Potential effect of non-pharmaceutical interventions (NPIs) on a Covid-19 epidemic in the UK 26th February 2020

In the event of a pandemic, without action, the NHS will be unable to meet all demands placed on it. Demand on beds is likely to overtake supply well before the peak is reached. Any interventions that could delay the peak, and/or reduce the size of the peak, whilst increasing the duration of the pandemic, are likely to be helpful, provided the pandemic 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. A combination of measures would be expected to have a greater impact, but the impacts are not strictly additive. SPI-M-O believes that combining all four measures, as a long-term policy, might have a similar impact to that seen in Hong Kong or mainland China – reducing the reproduction number to around 1. However, this would result in a large second epidemic once measures were lifted. Implementing a subset of measures (e.g. the first three) 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. This might be the preferred outcome for the NHS.

It is a political decision to consider whether it is preferable to enact stricter measures at first, lifting them gradually as required, or to start with fewer measures and add further measures if required. Surveillance data streams will allow real-time monitoring of epidemic growth rates and thus allow approximate evaluation of the impact of whatever package of interventions is implemented. It will likely not be feasible to provide estimates of the effectiveness of individual control measures, just the overall effectiveness of them all.

An additional strategy would be to apply more intense measures on those age or risk groups at most risk of experiencing severe disease (e.g. household isolation of those over 65, special measures around care homes). The majority of the population would then develop immunity, hopefully preventing any second wave, while reducing pressure on the NHS. However, SPI-M-O has not looked at the likely feasibility or effectiveness of such methods.

It is unclear how climate driven seasonality in transmission might affect the epidemic; however, if transmission is reduced by higher temperatures in the spring and summer, this might increase the impact of NPIs.

Some social distancing is to be expected, even in the absence of formal control measures. Ideally, we would monitor behavioural patterns during the epidemic.

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.

	Closure of schools	Home isolation of symptomatic cases, for 13 weeks, when enacted early	Voluntary household quarantine, for 13 weeks, when enacted early	Social distancing, for 13 weeks, when enacted early
Assumptions	Schools completely close nationally and children do not gather in other group settings. Children play an important role in transmission.	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 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.	All households reduce contacts outside the household or school/workplace by 75%. School contact rates are unchanged. Workplace contact rates are reduced by 25%. Household contact 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.*
Potential effectiveness in containing an outbreak	Unlikely to contain an outbreak on its own	Unlikely to contain an outbreak on its own	Unlikely to contain an outbreak on its own	Unlikely to contain an outbreak on its own, though likely to have a larger impact than each of the other 3 measures
Potential effectiveness in delaying an outbreak	No more than 3 weeks delay to peak and possibly much less	2-3 weeks delay to peak	Similar impact to home isolation	3-5 weeks delay to peak
Potential effectiveness in reducing the peak of an outbreak	If children have a similar role in transmission as to flu, around 10%-30% reduction in peak incidence could be achievable for a closure duration of over 8 weeks, when enacted early. Would be greater (~30% reduction) if universities were closed too	Reduction in peak incidence of maybe 20% (uncertainty range at least 15-25%)	Slightly greater but similar impact to home isolation of cases – reduction of perhaps 25% (uncertainty range at least 20-30%)	Substantial reduction in peak, maybe up to 50-60%

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Behavioural science considerations	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. Clear messaging about the purpose of school closures needed to prevent children continuing to mix. University closure less effective if most contact between students occurs outside of lectures. Will need to be accompanied by clear advice on mixing in halls and social spaces. International students may need clarity on visa issues.	Easiest measure to explain and justify to the public. 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. It will be important to make it socially unacceptable to attend work/school if unwell. Targeted support may promote compliance. This requires understanding of what the key stressors are and when they appear. This applies also to household quarantine.	Resistance & non-compliance will be greater if impacts of this policy 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. Variable compliance, due to variable capacity to comply, may lead to dissatisfaction. 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 'voluntary quarantine' should be portrayed as an act of altruistic civic duty.	Some degree of distancing is likely to be broadly supported by the public, at least initially i.e. cessation of sporting activities, music festivals. Frustration may arise in those unable to reduce social contact in their work. Guidance will be needed to mitigate this. Efficacy of reducing non-essential contact will appear low where essential contact is extensive. Some absenteeism may occur at schools. It will be important to understand how truancy policies will be applied if parents choose to withdraw children.

No assessment of combining the interventions above has been made at this time.