# COVID – Technical Advisory Cell: Briefing on Behavioural and Social Interventions

1. In the event of a severe epidemic, the NHS will be unable to meet all demands placed on it. In the reasonable worst-case scenario, demand on beds is likely to overtake supply well before the peak is reached.

2. There are a range of behavioural and social interventions that are evidenced as having been effective in responding to past epidemics. These interventions are well understood by the public and have been enacted in other countries. Modelling suggests as compliance drops so does impact, but there is no major inflexion point at which a drop in compliance leads to a disproportionate drop in effect.

3. Applying behavioural interventions could be helpful in containing an epidemic to some degree or changing the shape of the epidemiological curve, potentially making the response of the NHS and other sectors more sustainable.

4. The objectives of these interventions could be to:

    - Contain the outbreak so that it does not become an epidemic (note – this unlikely to be achievable);
    - Delaying the peak so it occurs when the NHS is out of Winter pressures;
    - Reducing the size of and/or extending the peak so that the response by the NHS and other sectors can be maintained more sustainably; and
    - Reducing the total number of deaths by limiting the number of cases in vulnerable groups.

5. Any intervention would need to be Government policy for a significant duration (2-3 months) in order to see the benefit, as removing and/or relaxing the intervention too early could result in a new outbreak and potentially extend transmission of the virus into Winter 2020. However, the timescale for this are uncertain and would need to be kept under review to provide confidence that these are in place to sufficiently cover the peak of the outbreak.

6. SAGE considered that measures relating to individual isolation will likely need to be enacted within the next 10 to 14 days to be fully effective, and those concerning household quarantining and social distancing of the elderly and vulnerable 2-3 weeks after this. However, the triggers for individual and household isolation could be met earlier depending on the progress of the outbreak in the UK.

7. Case numbers are reviewed daily to advise further on the meeting of any trigger points. Activation points were discussed in SAGE on the 10th March with consideration given to a threshold of 300 patients in intensive care. As of the 10th March there were 17 patients in ICU, likely to increase to 100 within the next ten days, then 300 shortly after.

8. Preventing or reducing an epidemic requires the reproduction number (the average number of people one individual will infect) to fall below 1 and be maintained there (currently it is 2.4, which means one infected person might infect two point four others.

9. Modelling suggests that the stringent interventions introduced in Wuhan from 23 January (quarantine and movement restrictions) may have reduced the reproduction number to below one. However, there are differing views across the scientific community about whether other factors were involved in this. There is also speculation that the approach taken in Wuhan, to apply stringent regulations which have been rapidly lifted, may result in a subsequent second larger peak.

10. Hong Kong and Singapore are undertaking extensive contact tracing as well as a raft of social distancing measures such as school closures and self-isolation, but not to the same level of stringency as seen in Wuhan. There is also anecdotal evidence of extensive self-isolation by the general population. The roughly linear increase in the number of cases in Hong Kong and Singapore suggest that this approach has held the reproduction number around one.

11. It is considered that the epicentre in Lombardy had developed further before control measures were introduced than Wuhan, with community transmission from late January – more stringent control measures were enacted in Italy as the health system may have been at risk.

**Behavioural control measure interventions**

- Modelling evidence suggests that some interventions such as the restriction of mass gatherings (which includes closure of sporting fixtures, bars, restaurants, cinemas) whilst assumed to be effective, are not supported by evidence. Only a modest reduction in the infection related deaths (2%) is predicted for restricting mass gatherings. This is due to the limited exposure time (5.3% of total time), even if the transmission risk is weighted higher. Other measures that impact other more common activities, such as work and home (e.g. self-isolation of symptomatic individuals) have a greater impact on reduction of deaths (11%).

- The size of gathering as much a factor for transmissibility, as time of contact and nature of activity. A rough estimate from the current data is that you might expect one transmission event every two days. The likelihood of a transmission event in a rugby match is limited to a two-hour period. Avoiding behaviours that might propagate transmission (e.g. handshaking or kissing) reduces risk of infecting yourself or others. Some mass events might be higher risk than others (e.g. conferences that are over a day-long or weddings where there is closer contact (e.g. kissing)). However, the amount of time for an individual spent in mass gatherings is much smaller than that spend at home or in work. You are also more likely to kiss relatives than you are to fellow rugby fans..

- Home and work based distancing interventions have a greater individual impact. When combined self-isolation, household quarantine and social distancing of vulnerable groups and over 70s is predicted to lead to a 37% reduction in infection related deaths

- Some combinations of behavioural interventions have a greater impact on reducing deaths compared with others that together reduce bed demand. Overlaying too many behavioural and social interventions, as seen in Italy, could sufficiently flatten the epidemic such that it will peak eventually in winter months. Ideally, the interventions will move the epidemic into the summer months where demand for NHS services is lower.

- Behavioural scientists have stressed the importance of ensuring that there is equity and accessibility of BSI particularly for poorer facilities (e.g. the actions are able to be followed. Any feeling of unfairness will kill all government intervention.

**General conclusions on the impact of behavioural and social interventions during the reasonable worst-case scenario**

12. Any of the measures listed below could, on their own, potentially flatten and extend the peak of the epidemic by some degree. This would prolong the outbreak, but the lower maximum case numbers would reduce pressures on the NHS and other sectors. However, it should be noted that even without Government intervention, public behavioural change will have some (potentially very significant) effect.

13. A combination of these measures is expected to have a greater impact: implementing a subset of measures would be ideal. Whilst this would have a more moderate impact it would be much less likely to result in a second wave. In comparison, combining stringent social distancing measures, school closures and quarantining cases, as a long-term policy, may have a similar impact to that seen in Hong Kong or Singapore, but this could result in a large second epidemic wave once the measures were lifted.

14. The timing of the interventions would be critical. It will not be possible to time their starting date optimally or identify the areas which will be most impacted first. A clearer understanding of when to turn on interventions is emerging from SAGE and is linked to cases identified in ICU surveillance. Ongoing monitoring will be essential to enable analysis of whether to ramp up interventions or lift them.

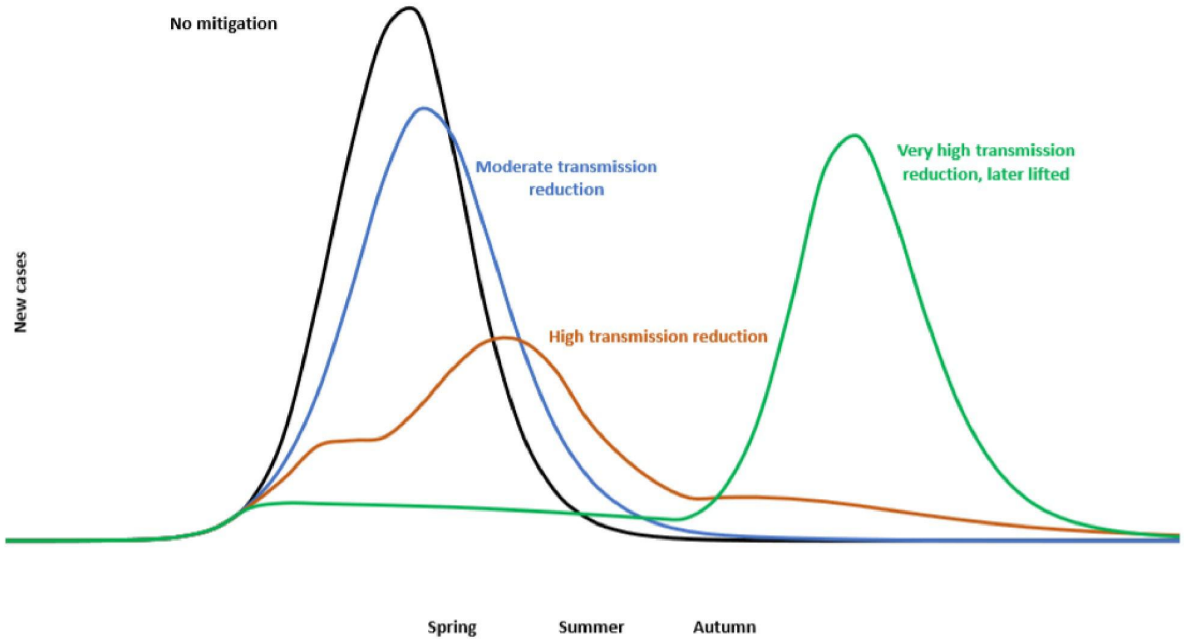
15. As the epidemic develops, the peak number of cases in each county may occur at different times. Modelling suggest this will be spread over around a 4 week period. As such national interventions, if enacted, would be in place earlier in the epidemiological curve in some areas than others.

16. These interventions assume compliance levels of 50% or more over long periods of time. This may be unachievable in the UK population and uptake of these measures is likely to vary across groups, possibly leading to variation in outbreak intensities across different communities. Overall policy effectiveness of home isolation and whole household isolation shows a linear dependence on the assumed compliance with case isolation. A reduction in compliance of 20% in home isolation and whole household isolation measures, when combined with social distancing for vulnerable groups would only lead to a modest reduction in the effect (around 5% in the peak bed demand and total deaths).

**Illustrative impact of behavioural and social interventions lasting several months on a reasonable worst-case epidemic (Figure 1)**

**Key**

The reasonable worst-case scenario, with no mitigating measures, would likely peak during April-May, with a high peak incidence.

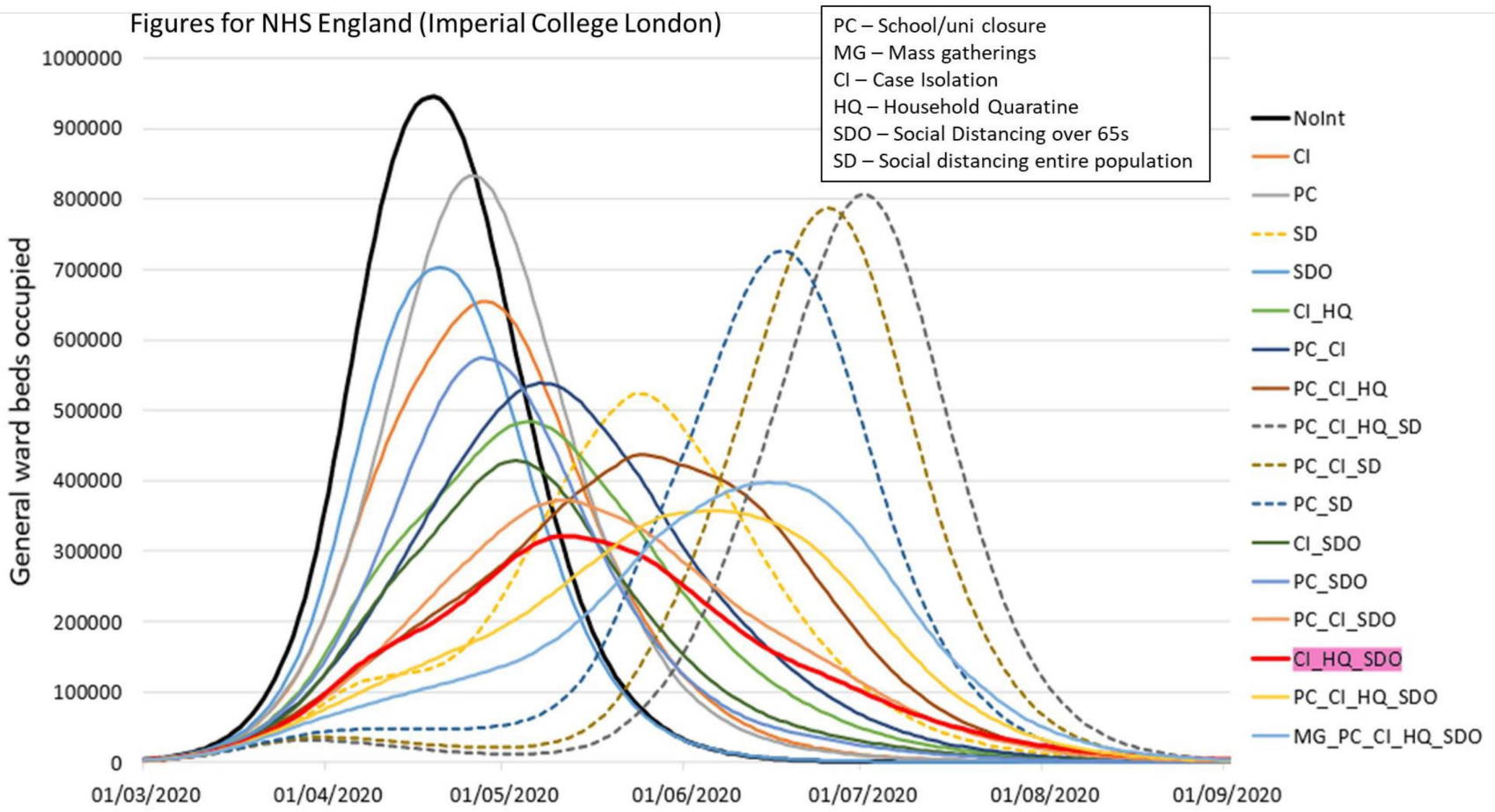



Behavioural and social interventions which moderately reduce transmission are unlikely to greatly reduce the total number of cases but could reduce and slightly delay the peak. This scenario may also arise from behavioural changes without government intervention.

Behavioural and social interventions which further reduce transmission could delay and reduce the peak still further.

Very stringent behavioural and social interventions could have a similar scale of impact to Hong Kong and prevent a major epidemic. However, when lifted, a large epidemic would likely follow. Depending how long they were in place, this could peak in autumn.

**Please note: The scale and timings of the epidemic curves in this diagram are illustrative only, but their patterns are robust.**


Figures for NHS England (Imperial College London)
PC – School/uni closure
MG – Mass gatherings
CI – Case Isolation
HQ – Household Quaratine
SDO – Social Distancing over 65s
SD – Social distancing entire population
General ward beds occupied
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
01/03/2020
01/04/2020
01/05/2020
01/06/2020
01/07/2020
01/08/2020
01/09/2020
NoInt
CI
PC
SD
SDO
CI_HQ
PC_CI
PC_CI_HQ
PC_CI_HQ_SD
PC_CI_SD
PC_SD
CI_SDO
PC_SDO
PC_CI_SDO
CI_HQ_SDO
PC_CI_HQ_SDO
MG_PC_CI_HQ_SDO

**BSI Policies examined by Imperial College London (Neil Ferguson)**

**MG - stopping mass gatherings**. Includes shutting, in order of significance, bars/pubs, restaurants, cinemas, night clubs, sporting fixtures, places of worship and theatre. These represent about 12m contact hours of activity per day, or 5.3% of all hours outside home, school or work. Assuming a 3-fold higher risk of transmission than other activities, preventing them might reduce transmission outside household, school or work contacts by 16%.

**PC - closure of schools and universities**. Schools assumed to completely close, 25% of universities remain open. Household contact rates for student families increased by 50% during closure. Contacts outside the household increase by 25% during closure.

**CI - case isolation in the home**. 70% of symptomatic cases withdraw to the home for 7 days, reducing non household contacts by 75%. Household contacts unchanged.

**HQ - voluntary home quarantine**. Following the identification of a symptomatic case in the household, all other household members withdraw to the home for 14 days. Household contacts double during quarantine, all contact outside the household are reduced by 75%. 50% of households are assumed to comply with the policy.

**SDO – Social distancing of those over 65 years of age**. 75% compliance with policy. Those who do comply reduce contacts in schools or workplaces by 50%, increase household contact rates by 25%, but reduce all other contacts by 75%. This policy implies cessation of all activities outside the household (including social contact between different households) bar the essentials. Policy would need to include rigorous infection control in care/nursing homes. This policy is assumed to continue for 4 weeks longer than all other policies.

**SD - social distancing of entire population**. All households reduce contacts outside the household or school/workplace by 75%. School contact rates are assumed to be unchanged. Workplace contact rates are reduced by 25%. Household contact rates are assumed to increase by 25%. This policy implies cessation of all activities outside the household (including social contact between different households) bar the essentials and attending school and work.