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

SIGNED OFF BY CHAIRS ON BEHALF OF SPI-M-O – REISSUED 2nd JULY TO CORRECT TYPOGRAPHICAL ERROR

Date: 1st July 2020

Summary

1. It is highly likely that the overall reproduction number, **R**, in all four nations of the UK has been below 1 in recent weeks. SPI-M-O's best estimate for **the UK is that R remains between 0.7 and 0.9**.

2. The **growth rate** records how quickly the number of infections is changing each day. If the growth rate is greater than zero (i.e. positive), then the number of infections will grow. If the growth rate is less than zero (i.e. negative) then the number of infections will shrink. SPI-M-O's consensus estimate is that **the growth rate per day in the UK is between 0% and -6% per day**.

3. Regional 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.

4. Low numbers in the devolved administrations and some regions of England means there is growing uncertainty in estimates of R and growth rate for these areas. SPI-M-O propose a framework for a suggested threshold for when R can be considered to no longer be insightful for decision makers and believe that this point has been reached for some areas, especially in the devolved administrations. Improved access to testing data will allow this work to develop.

Reproduction number

5. 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.

6. Uncertainty in R increases as the number of infections decrease. SPI-M-O's agreed national estimates of R are summarised in **Table 1** and **Figures 1 and 2**. SPI-M-O's best estimate for **the UK is that R remains between 0.7 and 0.9**. The previous three consensus estimates of R have been included to show the trend in the estimates.

7. **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, nor therefore in SPI-M-O's estimates of R**. Other data sources, however, may provide more timely indications of changes in transmission, such as the ONS swabbing survey and the CoMix behavioural survey that studies how contact patterns are changing over time.

8. The latest results from the CoMix behavioural survey suggest there continues to be an increase in the number of contacts people are making. Reported contacts outside of the home tend to be of shorter duration than before the epidemic, however, in recent weeks the survey has seen an increase in indoor contacts and a slight decrease in handwashing.

Growth rates

9. Estimates of the growth rate of the epidemic require fewer assumptions and are an inherently less volatile measure although, as with R, uncertainty increases when incidence is low. Reasons for this have been given in previous consensus statements. As with R, SPI-M-O's consensus estimates of the growth rate are based on a statistical combination of estimates from several modelling groups.

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

11. SPI-M-O's consensus estimate is that the epidemic is slowly shrinking in the UK, with a growth rate each day that can be interpreted as -6% to 0% per day. SPI-M-O's agreed national estimates of growth rate are summarised in **Table 1**. Rounding and difference in the models used in the combinations account for differences between estimates of R and growth rates. Such variation shows the important of policy makers applying judgement based on these metrics, and not relying solely on their values.

Regional variation

12. Estimates of R at regional levels are subject to the same difficulties in interpretation of national estimates, and these are amplified due to the smaller numbers of cases. Publishing several estimates increases the statistical chance that one of them is high by chance. SPI-M-O does not have confidence that regional R estimates are sufficiently robust to inform regional policy decisions.

13. Consensus estimates for the regional growth rates per day in England are also given in **Table 1** and **Figure 3**. For completeness, consensus regional estimates of R for England are given in **Table 1** and **Figure 4**, some of the ranges of R include 1.

14. The current outbreak happening locally in Leicester is an example of how small spatial scale variability could impact regional metrics. It may also offer opportunities for learning, and identification of potential indicators. Assessment of spatial patterns in recent data streams for Leicester may offer insight for identification of future outbreaks; these data need to be at the finest possible scale and include both positive and negative testing results.

15. SPI-M anticipate that there may be several other local outbreaks, similar to Leicester, about to break or already happening. Local public health interventions, including stringent local social distancing measures, will need to be used quickly and efficiently to bring transmission under control and prevent local outbreaks becoming more widespread at both regional and national levels. This is particularly a concern for SPI-M with the current levels of incidence in the England population.

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[1] The growth rate, λ, is the slope of the exponential curve $y = e^{\lambda t}$, where y is the number of new infections, and t is time, given in days

Framework for a publication threshold for R and growth rates

16. There are three disparate reasons why R might not be a reliable measure for deciding policy:

    - Case numbers being low

    - Heterogeneity / variability in transmission, for example due to a localised outbreak, so a single average does not represent the overall situation

    - Variability in estimates from different data streams

    SPI-M-O have developed a preliminary schema for marking the reliability of R estimates for informing policy decisions. The first two can be combined quantitatively, and the third is assured through additional commentary.

17. This schema could be scored on a 0-3 scale of reliability for each estimate of R. The precise wording and presentation of these scores is to be finalised and formally agreed by SPI-M-O, but provisional wording is as follows:

    0) It is highly unlikely that these estimates can be relied upon due to the low levels of infection and/or clustered nature of the outbreak in this region

    1) It is unlikely that these estimates can be relied upon due to the low levels of infection and/or clustered nature of the outbreak in this region

    2) It is likely that these estimates are reliable and are a good measure of the current situation

    3) It is highly likely that these estimates are reliable and are a good measure of the current situation

    Scores of 0 and 1 would be considered unreliable estimates and may not be suitable for wider use without considerable commentary and caveats as there is a high risk of misinterpretation.

18. The communication of the level of reliability of estimates is recommended by SPI-M-O. If scores / symbols are used in the communication care must be taken that they cannot be misinterpreted as a judgement on the quality of the data, and words and explanation is preferable to symbols generally. The scale could be reduced to binary (i.e. reliable / not reliable). The scale could be used to decide to not publish estimates, or to continue to publish, but mark with reliability scores.

19. Detailed data on testing, including negative tests, is essential for understanding local transmission patterns. However, apart from high level data, this is currently is not accessible to SPI-M-O, and its reliability and robustness is unknown. Only death data are considered a strong enough proxy indicator for infections at present. Due to the extensive lag from infection to death, a move to a timelier indicator is needed.

20. The reliability of an estimate of R for a region depend on whether the average is an accurate reflection of the more local situation, i.e, localised outbreak(s) in one or more sub-areas (for example: local authorities within a region), with lower case numbers elsewhere. SPI-M-O propose that this should be based on the number of positive tests per area normalised by the total number of tests and population. Negative testing data, however, is not currently publicly available, and so this would not be a transparent indicator of reliability. It is essential to consider any variability or conflict in data streams alongside this variance metric.

21. **The difficulties in finalising the details within this proposed framework means that SPI-M-O recommend further work on what is possible and continue to request testing data.** In particular, access to both positive and negative Pillar 1 and 2 testing data is essential at the finest possible spatial scales. In the first instance, negative testing data at lower-tier local authority level, matching that available for positive testing, will be invaluable. Data at lower geographies, such as MSOA or LSOA, will become more important if outbreaks and clusters become more localised.

Incidence

22. The relationship between infection, symptoms, swab positivity, hospitalisation and death is becoming clearer, but uncertainties remain in estimating the number of new daily infections.

23. Modelled estimates of incidence are generally higher than those from the ONS swabbing surveys. The reason for this is not yet clear. It is likely to be partly explained by the fact that the ONS survey does not include care homes or hospitals, where infection rates are higher than the general population. It is also possible that the data streams available to SPI-M-O are biased towards health and social care associated infections. Further data to disentangle the relationship between transmission in different settings is required. Although combined estimates from three SPI-M models give a 90% confidence interval of 3,500-19,000 new infections per day in England, SPI-M has low confidence in this assessment.

24. Data from the ONS swabbing survey between 14th June and 27th June estimate that an average of 25,000 people in the community in England (confidence interval 12,000 to 44,000) would have swabbed positive for SARS-CoV-2 during this time period. The study estimates that between 14th June and 27th June, incidence was 0.045 new infections per 100 people followed for 1 week, with a confidence interval of 0.024 to 0.085. Although ONS's survey can directly estimate incidence, it is based on a very small number of positive tests.

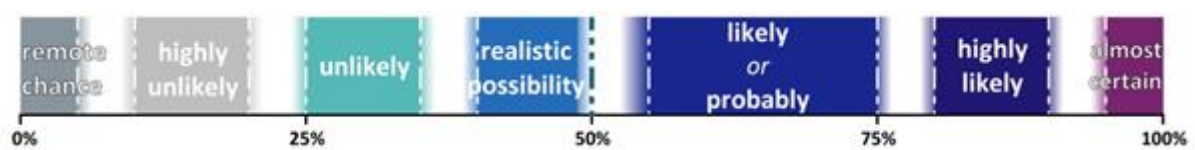## Annex: PHIA framework of language for discussing probabilities

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 – 0.9	-5% to -2%
Scotland	0.6 –0.8	-10% to -1%
Wales	0.7 – 0.9	-7% to +3%
Northern Ireland	0.5 – 0.9	-7% to 0%
UK	**0.7 – 0.9**	**-6% to 0%**

NHS England region	R	Growth rate per day
East of England	0.7 – 0.9	-5% to 0%
London	0.8 – 1.1	-4% to +2%
Midlands	0.8 – 1.0	-4% to 0%
North East and Yorkshire	0.8 – 1.0	-5% to 0%
North West	0.7 – 0.9	-4% to 0%
South East	0.7 – 1.0	-5% to 0%
South West	0.7 – 1.0	-7% to +2%

Figure 1: SPI-M 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.
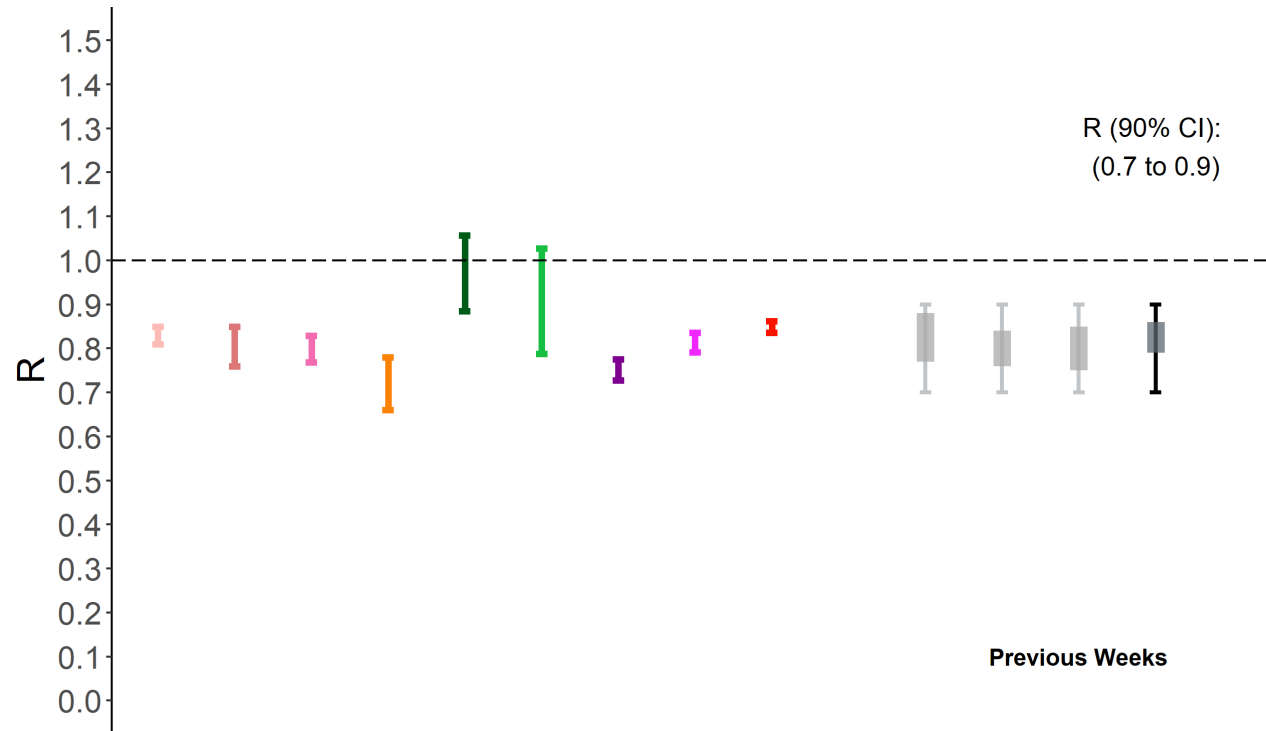
Figure 2: SPI-M groups estimates of median R in the four nations of the UK, including 90% confidence intervals. Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 1 decimal place.
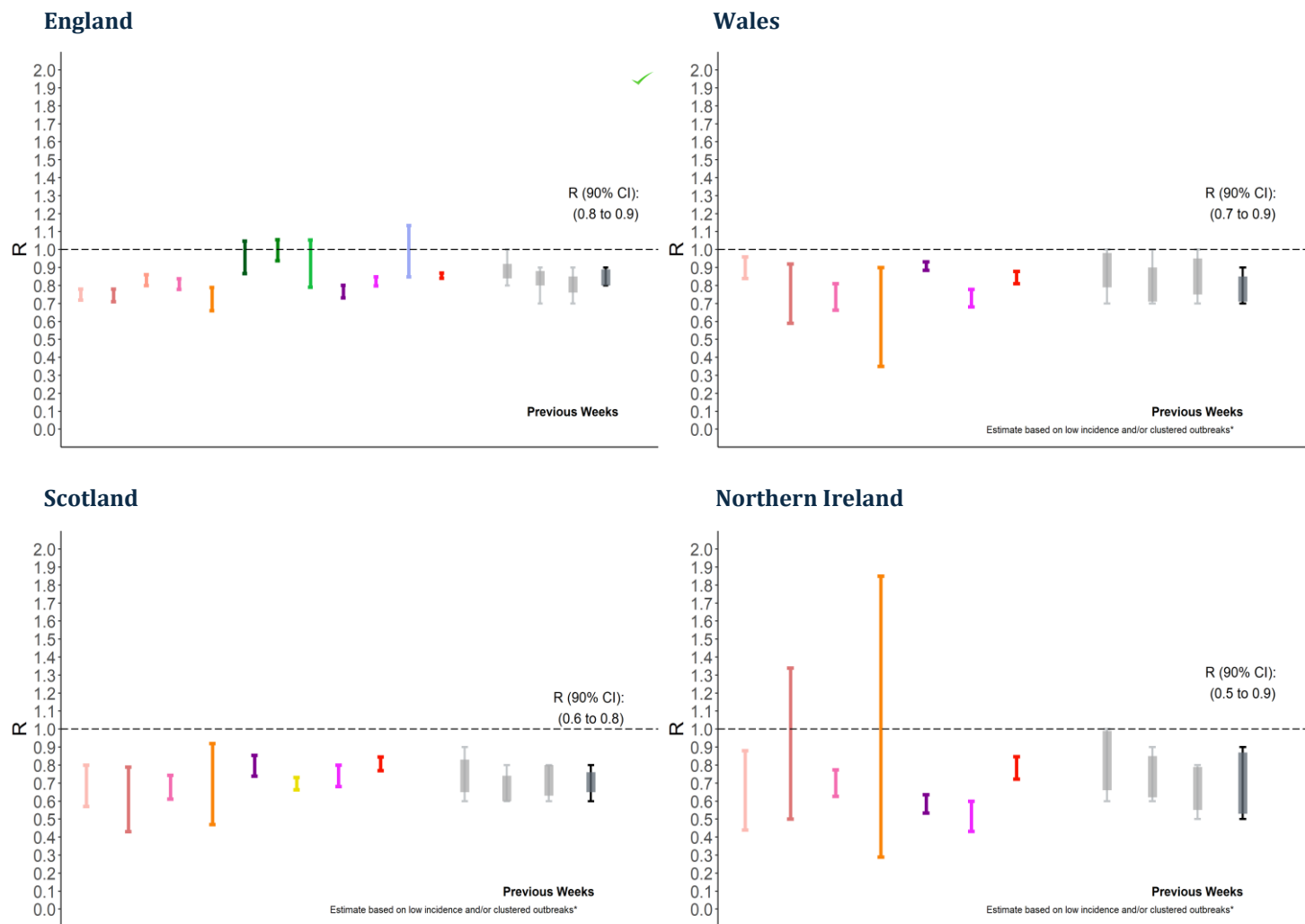
Figure 3: SPI-M groups estimates of the growth rate in NHS England regions, including 90% confidence intervals. Bars represent different modelling groups. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 2 decimal places.
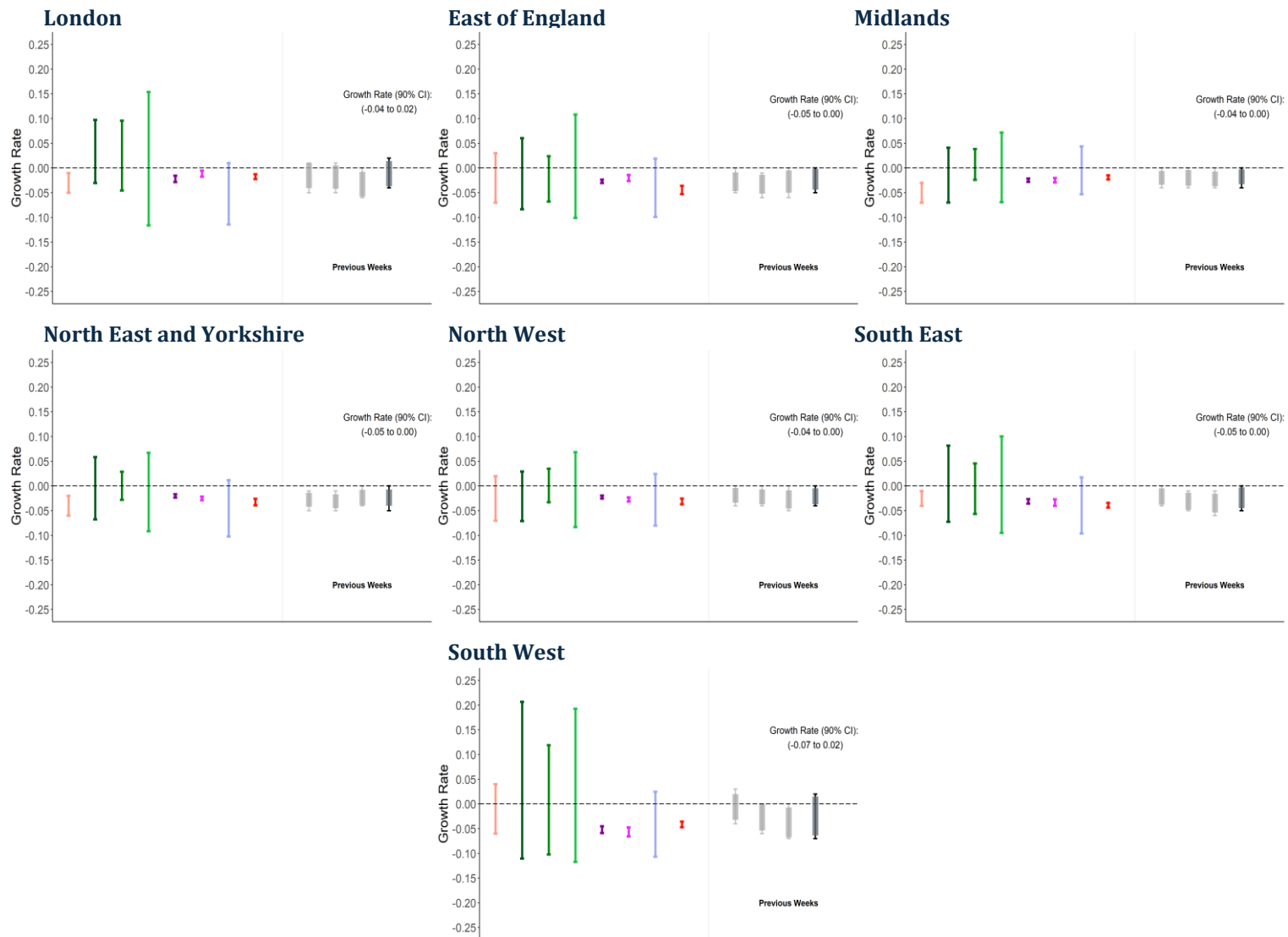
Figure 4: SPI-M groups estimates of median R in the NHS England regions, including 90% confidence intervals. Bars represent different independent estimates. The grey shaded areas represent the combined numerical range and the black bars are the combined range after rounding to 1 decimal place.