**Seventy-ninth SAGE meeting on COVID-19, 04 February 2021**
**Held via Video Teleconference**

**Summary**
1.  Data show that the restrictions in place (and people's adherence to them) are reducing the size of the epidemic (high confidence). R in the UK is between 0.7 and 1.0, while in England it is between 0.7 and 0.9. Estimates of R for Scotland, Wales, and Northern Ireland are all also between 0.7 and 0.9. The growth rate in new infections in the UK and England is between -5% and -2% per day. However, these reductions are from exceptionally high peaks of infections and hospitalisations, and the NHS remains under very significant pressure.

2.  PHE is investigating clusters of cases of two different variants containing E484K mutations, one of which is the B.1.1.7 variant with the E484K mutation. This mutation appears to have arisen at least 5 times independently in B.1.1.7, which suggests that it is likely to re-emerge, even if the current transmission is brought under control. There are significant benefits to reducing and delaying the spread of new variants. The most effective way to reduce the likelihood of new variants emerging in the first place is to reduce overall prevalence to the lowest possible level. Sustained community transmission of one or more variants at some point in the future may be unavoidable if prevalence remains high.

3.  Immunity certification could be used in addition to other measures to control transmission and/or to enable the relaxation of certain measures, but it is an imperfect tool and a risk-based approach should be adopted. The prevalence of infection in the community will have an important impact on the level of risk and effectiveness of certification (it may be very effective when prevalence is low, but less effective at high prevalence). Operational, behavioural and ethical issues all need to be considered for specific use cases. Pilot studies and randomised trials are recommended.

4.  Vaccines do not provide perfect protection from infection or disease and will not reach 100% of the population. Even when a significant proportion of the population has been vaccinated lifting NPIs will increase infections and there is a likelihood of epidemic resurgence (third wave) if restrictions are relaxed such that R is allowed to increase to above 1 (high confidence). There is the potential for such a resurgence to result in a very large number of infections if restrictions are lifted early or rapidly, which would lead to large numbers of hospitalisations and deaths unless vaccine coverage is very high.

5.  Relaxing measures later has two benefits; it allows prevalence to be brought down further, and also allows more people to be vaccinated before R increases. The combined effect of these means a significantly smaller resurgence and more time to react to any increase in infections or hospital admissions.

6.  Modelling indicates that relaxation of measures over six or nine months results in much smaller subsequent epidemic waves than relaxing measures over three months. Relaxation of a significant number of restrictions over three months starting from the beginning of April could lead to hospital occupancy higher than the January peak whereas relaxation over nine months would result in a much smaller peak (medium confidence, the modelling has some uncertainties and does not include seasonal changes). Retaining a baseline set of measures to reduce transmission even after other restrictions have been lifted would also reduce the scale of a resurgence (high confidence). These and potentially additional measures may be needed throughout Winter 2021/22.

7.  A key risk is the potential emergence and spread of variants which have a degree of immune escape. A new variant which could reinfect people who have already been vaccinated or have natural immunity would also reduce the impact of vaccination on

transmission, increasing the size of the epidemic further. As noted, keeping prevalence low is the best way to prevent emergence and spread of such variants.

8. As there are many uncertainties, changes to measures are best made based on epidemiological data rather than at predetermined dates. This makes it more likely that the epidemic can be kept under control. If there is an increase in transmission, it will take time for the data to show this, and then more time for any response to be implemented and then have an effect. Gradual relaxation would make it easier to monitor and assess the impact of changes.

9. Long COVID is likely to be a cluster of syndromes rather than a single one, and these syndromes may have different long-term outcomes.

10. COVID-19 is a multi-system disease and patients in hospital who survive may experience complications. Complications and worse functional outcomes are common even in younger, previously healthy patients.

11. COVID-19 complications and long COVID syndromes are likely to cause significant challenges for individuals and for the health and social care system in the coming years.


## Situation Update

12. Data show that the restrictions in place (and people's adherence to them) are reducing the size of the epidemic (high confidence), with admissions now falling in all regions, hospital occupancy also now declining, and ICU admissions no longer increasing. Lockdown measures are clearly working to reduce transmission. Comparison of recently observed data to medium term scenarios from several weeks ago shows daily hospital admissions tracking the more optimistic of these scenarios. However, these reductions are from exceptionally high peaks of infections and hospitalisations, and the NHS remains under very significant pressure.

13. SPI-M estimates that there are between 24,000 and 91,000 new infections per day in England. The ONS community infection survey for the most recent week of the study (24th to 30th January) estimates that an average of 846,900 people had COVID-19 in the community in England (credible interval 806,500 to 886,700), which is a decrease on estimates in January, although still a very large number.

14. R in the UK is between 0.7 and 1.0, while in England it is between 0.7 and 0.9. Estimates of R for Scotland, Wales, and Northern Ireland are all also between 0.7 and 0.9. R is a lagging indicator and these estimates are based on the latest data, available up to 1st February, including hospitalisations and deaths as well as symptomatic testing and prevalence studies. The growth rate in new infections in the UK and England is between -5% and -2% per day.

15. SPI-M estimates that R is now below 1 across all NHS England regions, although the upper limit of these ranges for the North East & Yorkshire and the North West are both 1. Although the epidemic is decreasing in all the nations and regions, transmission is heterogeneous more locally and may be increasing in some smaller areas. If the epidemic were to stop shrinking for any reason nationally (e.g. changes in restrictions or adherence), these areas would likely be under particular pressure.

16. It is too early to detect with any confidence the impact of vaccination on hospitalisations, though there are early indications of trends in hospitalisations of over-75s diverging from those in other age groups (though there may be other reasons for this). The impact of vaccination is not yet being seen in data for care home deaths as they have significant lag, though this impact should be seen in the data in the coming weeks.

17. The use of lateral flow devices has increased significantly to around 400-500k tests per day, primarily for asymptomatic testing. This asymptomatic testing is finding a significant number of cases which would not otherwise be identified. Using lateral

flow devices where tests would otherwise be done by PCR may affect comparability of data for example because lateral flow tests have lower sensitivity.

18. In the first wave, all ethnic minority groups were at elevated risk of COVID-19 related death compared to the White British population. In the second wave, the differences in the risk of COVID-19 related death have attenuated for Black African and Black Caribbean groups (high confidence) but increased in people from Bangladeshi and Pakistani background (high confidence). As the epidemic continues the impact on different groups may change, particularly if there continues to be differences in uptake of vaccines. The potential role of multioccupancy accommodation was again noted.

19. Analysis of data from a serological survey of a single close-knit community in the UK illustrates what can happen if infection is not carefully controlled. In the community studied, over 70% of adults became infected. Similar results have been reported from Manaus in Brazil. This may give some indication as to the levels of infection that might be seen in a largely uncontrolled epidemic.

20. Survey data indicate that a significant minority of people who could work from home are still going to their workplace. There are several possible reasons for this related to choices made by both employers and employees.

**ACTION: SPI-B** to share paper on working from home with CO and DHSC comms teams.

**ACTION: SAGE Secretariat** to invite Michael Marks to attend a future SAGE meeting to present his work.

### New variants

21. PHE has put in place a monitoring and assessment function for new variants. It is investigating clusters of cases of two different variants containing E484K mutations, both of which have other mutations which may enhance transmissibility relative to wild-type and where there appears to be some degree of community transmission.

22. One of these is the B.1.1.7 variant with the E484K mutation. This mutation appears to have arisen at least 5 times independently in B.1.1.7. This suggests that it is likely to re-emerge, even if the current transmission is brought under control.

23. There are significant benefits to reducing and delaying the spread of new variants, including giving more time to understand and prepare for them if they do spread (e.g. by developing diagnostics, vaccine updates and therapeutics). Preparation for those variants which are known to be likely to occur (because they have combinations of mutations which arise frequently and give some advantage) is also important. The most effective way to reduce the likelihood of new variants emerging in the first place is to reduce overall prevalence (high confidence). Sustained community transmission of one or more variants at some point in the future may be unavoidable if prevalence remains high.

24. Global laboratory biosecurity will increase in importance as an increasing number of laboratories work with an increasing range of variants. International collaboration on this will be key.

25. Whilst the UK has high levels of sequencing capacity by international standards, there are still constraints and there are trade-offs to be made between using it to investigate clusters of known variants, and surveillance for new variants.

**ACTION: PHE, COG-UK** and **Wendy Barclay** to develop a proposal for optimal targeting of UK sequencing capacity for public health need.

## Certification of immunity

26. Both natural infection and vaccination provide a high level (at least 77%) of protection against symptomatic and severe disease, after an interval of around 2 weeks after exposure or vaccination. This protection may take longer to develop in older citizens.
27. Natural infection provides protection against reinfection for around 7 out of 10 people for a period of at least 5-6 months. Immunisation with a single standard dose of the AstraZeneca vaccine provides protection against infection for around 7 out of 10 people for at least 90 days (equivalent data are not currently available for other vaccines in use in the UK).
28. Certification of immunity for certain uses may therefore be desirable (SAGE has previously provided advice on this – see SAGE 72). There are practical challenges associated with certification, such as setting an appropriate duration of validity for certificates, ensuring clear communication of risk, and preventing fraud.
29. Certification could be used in addition to other measures used to control transmission and/or to enable the relaxation of certain measures, but it is an imperfect tool and a risk-based approach should be adopted. The prevalence of infection in the community will have an important impact on the level of risk and effectiveness of certification (it may be very effective when prevalence is low, but less effective at high prevalence). The reliability of any immunity certificate will be reduced if virus variants with significant antigen escape are circulating.
30. SAGE has previously recommended use of pilot studies to understand the impact and practicalities of certification, including consideration of behavioural and ethical issues. Randomised trials to ascertain whether immunity certification alone would perform better, equally well or worse than other approaches, in controlled environments (when levels of infection are high and low) would also be valuable. In some controlled environments (e.g. healthcare settings) data could also be collected relating to both absenteeism and infection rates. The behavioural and ethical issues that need to be considered will vary depending on the use case.
31. Immunity certification should not permit the relaxation or avoidance of self-isolation if symptoms develop. Certificates should also not be used to replace other measures to protect high-risk individuals.

**ACTION**: **Cabinet Office** to consider if there are certification policy options which require more scientific advice.

**ACTION: PHE** to consider whether and how to run a clinical trial on immunity certification in controlled environments.

**ACTION: Tom Rodden** to review international evidence from pilots for events.

**ACTION: NERVTAG** to review evidence from ongoing SET-C work on immunity and certification.

## Vaccine and medium-term NPI scenarios

32. Vaccines, though highly effective, do not provide perfect protection from infection or disease and will not reach 100% of the population. Even when a significant proportion of the population has been vaccinated lifting NPIs will increase infections and there is a likelihood of epidemic resurgence if restrictions are relaxed such that R is allowed to increase to above 1 (high confidence). There is the potential for such a resurgence to result in a very large number of infections (third wave), if restrictions are lifted early or rapidly which would lead to large numbers of hospitalisations and deaths unless vaccine coverage is very high. SAGE 78 advised that reopening schools would lead to a 10-50% increase in R (medium confidence).

33. The impact on infections, hospitalisations and deaths is smaller if measures are released when prevalence is lower and if changes are made gradually (high confidence). The impact is also smaller if more people are vaccinated when measures are lifted (i.e. vaccine rollout is faster) and if vaccine uptake is higher, particularly in the most vulnerable groups (high confidence). Relaxing measures later therefore has two benefits; it allows prevalence to be brought down further, and also allows more people to be vaccinated before R increases. The combined effect of these means a significantly smaller resurgence.

34. As there are many uncertainties, including on what the effect of specific policies is on transmission, changes to measures are best made based on epidemiological data rather than based on predetermined dates. SAGE advises an "adaptive management" approach, responding to data, for example setting levels of infection or hospitalisation that would need to be reached before making changes. This makes it more likely that the epidemic can be kept under control.

35. Modelling indicates that relaxation of measures over six or nine months results in much smaller subsequent epidemic waves than relaxing measures over three months. Relaxation of a significant number of restrictions over three months starting from the beginning of April could lead to hospital occupancy higher than the January peak whereas relaxation over nine months would result in a much smaller peak (medium confidence).

36. Retaining a baseline set of policies to reduce transmission after other restrictions have been lifted would also reduce the scale of a resurgence (high confidence). A specific set of policies has not been modelled, but could include hygiene and environmental measures, communications to help people reduce their own risk, and test, trace, and isolate systems. These and potentially additional measures may be needed throughout Winter 2021/22.

37. One of the key uncertainties in the modelling is the impact of vaccines on blocking transmission (and reducing viral load). Further data on this will become available which will allow models to be refined. This and vaccine coverage are the two major uncertainties in the modelling. Seasonality is also not modelled. The current vaccination strategy is designed to stop serious illness rather than to reduce overall transmission.

38. A key risk is the potential emergence and spread of variants which have a degree of immune escape. A new variant which could reinfect people who have already been vaccinated or have natural immunity would also reduce the impact of vaccination on transmission, increasing the size of the epidemic further. As noted, keeping prevalence low is the best way to prevent emergence and spread of such variants.

39. Communities where vaccination uptake is low will be at particular risk in any resurgence.

40. An indication has not given by policymakers on the tolerable level of hospital occupancy for COVID-19 patients. This is one of the key factors which they will need to consider when balancing the harms of continued restrictions against the direct harms of COVID-19.

41. Seasonality is likely to have an impact both on the epidemic and also on the degree of harm caused by continued restrictions, and policymakers will need to factor this into their decision-making. Based on the experience of 2020, the situation in summer may be better than that in the winter (so the results of modelling may be pessimistic in summer and optimistic in winter). It was noted however, that there did not seem to be a strong seasonal advantage in the Southern Hemisphere over summer.

42. If there is an increase in transmission, it will take time for the data to show this, and then more time for any response to be implemented and have an effect. The risk associated with this lag needs to be considered when relaxing measures. Gradual relaxation would make it easier to monitor and assess the impact of changes. Maintaining control of the epidemic is easier at low levels of prevalence than at high levels.

## Long COVID and complications of COVID-19

43. Long COVID is likely to be a cluster of syndromes rather than a single one, and these syndromes may have different long-term outcomes. There are not currently internationally agreed case definitions, which are needed to help clinicians to understand and effectively treat these syndromes.
44. There are a wide range of symptoms associated with long COVID, with ONS survey data showing that 22% of respondents were still reporting at least one symptom at 5 weeks following COVID-19 infection, while 10% were still reporting symptoms at 12 weeks.
45. The most commonly reported symptoms at 5 weeks are fatigue (13%), cough (12%) headache (11%), loss of taste and/or smell (10%) and myalgia (9%), with females having a slightly higher 5-week prevalence than males (at 24% and 21%, respectively). Prevalence was greatest among those in the 35-49 years age group (27%), followed by 50-69 years (26%) and 25-34 years (25%).
46. It is not yet possible to estimate the prevalence of individual symptoms or age and sex breakdowns at 12 weeks due to insufficient sample sizes at longer follow-up times. ONS will continue collecting this data and will also launch a new CIS question on long COVID to improve understanding.
47. COVID-19 is a multi-system disease and patients in hospital who survive may experience complications. These complications are likely to have important short and long-term impacts for patients, healthcare utilisation, healthcare system preparedness, and society amidst the ongoing COVID-19 pandemic. These are different to the patients experiencing long COVID symptoms that were not hospitalised.
48. Disease severity at admission is a predictor of complications, so prevention likely requires a primary prevention strategy, i.e. vaccination. It is not yet clear to what extent vaccination will reduce complications, or the impact of long COVID. Existing comorbidities are also an indicator for complications post-admission.
49. Complications and worse functional outcomes are common even in younger, previously healthy patients. The impact may be greater on those patients who fall from a high functional baseline.
50. Complications are associated with reduced ability to self-care at discharge, with neurological complications being associated with the worst functional outcomes.
51. COVID-19 complications and long COVID are likely to cause significant challenges for individuals and for the health and social care system in the coming years.
52. Longitudinal studies, that include both people who have been hospitalised and those who have not, will be required to better understand these issues.

**ACTION: NERVTAG** to consider case definitions and to liaise with National Core Studies leads to ensure research questions are being considered.

## List of actions

**ACTION: SPI-B** to share paper on working from home with CO and DHSC comms teams.

**ACTION: SAGE Secretariat** to invite Michael Marks to attend a future SAGE meeting to present his work.

**ACTION: PHE, COG-UK** and **Wendy Barclay** to develop a proposal for optimal targeting of UK sequencing capacity for public health need.

**ACTION**: **Cabinet Office** to consider if there are certification policy options which require more scientific advice.

**ACTION: PHE** to consider whether and how to run a clinical trial on immunity certification in controlled environments.

**ACTION: Tom Rodden** to review international evidence from pilots for events.

**ACTION: NERVTAG** to review evidence from ongoing SET-C work on immunity and certification.

**Attendees**
**Scientific experts (34):** *Patrick Vallance (GCSA), Chris Whitty (CMO), Andrew Morris (HDR UK), Angela McLean (MOD), Catherine Noakes (Leeds), Charlotte Watts (FCDO CSA), Calum Semple (Liverpool), Fliss Bennee (Wales), Graham Medley (LSHTM), Harry Rutter (Bath), Ian Boyd (St Andrews), Ian Diamond (ONS), James Rubin (KCL), Jeanelle de Gruchy (ADPH), Jeremy Farrar (Wellcome), Jenny Harries (DHSC), John Edmunds (LSHTM), Julia Gog (Cambridge), Kamlesh Khunti (Leicester), Linda Partridge (Royal Society), Maria Zambon (PHE), Mark Walport (UKRI), Mark Wilcox (NHS),* ▮▮▮▮▮▮ *Michael Parker (Oxford), Peter Horby (Oxford), Phil Blythe (DfT CSA), Rob Orford (Wales, Health CSA), Sharon Peacock (PHE), Sheila Rowan (Scotland, CSA) Stephen Powis (NHS England), Susan Hopkins (PHE/NHST&T), Wendy Barclay (Imperial), and Yvonne Doyle (PHE).*

**Observers and government officials (25):** *Alan Penn (MHCLG CSA), Andrew Curran (HSE CSA),* ▮▮▮▮▮▮▮ *Ben Warner (No.10),* ▮▮▮▮▮▮▮▮▮ *Daniel Kleinberg (Scottish Govt), Declan Bradley (DoH Northern Ireland),* ▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮ *Imran Shafi (No. 10), James Benford (HMT), Jennifer Rubin (HO CSA), Jim McMenamin (Health Protection Scotland), Julian Fletcher (CO),* ▮▮▮▮▮ ▮▮▮▮▮▮▮ *Paul Monks (BEIS CSA),* ▮▮▮▮▮▮▮▮*,* ▮▮▮▮▮ ▮▮▮▮ *Rob Harrison (CO), Robin Grimes (CSA),* ▮▮▮▮▮▮▮ *Rupert Shute (HO dCSA), Thomas Waite (JBC),* ▮▮▮▮▮▮ *and Tom Rodden (DCMS CSA).*

**Secretariat (all GO-Science) (20):** ▮▮▮▮▮▮ ▮▮▮▮▮ ▮▮▮▮▮▮ ▮▮▮ ▮▮▮ ▮▮▮▮▮ ▮▮▮▮▮▮ ▮▮▮▮▮ ▮▮▮▮▮ ▮▮▮▮▮ ▮▮▮ ▮▮▮▮▮ ▮▮▮▮▮ ▮▮▮▮▮ ▮▮▮▮▮▮ ▮▮▮▮ *Simon Whitfield, Stuart Wainwright,* ▮▮▮▮▮ *and* ▮▮▮▮▮▮ ▮▮▮▮

**Total: 79**