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UK COVID-19 Vulnerability Impact Tracker Methodology

July 2021

Overview

People living in the UK are not equally vulnerable to the consequences of the COVID-19 pandemic. Health, economic, and social inequities make some communities more vulnerable than others. We have built a website that tracks how vulnerable communities are doing in the UK using real time COVID-19 surveillance and impacts data. We include six indicators:

- COVID-19 cases
- COVID-19 tests
- Deaths due to COVID-19
- Hospitalisations due to COVID-19
- Residents (16-64) claiming out of work Universal Credit and Jobseeker's Allowance
- Proportion of people reporting high anxiety

Data Sources

Vulnerability Scores

We use the British Red Cross COVID-19 Vulnerability Index to identify vulnerable communities in the UK. This index consists of the following:

- Clinical vulnerability
- Other health/wellbeing needs
- Economic/financial vulnerability
- Social vulnerability (including physical/geographical isolation)

The BRC COVID-19 Vulnerability Index provides scores at the Regional, Lower-Tier Local Authority, and Middle-Super Output Area levels. We use Local Tier Local Authority (LTLA) indices to match the geographical granularity of the COVID-19 surveillance and impacts data.

Note. BRC vulnerability scores for Isles of Scilly and Cornwall and City of London and Hackney were averaged and combined to align with combined reporting of these LTLAs from PHE cases/deaths/tests.
BRC vulnerability scores for Aylesbury Vale, Chiltern, South Bucks and Wycombe were averaged to align with Epiforecast's use of Buckinghamshire unitary authority (UTLA and LTLA; E06000060) when creating England hospitalisation multipliers.

Ranking and Decile Calculations

At the UK and national levels, using the function created by the BRC, we assign local authorities into an overall vulnerability decile based on rank within each nation, where 1 is least vulnerable and 10 is most vulnerable. We then split the deciles into top and bottom half to classify local authorities as high or low vulnerability. At the regional level, using the same BRC function, we reclassify high and low vulnerability areas according to their rank within each region.

COVID-19 Surveillance and Impacts Data

Heatmap: Cases

Nation	Source	Updated	Granularity	Earliest Data
All	PHE Daily COVID-19 Dashboard	Daily	LTLA	2020-02-09

Heatmap: Deaths

Nation	Source	Updated	Granularity	Earliest Data
All	PHE Daily COVID-19 Dashboard	Weekly	LTLA	2020-03-15

Heatmap: Tests

Nation	Source	Updated	Granularity	Earliest Data
England	PHE Daily COVID-19 Dashboard*	Daily	LTLA	2020-02-09
Northern Ireland	Northern Ireland DOH**	Daily	LTLA	2020-02-16
Scotland	NHS Scotland**	Daily	LTLA	2020-03-01
Wales	NHS Wales***	Daily	LTLA	2020-02-02

**Total tests calculated by summing Lateral Flow and PCR tests per LTLA.*

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***Pillar 1 and Pillar 2 (Lateral Flow and PCR)*
****PCR tests*

Heatmap: Hospitalisations

Nation	Source	Updated	Granularity	Earliest Data
England	PHE Daily COVID-19 Dashboard	Daily	NHS Acute Trusts	2020-03-22
Northern Ireland	Northern Ireland DOH	Daily	Health Board	2020-03-08
Scotland	NHS Scotland	Daily	Health Board	2020-09-20
Wales	StatsWales	Daily	Health Trust	2020-03-29

Note We use hospital admissions into NHS Acute trusts in England given the more detailed granularity of NHS trusts. We include the Powys non acute health board from Wales given the broader coverage of health boards in Wales.
Vulnerability is categorised at the level of LTLAs in England and at the level of Health Boards/Trusts in Scotland, Wales and Northern Ireland.
While we use hospital admissions for England, Northern Ireland and Wales, Scotland does not supply hospital admissions at the level of granularity required (Health Board). Instead we use daily count of patients in hospital with confirmed COVID-19, excluding people previously tested positive for COVID-19 but remained in hospital for another reason.
Scotland does not supply patient figures when less than 5 for Health Board.

Heatmap: Economic Impact/Claimant Count

Nation	Source	Updated	Granularity	Earliest Data
All	Universal Credit & Job Seeker's Allowance Claims	Monthly	LTLA	2019-01

Heatmap: Mental Health

Nation	Source	Updated	Granularity	Earliest Data
All	ONS COVID-19 Social Impacts Survey	Fortnightly	Region*	2021-01-03

**Data not available for Northern Ireland.*
**Since data is not available at LTLA level, we cannot show percentage likelihood heatmaps at the regional level.*

Regional Breakdown:

The data in this section are taken from the same sources as those listed above. We calculate new weekly rates as a rolling rate ending in the previous day.

**Since we are unable to calculate percentage likelihood scores for English Regions, Scotland, Northern Ireland, and Wales, anxiety data is not shown in this section.*
****For hospitalisations, the heatmap for Scotland is based on number of hospital patients as in Section 1. We show New weekly and total hospitalisations (hospital admissions) for Scotland to allow comparison with other regions/nations.*

Population Estimates

Population estimates are obtained from V3.6 of GADM (2019).

Vulnerability Spatial Aggregation

The British Red Cross COVID-19 Vulnerability Index provides scores at the Regional, Lower-Tier Local Authority, and Middle-Super Output Area levels. Some of our metrics, however, are given at the Clinical Commissioning Group, Health Board, and NHS Trust levels. The following explains how we approximated these scores.

Clinical Commissioning Group (CCG) and Health Board (HB)

1. Generate aggregate CCG and HB shapefile
2. Intersect CCG/HB shapefile with LTLA shapefile (Note, some LTLAs fall in 2+ CCGs)
3. Overlay population raster data with intersected CCG/HB and LTLA shapefile
4. Determine population count of each LTLA inside each CCG/HB, save as data frame
5. Join BRC LTLA Vulnerability scores to population CCG/HB & LTLA data frame
6. For each CCG/HB, calculate a population-weighted mean BRC LTLA score

NHS Trust

We use the Epiforecast R package which maps NHS Acute Trusts in England to LTLAs. These are probabilistic estimates based on total COVID-19 discharges until 30 September 2020. The package provides the estimated proportion of admissions to a given Trust that were admitted from a given local authority.

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Likelihood Percentage Calculations

Multiplier Calculation

Likelihood percentages reflect the difference in the mean outcome between the high and low vulnerability areas divided by the low vulnerability area outcome, multiplied by 100%:

$$Multiplier = \frac{mean(outcome_{high}) - mean(outcome_{low})}{mean(outcome_{low})} \cdot 100\%$$

To calculate multiplier at UK level, we average the multiplier across the 4 nations. This is because the BRC vulnerability scores are calculated at the level of nations and not across the entire UK. Depending on data availability, and if some multipliers are not available (see above), the UK average may be based all four nations or less.

Why is the Multiplier Not Available?

For the weeks where data has not been reported, we do not calculate the multiplier. In addition, for the weeks where total cases, deaths, and hospitalisations per geography are relatively low, we do not calculate the multiplier (as the data is too small to be considered significant). The current minimum thresholds are as follows:

- **Cases:** 100 total cases per 100k in past week in either high or low vulnerability group
- **Deaths:** 10 total deaths per 100k in past week in either high or low vulnerability group
- **Hospitalisations:** 25 total hospitalisations per 100k in past week in either high or low vulnerability group

Updates

July 2021: Multipliers now calculated weighting for population size
July 2021: Thresholds changed:

The current minimum thresholds are as follows:

- **Cases:** 30 total cases in past week in either high or low vulnerability group
- **Deaths:** 10 total deathsin past week in either high or low vulnerability group
- **Hospitalisations:** 20 in past week in either high or low vulnerability group