DRAFT Potential impact of behavioural and social interventions on a Covid-19 epidemic in the UK

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

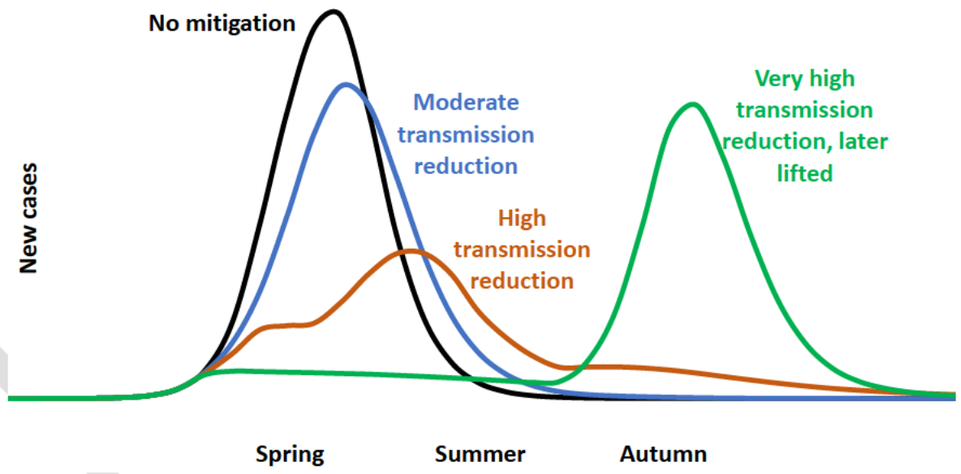
The reasonable worst-case scenario, with no mitigating measures, would likely peak during April-May, with a high peak incidence.

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.

The scale and timings of these epidemic curves are illustrative only, but their patterns are robust.



Impact of behavioural and social interventions that have taken place elsewhere

Preventing an epidemic requires the reproduction number to be reduced to below 1 and maintained there. Modelling suggests that the stringent behavioural and social interventions introduced in Wuhan from 23rd January may have reduced the reproduction number from 2.4 to around 1. There are differing views as to whether the measures brought it just above or just below 1; herd immunity (i.e. people already infected) will have pushed the reproduction number below 1, curbing the epidemic.

Both Hong Kong and Singapore are doing extensive contact tracing as well as a raft of social distance measures such as school closure and self-isolation, but not to the same level of stringency seen in Wuhan. There is anecdotal evidence of extensive self-isolation by the general population. There has been a roughly linear increase in the Hong Kong and Singapore outbreaks, suggesting that the reproduction number in these settings has been about 1.

Further details of the impacts of behavioural and social interventions in other countries are given in Annex 1 (Adoption and impact of non-pharmaceutical interventions for Covid-19).

General conclusions on the impact of behavioural and social interventions on a Reasonable Worst-Case epidemic, when implemented for 8-13 weeks (Table 1, 2)

All the results below are based on a reasonable worst-case scenario.

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. Interventions that could delay the peak, and/or reduce the size of the peak, whilst increasing the duration of the epidemic, are likely to be helpful provided the epidemic is not extended into late autumn/winter.

Any of the measures listed below could potentially flatten the peak of the epidemic and extend it to some extent. The greater the number of measures implemented, the larger the impact possible. Behavioural changes will have some (potentially very significant) effect, even without HMG intervention.

Combining stringent social distancing measures, school closures and quarantining of cases, as a long-term policy, might have a similar impact to that seen in Hong Kong or Singapore – reducing the reproduction number to around 1. But this could result in a large second epidemic once measures were lifted. Implementing a subset of measures would be expected to have a more moderate impact – still substantially reducing peak incidence, while making a second wave of infection in autumn less likely.

Any estimates of the potential impact of combinations of measures are assumption driven and subject to great uncertainty. Indicative results are given in Annexes 2 and 3 (Papers by MRC Centre for Global Infectious Disease Analysis and London School of Hygiene and Tropical Medicine), circulated with this paper.

Our best assessment is that single measures of the type considered below could reduce the peak NHS bed demand by somewhere in the range of 15-30%. Enacting a policy, for 13 weeks, of home isolation of cases with stringent social distancing of either all groups, or of the elderly, could be expected to reduce the total number of deaths by around a third, and the peak demand for hospital beds, critical care beds and deaths by 50-65%. Whatever the exact figure, NHS demand will greatly exceed supply in a reasonable worst case, even with behavioural and social interventions.

The timing of the interventions would be critical. Given current surveillance systems, it will not be possible to time their starting date optimally. For the same reason, it will not be possible to identify which places are hit hardest first, so **there is no case to be made to bring in interventions on a local level first. Widespread serology data and monitoring of behavioural changes are critical to enabling decisions on a) whether to ramp up interventions and b) when to lift them.** It may be practical to lift them on a regional basis. Given our belief that the epidemic will take off most quickly in London, there is a case for prioritising surveillance measures there initially.

The measures outlined below assume high levels of compliance over long periods of time. This may be unachievable in the UK population. Furthermore, uptake of these measures is likely to vary across groups, leading to variation in outbreak intensities in different communities.

SAGE secretariat, 03 March 2020

DRAFT Potential impact of behavioural and social interventions on a Covid-19 epidemic in the UK

Table 1: Potential impact of behavioural and social interventions on a Covid-19 epidemic in the UK

	Stopping large events such as concerts and sports	Closure of schools	Home isolation of symptomatic cases, for 13 weeks, when enacted early	Whole household isolation, for 13 weeks, when enacted early	Social distancing, for 13 weeks, when enacted early	Social distancing for those over 65, for 13 weeks, when enacted early	Potential effectiveness in containing an outbreak	Potential effectiveness in delaying an outbreak	Potential effectiveness in reducing the peak of an outbreak	Potential effectiveness in reducing total number of cases and deaths, excluding excess deaths caused by lack of NHS capacity
Interventions activated	X						None	Very little on their own	Very little on their own	Very little on their own
		X					Unlikely to contain an outbreak on its own	No more than 3 weeks delay to peak and possibly much less	If children have a similar role in transmission as to flu, around 10%-20% reduction in peak hospital demand with closures of 8-12 weeks. Only a modest impact on peak deaths (<5%)	Modest impact (<5%)
			X				Unlikely to contain an outbreak on its own	2-3 weeks delay to peak	Reduction in peak incidence of maybe 20% (uncertainty range at least 15-25%)	Modest impact (<5%)
				X			Unlikely to contain an outbreak on its own	2-3 weeks delay to peak	Reduction in peak incidence of maybe 25% (uncertainty range of at least 20-30%)	Modest impact (<10%)
					X		Unlikely to contain an outbreak on its own, though likely to have a larger impact than each of the other measures	3-5 weeks delay to peak	Substantial reduction in peak, may be up to 50 – 60%	Around 20-25% of deaths
						X	Will not contain an outbreak on its own	Negligible impact	Reduction in peak of total number of cases, but around 25 – 35% reduction in deaths and demand for hospital beds and critical care beds	Up to 5% of cases, but 20-35% of deaths
Assumptions	Includes, in order of significance, closing cinemas, night clubs, sporting fixtures, places of worship and theatre. Does not include closing bars and restaurants. This assumes contact rates outside the home are only reduced by around 5%	Schools completely close nationally and children do not gather in other group settings. Children play an important role in transmission but lower than flu.	65% of symptomatic cases withdraw to the home for 7 days, reducing non-household contacts by 75%. Household contacts unchanged.	Following the identification of a symptomatic case in the household, all other members withdraw for 14 days. Household contacts double, all contact outside the household reduced by 75%. 50% of households are assumed to comply.	All households reduce contacts outside the household or school/workplace by 75%. School contact rates are unchanged. Workplace contact rates reduced by 25%. Household contact increase by 25%. *This implies cessation of all activities outside the household bar the essentials and attending school and work.*	75% compliance. Those who comply increase household contacts by 25% but reduce other contacts by 75%. *This policy implies cessation of all activities outside the household (including social contact between different households) bar the essentials and attending school and work.*	-	-	-	-

Table 2: Behavioural science considerations for each potential intervention

	Stopping large events such as concerts and sport	Closure of schools	Home isolation of symptomatic cases, for 13 weeks, when enacted early	Whole household isolation, for 13 weeks, when enacted early	Social distancing, for 13 weeks, when enacted early	Social distancing for those over 65, for 13 weeks, when enacted early
Public attitudes & support	TO BE POPULATED FOLLOWING SAGE MEETING	70-90% of parents from closed schools supported the policy across 6 studies in previous incidents [4].	Easiest measure to explain and justify to the public. 84% in UK currently support mandatory quarantine [2]. 87% of those quarantined during H1N1 considered it useful and 73% justified.	Not aware of any data for household isolation.	Some degree of distancing is likely to be broadly supported by the public, at least initially i.e. cessation of sporting activities, music festivals. Attitudes may change as duration increases. 62% already expect major sporting events will be jeopardized. 21% currently avoiding large gatherings, 16% avoiding shaking hands. 65% expect it will take months to contain the virus [1,2]. For H1N1, ~50% agreed that avoiding large crowds would be effective in preventing spread of swine flu, with ~20% unsure [8].	Not aware of any data.
Likely compliance	TO BE POPULATED FOLLOWING SAGE MEETING	Two studies report contact rates in pupils are reduced by 55 to 65% [4]. Likely to be higher with good communication and with high risk perceptions. Longer duration closures may reduce compliance.	Adherence of ~50% to 90% in previous outbreaks, tending more to the higher end [3]. This is among those actively contacted by health services. Adherence among self-diagnosed people likely to be lower.	Not aware of any data for households of cases. Reasonable to assume a lower adherence in non-symptomatic household members.	Likely high, initially, for many social activities. However, displacement is also possible (e.g. football supporters congregating away from stadiums to watch matches). People actively changed their greetings during H1N1: 11% avoided hugging or kissing distant acquaintances, 10% avoided shaking hands with family or friends or distant acquaintances [9].	Unclear. Complicated in particular by households with both vulnerable and non-vulnerable members. At present [10]: 6% of older people leave their house once a week or less. 17% of older people have less than weekly contact with family, friends and neighbours. 11% have less than monthly contact.
Barriers / facilitators / communication issues	TO BE POPULATED FOLLOWING SAGE MEETING	Clear messaging about the purpose of school closures needed to prevent children continuing to mix. Current parental perception is that schools close to facilitate "deep cleaning" [7]. Those in lower socio-economic groups may be most impacted by disruption from school closure, e.g. more reliant on free school meals or unable to rearrange work to provide childcare. Allowing school premises to remain open to provide some community services, while sending most children home, may mitigate this.	Important to reinforce guidance on who should isolate, when, and for how long to prevent ambiguity reducing adherence, e.g. when symptoms are mild. Targeted support during isolation may promote compliance. This requires understanding of what the key stressors are and when they appear. This applies also to household quarantine. Unclear if "isolation" is clearest term to use. Requires evidence. Concerns likely to arise about impact on others within the household. In some occupations (esp. healthcare workers) it is the norm that people continue to work when unwell. Important to make it socially unacceptable to attend work/school if unwell. Messaging on isolation could be more powerful if framed as both an act of protecting oneself, as well as protecting others.	Resistance & non-compliance will be greater if impacts are inequitable. For those on low incomes, loss of income means inability to pay for food, heating, lighting, internet. This can be addressed by guaranteeing supplies during quarantine periods (e.g. agreements to waive online delivery charges). Ensuring supplies flow to households is essential. A desire to help among the wider community (e.g. taking on chores, delivering supplies) could be encouraged and scaffolded to support quarantined households. There is a risk of stigma, so isolation should be portrayed as an act of altruistic civic duty. Clear guidance required to outline the cycle of isolation, what to do if you live with a vulnerable person, and what to do if a member of the household becomes severely unwell. Variable compliance, due to variable capacity to comply may lead to dissatisfaction, e.g. essential work commitments, economic precarity and caring responsibilities outside of the home.	Where possible, businesses should encourage employees to work from home. Frustration may arise in those unable to reduce social contact in their work. Guidance will be needed to mitigate this. Important to stress legitimacy of interventions such as long-term suspension of mass gatherings to reduce dissatisfaction. Encouraging replacement behaviours and alternative social activities may reduce dissatisfaction (e.g. remote interactions).	

References:

Table 1: SPI-M results based on:

- SPI-M-O modelling consensus on school closures and supporting paper collated by Julia Gog, 19th February 2020
- SPI-M-O meeting, 26th February 2020
- Imperial College paper "Potential effect of behavioural and social interventions on a COVID-19 epidemic". That assumes:
- National policies triggered by national weekly symptomatic disease incidence triggers of 100 or 300 cases per 100,000 of population per week.
- 90% of symptomatic disease can be detected (e.g. via a community-based surveillance system such as FluSurvey).
- R_0 between 2.0 and 2.4.

Table 2: SPI-B underlying data:

Where possible, we have restricted our reviews to those of actual behaviour in analogous situations, with a preference for UK data.

[1] Ipsos MORI. Coronavirus: Opinion and reaction. Results for a multi-country poll, UK findings (Feb 19, 2020) [data collection Feb 14-15, n=~1,000]

[2] Ipsos MORI. Coronavirus: Opinion and reaction. Results for a multi-country poll, UK findings (Feb 12, 2020) [data collection Feb 7-9, n=1,000]

[3] Webster RK, Brooks SK, Smith LE, Woodland L, Wessely S, Rubin GJ. How to improve adherence with quarantine: Rapid review of the evidence. Public Health (under review)

[4] Brooks SK, Smith LE, Webster RK, Weston D, Woodland L, Hall I, Rubin GJ. The impact of unplanned school closure on children's social contact: Rapid evidence review. Eurosurveillance (under review)

[5] Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, Rubin GJ. The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. Lancet 2020, https://doi.org/10.1016/S0140-6736(20)30460-8

[6] Webster RK, Lieu R, Karimullina K, Hall I, Amlot R, Rubin GJ. A systematic review of infectious illness presenteeism: Prevalence, reasons and risk factors. BMC Public Health, 2019, 19:799

[7] Department of Health and Social Care focus groups, conducted mid-February (contact [redacted]).

[8] Rubin GJ, Potts HWW, Michie S. The impact of communications about swine flu (influenza A HINIv) on public responses to the outbreak: Results from 36 national telephone surveys in the UK. Health Technology Assessment. 2010;14(34):183-266 doi:10.3310/hta14340-03.

[9] SteelFisher GK, Blendon RJ, Ward JR, Rapoport R, Kahn EB, Kohl KS. Public response to the 2009 influenza A H1N1 pandemic: a polling study in five countries. Lancet Infect Dis. 2012;12(11):845-50.

[10] https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/reports-and-briefings/health--wellbeing/rb_june15_lonelines_in_later_life_evidence_review.pdf