | 2      |
| Moray                 | 18  | 0      |
| Na h-Eileanan Siar    | 22  | 1      |
| North Ayrshire        | 239                                       | 3      |

|                     |     |   |
|---------------------|-----|---|
| North Lanarkshire   | 346 | 4 |
| Orkney Islands      | 22  | 1 |
| Perth and Kinross   | 64  | 1 |
| Renfrewshire        | 223 | 3 |
| Scottish Borders    | 33  | 1 |
| Shetland Islands    | 13  | 0 |
| South Ayrshire      | 165 | 3 |
| South Lanarkshire   | 393 | 4 |
| Stirling            | 96  | 2 |
| West Dunbartonshire | 180 | 3 |
| West Lothian        | 235 | 3 |

### Indicator (a) map



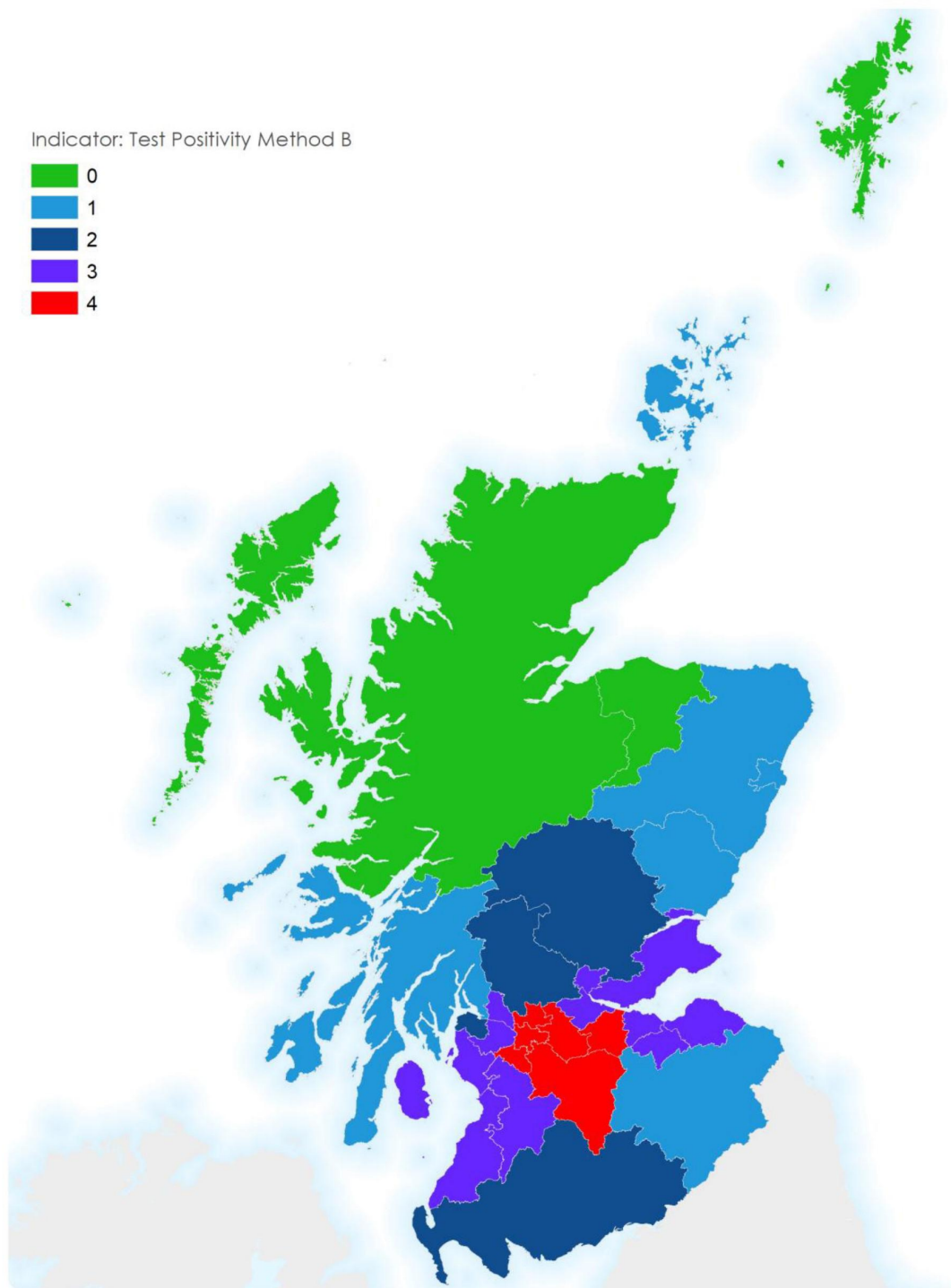
### Indicator b) - Percentage of tests that are positive over the past week

26. This indicator is defined as the 7 day average of the number of positive tests divided by all tests carried out over the past week. Local intelligence would be required where there are low numbers of tests.
27. There is a reporting delay in testing results so data is drawn with a 3 day lag to allow for results to be available.
28. This indicator is important as it reflects both levels of testing and, by drawing on positive test results, can indicate the spread of the virus. It is aligned with one of the [WHO epidemiological criteria](#) used to determine whether the epidemic is controlled in a country.

#### Indicator (b) table – Data and signals

|                       | Positivity rate | Signal |
|-----------------------|-----------------|--------|
| Aberdeen City         | 2.94            | 1      |
| Aberdeenshire         | 2.36            | 1      |
| Angus                 | 2.85            | 1      |
| Argyll and Bute       | 2.9             | 1      |
| City of Edinburgh     | 5.77            | 3      |
| Clackmannanshire      | 6.47            | 3      |
| Dumfries and Galloway | 4.03            | 2      |
| Dundee City           | 8.21            | 3      |
| East Ayrshire         | 9.5             | 3      |
| East Dunbartonshire   | 11.8            | 4      |
| East Lothian          | 6.01            | 3      |
| East Renfrewshire     | 11.22           | 4      |
| Falkirk               | 5.86            | 3      |
| Fife                  | 5.18            | 3      |
| Glasgow City          | 13.23           | 4      |
| Highland              | 1.34            | 0      |
| Inverclyde            | 3.19            | 2      |
| Midlothian            | 6.9             | 3      |
| Moray                 | 1.36            | 0      |
| Na h-Eileanan Siar    | 1.06            | 0      |
| North Ayrshire        | 9.85            | 3      |
| North Lanarkshire     | 13.57           | 4      |
| Orkney Islands        | 1.92            | 1      |
| Perth and Kinross     | 3.58            | 2      |
| Renfrewshire          | 8.58            | 3      |
| Scottish Borders      | 2.37            | 1      |
| Shetland Islands      | 0.7             | 0      |
| South Ayrshire        | 7.85            | 3      |
| South Lanarkshire     | 14.33           | 4      |
| Stirling              | 4.34            | 2      |
| West Dunbartonshire   | 6.84            | 3      |
| West Lothian          | 11.34           | 4      |

### Indicator (b) map



## Indicator c – Forecast weekly cases per 100,000 people

30. Based on Imperial College local authority area modelling of number of positive tests, relative to population size. The table and maps shows which local authorities would be at each level on the basis of information available on 28 October, based on the forecast for the week of 8 to 14 November.

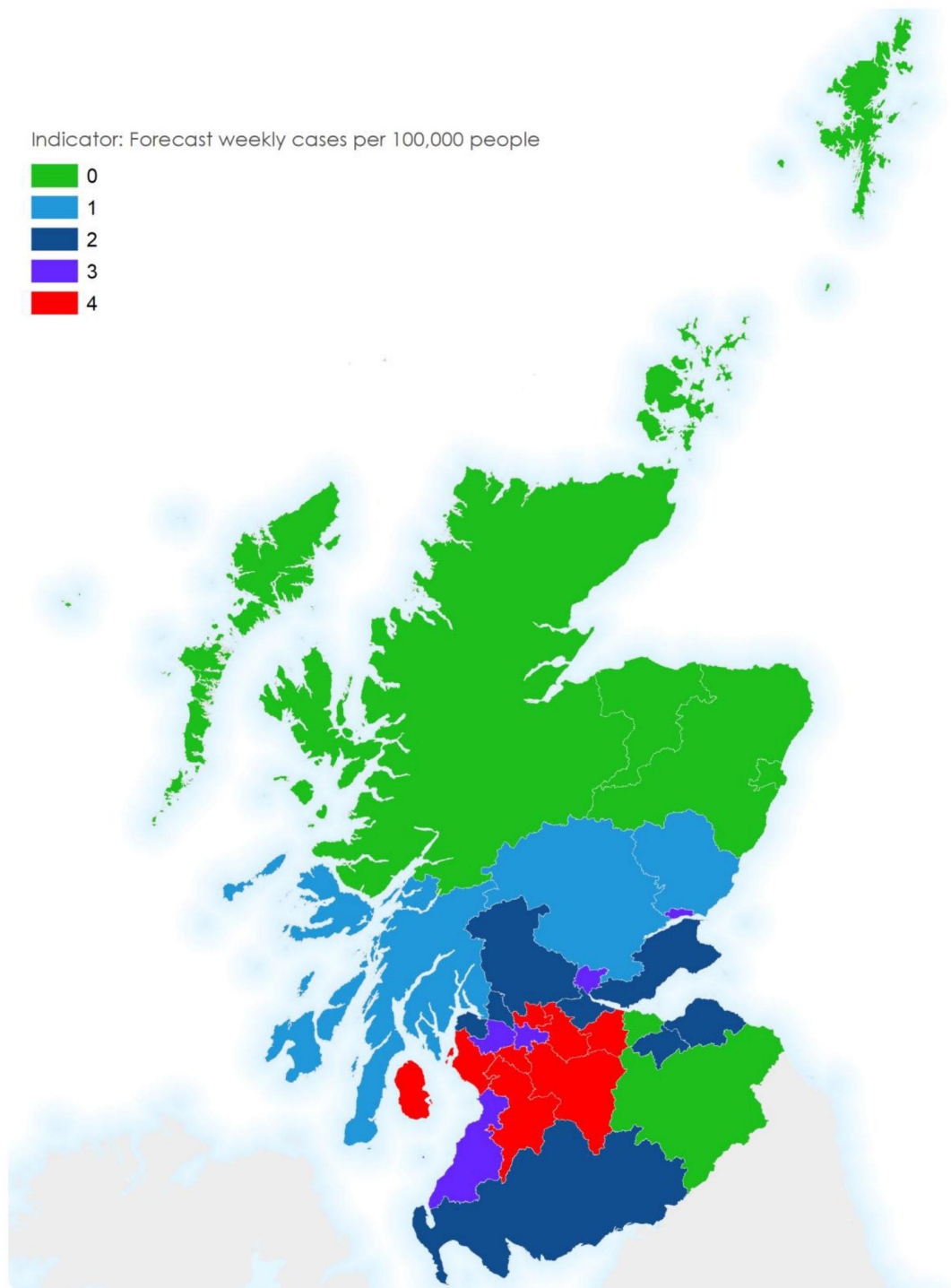
### Indicator (c) table – Data and signal

|                              | Hotspot<br>(Cases>500)<br>per 100,000 | Hotspot<br>(Cases>300)<br>per 100,000 | Hotspot<br>(Cases>100)<br>per 100,000 | Hotspot<br>(Cases>50)<br>per 100,000 | Signal |
|------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|--------------------------------------|--------|
| <b>Aberdeen City</b>         | 0%                                    | 0%                                    | 2%                                    | 11%                                  | 0      |
| <b>Aberdeenshire</b>         | 0%                                    | 1%                                    | 23%                                   | 67%                                  | 0      |
| <b>Angus</b>                 | 0%                                    | 4%                                    | 73%                                   | 96%                                  | 1      |
| <b>Argyll and Bute</b>       | 0%                                    | 2%                                    | 53%                                   | 85%                                  | 1      |
| <b>City of Edinburgh</b>     | 0%                                    | 0%                                    | 2%                                    | 28%                                  | 0      |
| <b>Clackmannanshire</b>      | 71%                                   | 95%                                   | 100%                                  | 100%                                 | 3      |
| <b>Dumfries and Galloway</b> | 1%                                    | 27%                                   | 88%                                   | 97%                                  | 2      |
| <b>Dundee City</b>           | 56%                                   | 92%                                   | 100%                                  | 100%                                 | 3      |
| <b>East Ayrshire</b>         | 80%                                   | 95%                                   | 100%                                  | 100%                                 | 4      |
| <b>East Dunbartonshire</b>   | 89%                                   | 99%                                   | 100%                                  | 100%                                 | 4      |
| <b>East Lothian</b>          | 0%                                    | 16%                                   | 88%                                   | 98%                                  | 2      |
| <b>East Renfrewshire</b>     | 82%                                   | 99%                                   | 100%                                  | 100%                                 | 4      |
| <b>Falkirk</b>               | 2%                                    | 39%                                   | 97%                                   | 100%                                 | 2      |
| <b>Fife</b>                  | 0%                                    | 4%                                    | 93%                                   | 100%                                 | 2      |
| <b>Glasgow City</b>          | 19%                                   | 85%                                   | 100%                                  | 100%                                 | 3      |
| <b>Highland</b>              | 0%                                    | 0%                                    | 1%                                    | 17%                                  | 0      |
| <b>Inverclyde</b>            | 1%                                    | 18%                                   | 91%                                   | 99%                                  | 2      |
| <b>Midlothian</b>            | 4%                                    | 47%                                   | 98%                                   | 100%                                 | 2      |
| <b>Moray</b>                 | 0%                                    | 0%                                    | 12%                                   | 44%                                  | 0      |
| <b>Na h-Eileanan Siar</b>    | 2%                                    | 7%                                    | 40%                                   | 59%                                  | 0      |
| <b>North Ayrshire</b>        | 98%                                   | 100%                                  | 100%                                  | 100%                                 | 4      |
| <b>North Lanarkshire</b>     | 88%                                   | 99%                                   | 100%                                  | 100%                                 | 4      |
| <b>Orkney Islands</b>        | 3%                                    | 9%                                    | 40%                                   | 58%                                  | 0      |
| <b>Perth and Kinross</b>     | 1%                                    | 6%                                    | 57%                                   | 87%                                  | 1      |
| <b>Renfrewshire</b>          | 47%                                   | 81%                                   | 99%                                   | 100%                                 | 3      |
| <b>Scottish Borders</b>      | 0%                                    | 0%                                    | 12%                                   | 49%                                  | 0      |
| <b>Shetland Islands</b>      | 1%                                    | 4%                                    | 28%                                   | 47%                                  | 0      |
| <b>South Ayrshire</b>        | 52%                                   | 93%                                   | 100%                                  | 100%                                 | 3      |
| <b>South Lanarkshire</b>     | 81%                                   | 98%                                   | 100%                                  | 100%                                 | 4      |
| <b>Stirling</b>              | 2%                                    | 20%                                   | 89%                                   | 98%                                  | 2      |
| <b>West Dunbartonshire</b>   | 21%                                   | 71%                                   | 99%                                   | 100%                                 | 2      |
| <b>West Lothian</b>          | 79%                                   | 98%                                   | 100%                                  | 100%                                 | 4      |

Forecast probability from <https://imperialcollegelondon.github.io/covid19local/#downloads>



### Indicator (c) map



## Indicator d – Forecast hospital demand

31. This indicator is defined as the six week ahead forecast of hospital demand, relative to capacity, by health board.
32. This number is based on Scottish Government national-level demand forecasting, applied to health boards according to Imperial College London two week local authority-based modelling. The national-level demand forecasts are quality assured as part of the SPI-M medium term predictions.
33. This indicator is important to account for areas where there is a significant risk of exceeding hospital capacity. The table and map shows the estimated capacity and forecast demand for the health board, and the resulting level.

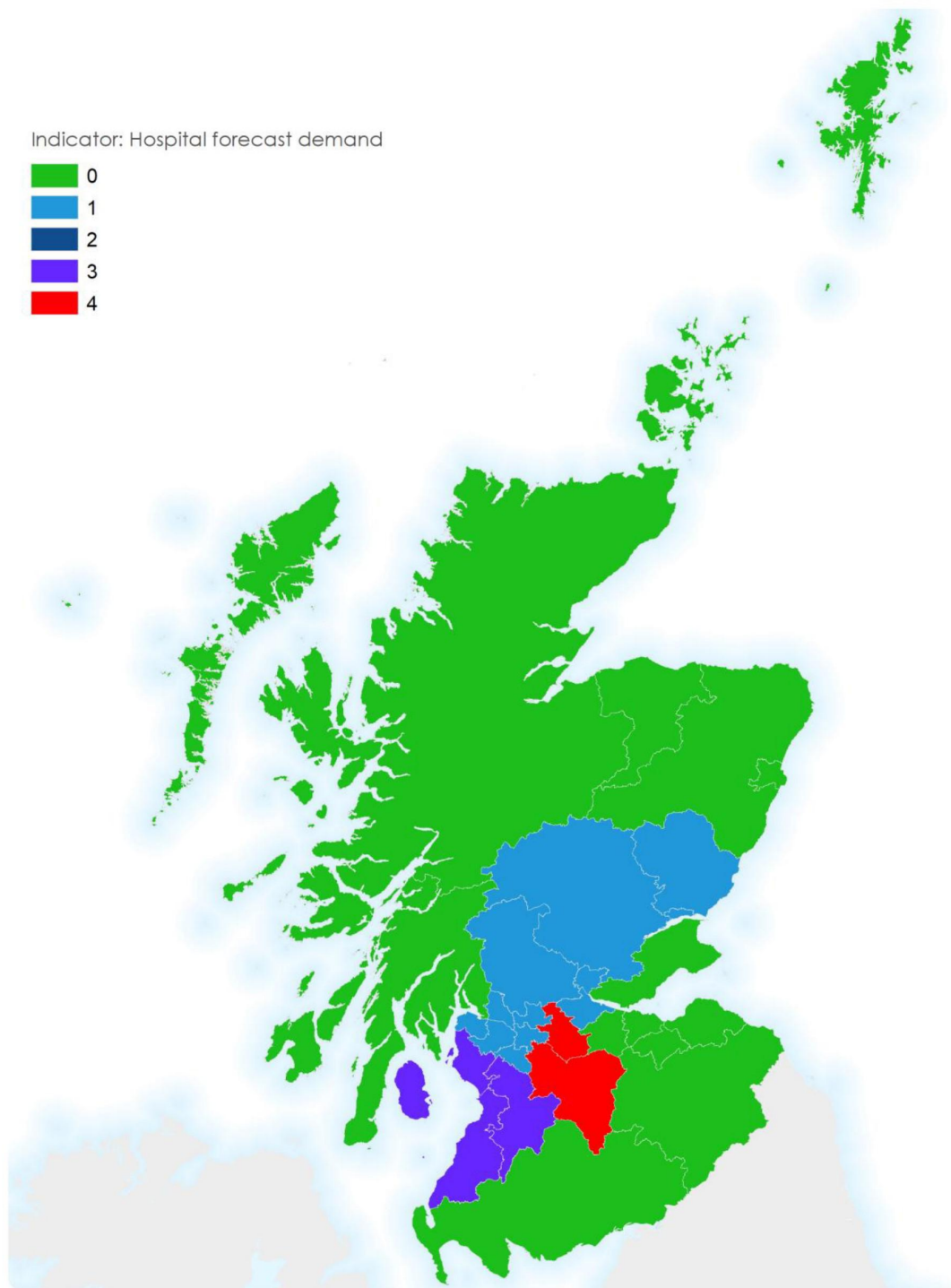
**Indicator (d) table – Data and signal**

| Health board                       | Local Covid beds* | Forecast demand |               |               |               | Signal |
|------------------------------------|-------------------|-----------------|---------------|---------------|---------------|--------|
|                                    |                   | 3 weeks ahead   | 4 weeks ahead | 5 weeks ahead | 6 weeks ahead |        |
| <b>Ayrshire &amp; Arran</b>        | 203               | 184             | 241           | 318           | 419           | 3      |
| <b>Borders</b>                     | 118               | 8               | 10            | 14            | 18            | 0      |
| <b>Dumfries &amp; Galloway</b>     | 90                | 26              | 34            | 44            | 58            | 0      |
| <b>Fife</b>                        | 322               | 48              | 62            | 82            | 108           | 0      |
| <b>Forth Valley</b>                | 144               | 74              | 97            | 128           | 168           | 1      |
| <b>Grampian</b>                    | 295               | 27              | 35            | 46            | 61            | 0      |
| <b>Greater Glasgow &amp; Clyde</b> | 1,070             | 520             | 678           | 898           | 1181          | 1      |
| <b>Highland</b>                    | 176               | 16              | 21            | 27            | 36            | 0      |
| <b>Lanarkshire</b>                 | 455               | 516             | 674           | 892           | 1173          | 4      |
| <b>Lothian</b>                     | 487               | 180             | 236           | 312           | 410           | 0      |
| <b>Orkney</b>                      | 28                | <5              | <5            | <5            | <5            | 0      |
| <b>Shetland</b>                    | 64                | <5              | <5            | <5            | <5            | 0      |
| <b>Tayside</b>                     | 172               | 89              | 117           | 154           | 203           | 1      |
| <b>Western Isles</b>               | 32                | <5              | <5            | <5            | 6             | 0      |

\* Beds potentially available for Covid patients. Scotland as a whole could provide over 3,000 Covid beds.

\*Does not include Louisa Jordan and National Waiting Times Centre

### Indicator (d) map



### Indicator e – Forecast ICU demand

34. This indicator is defined as the five-week-ahead forecast of ICU demand, relative to capacity, by health board.

35. This number is based on Scottish Government national-level demand forecasting, applied to health boards according to Imperial College London two week local authority-based modelling. The national-level demand forecasts are quality assured as part of the SPI M medium term predictions.

36. This indicator is important to account for areas where there is a significant risk of exceeding ICU capacity. The table and map show the estimated capacity and forecast demand for the health board, and the resulting level.

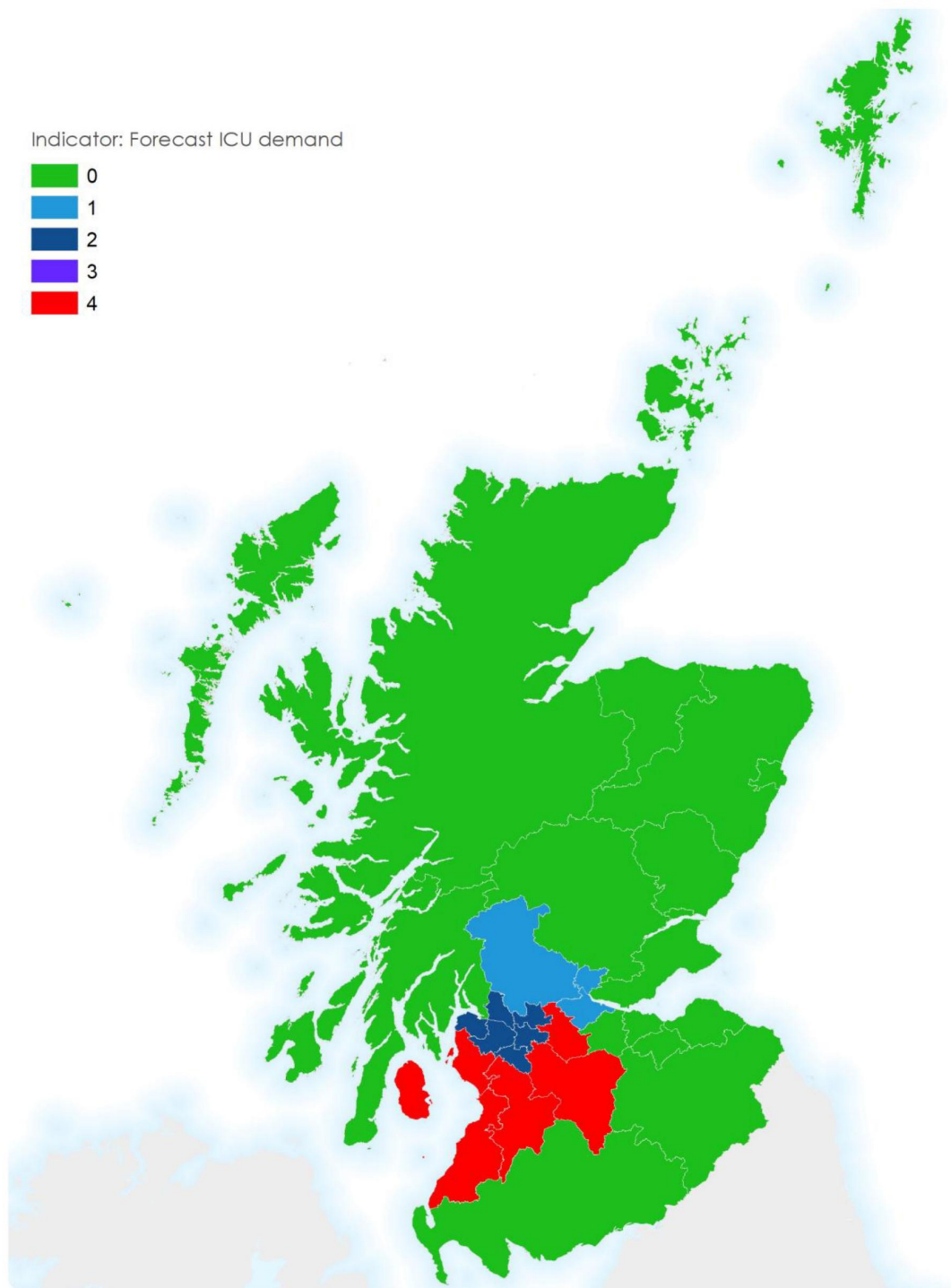
**Indicator (e) table – Data and signal**

| Health board            | ICU beds* | Forecast demand |               |               |               | Signal |
|-------------------------|-----------|-----------------|---------------|---------------|---------------|--------|
|                         |           | 2 weeks ahead   | 3 weeks ahead | 4 weeks ahead | 5 weeks ahead |        |
| Ayrshire & Arran        | 20        | 21              | 25            | 32            | 42            | 4      |
| Borders                 | 10        | <5              | <5            | <5            | <5            | 0      |
| Dumfries & Galloway     | 8         | <5              | <5            | <5            | 6             | 0      |
| Fife                    | 20        | 5               | 6             | 8             | 11            | 0      |
| Forth Valley            | 14        | 9               | 10            | 13            | 17            | 1      |
| Grampian                | 32        | <5              | <5            | 5             | 6             | 0      |
| Greater Glasgow & Clyde | 76        | 60              | 70            | 90            | 118           | 2      |
| Highland                | 16        | <5              | <5            | <5            | <5            | 0      |
| Lanarkshire             | 40        | 60              | 69            | 89            | 117           | 4      |
| Lothian                 | 55        | 21              | 24            | 31            | 41            | 0      |
| Orkney**                | 0         | <5              | <5            | <5            | <5            | 0      |
| Shetland**              | 0         | <5              | <5            | <5            | <5            | 0      |
| Tayside                 | 22        | 10              | 12            | 15            | 20            | 0      |
| Western Isles           | <5        | <5              | <5            | <5            | <5            | 0      |

\* ICU beds potentially available quickly for Covid patients and does not include Louisa Jordan and National Waiting Times Centre. The total number of ICU beds available in NHS Scotland could reach 700 if care was cancelled e.g. planned surgeries

\*\*Orkney and Shetland do not have their own ICU capacity, and are linked to Grampian for the this indicator.

### Indicator (e) map



## Establishing thresholds

37. Using the five indicators above, it is possible to set thresholds to act as a signalling mechanism. Once the indicator reached these thresholds it would indicate consideration of whether a change in level was required. We considered various ways of combining the criteria, but in the absence of detailed research to support weighting, we suggest that equal weighting of each would generally balance incidence and severity/impact. We also wish to allow the freedom to consider additional intelligence available that may influence an assessment of risk rather than being excessively prescriptive.
38. The ranges presented here remain work in progress. In particular, we are likely to adjust the ranges to calibrate against wider public health judgements and to ensure they are as useful as possible in generating signals prompting a holistic review of the level applied to a given local authority area.
39. An area is considered for level 4 when it broadly meets one of the following conditions:
- more than 300 cases over 7 days per 100,000 people for the local authority
  - over 10% positive tests over 7 days for the local authority – twice the rate for national concern given by WHO
  - probability over 75% of 500 cases over 7 days per 100,000 forecast for the local authority in two weeks' time
  - the projection of hospital bed use in the health board in three weeks' time is greater than the health board's estimated capacity
  - the projection of ICU bed use in the health board in two weeks' time is greater than twice its normal capacity
40. An area is considered for level 3 when it does not meet level 4 and it broadly meets one of the following conditions:
- between 150 and 300 cases over 7 days per 100,000 people for the local authority
  - between 5% and 10% positive tests over 7 days for the local authority
  - probability over 75% of 300 cases over 7 days per 100,000 forecast for the local authority in two weeks' time
  - the projection of hospital bed use in the health board in four weeks' time is greater than the health board's estimated capacity
  - the projection of ICU bed use in the health board in three weeks' time is greater than twice its normal capacity
41. An area is considered for level 2 when it does not meet level 3 and it broadly meets one of the following conditions:
- between 75 and 150 cases over 7 days per 100,000 people for the local authority
  - between 3% and 5% positive tests over 7 days for the local authority
  - probability over 75% of 100 cases over 7 days per 100,000 forecast for the local authority in two weeks' time

- d. the projection of hospital bed use in the health board in five weeks' time is greater than the health board's estimated capacity
  - e. the projection of ICU bed use in the health board in four weeks' time is greater than twice its normal capacity
42. An area is considered for level 1 when it does not meet level 2 and it broadly meets one of the following conditions:
- a. between 20 and 75 cases over 7 days per 100,000 people for the local authority
  - b. between 1.5% and 3% positive tests over 7 days for the local authority
  - c. probability over 75% of 50 cases over 7 days per 100,000 forecast for the local authority in two weeks' time
  - d. the projection of hospital bed use in the health board in six weeks' time is greater than the health board's estimated capacity
  - e. the projection of ICU bed use in the health board in five weeks' time is greater than twice its normal capacity
43. Note that these indicators combine Local Authority and Health Board data. In particular, indicators relating to hospital and ICU capacity apply for all the local authorities in that Health Board area.

## II – THE SOCIAL AND ECONOMIC CHARACTERISTICS OF LOCAL AUTHORITY AREAS

44. The indicators considered above relate mainly to the first and (to some extent) the second of the four harms caused by COVID-19. The levels set out in Scotland's Strategic Framework have been designed with reference to all four harms, consistent with the Scottish Government's COVID-19 Framework for Decision-Making. This section of the paper describes all four harms, and presents analysis to support consideration of possible differential four-harms impacts in different local authority areas. This is an area in which the Scottish Government has proposed partnership working with Health Boards and local government as part of implementation of the Strategic Framework.

### The Four Harms

45. **Harm 1** represents the direct impact of COVID. The factors taken into account when considering this harm include the setting, indoors or outdoors, the number of people potentially affected, the duration of the activity and the proximity of the people involved, the likelihood of droplet/aerosol production and spread and of touching surfaces and finally the possibility and ease of mitigations available. All of these factors are underpinned by the developing scientific evidence base, international experience and experience in Scotland. Higher risk activities are those that take place indoors in crowded, noisy environments with poor ventilation, many surfaces, physical space that makes distancing difficult (for example, shared bathrooms, canteens, few entrances and exits) and social environments that tend to discourage distancing. The latter is very relevant for household meetings in private homes, where maintaining distancing among family and friends is very difficult.

46. **Harm 2** focuses on the impact of COVID on both the health and social care service and wider impacts on public health. Work on the service impacts focused on hospital beds and ICU capacity, which has been modelled on a weekly basis, excess deaths and use of the health service for non COVID reasons. The wider public health aspects considered were around physical and mental health and wellbeing. The extent to which any activity proposed in any level has an impact on the capacity of the health service and/or the public's ability to access health or wider care services, along with the impact on the physical or mental health of the population, forms the basis for assessing Harm 2. Particular attention is paid to services for the most vulnerable in the community who, sadly, are often the section of the population most likely to suffer most from COVID infection. The physical and mental health consequences of restrictions that limited the possibility of exercise and activity were also seen as extremely important.
47. **Harm 3** overlaps to some extent with the wider physical and mental health impacts of Harm 2. Key considerations around Harm 3 are safety and security, learning and development, social capital and community cohesion, loneliness and anxiety, economic security and trust in government and the social contract. These wide-ranging considerations are analysed through a variety of data from health, justice, education and direct public polling. Close attention is paid to the needs of children and young people whose wellbeing and development are particularly impacted. The impacts of restrictions on those living alone are also a key concern in terms of social isolation. Equalities featured strongly in assessing social harms, as we know that diversity groups such as women, disabled people, the BAME community and those from lower socio-economic backgrounds have experienced particular disadvantage.
48. The dimensions of economic harm, **Harm 4**, include the direct impact on the economy and are inter-related to health and social harms through the indirect effects that a weaker economy can have on health and society through, for example, the impact of unemployment. Economic harms are reviewed using five criteria. The first is the channel of economic impact and the scale of contribution to economy pre-Covid-19 looking at economic indicators such as GDP weights of relevant sector, number of jobs and businesses involved. The second criterion is the extent of economic harm already arisen with Covid-19. This considers, for example, the fall in output and sales, cashflow and viability issues, jobs furloughed, relative importance of self-employment and productivity. The third is the rate at which further economic harm may continue and the rate at which economic harm may be reversed. The fourth criterion considers the duration and timing of proposed measures and impacts for example how long a sector might be closed, and when the easing or maintaining/imposing of the measure may take place. Finally, secondary impacts on health and social harms are considered in conjunction with harms 2 and 3.
49. The levels set out in *Scotland's Strategic Framework* were designed with reference to all four harms, to achieve the targeted impact on Harm 1 at each level, while mitigating as much as possible of the impact on Harms 2-4. The higher levels will have the most impact on reducing transmission and lowering R through reducing social mixing. However that reduction has increasingly negative public health and social impacts as social interaction is restricted, poverty rises, risks of longer term physical and mental



health problems increase and the resilience of the population is further tested. From an economic perspective, harms at each level gradually extend from impacting on specific sectors operating below capacity to the potential for entire sector closures with wider economic impacts on unemployment, the operation and resilience of supply chains, damage to business confidence and ultimately an inability to recover. The risks are to some extent mitigated by economic and financial support.

**50.** The following sections present data relevant to Harm 3 and Harm 4 disaggregated to local authority area.

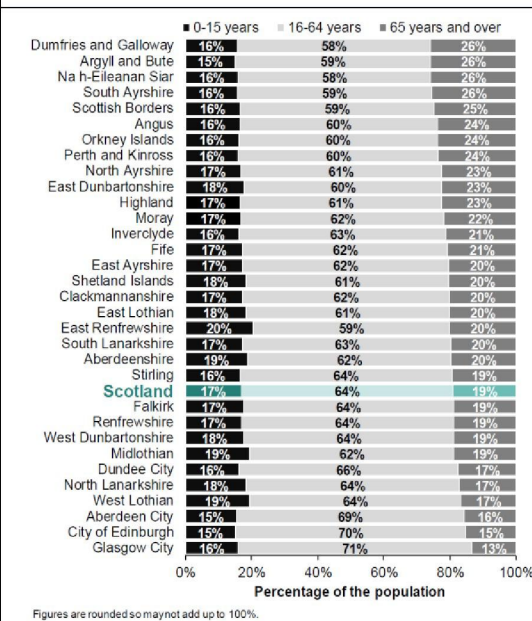
### **The demographics of local authorities**

#### **Age of the population**

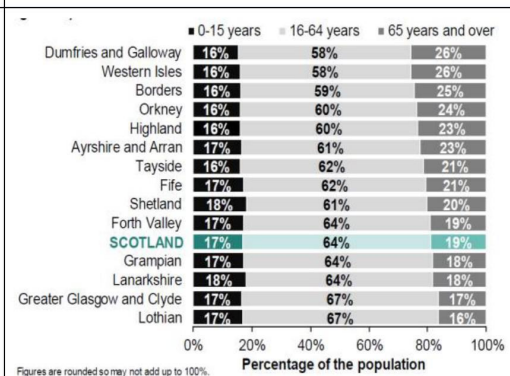
51. It is important to understand the makeup of each local authority area. Figures 1 and 2 highlight the varying age ranges present in each of our local authorities and health boards. Given the importance of age in terms of vulnerability to the virus and the eventual outcome areas with an older population may wish to assess risk differently to those with a younger population and to take different actions to protect the population.

52. Looking at the impact of age on health boards raises issues of capacity in hospitals as an older population is more likely to need hospital and/or ICU care and also aftercare in the community.

**Figure 1: Age Structure of Council areas 2019**



**Figure 2: Age structure of Health Boards 2019**



### Households in the population

53. Throughout the pandemic we have used ‘the household’ as the basis for restrictions and activities. Therefore it is important to understand something about household types in each local authority. Restrictions on meeting up can have a particular impact on larger families, more common in ethnic minority families and on lone person households.

54. Table 1 shows the makeup of households across Scotland by ethnicity. Households from Asian, Asian Scottish or Asian British backgrounds tend to be larger.

**Table 1 Average size of all households, and average number of children  
- Ethnicity of highest income householder**

| <b>Ethnicity</b>                       | <b>Average number of children</b> | <b>Average household size</b> |
|--|-----------------------------------|-------------------------------|
| White                                  | 0.4                               | 2.1                           |
| Any Mixed or Multiple Ethnic Groups    | 0.2                               | 1.8                           |
| Asian, Asian Scottish or Asian British | 0.9                               | 2.9                           |
| African                                | 0.7                               | 2.2                           |
| Caribbean or Black                     | 0.3                               | 1.9                           |
| Other Ethnic Group                     | 0.7                               | 2.6                           |
| All                                    | 0.4                               | 2.1                           |

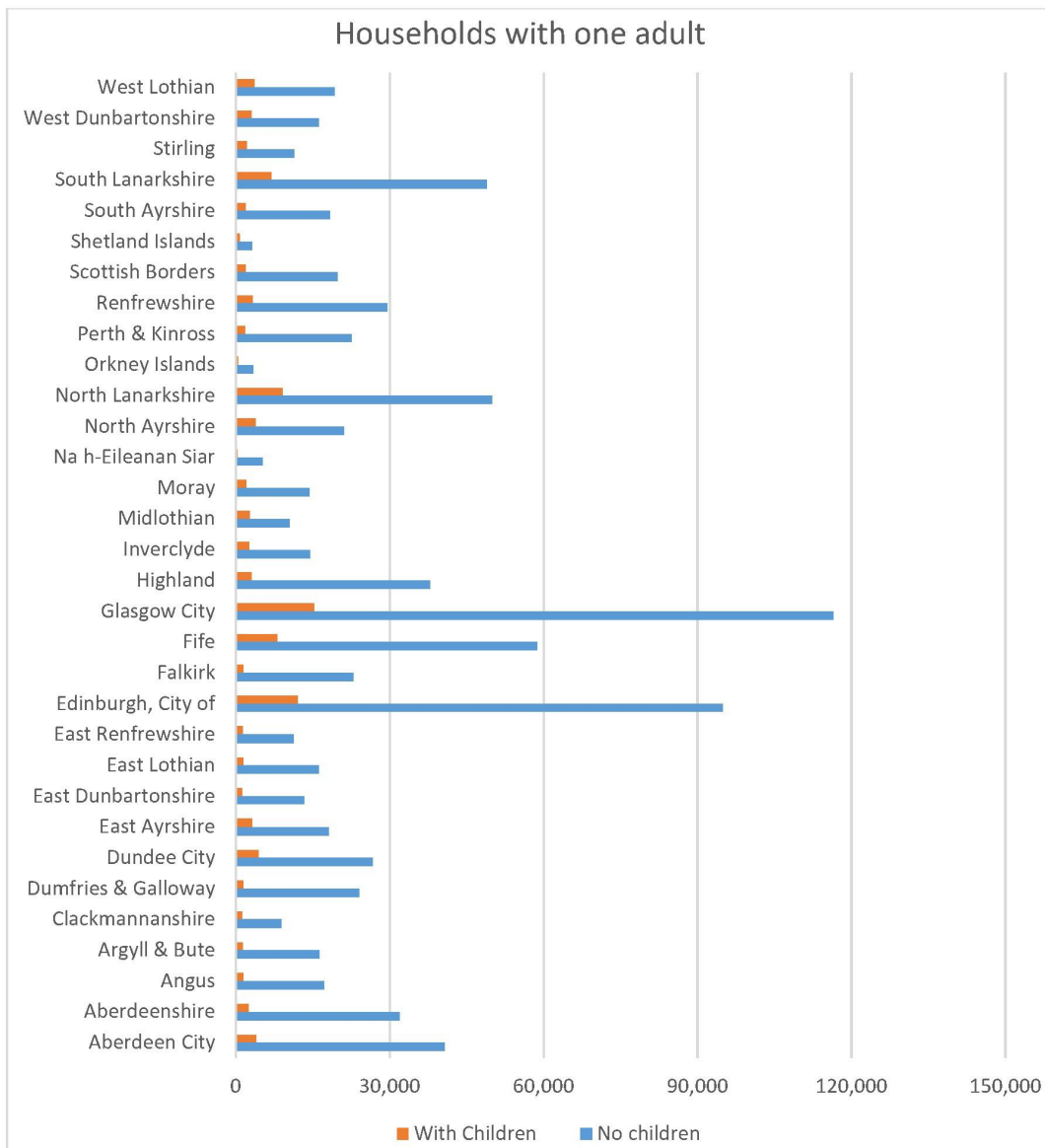
55. Larger households may be disadvantaged in terms of their ability to meet with other households depending on how socialising rules are specified.

56. Figure 3<sup>1</sup> shows the number of adults living alone or with children under 18. As adults living alone are particularly impacted by restrictions on socialising and may also be in more need of support or assistance if self-isolating, the size of this particular group should be considered.

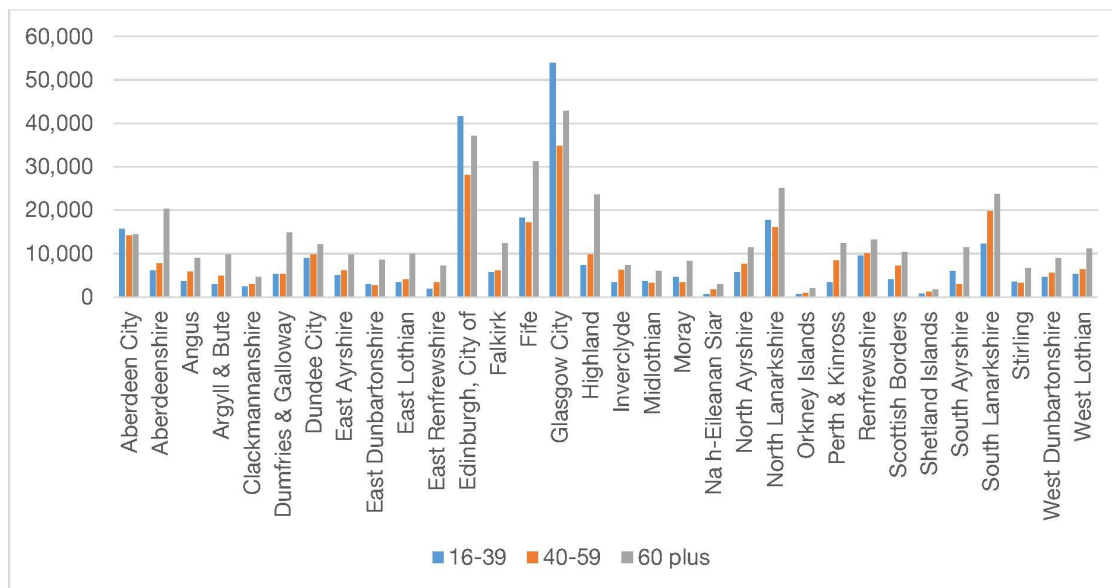
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<sup>1</sup> Scottish Household Survey 2019

**Figure 3: Households with one adult with or without children**



**Figure 4<sup>2</sup>: Households with one adult by age**



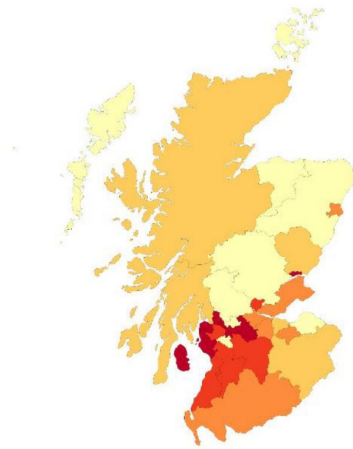
57. **Figure 4** looks at lone households by age - this provides further information to support consideration of local need.

58. The general socio-economic status of a local authority will have a significant impact on its vulnerability to COVID. This can be measured by looking at social, public health and economic indicators. The ScotPHO COVID-19 social/clinical Vulnerability Index provide one method of exploring the different profile of each local authority. This index is built on a range of clinical and social indicators<sup>3</sup>. **Figure 5** below highlights those areas regarded as more vulnerable using this index concentrated generally across the central belt.

<sup>2</sup> Scottish Household Survey 2019

<sup>3</sup> <https://scotland.shinyapps.io/scotpho-covid-vulnerability/>

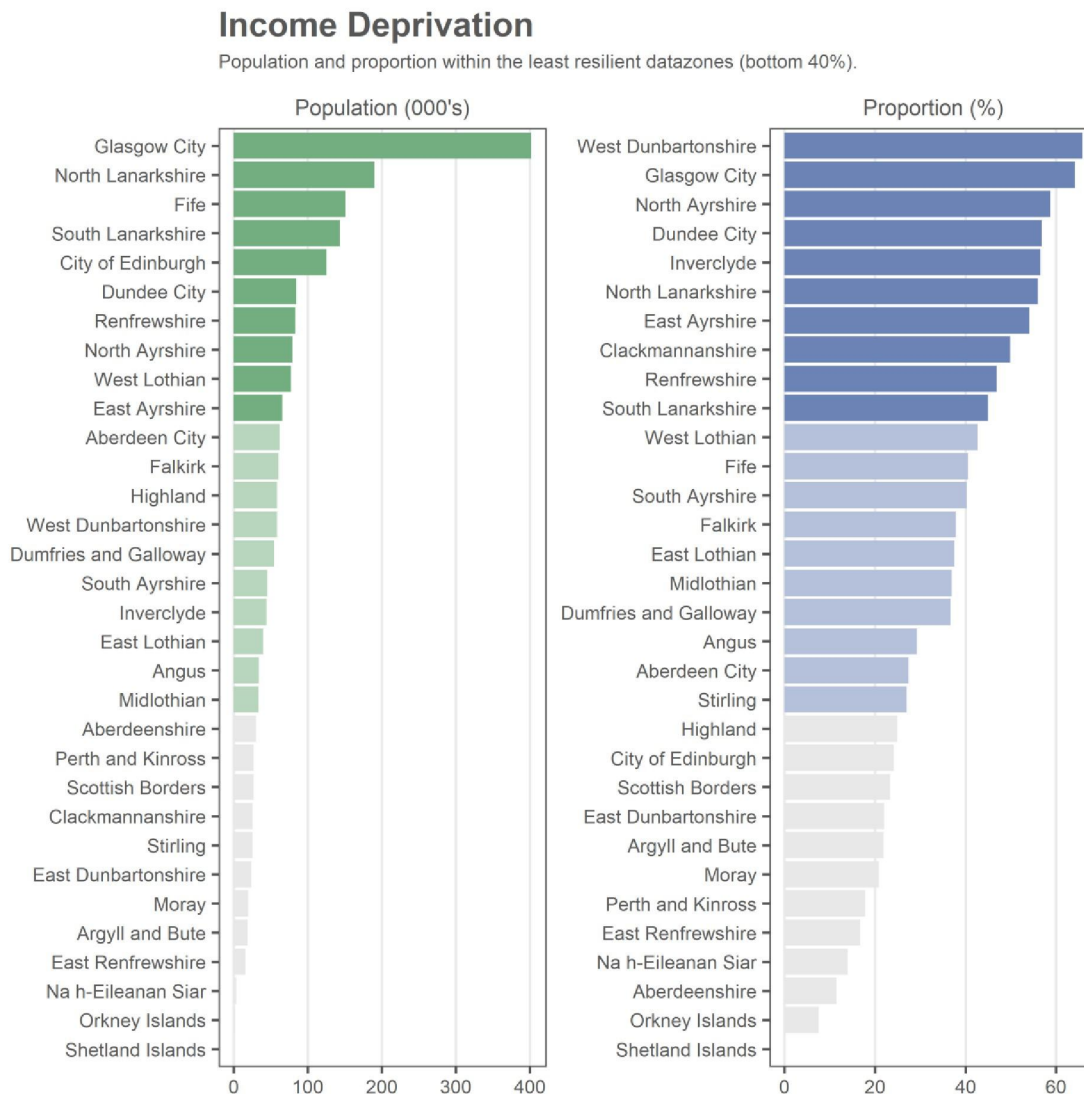
**Figure 5:** Local authority areas of Scotland - COVID vulnerability



*Darker coloured areas on the map are regarded as more vulnerable as a function of ill health and poverty amongst the population.*

59. Focusing in and looking at poverty amongst Scotland's local authorities gives an overview of the areas regarded as least resilient due to income deprivation. **Figure 6** shows the proportion and population living in the least resilient data zones across Scotland. Again there is a general clustering across the central belt.

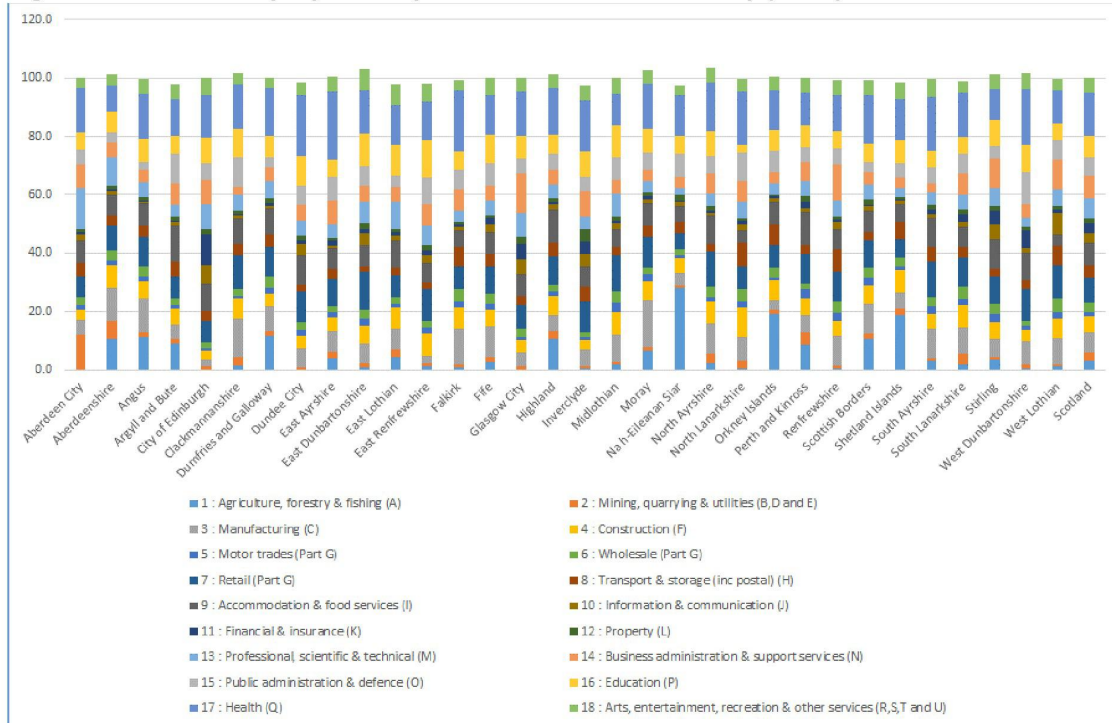
**Figure 6: Income deprivation and resilience**



**The economic profile of local authorities**

60. It is important to understand the economic profile of each local authority area. **Figure 7** and **Table 2** highlight the share of employment by sectors in each of our local authorities while the Table focuses on selected sectors that are currently fragile and potentially at risk from further restrictions – Retail, Accommodation and Food Services, and Arts and Recreation.

**Figure 7: Share of Employment by Sector and Local Authority (2018)**



*Business Register and Employment Survey. Includes self-employment*

61. The share of employment in Retail is highest in East Dunbartonshire, Midlothian and the Ayrshires, while the share of employment in Accommodation and Food Services is highest in rural areas (Argyll and Bute, Highland and Perth and Kinross). The share of employment in Arts and Entertainment is highest in East Dunbartonshire, East Lothian and South Ayrshire.

**Table 2: Share of Employment in Selected Sectors by Local Authority (2018)**

| Area              | 7 : Retail (Part G) | 9 : Accommodation & food services (I) | 18 : Arts, entertainment, recreation & other services (R,S,T and U) |
|-------------------|---------------------|---------------------------------------|---|
| Aberdeen City     | 6.9                 | 8.0                                   | 3.4   |
| Aberdeenshire     | 8.8                 | 7.0                                   | 3.9   |
| Angus             | 10.3                | 7.7                                   | 5.1   |
| Argyll and Bute   | 7.5                 | 12.5                                  | 5.0   |
| City of Edinburgh | 7.6                 | 9.3                                   | 5.7   |
| Clackmannanshire  | 11.7                | 8.3                                   | 4.0   |

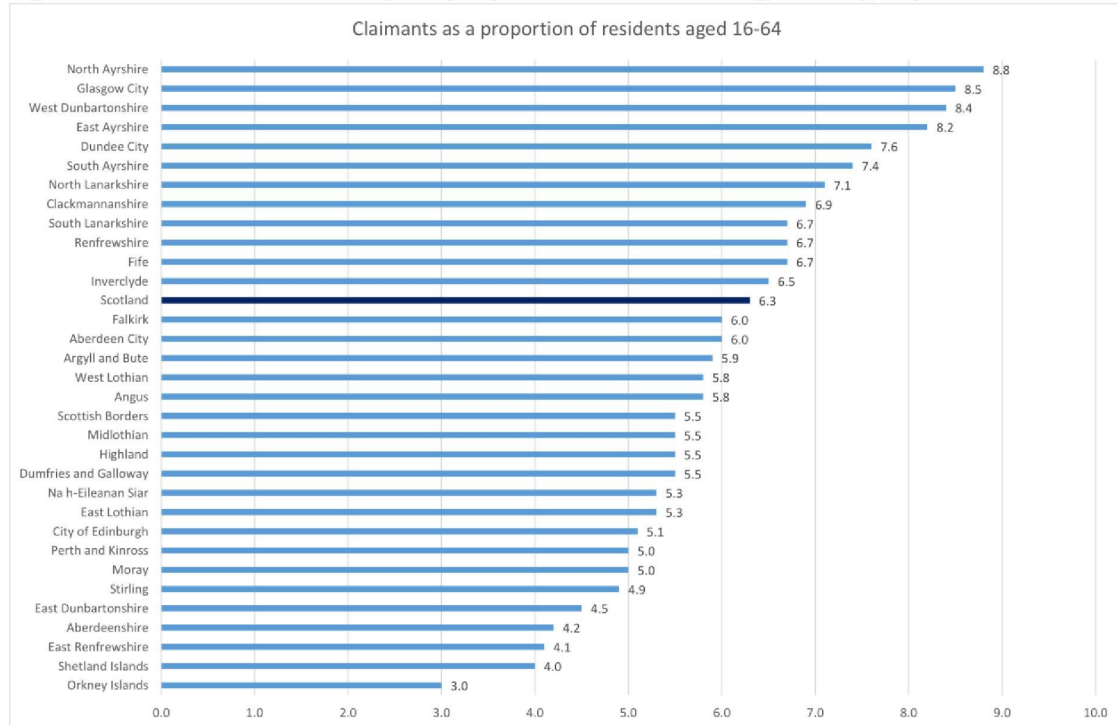


|                       |            |            |            |
|-----------------------|------------|------------|------------|
| Dumfries and Galloway | 10.3       | 8.8        | 3.7        |
| Dundee City           | 10.4       | 10.4       | 4.5        |
| East Ayrshire         | 9.3        | 7.0        | 5.2        |
| East Dunbartonshire   | 13.0       | 7.4        | 7.4        |
| East Lothian          | 7.6        | 9.1        | 6.8        |
| East Renfrewshire     | 10.9       | 6.5        | 6.5        |
| Falkirk               | 7.5        | 6.0        | 3.7        |
| Fife                  | 9.4        | 7.2        | 5.8        |
| Glasgow City          | 8.2        | 7.5        | 4.6        |
| Highland              | 9.6        | 11.2       | 4.8        |
| Inverclyde            | 10.3       | 6.9        | 5.2        |
| Midlothian            | 12.5       | 6.2        | 5.5        |
| Moray                 | 10.5       | 7.9        | 4.6        |
| Na h-Eileanan Siar    | 5.6        | 5.6        | 3.1        |
| North Ayrshire        | 11.9       | 9.5        | 5.4        |
| North Lanarkshire     | 8.0        | 4.3        | 4.3        |
| Orkney Islands        | 7.7        | 7.7        | 4.6        |
| Perth and Kinross     | 10.1       | 11.6       | 5.1        |
| Renfrewshire          | 10.1       | 6.7        | 5.1        |
| Scottish Borders      | 9.4        | 7.3        | 5.2        |
| Shetland Islands      | 6.2        | 6.2        | 5.6        |
| South Ayrshire        | 12.2       | 10.2       | 6.1        |
| South Lanarkshire     | 10.0       | 6.7        | 4.2        |
| Stirling              | 9.2        | 10.2       | 5.1        |
| West Dunbartonshire   | 10.9       | 9.4        | 5.5        |
| West Lothian          | 11.5       | 3.8        | 3.8        |
| <b>Scotland</b>       | <b>8.9</b> | <b>7.9</b> | <b>4.8</b> |

*Source: Business Register and Employment Survey. Includes self-employment*

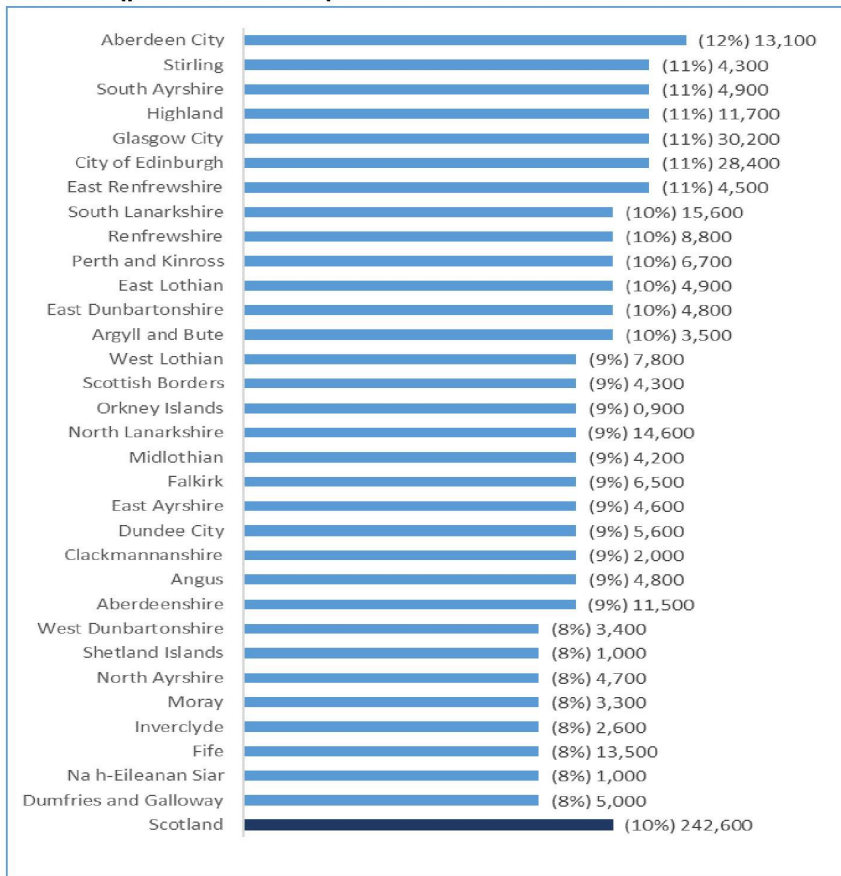
62. **Figure 8** shows the Claimant Count (those claiming unemployment related benefits) by local authority area. North Ayrshire, Glasgow City, West Dunbartonshire and East Ayrshire are the four local authority areas with Claimant Count Rates above 8% in September 2020. **Figure 9** shows the rate of employment furloughed.

**Figure 8: Claimant Count Rate (as a proportion of residents age 16-64), September 2020.**



Source: ONS, NOMIS

**Figure 9: Rate of Employments Furloughed as at 31 August 2020 by Local Authority, Scotland (provisional data)**



Source: Coronavirus Job Retention Scheme, HMRC