

### **Note added for publication**

*This paper contains estimates of the reproduction number (R) for the UK, four nations and NHS England regions. Please note that estimates for the four nations and regions are from individual modelling groups, and not agreed consensus estimates from SAGE.*

*R is an average value that can vary in different parts of the country, communities, and subsections of the population. It cannot be measured directly so there is always some uncertainty around its exact value. Estimates of R for Scotland, Wales, Northern Ireland and NHSE England regions are subject to greater uncertainty given the lower number of cases and increased variation.*

*Different modelling groups use different data sources to estimate R using complex mathematical models that simulate the spread of infections. Some may even use all these sources of information to adjust their models to better reflect the real-world situation. There is uncertainty in all these data sources, which is why R estimates can vary between different models, and why we do not rely on one model; evidence is considered, discussed and R is presented as a range.*

*Given wide uncertainty ranges, it should not be concluded from estimates in this paper that R is higher or lower in different regions or nations.*

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

**Date: 11<sup>th</sup> May 2020**

### **Summary**

1. SPI-M-O's best estimate is that the overall reproduction number,  $R_t$ , is between 0.7 and 1.0. While it is almost certain to be under 1, it could be close to it. It is the consensus view of SPI-M-O that the overall reproduction number has increased slightly. This is because the number of cases in the community is decreasing while the number in or seeded by care homes or hospitals remains broadly flat. As a result, hospital or care home cases represent a higher proportion of total cases. This means that the rate at which the overall epidemic is shrinking has slowed.
2. Incidence remains uncertain, with estimates ranging from 10,000 – 40,000 new infections per day. Uncertainty in this range is primarily due to differing assumptions on the proportion of infections that are asymptomatic; as further community surveys of swabbing and serological data become available, this uncertainty will reduce.

### **Reproduction number**

3. The reproduction number is the average number of secondary infections produced by a single infected individual.  $R_t$  is a summary value that in reality varies in different parts of the country, communities, and subsections of the population.
4. There are three environments which are particularly relevant to the current situation: the community, care homes, and hospitals. These are not independent; infection can be

spread between hospitals and care homes, from these environments back into the community, and vice versa.

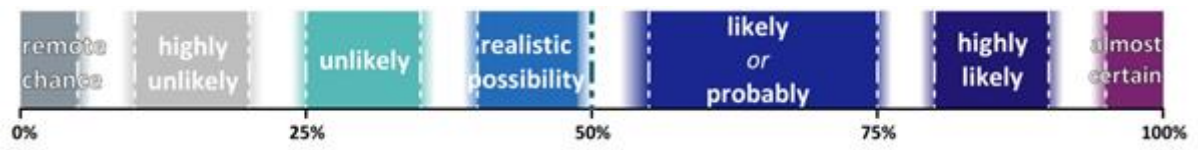
5. Estimates of  $R_t$  are sensitive to differences in modelling methodology, the choice of data source used, the time frame considered, and will always carry some level of uncertainty. SPI-M-O's approach is for different modelling groups to independently estimate  $R_t$  to reflect this inherent uncertainty.
6. SPI-M-O's best estimate is that the overall reproduction number is between 0.7 and 1.0. While it is almost certain to be under 1, it could be close to it. It is the consensus view of SPI-M-O that the overall reproduction number has increased slightly. This is because the number of cases in the community is decreasing while the number in or seeded by care homes or hospitals remains broadly flat. As a result, hospital or care home cases represent a higher proportion of total cases. This means that the rate at which the overall epidemic is shrinking has slowed.
7. The reproduction number in the community is almost certain to be lower than  $R$  overall, possibly as low as 0.5-0.6, and key workers and their households are likely to represent a significant proportion of infections in the community.
8. SPI-M modelling groups' estimates of  $R_t$  in different regions and nations of the UK vary, but are consistent in estimating that overall  $R_t$  is below 1. These are summarised in **Table 1** and **Figure 1** in Annex 2. Given the wide uncertainty ranges and the small number of cases in some areas, we cannot conclude the  $R_t$  is higher or lower in any nation or region.
9. Hospital-acquired infections are estimated to make up more than 10% of new and newly diagnosed cases of COVID-19 in hospital, with extremely high variation between hospitals. NHS England data show 10-15% of new and newly confirmed hospital cases come from care homes, and it is estimated that a further 2-5% are from health and care workers. This implies that a minimum of 25% of new hospital cases are not acquired in the community. This is likely to be an underestimate as it does not include people who acquire COVID-19 in hospital, leave, and are then re-admitted, or people who acquire infection in outpatient departments. Nor does it account for infections spread in the community by healthcare workers.
10.  $R_t$  in hospital is difficult to determine, as it comprises multiple transmission routes: viral transmission from the community into hospitals and vice versa, between care homes and hospitals, as well as within hospital itself.

11. Evidence on how the number of healthcare acquired infections is changing over time is relatively weak. That which is available, including from both England and Scotland, suggests that this number is broadly flat. There is increasing evidence that transmission among staff is responsible for a large proportion of these infections. It is very likely that healthcare acquired infections are being seeded back into the community.
12. Evidence on how the epidemic in care homes is changing over time remains weak. All cause deaths reported to the Care Quality Commission have reduced from a peak in mid-April. The number of COVID-19 deaths in care homes appear to be decreasing in the most recent data although this may be due to reporting issues. Numbers of care home outbreaks reported each day has decreased from 150 to 100 per day, yet swab positive cases are still identified and outbreaks within care homes seem to be ongoing. The epidemic in care homes is being studied in greater depth by a separate SAGE subgroup.
13. Once cases of COVID-19 are within care homes, outbreaks can become very large. The most effective way to prevent deaths within care homes is to prevent outbreaks happening there in the first place. Over 60% of care homes have not reported an outbreak as yet, although most of these are smaller care homes with fewer than 50 beds, and the top priority should be to keep this proportion as high as possible.

### **Prevalence and incidence of COVID-19**

14. The current number of new infections per day remains uncertain. Emerging community swabbing data collected from an ONS pilot between 26<sup>th</sup> and 8<sup>th</sup> May suggests that 136,000 people in England (confidence interval 76,000 to 225,000) would have swabbed positive with SARS-CoV-2 on 8<sup>th</sup> May.
15. Preliminary results from these swabbing surveys support the view that a significant proportion of infections in the UK are directly associated with health and social care workers.
16. Central estimates from different members of SPI-M-O for the incidence of infection (including those with no symptoms) range from 10,000-40,000 new infections per day.
17. As additional community swabbing and serological testing is carried out, our understanding of prevalence and incidence of COVID-19 in the population will improve, and help to settle this central uncertainty.

## Annex 1: SAGE framework of language for discussing probabilities



## Annex 2: Different groups' estimates of reproduction number

**Table 1:** SPI-M groups estimates of median  $R_t$  by region / nation including (95% confidence intervals).

Nation / Region	Group 1	Group 2	Group 3	Group 4	Group 5
East of England	0.71 (0.68 – 0.74)	0.9 (0.8 – 1.0)	0.80 (0.75 – 0.83)	0.74 (0.70 – 0.78)	0.80 (0.80 – 0.81)
London	0.40 (0.36 – 0.43)	0.9 (0.8 – 1.0)	0.71 (0.65 – 0.76)	0.72 (0.67 – 0.76)	0.69 (0.68 – 0.70)
Midlands	0.68 (0.65 – 0.71)	1.0 (0.9 – 1.1)	0.75 (0.71 – 0.80)	n/a	0.70 (0.70 – 0.71)
North East and Yorkshire	0.80 (0.76 – 0.83)	0.9 (0.8 – 1.0)	0.80 (0.76 – 0.85)	n/a	0.82 (0.81 – 0.83)
North West	0.73 (0.70 – 0.76)	1.0 (0.9 – 1.1)	0.81 (0.78 – 0.84)	0.77 (0.74 – 0.80)	0.74 (0.74 – 0.76)
South East	0.71 (0.68 – 0.74)	0.9 (0.7 – 1.0)	0.76 (0.69 – 0.82)	0.72 (0.69 – 0.76)	0.72 (0.71 – 0.74)
South West	0.76 (0.72 – 0.80)	1.0 (0.8 – 1.2)	0.72 (0.63 – 0.79)	0.73 (0.67 – 0.79)	0.73 (0.72 – 0.74)
England	0.75 (0.72 – 0.77)	0.9 (0.9 – 1.0)	0.77 (0.73 – 0.81)	0.86 (0.83 – 0.88)	0.74 (0.73 – 0.75)
Scotland		0.9 (0.7 – 1.1)	0.88 (0.84 – 0.91)	0.95 (0.85 – 1.05)	0.86 (0.85 – 0.88)
Wales		0.9 (0.6 – 1.1)	0.85 (0.80 – 0.89)	0.92 (0.78 – 1.07)	0.82 (0.81 – 0.85)
Northern Ireland			0.91 (0.85 – 0.95)	0.74 (0.57 – 0.93)	0.69 (0.66 – 0.75)

**Figure 1:** SPI-M groups estimates of median  $R_t$  by region / nation, including 95% confidence intervals (smaller dots), where colours represent different modelling groups.

