



UK Health
Security
Agency

Epidemiology modelling review group: consensus statement on COVID-19

Date: 22 September 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 [Annexe A](#).

Summary

1. The UKHSA's best estimate for R in England is between 0.8 and 1.0. R is estimated to be between 0.8 and 1.1 for Scotland, 0.8 and 1.0 for Wales, and 0.7 and 0.9 for Northern Ireland ([Figure 1](#)). These estimates are based on models¹ fitted to data available up to 20 September 2021, including hospitalisations, deaths, testing, wastewater samples and longitudinal studies, and therefore do not fully reflect the effect of the return of schools in England.
2. Combined estimates² show that the incidence³ is between 36,000 and 66,000 new infections per day in England.

Incidence and prevalence

3. During its most recent week (ending 18 September), the ONS Covid infection survey estimates⁴ that an average of 620,100 people had COVID-19 in the community in England (95% credible interval 577,100 to 663,900). The survey does not include people in care homes, hospitals, or prisons. Estimates from across the 4 nations of the UK are:
 - England 620,100 (95% credible interval 577,100 to 663,900)
 - Scotland 120,200 (95% credible interval 101,000 to 141,500)
 - Wales 50,700 (95% credible interval 39,900 to 62,700)
 - Northern Ireland 30,300 (95% credible interval 22,800 to 39,200)

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. For example, 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.

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

National and regional estimates of growth rates are summarised in [Figure 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. UKHSA's best estimate for R in in England is between 0.8 and 1.0. R is estimated to be between 0.8 and 1.1 for Scotland, 0.8 and 1.0 for Wales, and 0.7 and 0.9 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 20 September 2021⁶.
8. R is an indicator that lags by two to three weeks⁷, due to the time required for changes to be seen in data streams. This inherent lag means that recent fluctuations should not be expected to be consistent with these estimates, and estimates may not represent transmission trends now.
9. The estimates for R and growth rate in England are consistent with a plateau or gradual decline in transmission. As the effect of the return of schools and the associated behavioural changes are not fully reflected in the estimates, there is therefore uncertainty around the status of the epidemic and its future trends.

⁵ Further technical information on the growth rate can be found in Plus Magazine: [The growth rate of COVID-19 | plus.maths.org](https://plus.maths.org).

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.

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)**Table 1a. Nations**

Nation	R	Daily growth rate	Doubling time⁸
England	0.8 to 1.0	-3% to -1%	-24 days to flat
Wales ⁹	0.8 to 1.0	-2% to +1%	Flat
Scotland	0.8 to 1.1	-3% to +2%	-26 days to flat
Northern Ireland	0.7 to 0.9	-4% to -1%	-36 to -17 days

Table 1b. NHS England regions

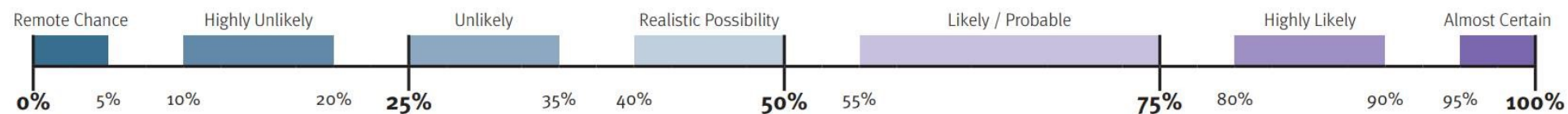
NHS England region	R	Daily growth rate	Doubling time⁸
London	0.8 to 1.0	-3% to -1%	-25 days to flat
East of England	0.8 to 1.0	-3% to 0%	-26 days to flat
Midlands	0.8 to 1.0	-3% to -1%	-27 days to flat
North East and Yorkshire	0.8 to 1.0	-3% to 0%	-28 days to flat
North West	0.8 to 1.0	-2% to +1%	Flat
South East	0.7 to 0.9	-4% to -1%	-19 days to flat
South West	0.7 to 0.9	-5% to -1%	-15 days to flat

⁸ 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.

⁹ Intervals of the R and growth rate estimates for Wales do not exactly correspond to each other due to the submission of different independent estimates, differing methodologies introducing different lags, and rounding in presentation

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 ([1](#), [2](#)), Imperial College London ([3](#), [8](#)), University of Warwick ([4](#), [5](#)), University of Exeter and University of Bristol ([6](#)), Lancaster University ([7](#)), University of Manchester, Public Health England and University of Cambridge ([9](#)). The UKHSA would also like to thank the European Bioinformatics Institute ([10](#)), University of Oxford ([11](#), [12](#)), University of Liverpool ([13](#)), and the Institute of Disease Modeling ([14](#)) for contributing model outputs. The UKHSA also acknowledges the work developing combination estimates from Defence and Science Technology Laboratory ([15](#)). 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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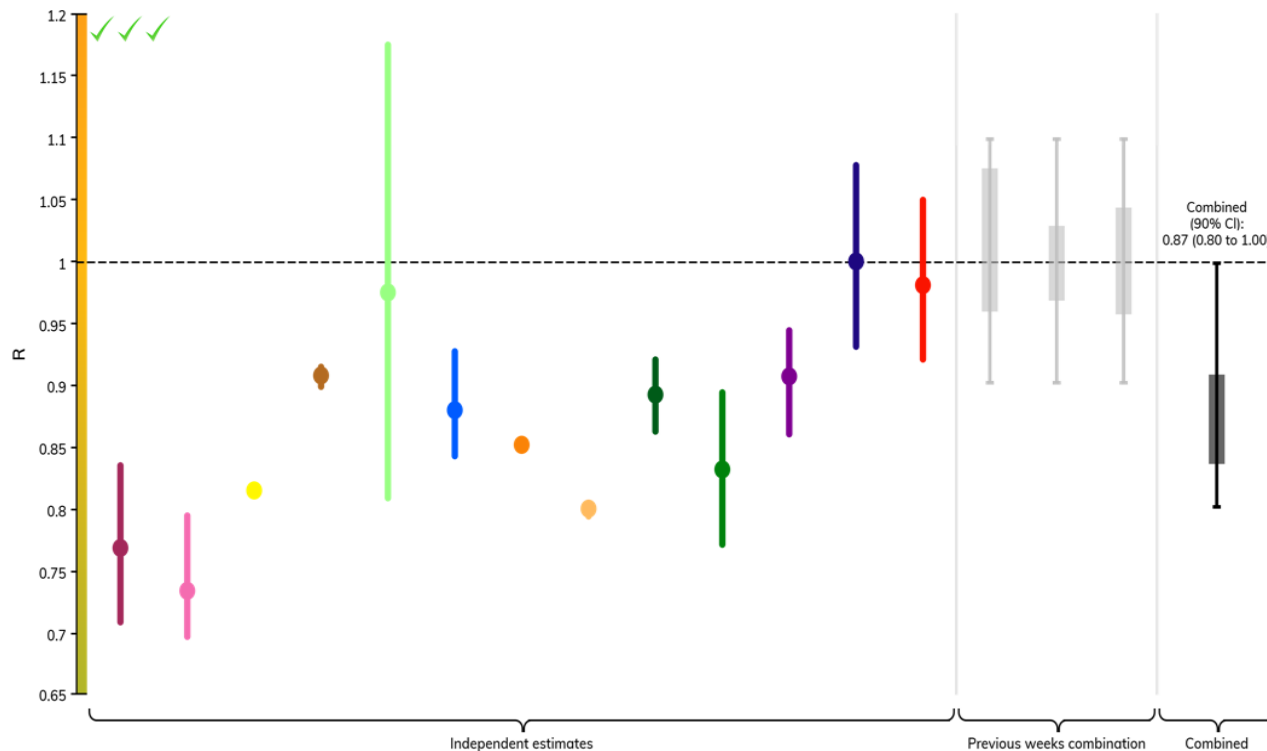
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Figure 1a. Estimates of R in the 4 nations of the UK (90% credible intervals)

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

England



Scotland

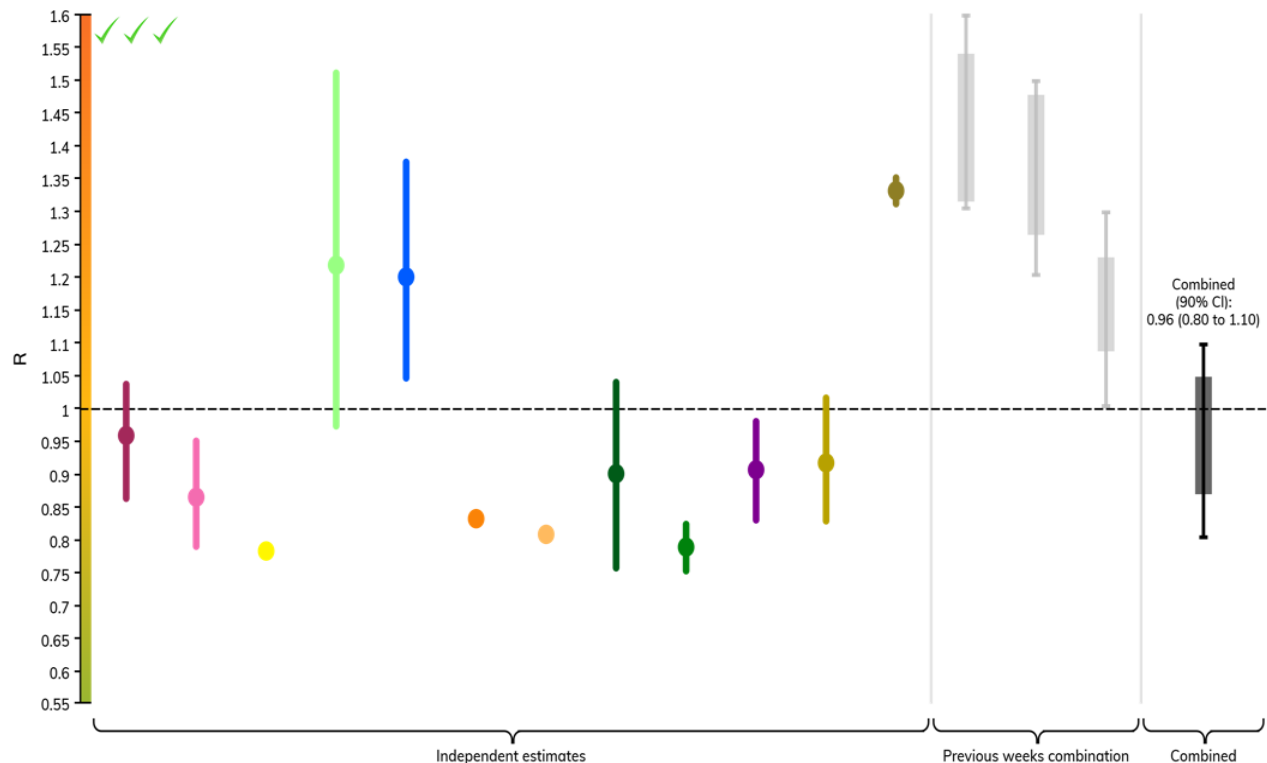
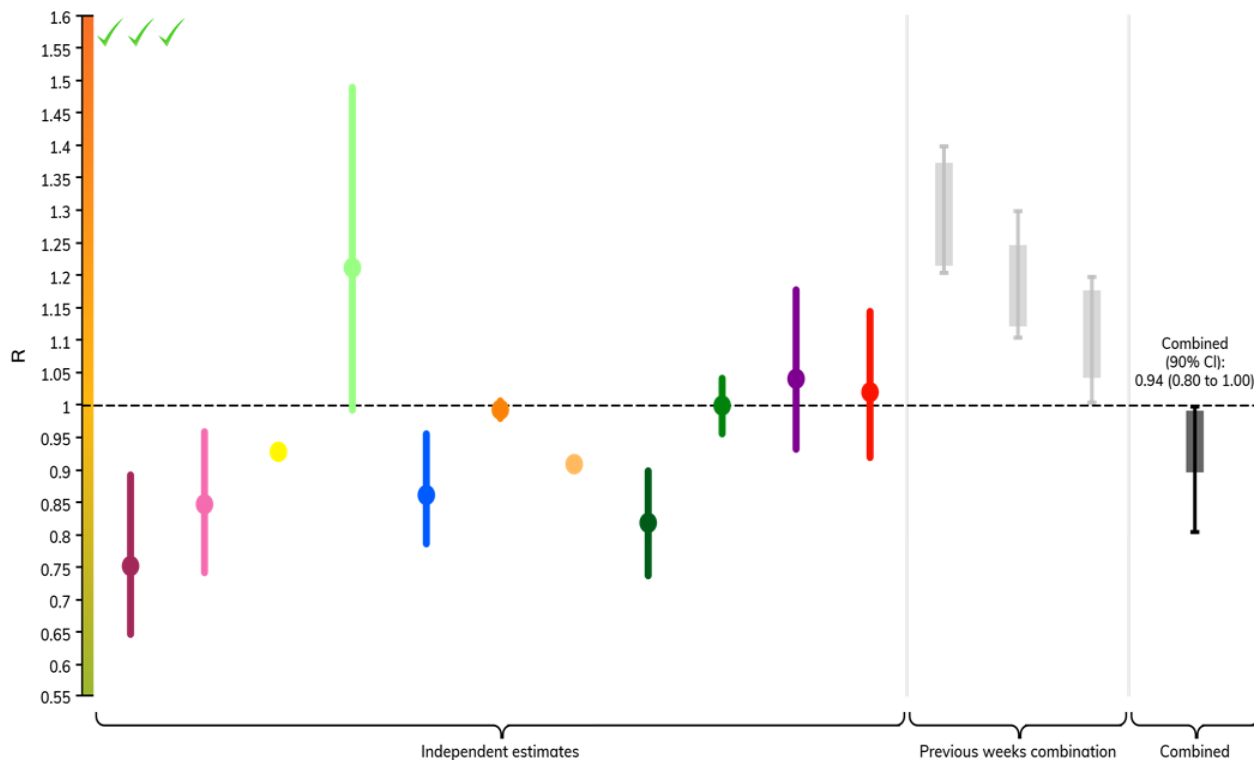


Figure 1b. Estimates of R in the 4 nations of the UK (90% credible intervals)

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.

Wales



Northern Ireland

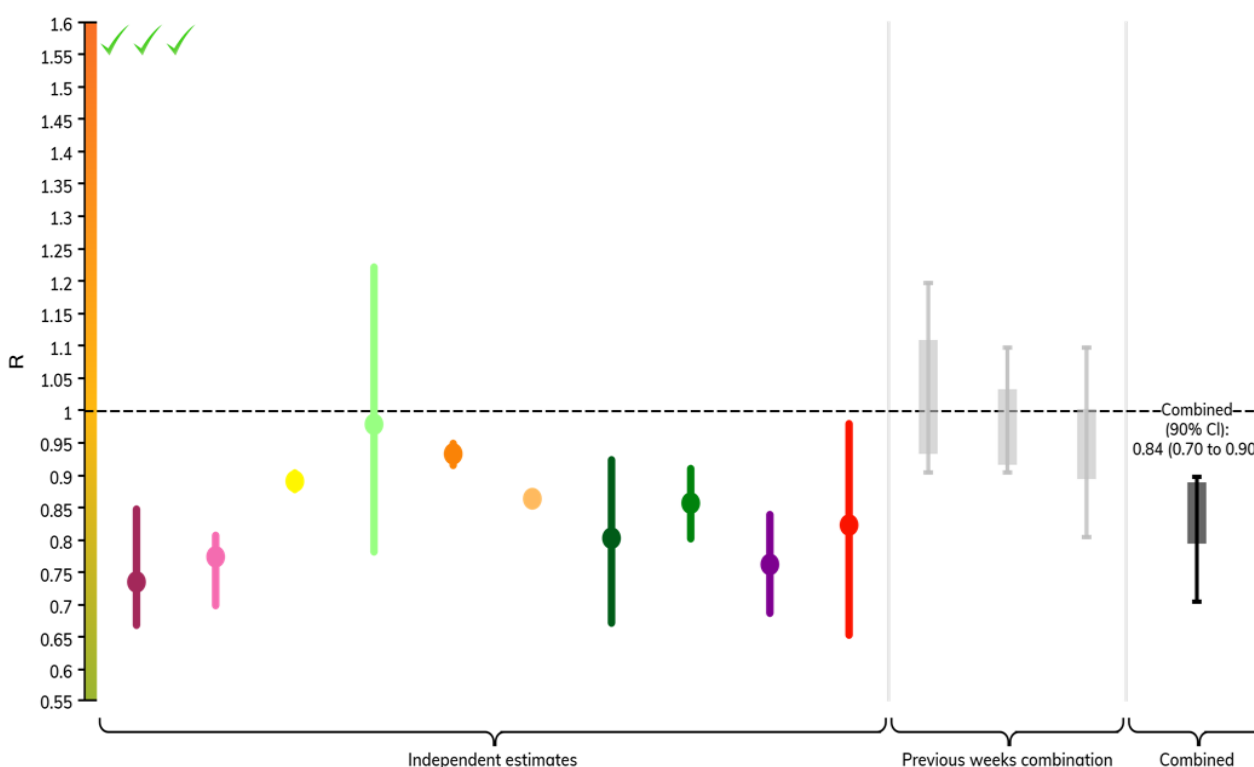
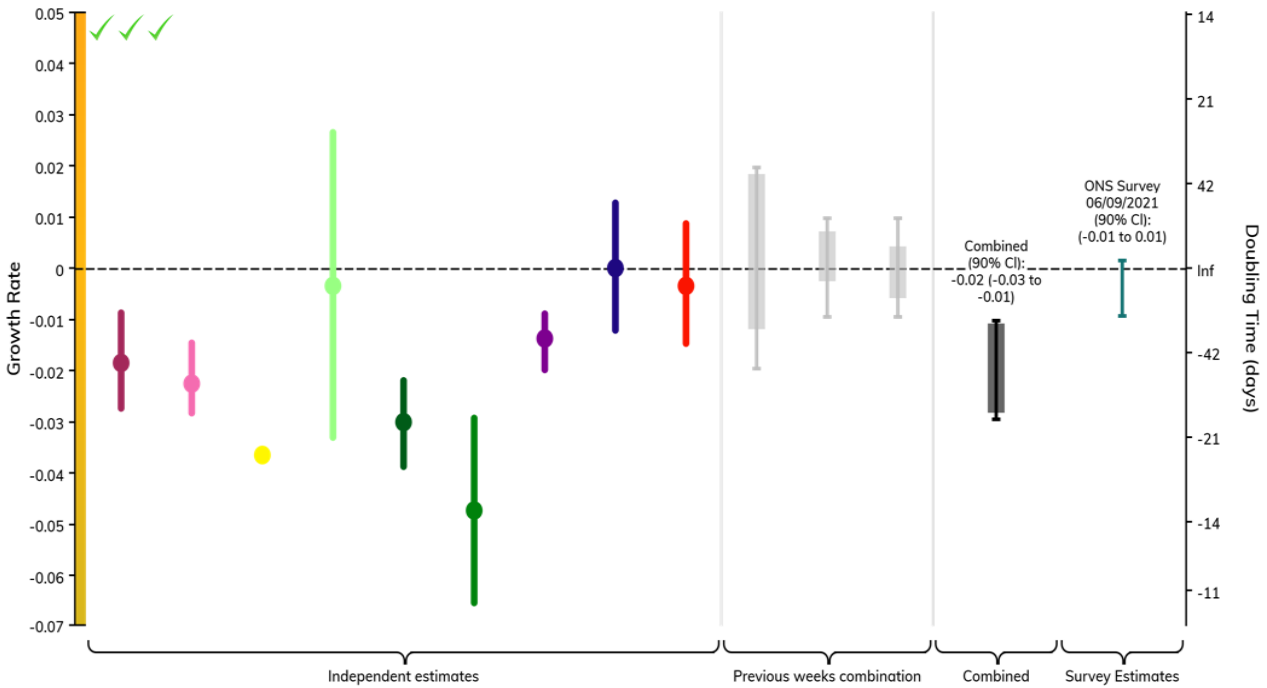


Figure 2a. Estimates of the growth rate in NHS England nations, including 90% credible intervals

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.

England



Scotland

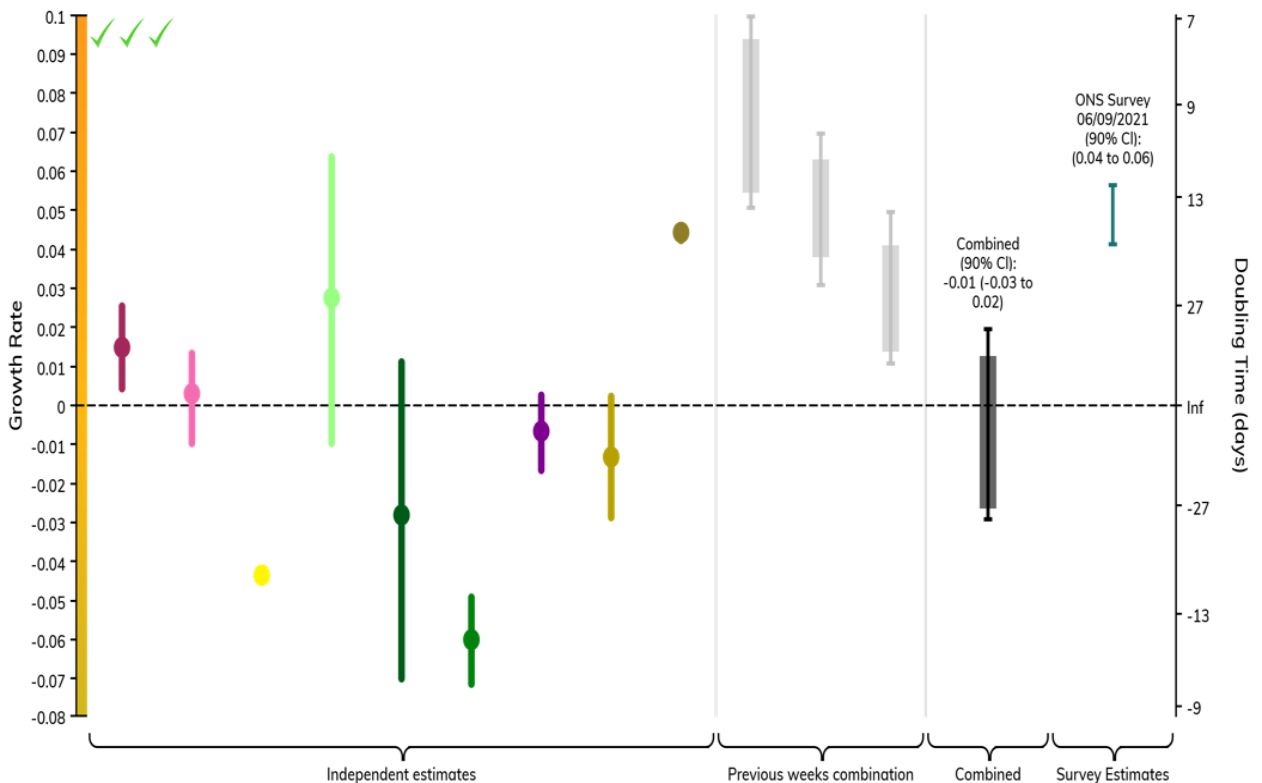
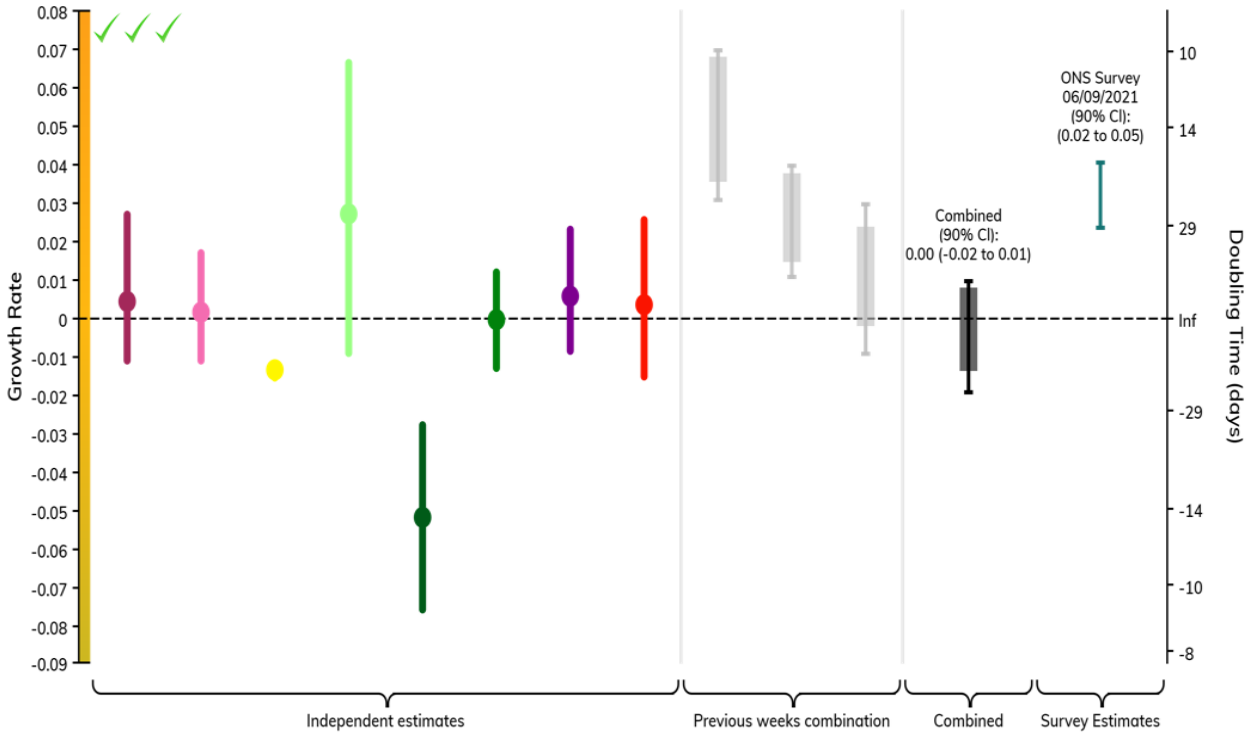


Figure 2b. Estimates of the growth rate in NHS England nations, including 90% credible intervals

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.

Wales



Northern Ireland

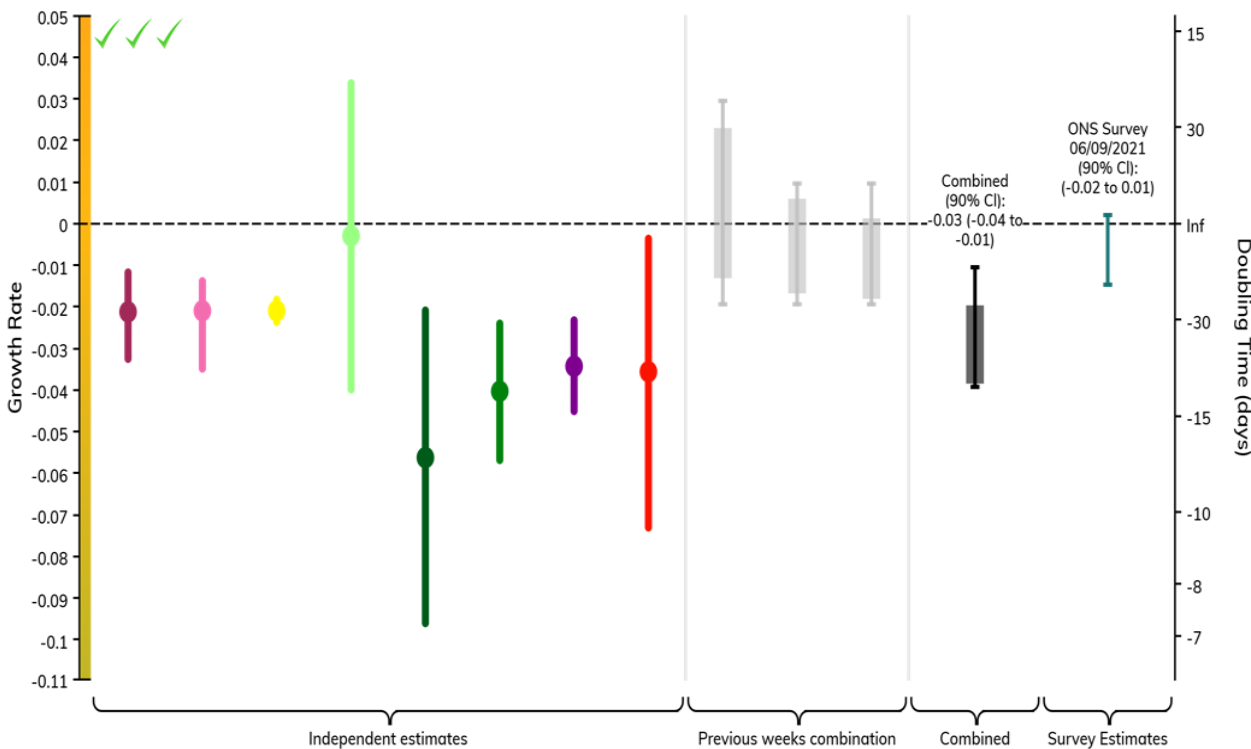
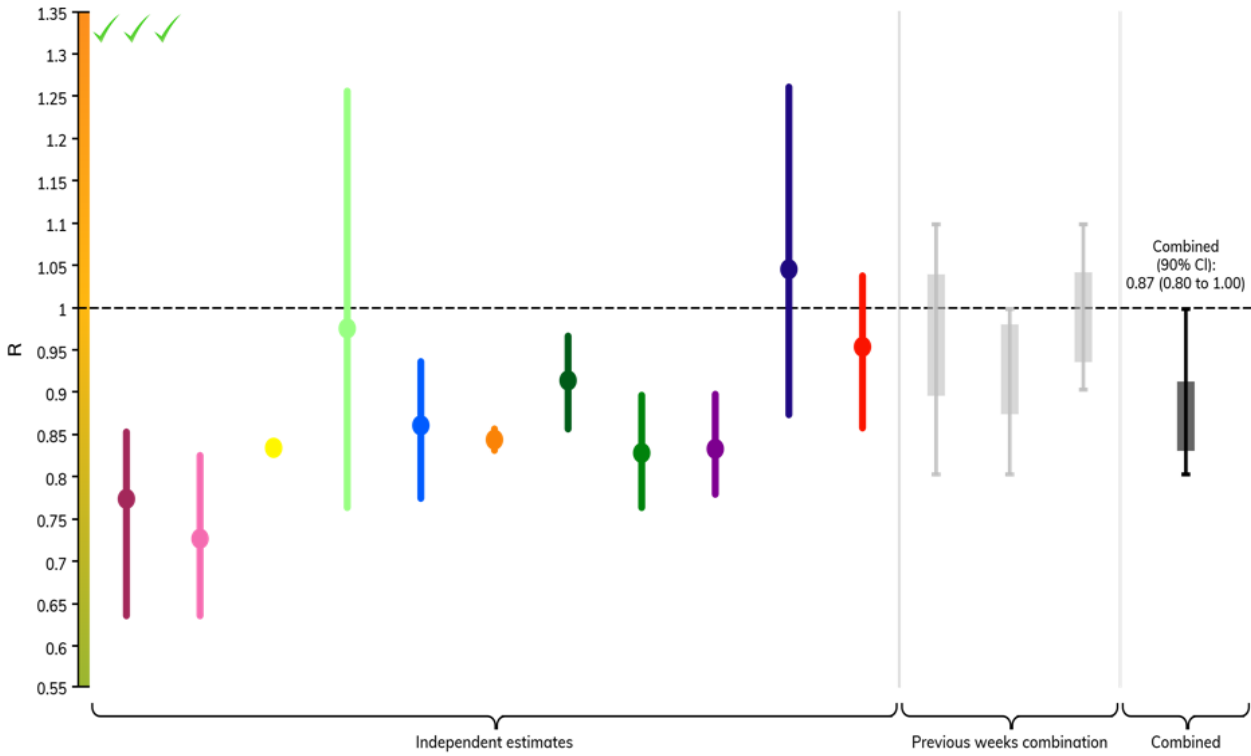


Figure 3a. Estimates of R in the NHS England regions, including 90% credible intervals
 Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding outwards to one decimal place.

London



East of England

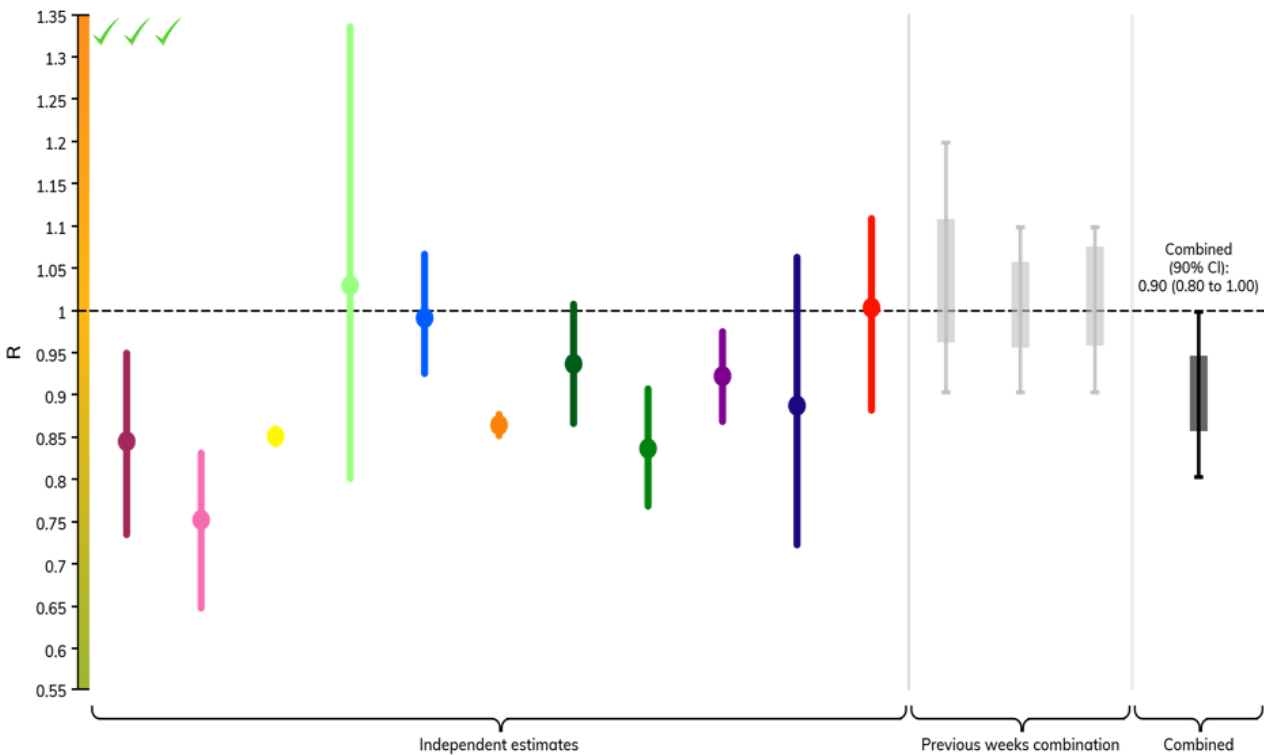
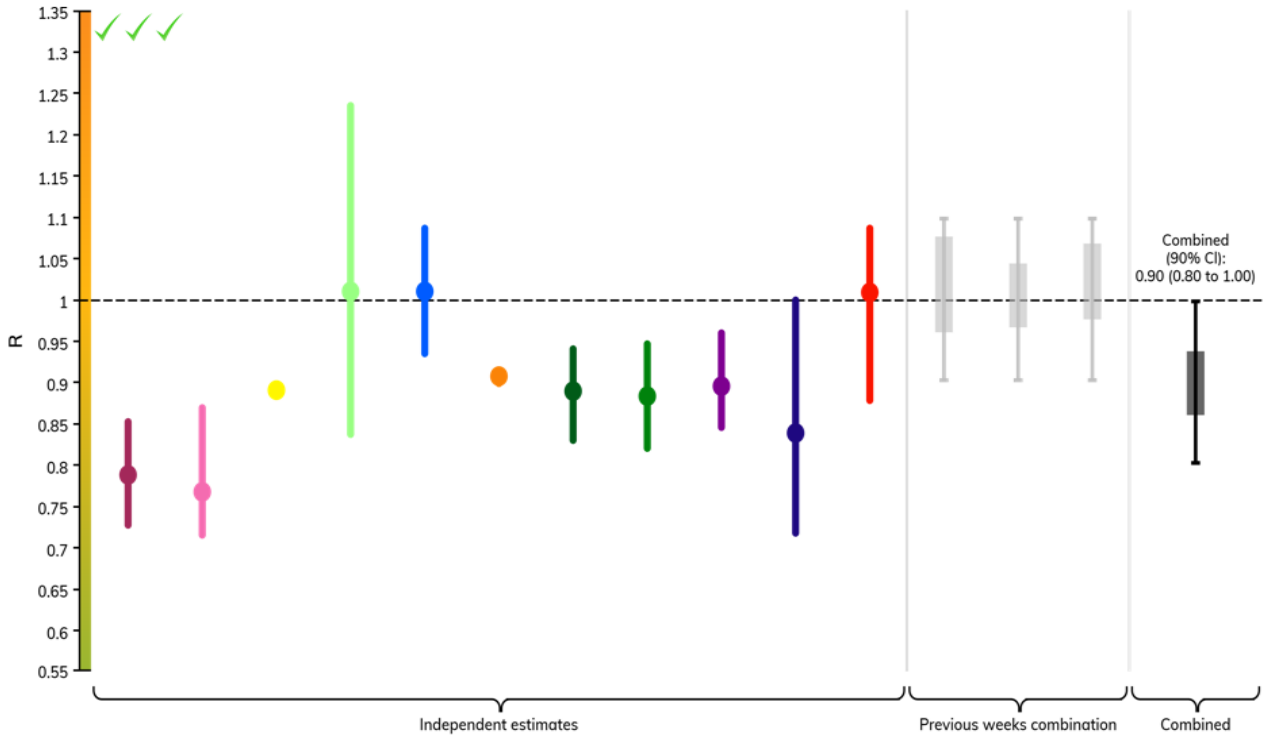


Figure 3b. Estimates of R in the NHS England regions, including 90% credible intervals
 Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding outwards to one decimal place.

Midlands



North East and Yorkshire

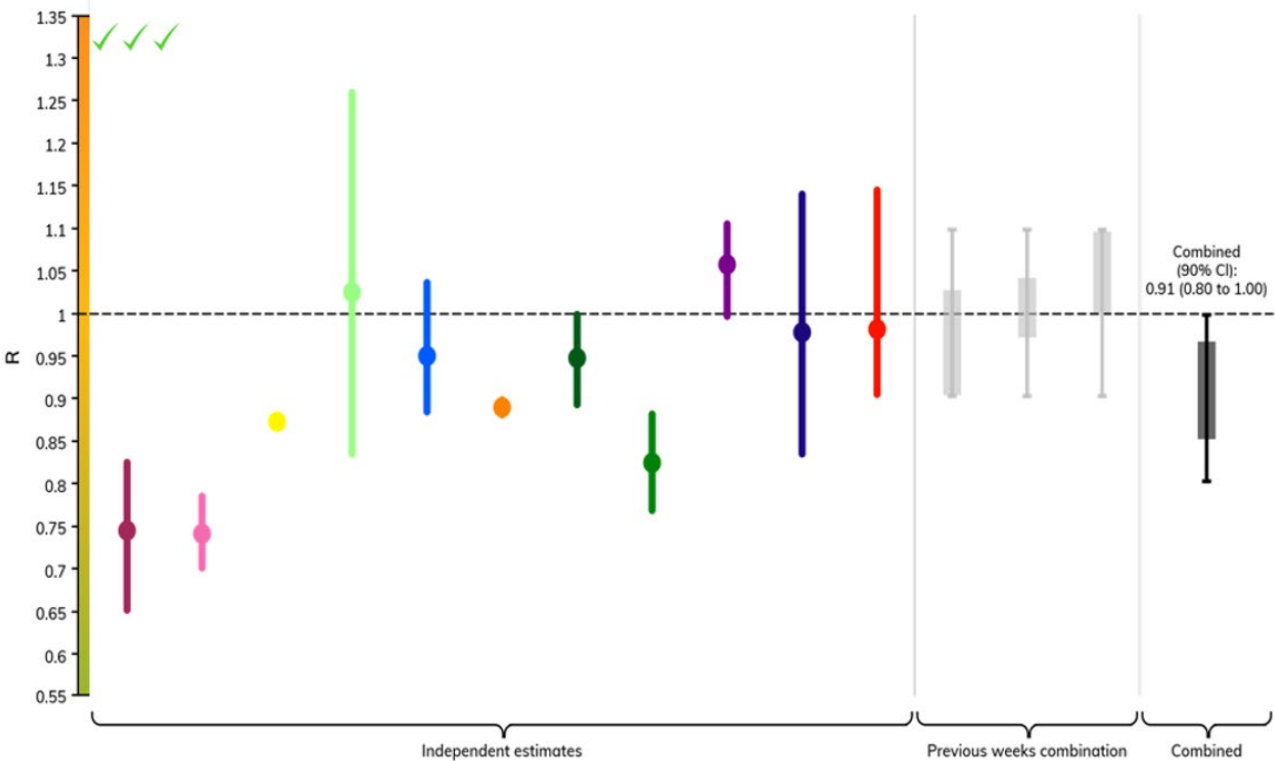
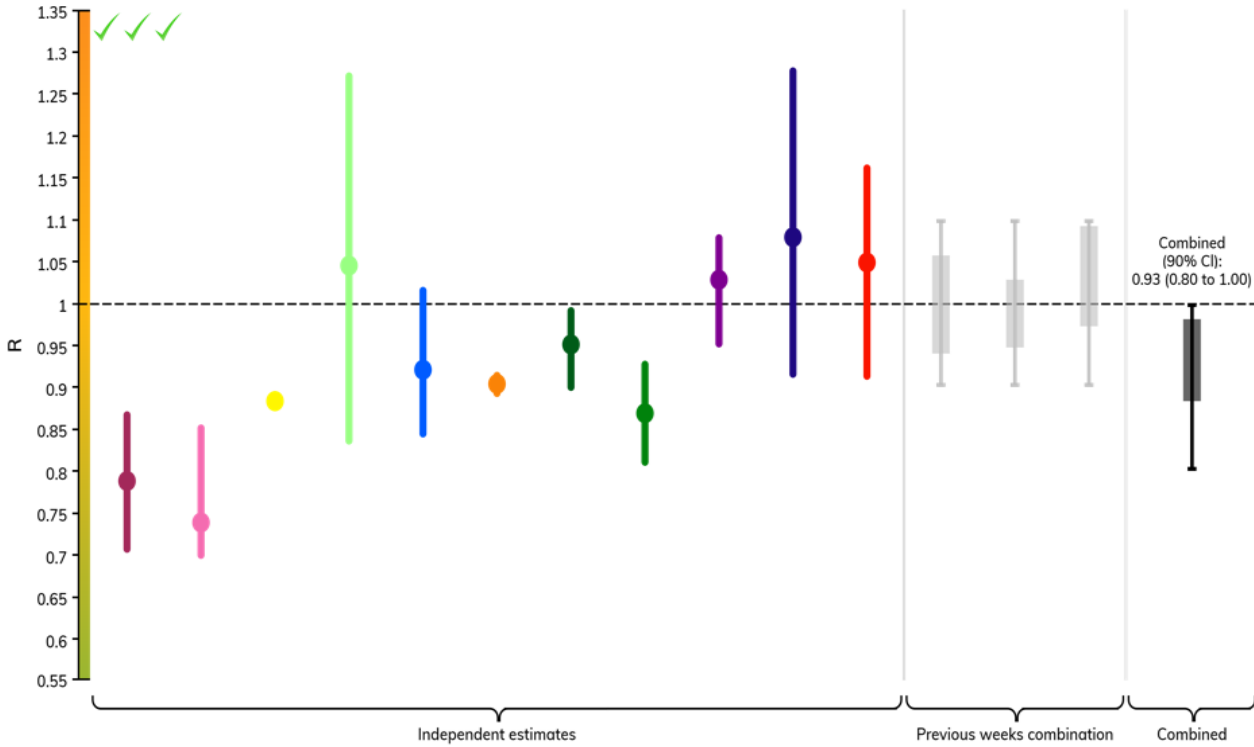


Figure 3c. Estimates of R in the NHS England regions, including 90% credible intervals
 Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding outwards to one decimal place.

North West



South East

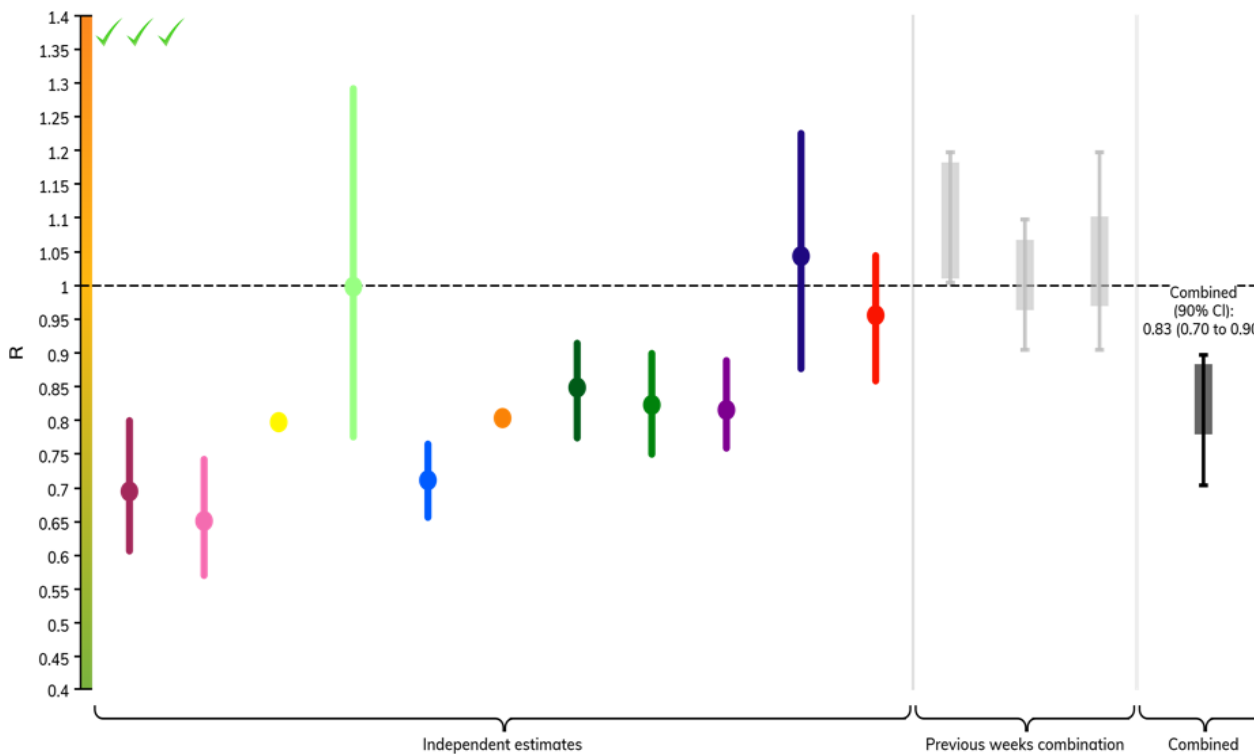
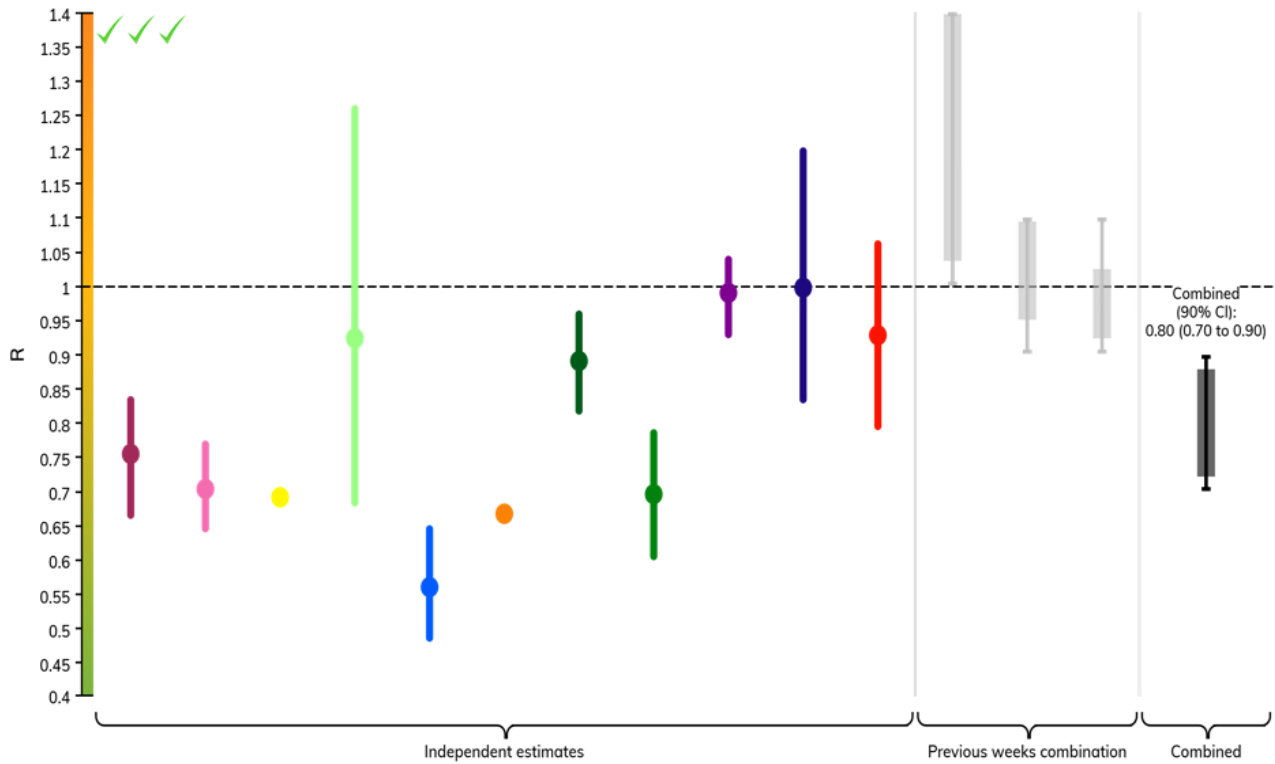


Figure 3d. Estimates of R in the NHS England regions, including 90% credible intervals
 Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding outwards to one decimal place.

South West



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