SPI-M-O: Consensus Statement on COVID-19

Summary

1. SPI-M-O's best estimates for **R in the UK and in England are between 1.1 – 1.2 and 1.1 – 1.3 respectively.** Estimates of R for Scotland and Northern Ireland are 0.9 – 1.1, and for Wales is 1.0 – 1.3. R is a lagging indicator and these estimates are based on the latest data available up to 14th December.

2. R and growth rates have increased in all areas of the UK, compared to last week. The epidemic is growing in much of the country and the East of England, London, and the South East now have R estimates **well above 1**. All other regions have R estimates above or spanning 1.

3. SPI-M-O estimate that there are between **57,000 and 77,000 new infections per day in England.**

4. **It is still too early to see the full impact of the new tiers system, implemented in England from 2nd December, in these estimates.** It will likely take several more days for the data to fully show expected changes in hospitalisations and deaths. Nonetheless, the models are clearly picking up the signals of increased transmission in England since the changes came into effect.

5. Scenario modelling for the weeks either side of Christmas has demonstrated that there is still great uncertainty in the medium term trajectory of the epidemic, as it will depend on how people behave over this time, the full impact of current policies, and any future changes to tiers. The number of new hospital admissions is currently high, and there is realistic potential to surpass the number seen in the first wave if the current increases continue or rise.

Incidence and prevalence

6. Combined estimates from six SPI-M-O models, using data available up to 14th December, suggest there are between **57,000 and 77,000 new infections per day in England**.

7. Modelling from the ONS community infection survey for the most recent week of the study (6th to 12th December) estimates that an average of **567,300 people had COVID-19** in the community in England (credible interval 533,600 to 602,300). The survey does not include people in care homes, hospitals, or university halls of residence. The equivalent estimates for the devolved administrations are:

England	567,300 (credible interval 533,600 to 602,300)
Scotland	52,500 (credible interval 41,600 to 64,600)
Wales	33,400 (credible interval 23,800 to 44,300)
Northern Ireland	8,500 (credible interval 5,100 to 13,000)

Reproduction number and growth rate

8. The reproduction number is the average number of secondary infections produced by a single infected individual. R is an average value over time, geographies, and communities. This should be considered when interpreting the R estimate for the UK given the differences in policies across the four nations.

9. **SPI-M-O's best estimate for R in the UK is between 1.1 – 1.2 while in England this is between 1.1 – 1.3.** Estimates of R for Scotland and Northern Ireland are 0.9 – 1.1, and for Wales is 1.0 – 1.3. R is a lagging indicator and these estimates are based on the latest data available up to 14th December. SPI-M-O's agreed national and regional estimates are summarised in Table 1 and Figures 2, 3, and 5.

10. **It is too early to see the full impact of the new tiers system, implemented in England from 2nd December, in these estimates.** It will likely take several more days for the data to fully show expected changes in hospitalisations and deaths. Data from the past two weeks, however, are influencing the estimates of R so that the effects of both pre- and post-measures from 2nd December are included.

11. There is considerable local heterogeneity in the epidemic, but it is growing in much of England, with R well above 1 in the East of England, London, and South East. Cluster analysis has identified that, between 20th November and 5th December, the growth pattern of cases in a group of contiguous local authorities in Kent diverged from the rest of the country.

12. For small daily changes, the growth rate is approximately the proportion by which the number of infections increases or decreases per day, i.e. the rate at which an epidemic is growing or shrinking[1].

13. SPI-M-O's consensus estimate is that the **growth rate in the UK is between +1% to +4% per day**, and between +2% and +4% in England. SPI-M-O's national and regional estimates of growth rates are summarised in Table 1 and Figure 4.

14. SPI-M-O estimate that the number of new infections is doubling every 22 to 35 days in the UK and every 19 to 28 days in England. The East of England has the shortest doubling time of 14 days.

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[1] Further technical information on the growth rate can be found in Plus magazine.

Healthcare acquired infection

15. Figure 1 shows the number of new confirmed COVID-19 cases in hospitals in England each week based on data from NHS England's situation report. Colours show the likely source of the infection, with red and pink representing people with positive tests before or shortly after admission from the community, and blue those with positive tests before or shortly after admission from care homes. Dark green show people whose positive test was 3 to 7 days after admission and therefore were possibly infected within hospital; and light green is those whose positive test was more than 7 days after admission and were therefore probably infected within hospital.

16. It can be clearly seen that the proportion of infections that were possibly or probably acquired in hospital steadily increased throughout October and November. This level of healthcare acquired infection will have implications for further onward transmissions in the community. It may also affect the impact of vaccines given to patients and staff.

Figure 1: Number of new confirmed cases in hospitals in England per week, as reported in NHS England's situation report. The colour of each bar refers to the patients' entry route to hospital and the timing of their positive test. Light blue = positive test before arrival from care home; dark blue = positive test within 2 days of arrival from care home; red = positive test within 2 days of admission from community; pink = positive test before admission from community; light green = positive test 3 to 7 days post-admission; dark green = positive test over 7 days post admission.
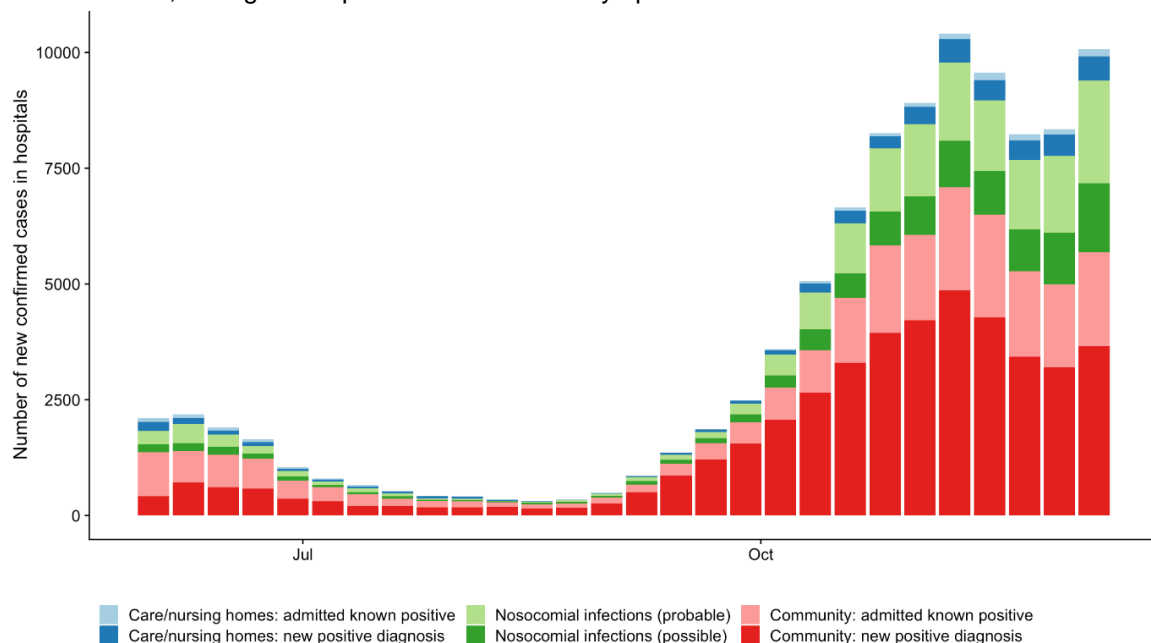
## Scenarios for the coming weeks

17. The introduction of the new tiering system in England and the planned relaxation of restrictions over the festive period means that the medium-term trajectory of the epidemic is highly uncertain. A subset of SPI-M-O models have been used to investigate a range of scenarios over the next six weeks.

18. Modelling groups have used data from the first period of tiering, current trends, and their expert judgement to create a) high and low transmission scenarios for the period before 22nd December and the period after the 28th December and b) high and low scenarios for the 23rd to 27th December.

19. The high and low transmission scenarios up to 22nd December and from 28th December onwards, are based on optimistic and pessimistic, but plausible, impacts of the new tiering system in England. Different groups have taken different approaches that include equating to specific R values (for example, transmission decreases to 90% of current levels for the low scenarios or similar to values from periods of growth in transmission), or map to previous impact of tiers[2].

20. The different groups have also modelled the festive period in different ways. In the low festive scenario, groups have assumed that there is either less (for example, 90% of current levels) or no additional mixing during this period. In the high scenario, groups have assumed there is substantially more mixing (for example, 50% more than current levels), especially in the over 65's.

21. **These scenarios are not predictions or forecasts**, but illustrations of the implications for the epidemic depending on how measures and behaviour change over the coming weeks.

22. The different modelling groups' estimates have been statistically combined. Figures 6, 7, and 8 illustrate the scenario of a) high transmission pre- and post-Christmas and high transmission over the festive period, b) low transmission pre- and post-Christmas and low transmission over the festive period and c) the latest projections based on the current trajectory (i.e. not accounting for any changes over Christmas nor recent or future policy changes).

23. These figures show three things:
    - **There is considerably uncertainty in how the epidemic will unfold over the next few weeks, with close to an order of magnitude's difference between the number of hospital admissions possible.**
    - The full effect of the festive period will not be apparent until January.
    - Even a short period of epidemic growth could lead to the number of new hospital admissions in early January 2021 exceeding the peak of the first wave.

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[2] SAGE papers: SPI-M-O: Statement on tiers in England and Impact of Interventions TFG: The UK's four nations' autumn interventions

24. The highest part of the peak of new hospital admissions during the first wave was short and acute. A sustained period of hospital admissions similar to, or just below, the first wave would result in much greater pressure on the health service, even before considering the usual winter pressures.

Annex: PHIA framework of language for discussing probabilities
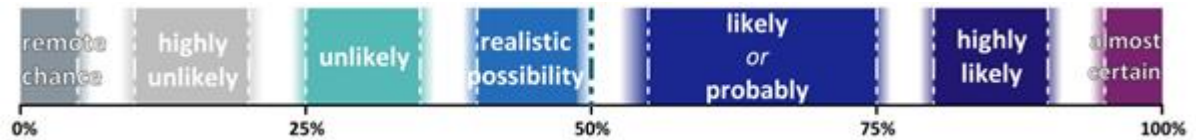
Table 1: Combined estimate of R and the growth rate in the UK, four nations and NHS England regions (90% confidence interval)[3]

Nation	R	Growth rate per day
England	1.1 – 1.3	+2% to +4%
Scotland	0.9 – 1.1	-2% to +2%
Wales	1.0 – 1.3	+1% to +4%
Northern Ireland	0.9 – 1.1	-2% to +1%
UK	**1.1 – 1.2**	**+1% to +4%**

NHS England region	R	Growth rate per day
East of England	1.2 – 1.4	+4% to +6%
London	1.1 – 1.3	+3% to +6%
Midlands	1.0 – 1.2	+1% to +3%
North East and Yorkshire	0.9 – 1.1	-1% to +1%
North West	0.9 – 1.1	0% to +2%
South East	1.1 – 1.3	+3% to +5%
South West	0.9 – 1.2	0% to +3%

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[3] The estimate intervals for R and growth may not exactly correspond to each other due to the submission of different independent estimates and rounding in presentation.

Figure 2: SPI-M-O groups' estimates of median R in the UK, including 90% confidence intervals. Bars represent different independent estimates. The grey shaded area represents the combined numerical range and the black bar is the combined range after rounding to 1 decimal place. The UK estimate of R is the average over very different epidemiological situations and should be regarded as a guide to the general trend rather than a description of the epidemic state.
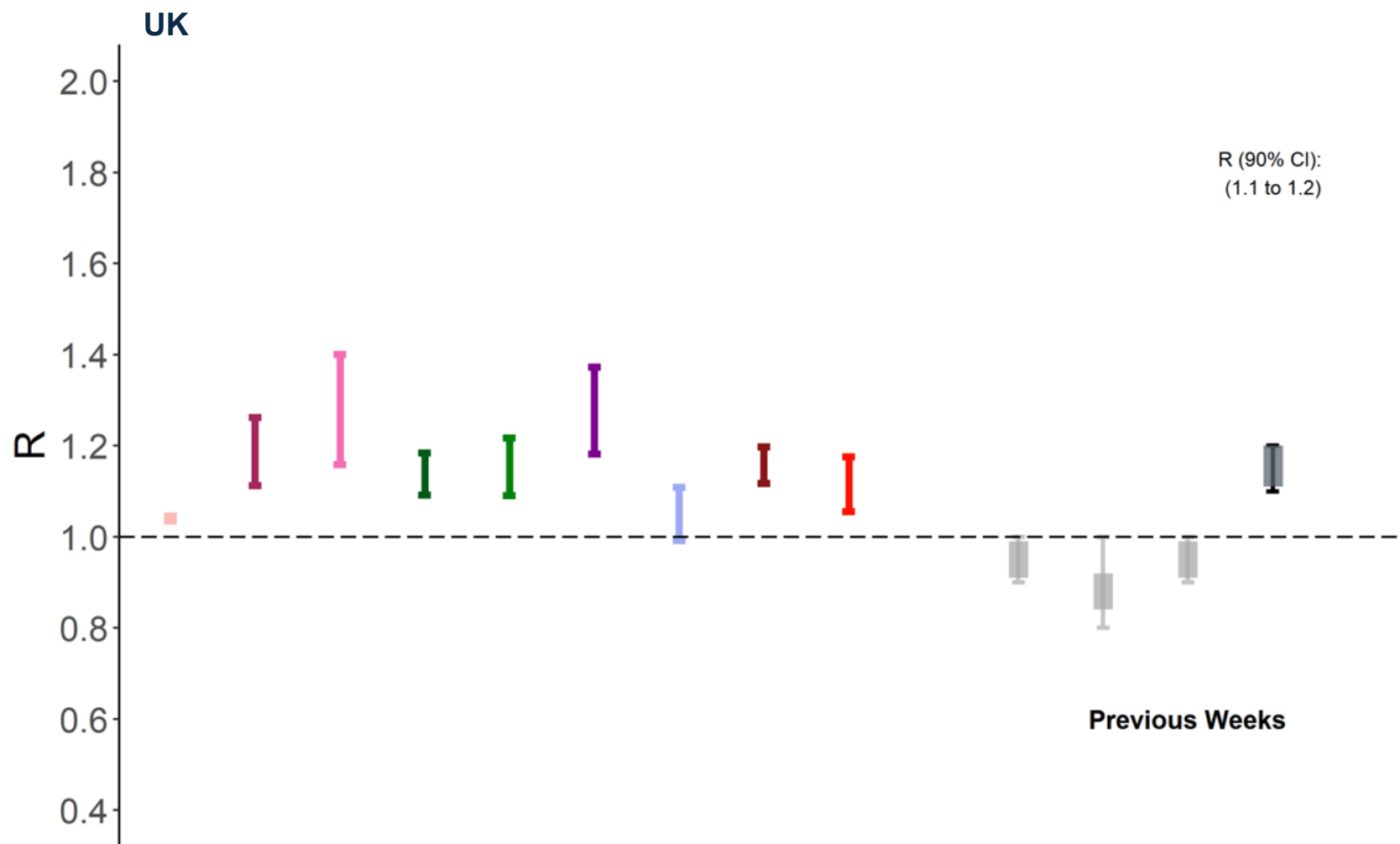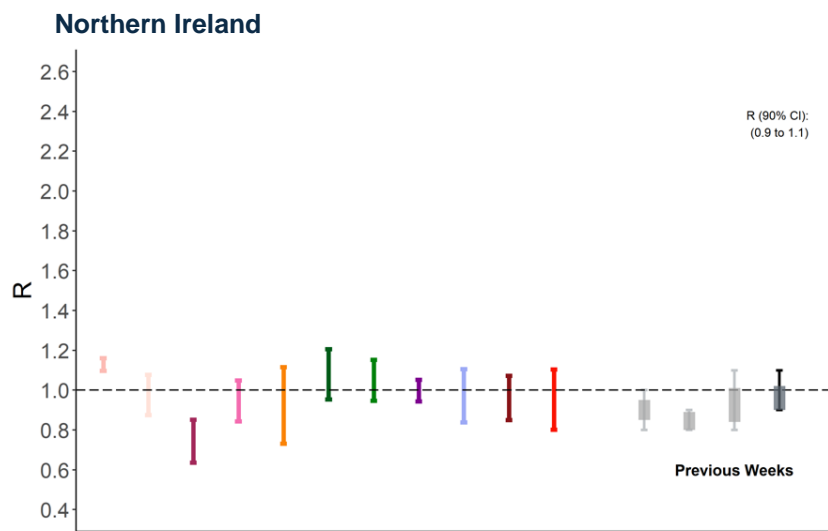
Figure 3: SPI-M-O groups estimates of median R in the four nations of the UK, including 90% confidence intervals. Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 1 decimal place.
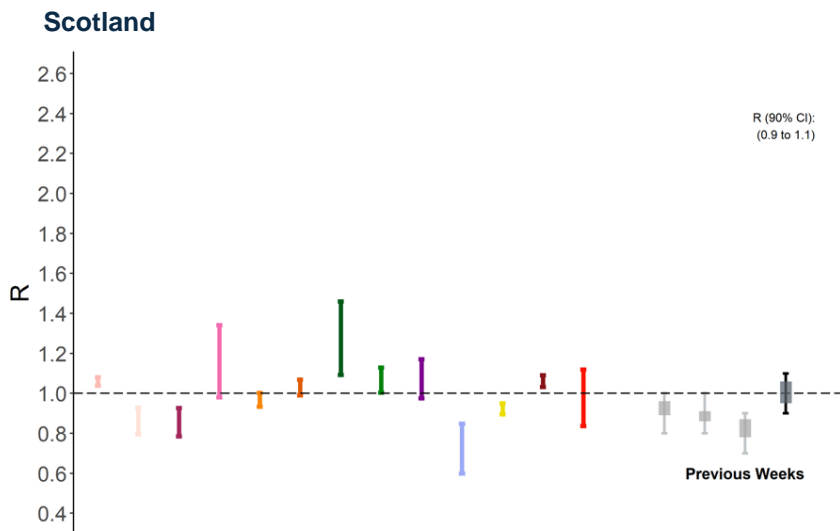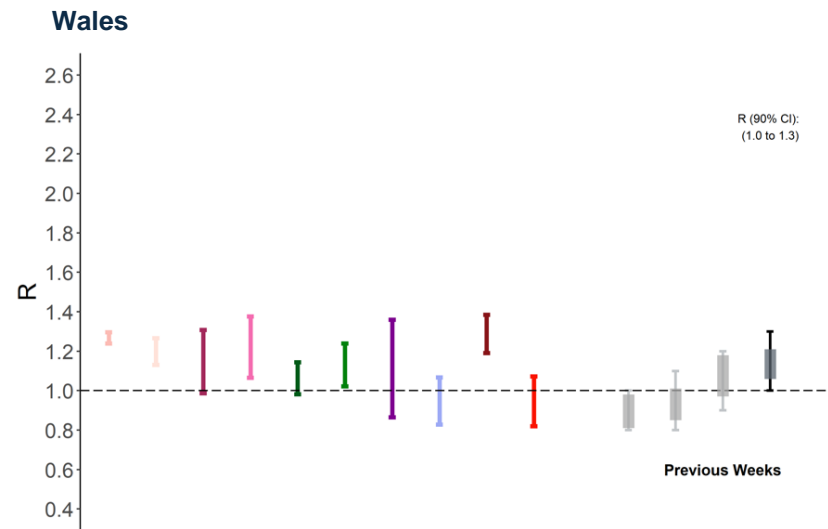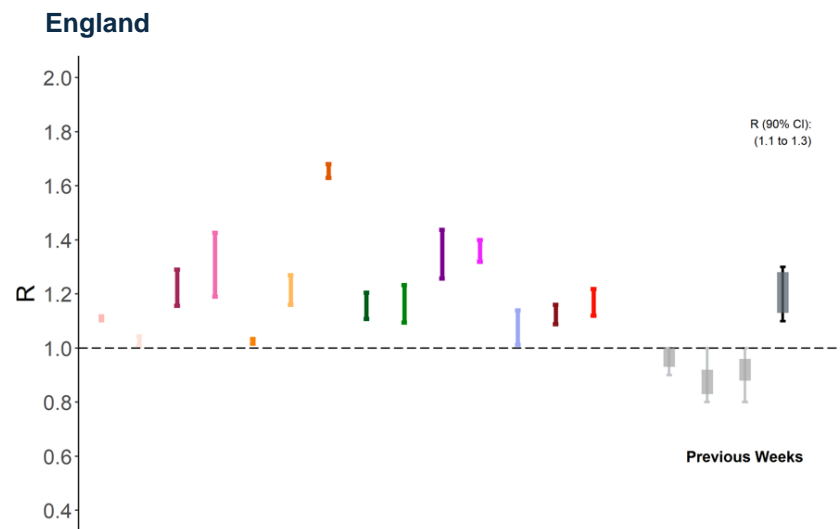
Figure 4: SPI-M-O groups estimates of the growth rate in NHS England regions, including 90% confidence intervals. Bars represent different modelling groups. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 2 decimal places.
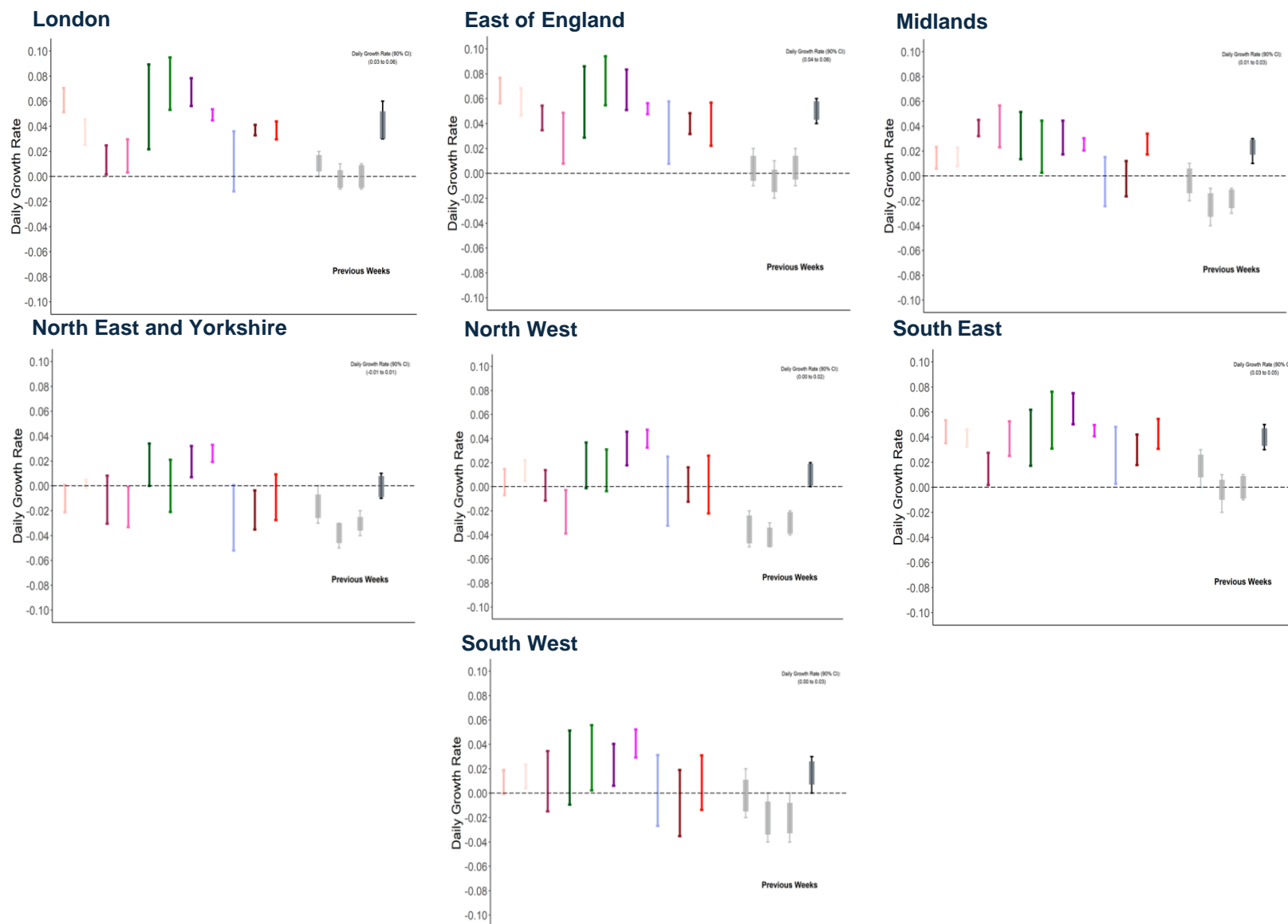
Figure 5: SPI-M-O groups estimates of median R in the NHS England regions, including 90% confidence intervals. Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 1 decimal place.
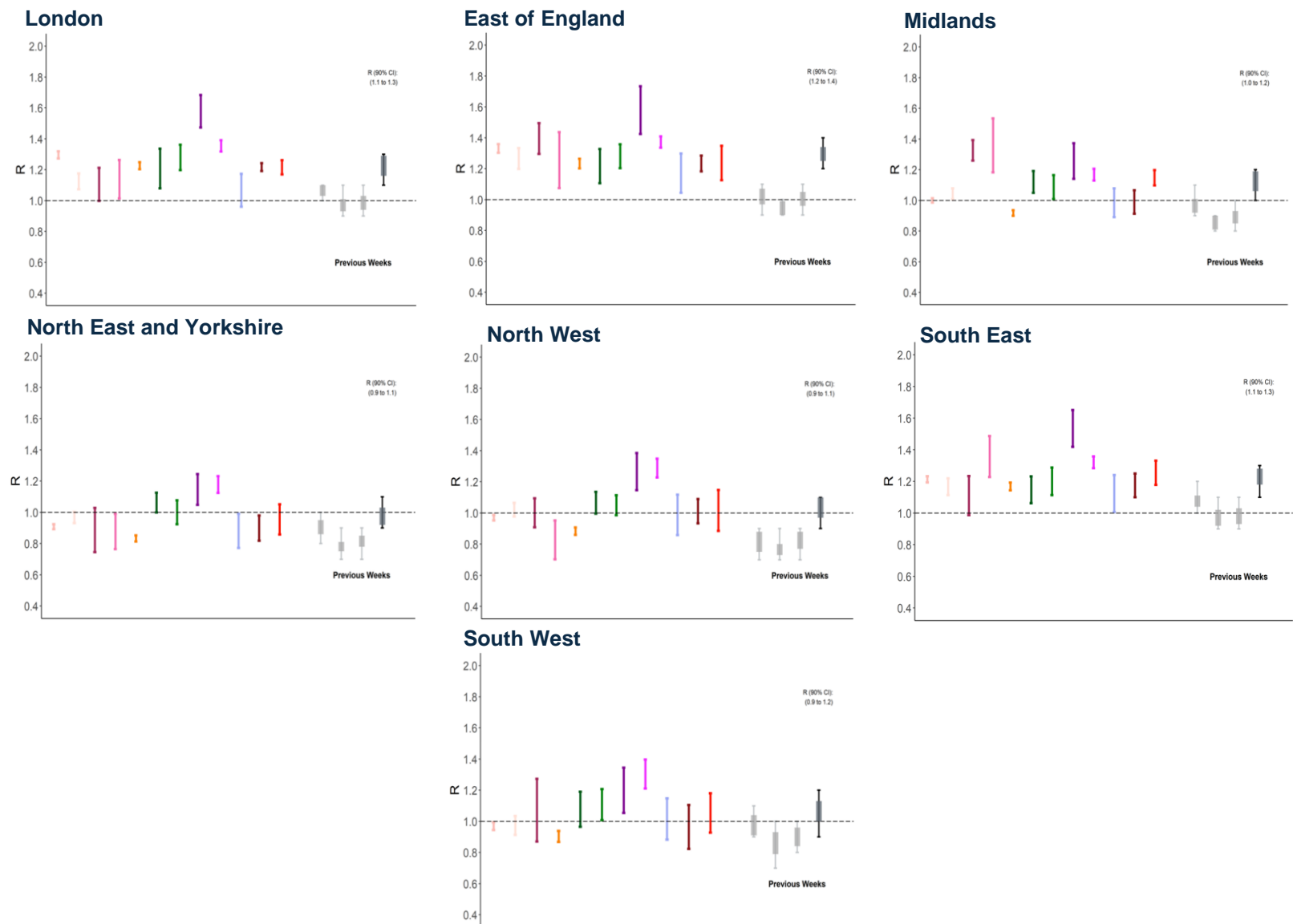
Figure 6: Combined estimates from SPI-M-O groups of estimates of hospital admissions in England in three scenarios: orange = high transmission pre- and post-festive period and high transmission over Christmas; green = low transmission pre- and post-festive period and low transmission over Christmas; grey = medium term projection based on current trends in epidemiological data and assuming no impact of Christmas. More detail is given above. Shaded areas are interquartile ranges, and the horizontal dashed line is the first wave peak. **It is highly likely that firm action would be taken if hospital admissions were considerably higher than their first wave peak. As a result, the vertical axis has been truncated at 150% of the first wave peak hospitalisations.**
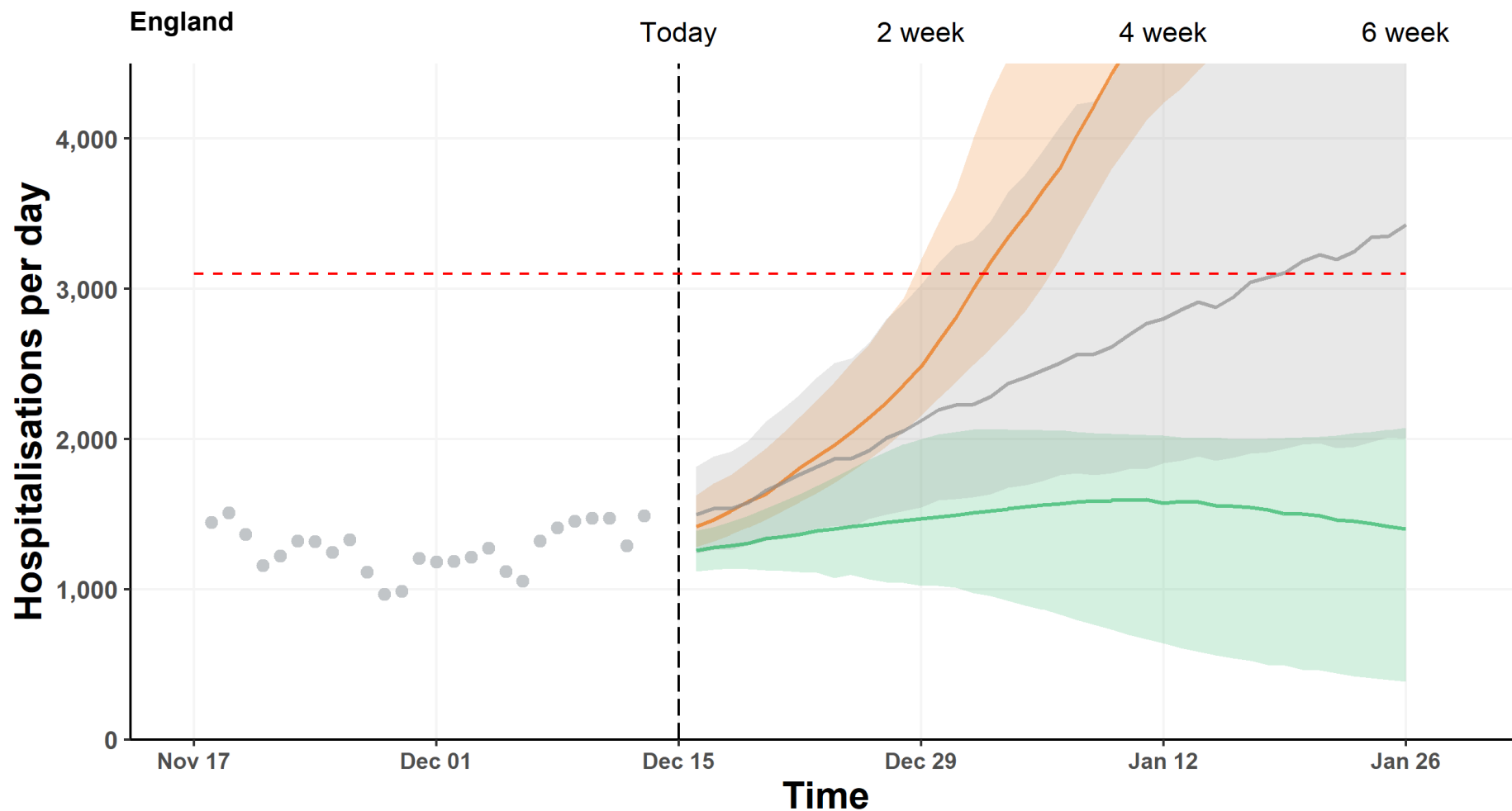
Figure 7: Combined estimates from SPI-M-O groups of estimates of hospital admissions in Wales in three scenarios: orange = high transmission pre- and post-festive period and high transmission over Christmas; green = low transmission pre- and post-festive period and low transmission over Christmas; grey = medium term projection based on current trends in epidemiological data and assuming no impact of Christmas. More detail is given above. Shaded areas are interquartile ranges, and the horizontal dashed line is the first wave peak. **It is highly likely that firm action would be taken if hospital admissions were considerably higher than their first wave peak. As a result, the vertical axis has been truncated at 150% of the first wave peak hospitalisations.**
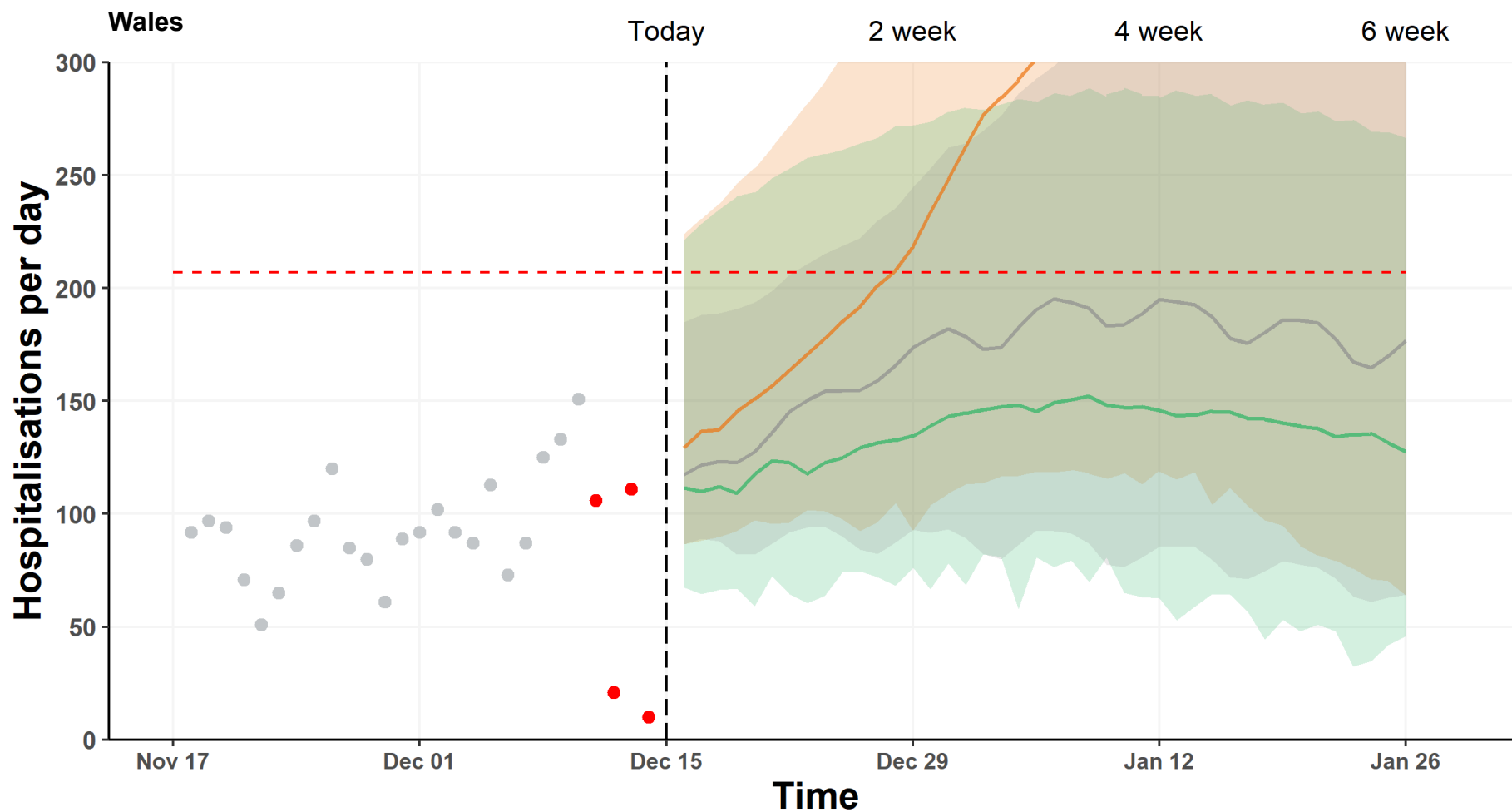
Figure 8: Combined estimates from SPI-M-O groups of estimates of hospital admissions in NHS England regions in three scenarios: orange = high transmission pre- and post-festive period and high transmission over Christmas; green = low transmission pre- and post-festive period and low transmission over Christmas; grey = medium term projection based on current trends in epidemiological data and assuming no impact of Christmas. More detail is given above. Shaded areas are interquartile ranges, and the horizontal dashed line is the first wave peak. **It is highly likely that firm action would be taken if hospital admissions were considerably higher than their first wave peak. As a result, the vertical axis has been truncated at 150% of the first wave peak hospitalisations in England. For some regions the first wave peak is above the limit of the truncated y axis.**