Note added for publication

This paper includes estimates of the change in pillar 2 test positivity in England. Please note that trends in this data are difficult to interpret due to changes in testing behaviour and testing strategies, particularly in areas of local intervention where testing volumes have increased.

We cannot currently tell how much of the estimated change in pillar 2 positivity represents a true change in the number of infections, and how much arises from changes in targeting of pillar 2 testing towards (or away from) people who are infected, for example populations with higher or lower prevalence.

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

Date: 5th August 2020

SIGNED OFF BY SPI-M CO-CHAIRS ON BEHALF OF SPI-M-O

Summary

1. SPI-M-O's best estimate for **R in the UK is between 0.8 and 1.0**. This 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 of the country as a whole.

2. SPI-M-O's best estimate for **R in England is between 0.8 and 1.0**. Estimates of R, however, always rely on lagged data. Models that use pillar 2 testing data, a likely leading indicator for changes in transmission, suggest higher values for R in England and several of its regions than those models using more lagged indicators, such as the number of deaths. As a result, **SPI-M-O do not have confidence that R is *currently* below 1 in England**.

3. The growth rate records how quickly the number of infections is changing each day. SPI-M-O's consensus estimate is that **the growth rate per day in the UK is between 0% and -5% per day**. Care should be taken when interpreting R and growth rate estimates for the UK as this figure masks wide variation in the number of cases and pattern of how this is changing in different parts of the country. As with the England estimate of R, this estimate is also lagged behind current levels of transmission.

4. The proportion of pillar 2 tests returning a positive result provides a more timely indicator of changes in community transmission. Observation of the proportion of people testing positive in pillar 2 suggests that the epidemic has been growing at around **+2% per day over the past 2 weeks** in England (95% confidence interval +0.7% to +2.6%).

5. **Care should be taken when interpreting the R and growth rate estimates for Scotland, Wales, Northern Ireland, East of England, London, North East and Yorkshire, Midlands and South West.** This is because these estimates are based on low

case numbers and / or dominated by clustered outbreaks and are insufficiently robust to inform policy decisions.

6. Estimates of R and the growth rates per day are less reliable and less useful in determining the state of the epidemic when disease incidence is low or where there is significant variability in the population, for example, local outbreaks. Both are average measures and will smooth over outbreaks at small spatial scales or over short periods of time.

7. **SPI-M-O wish to support the Test and Trace system to collect the key information and data that are the most important ahead of autumn and winter.** A series of recommendations are described below to indicate the data needed for surveillance of the epidemic in the UK.

Reproduction number

8. The reproduction number is the average number of secondary infections produced by a single infected individual. R is an average over time, geographies and communities. Whilst it varies in different geographies and settings of the population, separating transmission within and between these sub-populations increases uncertainty.

9. Uncertainty in R increases as the number of infections decreases. SPI-M-O's agreed national estimates of R are summarised in **Table 1** and **Figures 2 and 3**. SPI-M-O's best estimate for **the UK is that R is between 0.8 and 1.0**. The previous three consensus estimates of R have been included to show the trend in the estimates.

10. SPI-M-O **do not have confidence that R is *currently* below 1 in England**. Models that use pillar 2 testing data, a likely leading indicator for changes in transmission, suggest higher values for R in England and several of its regions than those models that use more lagged indicators, such as deaths.

11. **Any changes in transmission patterns that may have occurred in the last two to three weeks will not yet be reflected in the epidemiological data that underpin SPI-M-O models and therefore nor in SPI-M-O's consensus estimates of R.**

Growth rates

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 per day in the UK is between **0% to -5% per day**. SPI-M-O's national estimates of growth rate are summarised in **Table 1**.

14. The growth rate is estimated from the same epidemiological data that SPI-M-O uses to estimate R and therefore is subject to the same time lags when detecting changes in transmission. The proportion of pillar 2 tests returning a positive result provides a more timely indicator of observed changes in community transmission. Observation of the proportion of people testing positive in pillar 2 data suggests that the epidemic has been growing at around **+2% per day over the past 2 weeks** in England (95% confidence interval +0.7% to +2.6%).

15. Rounding and differences between the models used in the combinations account for differences between estimates of R and estimated growth rates. Such variation highlights the importance of applying judgement when using these metrics.

Regional variation

16. Estimates of R at regional levels are subject to the same difficulties in interpretation as national estimates, and these are amplified due to the smaller numbers of cases.

17. Consensus estimates for the regional growth rates per day in England are also given in **Table 1** and **Figure 4**. For completeness, consensus regional estimates of R for England are given in **Table 1** and **Figure 5**, some of the ranges of R include 1.

Reliability of R and growth rates

18. R becomes an unreliable measure for informing policy when case numbers fall to low levels, there is variability in estimates from different data streams, or there is a high degree of variability in transmission, for example, due to a localised outbreak.

19. SPI-M-O's view is that **care should be taken when interpreting the R and growth rate estimates for: Scotland, Wales, Northern Ireland, East of England, London, North**

[1] The growth rate λ is the exponent of the exponential curve $y = e^{\lambda t}$, where y is the number of new infections, and t is time, given in days. It is approximately the change per day (so λ=-0.04 corresponds to a 4% decline in cases per day).

East and Yorkshire, Midlands and South West. This is because these estimates are based on low case numbers and / or clustered outbreaks. SPI-M-O does not have confidence that these R estimates are sufficiently robust to inform national/regional policy decisions.

20. Care should also be taken when interpreting the R and growth rate estimates for the UK. This figure masks wide variation in the number of cases and pattern of how this is changing in different parts of the country.

Incidence

21. Combined estimates from three SPI-M-O models give a 90% confidence interval of **1,000 – 2,000 new infections per day** in England.

22. Data from the ONS swabbing survey for the most recent week of the study (27th July to 2nd August) estimates that an average of **28,300 people** were positive for SARS-CoV-2 in the community in England (confidence interval 18,900 to 40,800). The study also estimates that, during the same week, there were **3,700 new infections per day**, with a confidence interval of 2,100 to 6,400. Although the ONS survey can directly estimate incidence, it is based on a very small number of positive tests.

Potential alternative interventions to minimise the risk of resurgence

23. Intervention strategies can be considered as two complementary, dynamic layers: one focused on testing and screening, and the other on control measures. The preferred strategy will differ depending on prevalence and whether interventions are at the national or local level. Identification of the most appropriate strategies, and effectiveness of measures is dependent on improved testing data.

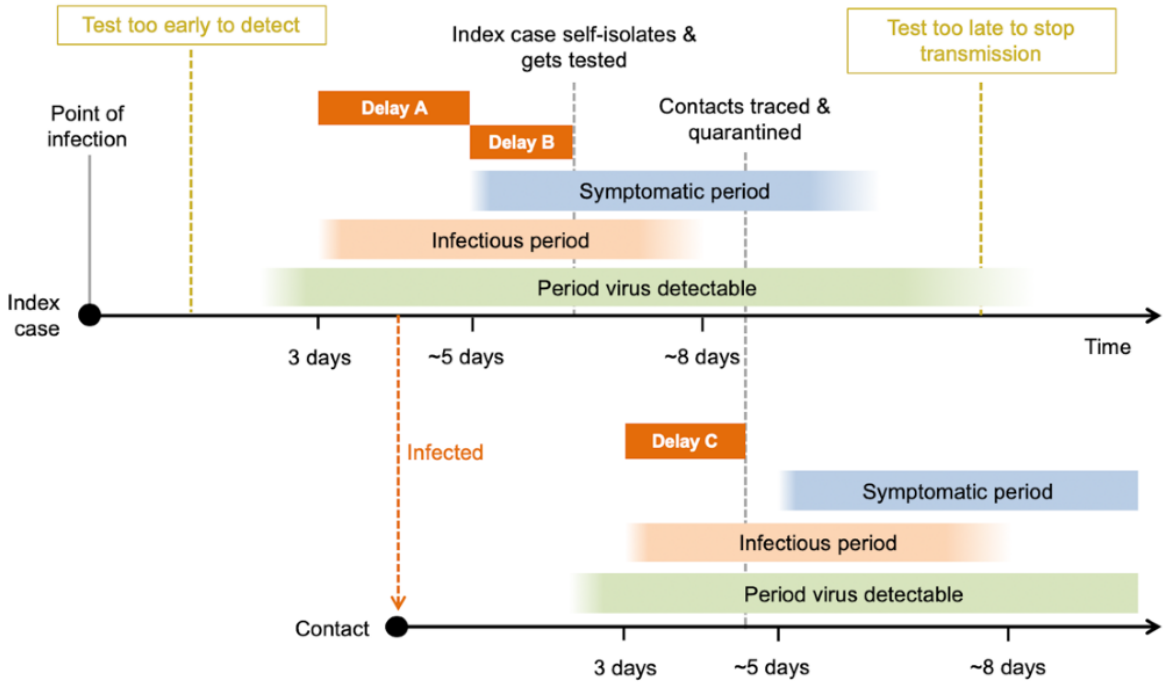
24. SPI-M-O has previously discussed several testing measures in previous consensus statements. There is particular potential for serial testing strategies to reduce the length of quarantine, both for contacts of a known index case self-isolating under test and trace, and for those under travel quarantine. The SPI-M-O consensus statement and accompanying paper on serial testing and false negatives from SAGE 42 (18 June 2020) discusses this in further detail.

25. SPI-M-O have also previously emphasised the importance of identifying cases which are not associated with known transmission chains or clusters. Backwards contact tracing is an effective means of identifying transmission clusters, and potentially more efficient than

forwards-tracing, if most index cases transmit to very few people. It is essential, however, that basic forwards contact tracing service is operationally efficient first.

26. The timeline of infection events in an index case and a contact is summarised in Figure 1.

Figure 1: A timeline of transmission – three key delays drive the outbreak: time from onset of infectiousness to onset of symptoms (delay A); onset of symptoms to isolation of the index case (delay B); and time from onset of infectiousness in a contact to quarantine of that contact (delay C).



27. Various kinds of mass testing (screening) aim to shorten delay A and recruit a larger proportion of all infections into the Test and Trace system and search for clusters. Such screening should focus on known loci of transmission, e.g. hospitals and care-homes. SPI-M-O recommends that everyone released from hospital be tested first, given that hospitals are a known source of infection. As further high-risk settings emerge, screening should extend to those: schools, universities and workplaces are all candidate settings. Delay B can be shortened with clear communications and incentives to self-quarantine and get tested immediately upon symptom onset. A rapid and effective Test and Trace system would shorten delay C.

28. Further additional interventions discussed by SPI-M-O included:

    - "infection-free" passports with a rate of expiry driven by local prevalence of infection
    - planned "low-contact" breaks around school holidays, in which physical contact outside the home would be minimised

- individual “contact budgets” so that people could understand more about their own exposure to others
- testing focused on carers of vulnerable individuals (discussed separately in the document – Protecting high risk individuals as an approach to controlling COVID-19 outbreaks”)

29. **SPI-M-O wish to support the Test and Trace system to collect the key information and data that are the most important ahead of autumn and winter.** There are certain data relating to each individual in the system that are vital for good epidemiological modelling and surveillance that SPI-M-O strongly recommend NHS Test and Trace consider collecting as the new system develops and improves. These include:
    - Recording of symptom onset time of index cases
    - All traced contacts should be tested within an appropriate interval after exposure to an index case
    - Routine multiple follow ups with contacts of index cases, after initial contact to gather information such as:
        - whether they subsequently test positive,
        - when their symptom onset is,
        - whether they enter isolation/quarantine,
        - behaviour during isolation/quarantine etc. – are they adhering to quarantine; if not, what is preventing that and what support is needed?
    - Information on barriers to adherence will allow government to build up a picture, in case there are particularly common barriers, or if specific groups of people, e.g. homeless or traveller communities, are having difficulties adhering – changes to the system can then be considered.
    - Location setting where suspected to have contacted virus (e.g. household, school, workplace incl. type of workplace, social setting e.g. pub/restaurant, or a transient event e.g. a wedding)
    - Commuting patterns, including mode of transport
    - Types of relationship between contact and index case e.g. household or support bubble member, in the same shop / leisure facility, etc.
    - Timings of interactions with the T&T system and any tests (antigen and serology)

- Proportion of cases associated with a known cluster / proportion of cases not associated with known case or transmission chain – if this proportion is low, then scale up testing of individuals and use backwards contact tracing accordingly
- Positive serology test result – this allow for the prevention of asking individuals to quarantine multiple times

30. Until data is gathered that describes the likely source of infection for every known case, SPI-M-O will be unable to prove risk-based assessments for transmission under current or future interventions, nor will it be possible to increase the accuracy of models that simulate the spread of the epidemic.

Annex: PHIA framework of language for discussing probabilities

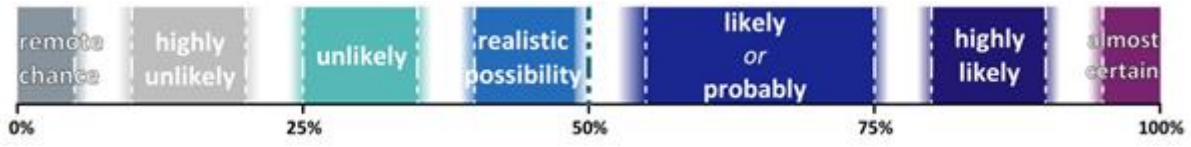


Table 1: Combined estimate of R and the growth rate in the UK, four nations and English NHS regions (90% confidence interval)

Nation	R	Growth rate per day
England	0.8 – 1.0	0% to -3%
Scotland*	0.6 – 1.0	-2% to -12%
Wales*	0.7 – 1.1	+4% to -3%
Northern Ireland*	0.4 – 1.1	-2% to -16%
UK†	**0.8 – 1.0**	**0% to -5%**

NHS England region	R	Growth rate per day
East of England*	0.7 – 0.9	-1% to -4%
London*	0.8 – 1.1	+1% to -4%
Midlands*	0.8 – 1.0	0% to -3%
North East and Yorkshire*	0.8 – 1.0	0% to -4%
North West	0.8 – 1.1	+1% to -3%
South East	0.8 – 1.0	0% to -4%
South West*	0.8 – 1.1	+3% to -3%

***Care should be taken when interpreting these estimates as they are based on low incidence and/or clustered outbreaks within this area.
† 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 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.

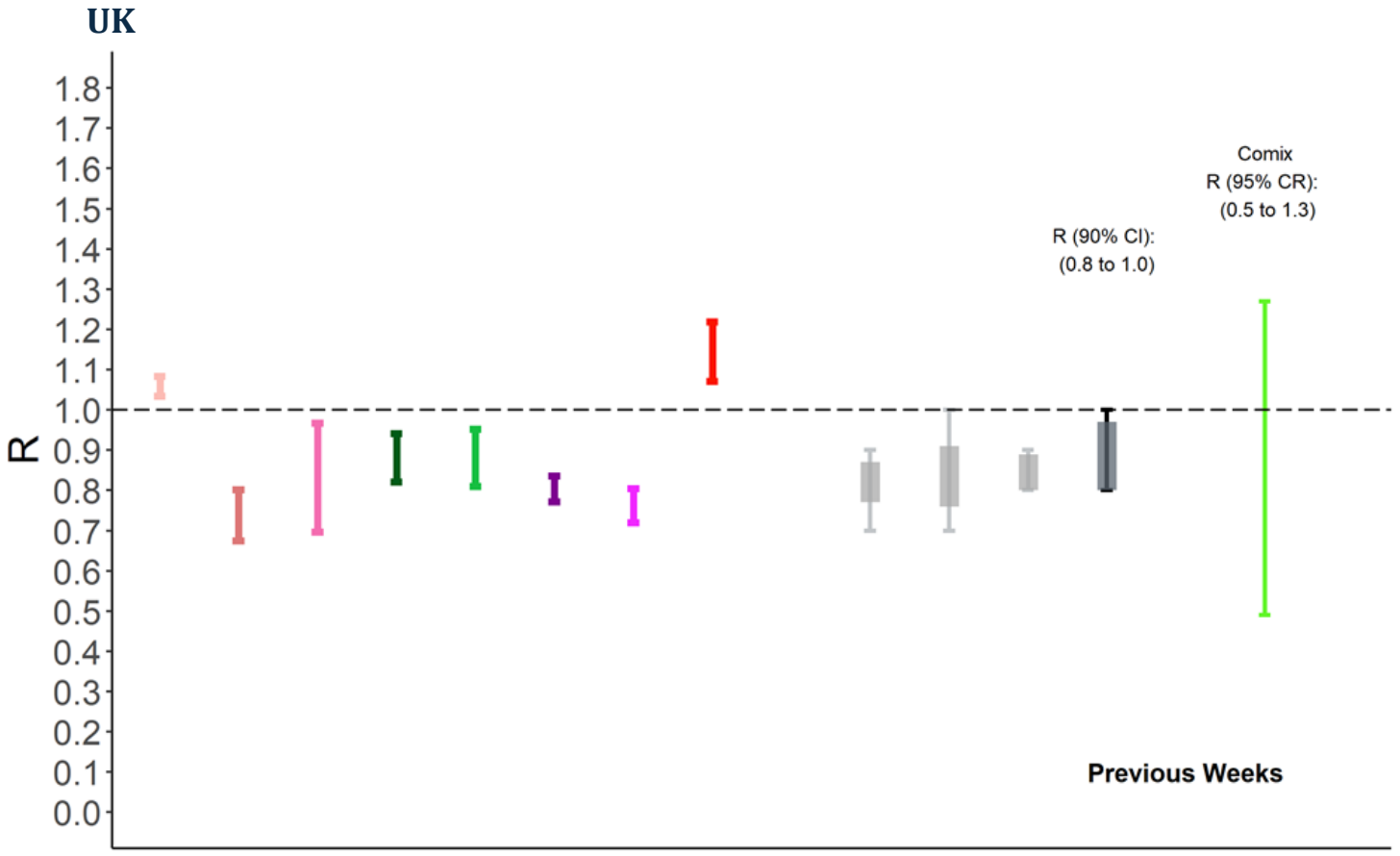


Figure 3: SPI-M-O groups estimates of median R in the four nations of the UK, including 90% confidence intervals. Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 1 decimal place.

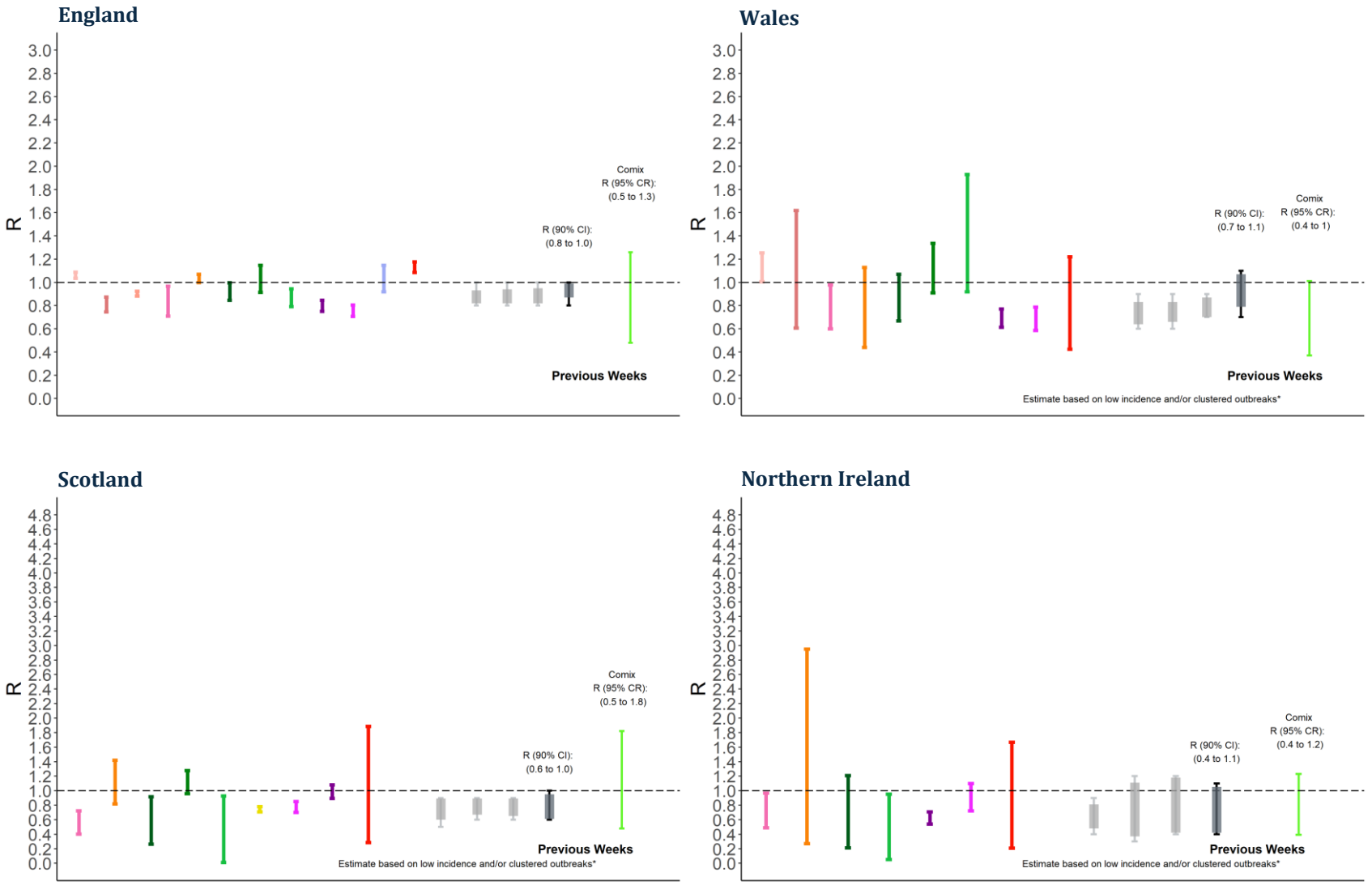


Figure 4: SPI-M-O groups estimates of the growth rate in NHS England regions, including 90% confidence intervals. Bars represent different modelling groups. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 2 decimal places.

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.