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

Date: 10th February 2021

All probability statements are in line with the framework given in the Annex.

Summary

1. SPI-M-O's best estimates for **R in the UK, and all four nations are between 0.7 and 0.9.** R is a lagging indicator and these estimates are based on the latest data, available up to 8th February, including hospitalisations and deaths as well as symptomatic testing and prevalence studies.
2. SPI-M-O is confident that R is now below 1 across all NHS England regions. Although the epidemic continues to decrease in all the nations and regions, transmission is heterogeneous more locally. This heterogeneity contributes to the variation in R estimates and will be important for future patterns.
3. SPI-M-O estimates that there are between **28,000 and 58,000 new infections per day in England.**
4. SPI-M-O is actively looking for signals of the population level impact of vaccination. There are no clear signals yet.
5. Although R is below 1, prevalence remains high across the country. Any relaxation of measures will need to be careful, particularly considering the situation at the time of each stage of easing. Any signal from increased transmission in younger age groups will take time to see and require careful assessment, particularly as vaccination is likely to change how infections spread between age groups. An adaptive management approach where the situation at each point of easing is assessed is therefore advisable.
6. Any period of high prevalence combined with accumulating immunity (either through infection or vaccination) provides both the selection pressure and the opportunity for escape mutants to emerge, therefore keeping prevalence low is key to reducing the probability of the emergence of further new variants in the UK.

Incidence and prevalence

7. Combined estimates from five SPI-M-O models, using data available up to 8th February, suggest there are between **28,000 and 58,000 new infections per day in England**.
8. The ONS community infection survey for the most recent week of the study (31st January to 6th February) estimates that an average of **695,400 people had COVID-19** in the community in England (credible interval **660,200** to **732,200**). The survey does not include

people in care homes, hospitals, or prisons. Estimates from across the four nations of the UK are:

England	695,400 (credible interval 660,200 to 732,200)
Scotland	35,400 (credible interval 30,100 to 41,000)
Wales	35,300 (credible interval 29,700 to 41,500)
Northern Ireland	24,400 (credible interval 19,700 to 29,600)

Reproduction number and growth rate

9. 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].

10. SPI-M-O's consensus estimate is that the **growth rate in the UK is between -5% and -2% per day, and between -5% and -3% in England**. SPI-M-O's national and regional estimates of growth rates are summarised in Table 1 and Figure 5.

11. SPI-M-O has assumed a constant generation time (i.e. the time from one infection to the next) since the emergence of the new UK variant, B1.1.7. There is emerging evidence that this may not be the case and that B1.1.7's generation time is shorter than those of previous variants. If true, SPI-M-O will overestimate the value of R when it is above 1 and underestimate it when R is below 1. Further work to investigate this is required.

12. 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.

13. **SPI-M-O's best estimates for R in the UK and all four nations are between 0.7 and 0.9**. SPI-M-O's agreed national estimates are summarised in Table 1 and Figures 3 and 4. R is a lagging indicator and these estimates are based on the latest data available up to 8th February.

14. SPI-M-O remains confident that R is below 1 in all NHS England regions. The regional R estimates can be seen in Table 1 and Figure 6. While R appears to be below 1 across the country, it is possible a small number of locations still experience slow growth or a broadly flat trajectory. If a widespread return to growth were seen, for example due to a relaxation in non-pharmaceutical interventions (NPIs), this heterogeneity would be magnified, and areas that have high prevalence will become future areas of concern, especially if they correlate with communities with low vaccine uptake.

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

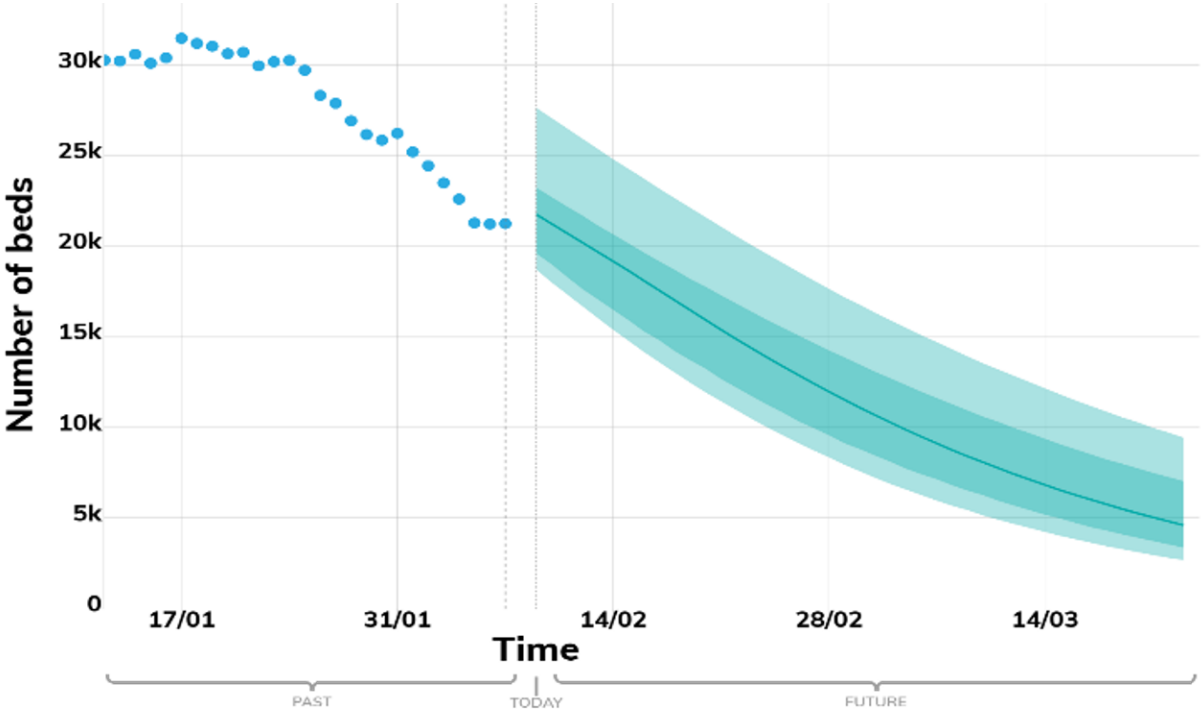
15. While R is below 1, prevalence remains very high. Any loosening of measures will need to be done carefully and depends on prevalence continuing to fall.

Considerations for easing measures

16. As discussed in previous consensus statements[2], it is recommended that any easing of current measures happens slowly over time once the number of vulnerable people who are unprotected is low; hospital occupancy is low, and that this relaxation should unfold gradually. As SPI-M-O's medium-term projections suggest COVID-19 hospital occupancy in England may be below 10,000 in early March 2021 (Figure 1), the committee has considered the following:

    - What might be the first signs that measures have relaxed too far too quickly?
    - Which points might be most risky as measures are eased?
    - How might the impact of easing vary, both spatially and socially?
    - What impact might new emerging variants of concern have?

Figure 1: SPI-M-O six-week medium-term projection for daily hospital occupancy in NHS acute trusts in England. Data points shown up to 8th February and are taken from the NHS England daily situation report. Median trajectory (solid line) with interquartile range (dark band) and 90% confidence intervals (light band) of model combinations shown.



[2] SAGE 75; SPI-M-O: Consensus statement on COVID-19, 6 January 2021
SAGE 76; SPI-M-O: Consensus statement on COVID-19, 13 January 2021

What might be the first signs that measures have relaxed too far too quickly?

17. In previous waves of the epidemic, younger age groups have often been the first to experience increases in transmission before infections spread into older age groups, as shown in the ONS COVID-19 Infection Study (CIS)[3]. Vaccination rollout to very large proportions of the most vulnerable groups, however, will likely make this relationship weaker.

18. These increases in infections between age groups may still take four to six weeks to be seen conclusively, due to the inherent time delays in the epidemiological processes (infection to symptoms to seeking a test to needing healthcare). Given these delays, any signal may only be seen after infections begin to spread through the community. It would be easier and more efficient (in terms of duration of interventions) to react to this when prevalence is low compared to if prevalence were high; even at low prevalence it will still be important to react to early signals of increasing transmission.

19. The interplay of schools opening with other easings over time is also unknown but could confound signals that should be concerning.

20. As vaccination rolls out, it may take more infections in younger age groups to lead to the same number of severe outcomes in older age groups. Many people in ICUs with COVID-19, however, are in younger age groups who will be vaccinated later, and it may be some time before any changes in age-distribution of cases can be expected to reduce the pressures on ICU and other parts of secondary care.

Which points might be most risky as measures are eased?

21. Epidemic dynamics and population behaviour during a declining epidemic are highly likely to be different from those during an epidemic that is growing, making them difficult to predict. **An adaptive management approach where the situation at each point of easing is assessed is therefore advisable.**

22. The success of each phase of relaxing measures is dependent in part on the situation before it; pausing to assess that situation and fully understand the implications for the next phase on transmission is needed. This is important at every phase of easing, but *particularly so* as easing begins (when the impact of vaccines is more uncertain) and at the largest and riskiest relaxations.

23. Adequate time is needed between successive phases of relaxing measures to see the impact of easing restrictions. If schools open in early March, the school holidays around

[3] SAGE 78; Children's Task and Finish Group: update to 17th December 2020 paper on children, schools, and transmission.

Easter provide a natural time during which to take stock and assess what impact opening schools has had on transmission. A further natural point for such a break could also be an extended summer half term holiday. If prevalence appears to be increasing, introducing a circuit break of two to three weeks over this half term could be beneficial; if prevalence is low and stable during the first half of the summer term, this could be cancelled.

24. Community infection surveys (REACT from Imperial College London and CIS from ONS) are likely to give an indication that infections are rising. Prevalence is a key indicator, however *perceived* prevalence and risk in the wider community is also likely to have an impact.

How might the impact of easing vary, both spatially and socially?

25. There will be different levels of prevalence across the country and, as seen in previous easings of restrictions, different areas will behave in different ways. This will be further compounded by different levels of vaccine uptake. Anywhere with higher levels of prevalence at the point restrictions are eased could lead to localised flare ups of growth, and this will lead to more disease if these areas also have lower vaccine uptake. Different groups and localities will be of differing importance, depending on how low prevalence gets. In general, the lower the prevalence before easing, the less the heterogeneity and the fewer and smaller the issues that are likely to arise.
26. There is evidence of lower vaccine uptake, and so reduced protection, in Black, Asian, and Minority Ethnic communities. Combined with more severe outcomes (for example hospitalisations and deaths), this could lead to substantial overrepresentation of these groups in future hospitalisation and deaths, with a double effect on morbidity in these groups. It is also possible that these groups with less vaccine-protection could also act to seed infections back into the wider community. A trade-off could exist, however, in vaccine hesitant groups if natural immunity that has been acquired through previous infections compensates for lack of vaccine-acquired immunity.
27. SPI-M-O's principal concern is that, during easing of measures, infection gradually seeds out from higher prevalence areas and/or communities whilst overall prevalence remains relatively low, but then grows rapidly everywhere when behaviour changes to allow more contacts. This is largely what happened during summer 2020, resulting in a rapidly increasing epidemic in the following September and October.

Likely impact of more transmissible or immune escape variants

28. As immunity accumulates in a population, the potential for the virus to evolve to overcome it increases. The higher the prevalence, the greater the probability that any new variant

might escape the current immunity; this evolution of immune evasion can happen in the absence of vaccine-induced selection pressure (for example the substitution E484K seen in SARS-CoV-2).

29. As more people are vaccinated, the relative advantage of any such escape mutant increases.

30. Any period of high prevalence combined with accumulating immunity (either through infection or vaccination) provides both the selection pressure and the opportunity for escape mutants. **A strategy of high prevalence with R around 1, where reducing transmission relies on vaccination to allow loosening of measures, is a more dangerous approach, with respect to vaccine escape.**

31. The UK, however, is not a closed system and the relative risk of an escape mutant arising from local transmission versus it being introduced from other countries needs to be considered, as there may be repeated introductions from elsewhere, despite improved quarantine. The UK is a world leader in sequencing and so is likely to identify any new variants quickly; this may not be the case in other countries.

32. It is highly likely more variants (both homegrown and imported) will evolve; if prevalence is low, it will be considerably easier to manage these.

Relative impact of school reopening options

33. As set out in previous papers[4], SPI-M-O's consensus view is that the opening of primary and secondary schools is likely to increase effective R by a factor of 1.1 to 1.5 (10% to 50%). One modelling group has further explored this by assessing the relative impact of increasing cohorts of pupils returning to schools on R, based on analysis of contact patterns reported in CoMix during November (national restrictions) and January (second national lockdown) in England[5]. During these periods, schools were open in the former but largely closed in the latter.

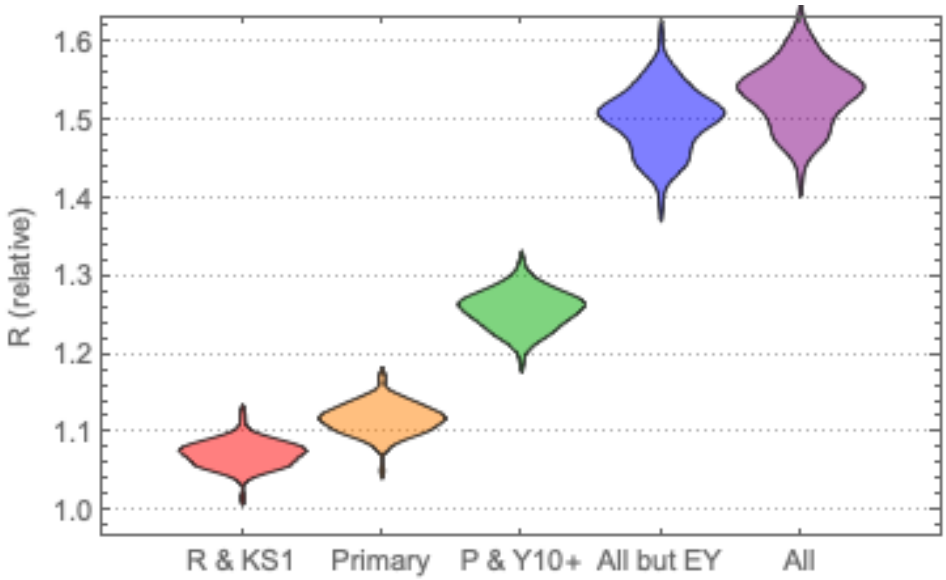
34. The relative impact on R is highly sensitive to assumptions on susceptibility and infectivity by age – particularly any distinction between primary and secondary school-aged children. Given the CoMix mixing patterns, estimated values of R for the periods considered, and a broadly plausible range for the effect of the new variant, the assumption of equal

[4] SAGE 78; SPI-M-O: Statement on relaxation of NPIs and the re-opening of schools

[5] This analysis follows from the CoMix report "*The effect of school opening or closure on social contacts in England from the CoMix social contact survey*" and is based on the same underlying contact matrices (for the two periods 5th November to 2nd December 2020 and 5th to 18th January 2021) and susceptibility/infectivity profiles. This analysis also considered one further susceptibility/infectivity profile from household transmission analysis of the ONS COVID-19 Infection Survey.

susceptibility and infectivity for children and adults is not consistent with the observed R from these periods.

Figure 2: Relative impact on R for five options for school opening (reception & key stage 1 – red; primary schools – yellow; primary schools & secondary exam years – green; primary & secondary schools – blue; and primary & secondary schools, with full attendance in early years settings – purple), compared to a January baseline (attendance of vulnerable and key worker children; partial attendance in early years settings). This is shown for one of the profiles for susceptibility and infectivity assumptions.



35. As expected, the relative impact on R increases as additional cohorts of children return to school. The largest relative difference arises from the return of non-exam years secondary pupils (the green to blue step in Figure 2). Rather than this group being key for transmission *per se*, this largely results from compounding the impact from other groups of pupils who have already returned. Furthermore, if contacts with and between older children are more COVID-secure, then the relative difference will change.

36. The opening of school settings does not only affect children and staff, but also impacts parental behaviour and other contacts outside of school. The effect of varying levels of adult mixing between that observed in January to those in November, when schools were open is relatively small. The exception to this is the two cohorts including only primary school-age children (reception & key stage 1, and all primary years) where there is an increased impact on relative R from the levels of adult mixing associated with schools being open.

37. This suggests that the return of younger children to school may catalyse further adult contacts – for example, by enabling parents and carers to return to their workplace. This is consistent with the Avon Longitudinal Study of Parents and Children (ALSPAC), which finds that parents with children who are attending nursery and school report higher numbers of contacts than parents whose children are not attending nursery or school.

38. Figure 2 is based on contact matrices from November and January, taking the national restrictions from November as the model for mixing when schools are open. It implicitly assumes that all change in contacts between these dates is attributable to the impact of schools being open or closed.

39. The national restrictions in November may not be representative of social mixing and the impact of schools returning in the future if wider behaviour changes. If, for example, people's behaviour becomes riskier as more of the population is vaccinated, then it is possible that levels of increased mixing when schools are open would be greater than those seen in November, or that different age groups will be exposed. Similarly, there may be a seasonal impact, with more social mixing associated with schools during warmer weather.

40. As previously stated, schools cannot be viewed in isolation and must be considered in the context of the trajectory of the epidemic, other NPIs, and the impact on the NHS. As other NPIs are relaxed, it is likely that there will be interaction between measures and the relative role played by schools may be larger or smaller than that seen in November. This analysis also does not capture the network implications of re-opening schools, and the potential to create transmission chains across schools and households.

COVID-19 in Prisons

41. As is widely cited, imprisoned populations are especially vulnerable to infectious diseases, including COVID-19, due to a variety of different factors including crowding, confined spaces, and high population turnover. Despite implementing control measures such as enhanced social distancing, compartmentalisation and test and trace, there have been many COVID-19 outbreaks reported in prisons.

42. There is interaction between the community and prisons which creates risk of transmission between the two settings, including staff members travelling in and out of their workplace and general turnover of the imprisoned population. It is possible that prisons are driving some local outbreaks in the community, however, SPI-M-O have not seen data that would allow an assessment of how likely this is.

43. If evidence suggests that prisons could drive community outbreaks, one strategy discussed by SPI-M-O to reduce this impact was to vaccinate prison staff and potentially prisoners serving longer-term sentences. The total prison population is currently around 78,000[6], meaning that only a relatively small amount of vaccine resource would be

[6] Offender management statistics quarterly, Prison population: 31 December 2020

required to vaccinate the entire prison population. It is also possible that vaccinations for prison staff alone could be almost as effective as vaccinating the whole prison population, in terms of protection.

Annex: PHIA framework of language for discussing probabilities

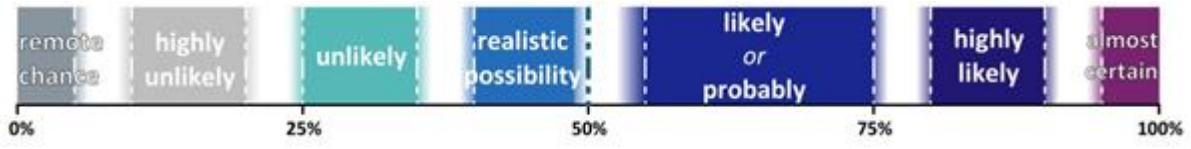


Table 1: Combined estimates of R values and growth rates in the UK, four nations, and NHS England regions (90% confidence interval)[g]

Nation	R	Growth rate per day
England	0.7 to 0.9	-5% to -3%
Scotland	0.7 to 0.9	-5% to -2%
Wales	0.7 to 0.9	-6% to -2%
Northern Ireland	0.7 to 0.9	-5% to -3%
UK	**0.7 to 0.9**	**-5% to -2%**

NHS England region	R	Growth rate per day
East of England	0.7 to 0.9	-6% to -3%
London	0.6 to 0.8	-6% to -4%
Midlands	0.7 to 0.9	-4% to -2%
North East and Yorkshire	0.8 to 0.9	-4% to -1%
North West	0.7 to 0.9	-4% to -2%
South East	0.7 to 0.8	-6% to -3%
South West	0.7 to 0.9	-5% to -3%

[g] The estimate 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. R estimate intervals for the UK may not exactly correspond to its constituent nations for the same reason.

Figure 3: 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.

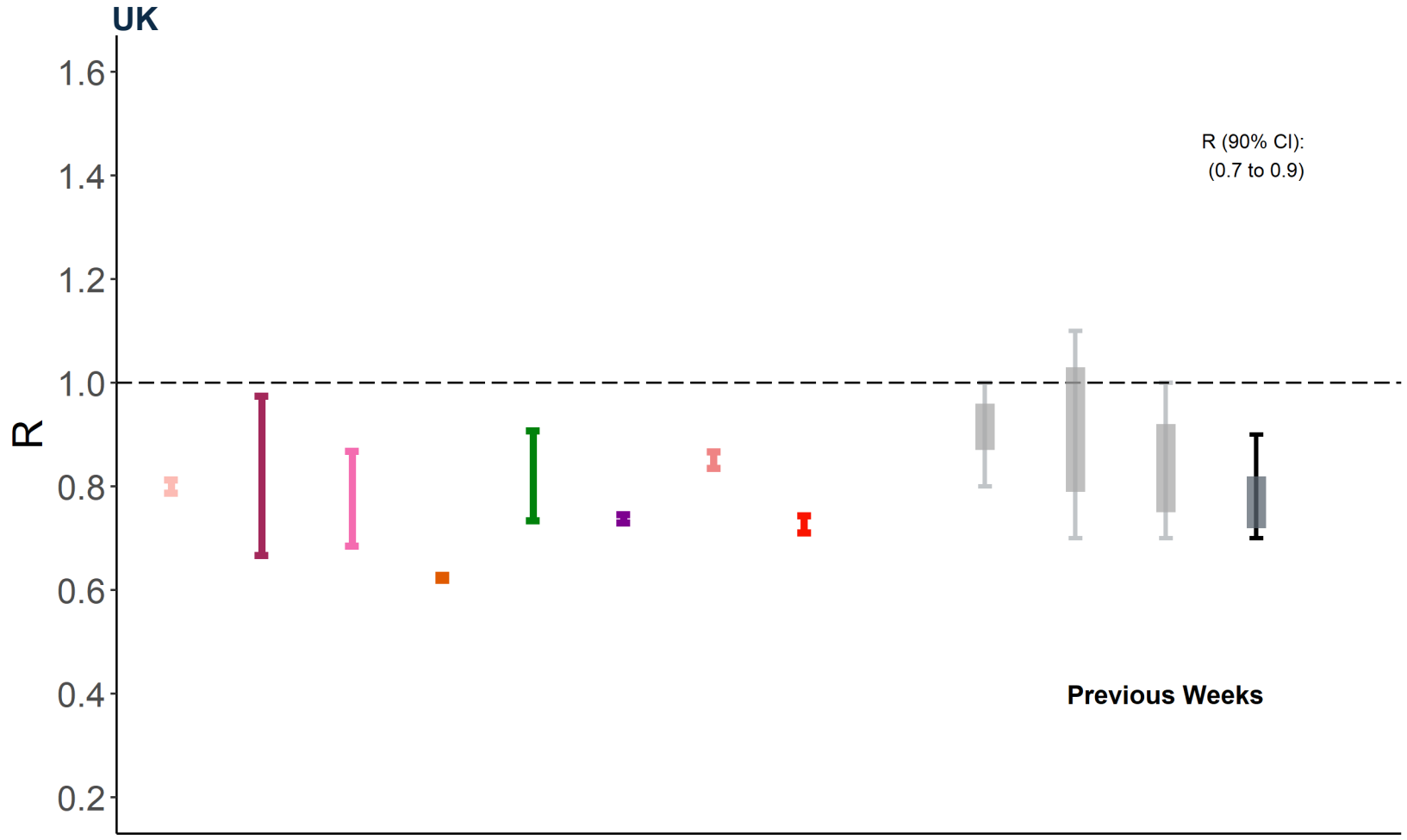


Figure 4: SPI-M-O groups estimates of median R in the four nations of the UK, including 90% confidence intervals. Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 1 decimal place.

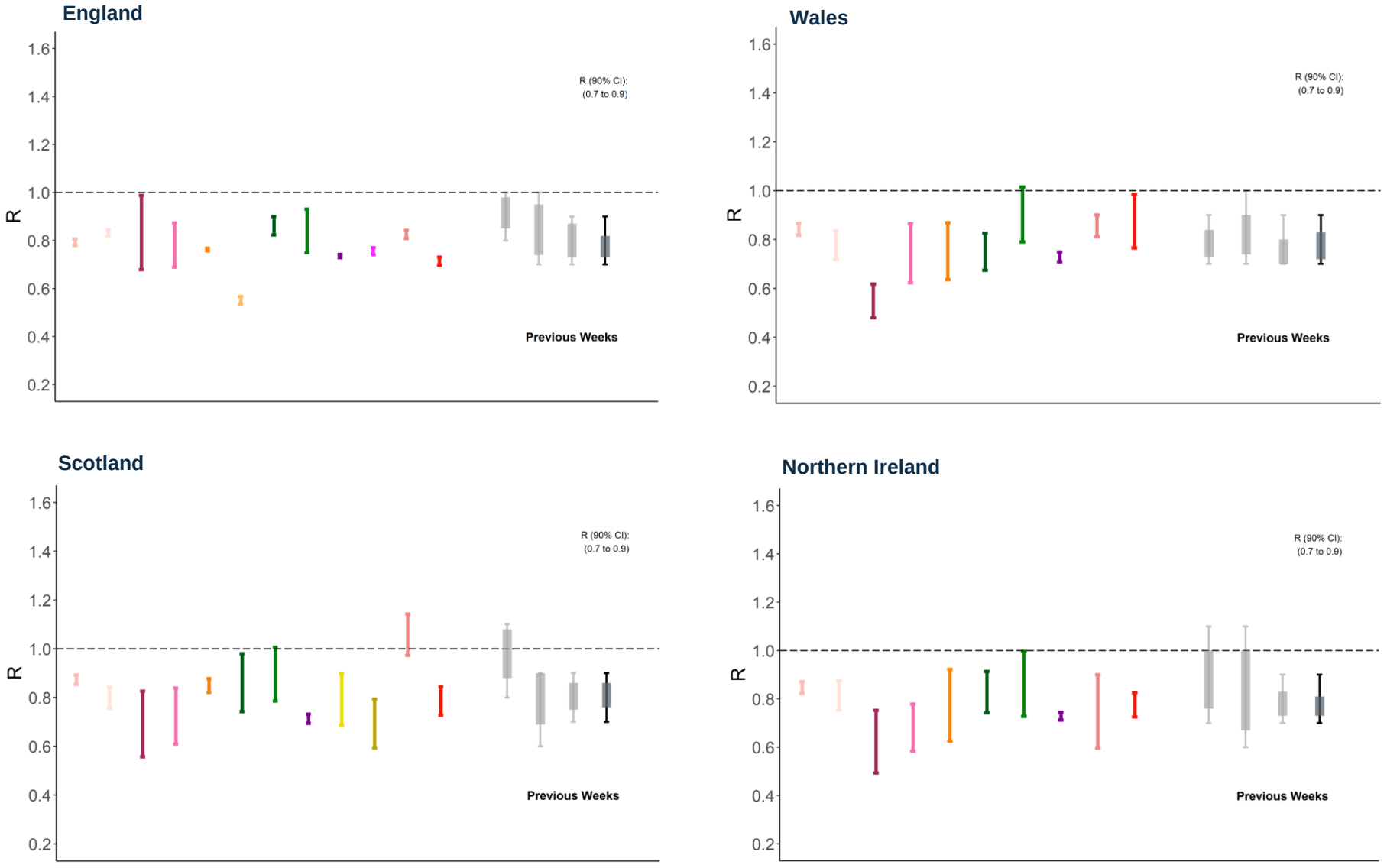


Figure 5: SPI-M-O groups' estimates of the growth rate in NHS England regions, including 90% confidence intervals. Bars represent different modelling groups. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 2 decimal places.

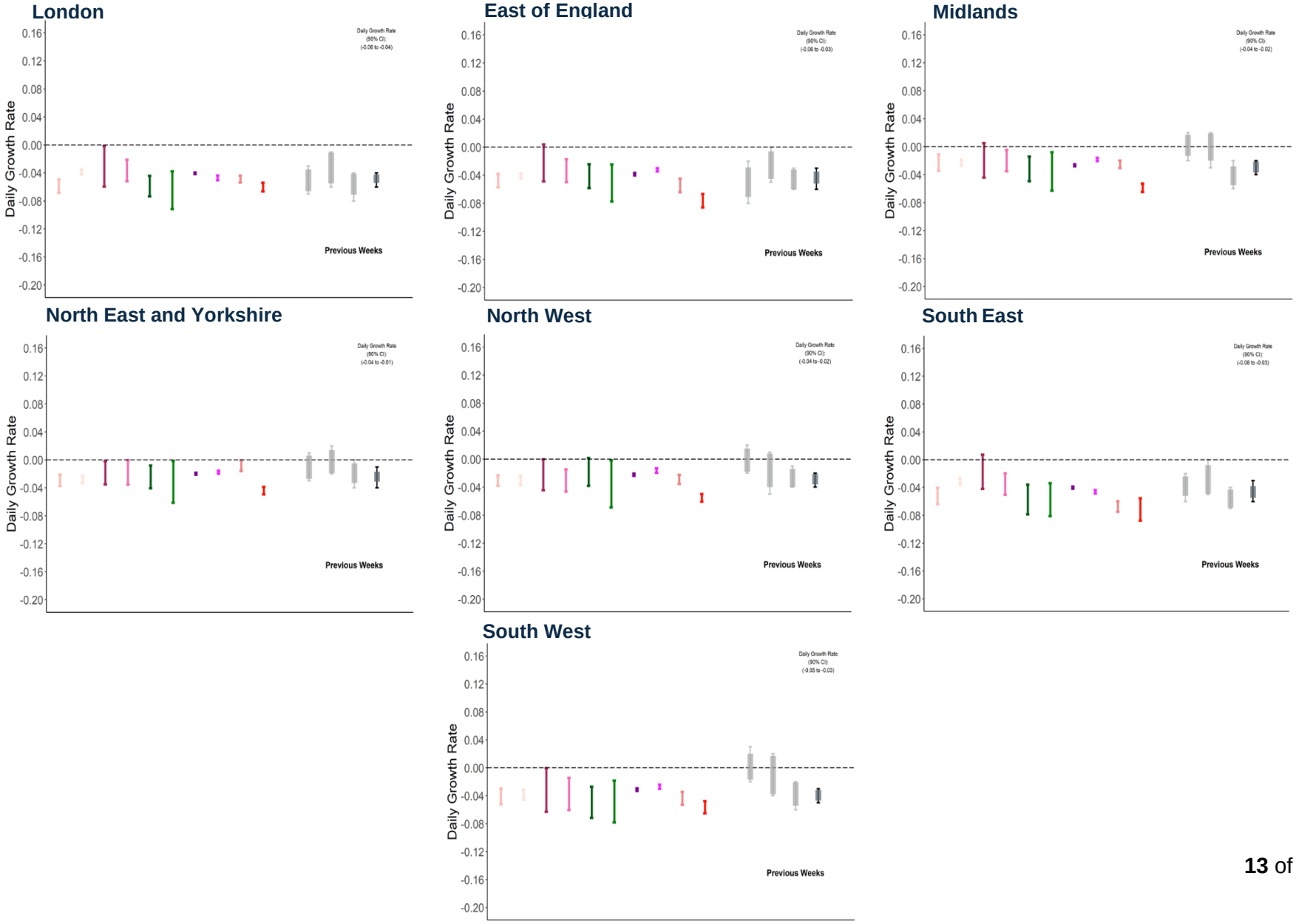


Figure 6: SPI-M-O groups' estimates of median R in the NHS England regions, including 90% confidence intervals. Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 1 decimal place.