

Epidemiology Modelling Review Group: Consensus Statement on COVID-19

Date: 28 July 2021

Introduction

The UK Health Security Agency (UKHSA) Epidemiology Modelling Review Group (EMRG) shares this consensus statement on coronavirus (COVID-19) with acknowledgment to SPI-M-O, who have developed and shared modelling methodologies and contribute model outputs to these combined estimates.

All probability statements are in line with the framework given in <u>Annexe A</u>.

Summary

- The UKHSA's best estimate for R in England is between 1.1 and 1.4. R is estimated to be between 0.8 and 1.0 for Scotland, 1.0 and 1.3 for Wales, and 1.3 and 1.7 for Northern Ireland (Figure 1). These estimates are based on models¹ fitted to data available up to 26 July 2021, including hospitalisations, deaths, testing, wastewater samples and longitudinal population sampling studies. They reflect the epidemic 2 weeks prior to that date.
- 2. Combined estimates from 7 models² show that the incidence³ is between 46,000 and 80,000 new infections per day in England.

Incidence and prevalence

- 3. During its most recent week (ending 24 July), the ONS Covid infection survey estimated⁴ that an average of 856,200 people had COVID-19 in the community in England (95% credible interval 798,600 to 915,000). The survey does not include people in care homes, hospitals, or prisons. Estimates from across the 4 nations of the UK are:
 - England 856,200 (95% credible interval 798,600 to 915,000)
 - Scotland 49,500 (95% credible interval 38,300 to 62,300)
 - Wales 18,800 (95% credible interval 12,700 to 26,000)
 - Northern Ireland 27,200 (95% credible interval 18,200 to 38,200)

Growth rate and reproduction number

4. For small daily changes, the growth rate is approximately the proportion by which the number of infections increases or decreases per day, that is, the speed at which an epidemic is growing or shrinking.⁵

¹ Model estimates are required as quantities such as the Reproduction Number (R) are not directly observable. Instead, a variety of independently produced models are used to interpret the data and estimate R.

² Different nations and regions may use different sets of models for these estimates; hence caution should be applied in drawing direct comparisons. Fewer models produce estimates for Wales and Northern Ireland. ³ The number of new infections per day.

⁴ These estimates can be subject to revision as further information is available and modelled.

⁵ More technical information on the growth rate can be found in Plus Magazine: <u>The growth rate of COVID-19.</u>

- 5. EMRG's consensus estimates for the growth rates in the 4 nations are (90% credible interval):
 - England: +2% to +5% per day
 - Scotland: -3% to +1% per day
 - Wales: +1% to +4% per day
 - Northern Ireland: +5% to +10% per day

National and regional estimates of growth rates are summarised in Table 1 and Figure 2.

- 6. The reproduction number (R) is the average number of secondary infections produced by a single infected individual; it is an average over time, geographies, viral variants, and communities.
- 7. The UKHSA's best estimate for R in England is between 1.1 and 1.4. R is estimated to be between 0.8 and 1.0 for Scotland, 1.0 and 1.3 for Wales, and 1.3 and 1.7 for Northern Ireland. UKHSA's agreed national estimates are summarised in Table 1 and Figure 1, and these are based on the latest data available up to 26 July 2021⁶. Regional estimates for England can be seen in Table 1 and Figure 3.
- 8. R is an indicator that lags by 2 to 3 weeks,⁷ and therefore does not reflect any behavioural changes that have happened during this time, due to the time required for changes to be seen in data streams.
- 9. This inherent lag means that recent fluctuations should not be expected to be consistent with these estimates.

Nation	R	Daily growth rate	Doubling time ⁹
England	1.1 to 1.4	+2 to +5%	15 to 27 days
Scotland	0.8 to 1.0	-3 to +1%	-28 days to flat
Wales	1.0 to 1.3	+1 to +4%	18 days to flat
Northern Ireland	1.3 to 1.7	+5 to +10%	8 to 13 days
NHS England region	R	Daily growth rate	Doubling time
East of England	1.3 to 1.5	+4 to +7%	11 to 16 days
London	1.2 to 1.5	+4 to +6%	12 to 18 days

Table 1. Combined estimates of R values growth rates and doubling times in the 4 nations of the UK and NHS England regions (90% credible interval)⁸

⁶ Different models fit to different windows of time using different methodologies, hence not all models will fit up to this precise date.

⁷ Different data-streams and different models are expected to be lagged in their estimates by different amounts when compared with the true underlying epidemiological situation. This is due to multiple lags such as reporting and delays in the infection processes. However, the consensus combination generally reflects a 2-week lag.

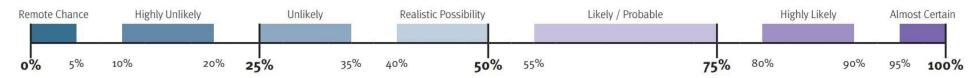
⁸ The estimated intervals for R and growth rate may not exactly correspond to each other due to the submission of different independent estimates and rounding in presentation.

⁹ Any estimates with a halving or doubling time of more than 40 days have been described as flat. Negative values of doubling time indicate a halving time (the time expected for cases to fall by 50%). Doubling time here is calculated using the growth rate.

NHS England region	R	Daily growth rate	Doubling time
Midlands	1.1 to 1.4	+2 to +6%	13 to 28 days
North East and Yorkshire	1.1 to 1.3	+1 to +5%	14 days to flat
North West	1.0 to 1.2	+0 to +3%	30 days to flat
South East	1.2 to 1.5	+4 to +7%	11 to 17 days
South West	1.2 to 1.5	+3 to +6%	12 to 19 days

Annexe A. PHIA framework of language for discussing probabilities

The yardstick splits the probability scale into 7 ranges from remote chance (0 to 5% probability) to almost certain (95% to 100% probability).



Acknowledgements

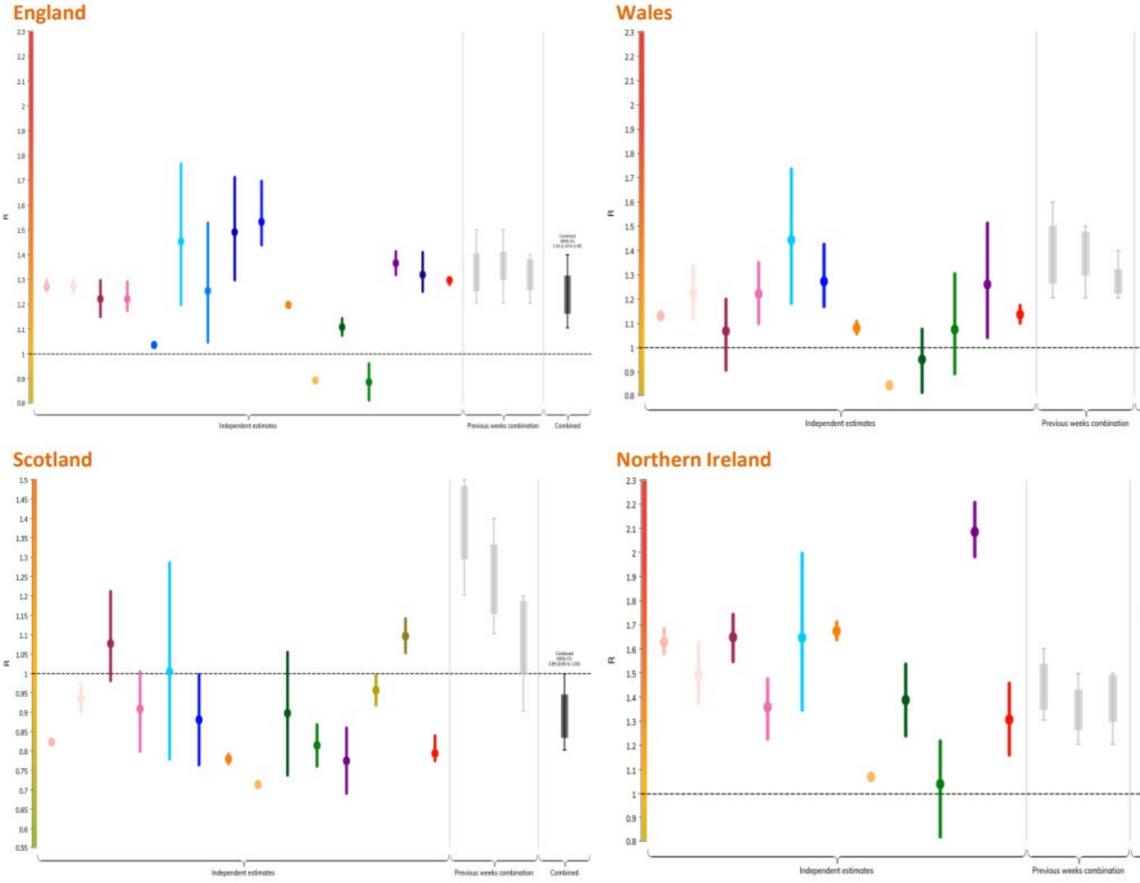
The UKHSA takes responsibility for this consensus statement and its contents. However, the UKHSA would like to acknowledge the work of SPI-M-O and academic partners in developing methodologies and sharing these, as well as continuing to contribute model outputs to the combined estimates. These estimates include contribution from LSHTM (<u>1</u>, <u>2</u>), Imperial College London (<u>3</u>), University of Warwick (<u>4</u>, <u>5</u>), University of Exeter and University of Bristol (<u>6</u>), Lancaster University (<u>7</u>, <u>8</u>), University of Manchester, Public Health England and University of Cambridge (<u>9</u>). The UKHSA would also like to thank the European Bioinformatics Institute (<u>10</u>), University of Oxford (<u>11</u>, <u>12</u>), University of Liverpool (<u>13</u>), and the Institute of Disease Modelling (<u>14</u>) for contributing model outputs. The UKHSA also acknowledges the work developing combination estimates from Defence and Science Technology Laboratory (<u>15</u>). UKHSA also thanks and acknowledges the support and collaboration of the SPI-M-O Secretariat and co-Chairs, as well as colleagues across the 4 nations.

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Figure 1. Estimates of R in the 4 nations of the UK (90% credible intervals). Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding outwards to one decimal place







Combined

Figure 2. Estimates of the growth rate in NHS England regions, including 90% credible intervals. Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding outwards to the nearest per cent

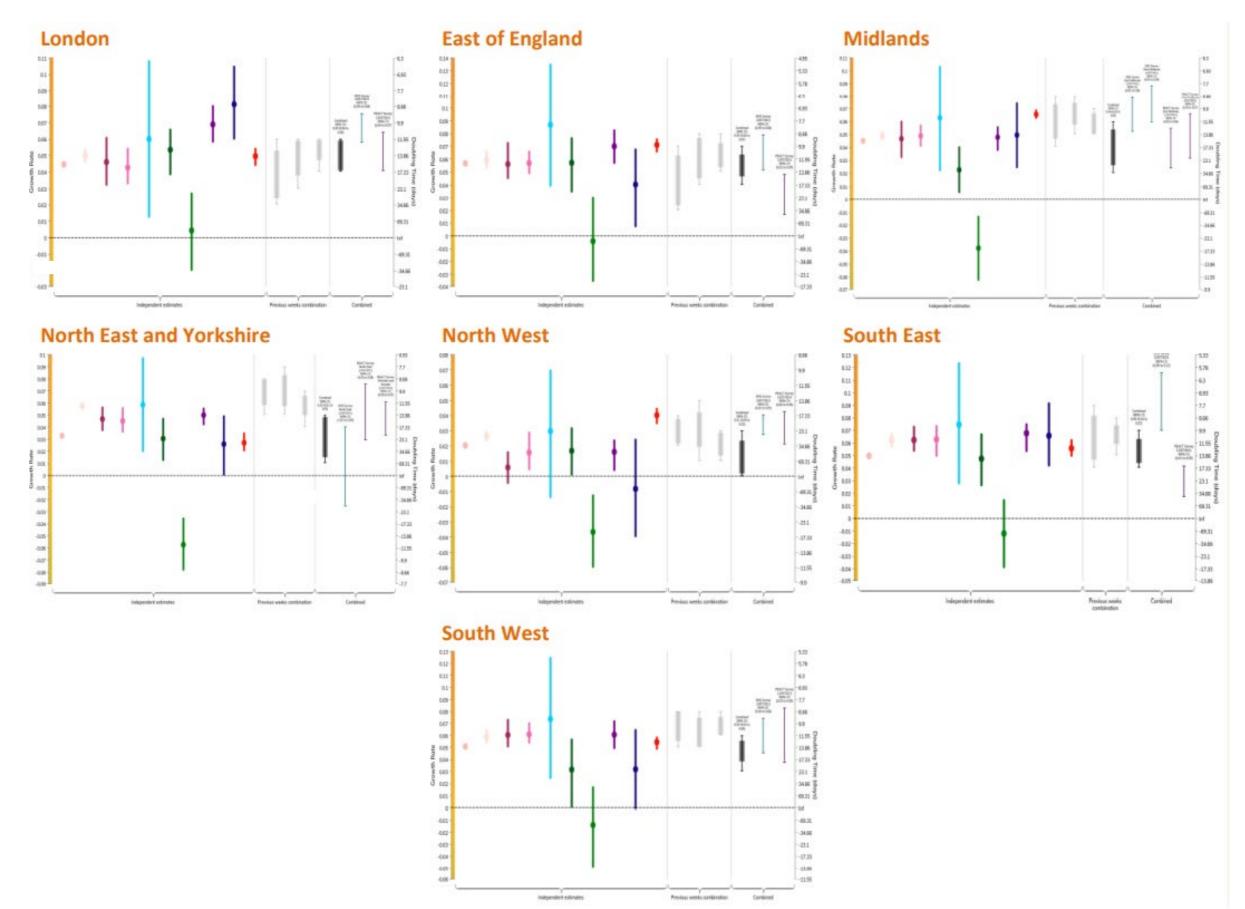
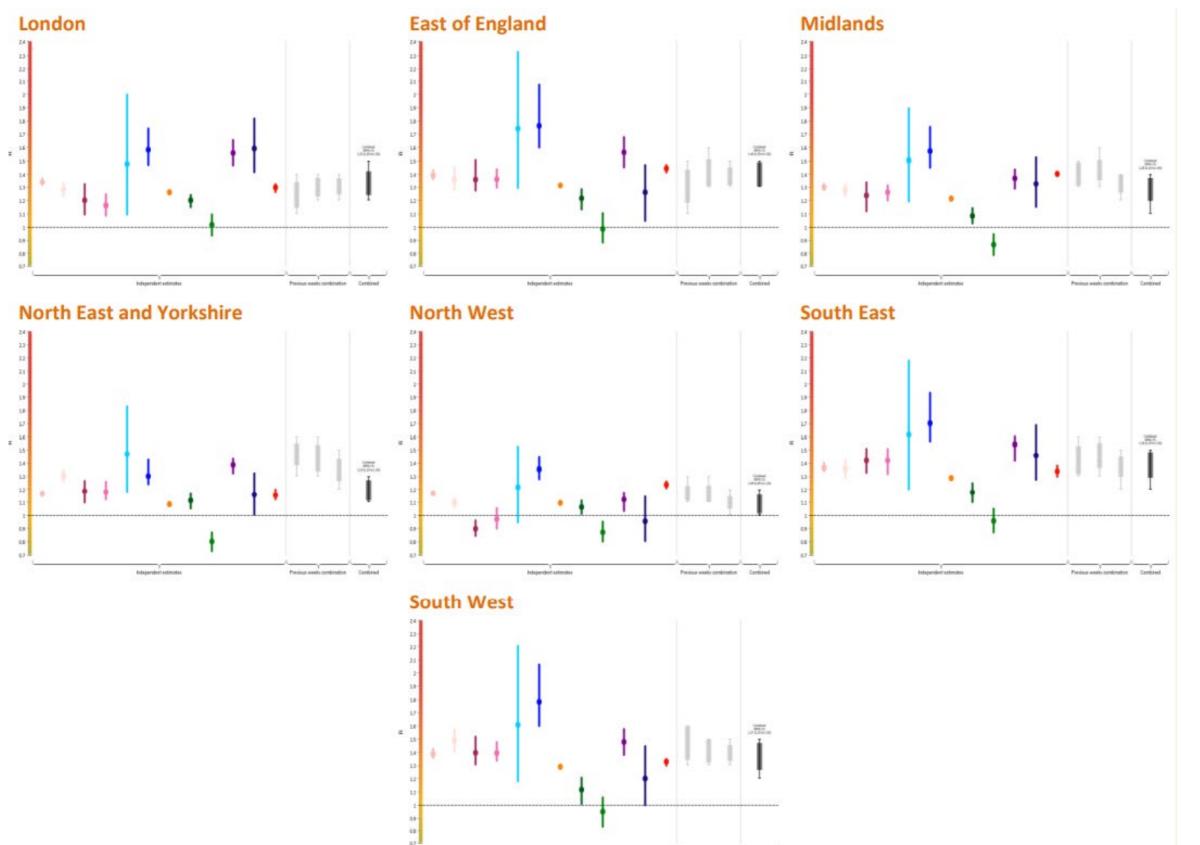


Figure 3. Estimates of R in the NHS England regions, including 90% credible intervals. Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding outwards to one decimal place



Independent autimotes

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