

Key uncertainties related to the risk of overwhelming the NHS

Steven Riley, 20th January 2021

MRC Centre for Global Infectious Disease Analysis and REACT Study Investigators, Imperial College London

Summary

- A conservative timeline to reach an initial post-vaccine state is 6 months. There is high uncertainty about the number of deaths that will occur in that period and also about the average number of COVID-19 inpatients in NHS hospitals.
- The concept of a health service being overwhelmed as a discrete event is not defined, so it's difficult to assess the risk of it happening or ways to mitigate that risk
- Among current interventions, the only options seem to be related to lockdown durations, compliance and strincencies
- Feedback from any changes to lockdown policies is slow, so there are few opportunities to modify policy within the vaccine rollout timeline
- The efficacy of the current lockdown is not yet apparent
- If it were possible, arguments for an expensive fixed-term intervention that reduces incidence are probably stronger now than at any point in the pandemic
- Returning to near-normal life because of the vaccine program is not guaranteed. Also, if the current lockdown is successful in maintaining R below 1 and reducing prevalence, the release of lockdown would present a new set of risks.

Background

The UK has approved three vaccines against COVID-19 and is rolling them out as quickly as possible. England is currently in its 3rd national lockdown and the majority of Wales, Scotland and Northern Ireland are under similar restrictions. The key health metrics that will likely be used to judge our response over the next 6 months are: average numbers of hospitalized patients and total deaths. At the current stage of the epidemic, both hospitalizations and deaths are currently above those seen at the peak of the first wave. Although there are many other health metrics, these two seem to be the most frequently commented on by policy makers and the media.

Timeline

Current vaccine procurement and distribution suggests that a large proportion of the adult population in the UK will have been offered vaccines by the end of July, with high proportions in the most at-risk age groups earlier than that. Therefore, it is reasonable to assume we will be in a post-vaccine-wave-1 scenario at the very latest by that time (but not guaranteed). There is high uncertainty about the number of deaths that will occur in that period and the average number of COVID-19 inpatient in NHS hospitals.

The concept of “overwhelming”

In order to assess the risk that an event may happen and then reduce that risk, we need to precisely define the event. However, this may not be currently possible for the concept of the NHS being overwhelmed.

As the number of COVID-19 cases increase, the resources available to each case is reduced. This tradeoff is likely a gradual process that is always present. The low hospital case fatality rates during summer 2020 may reflect this to some degree: with mild cases being more likely to be admitted when cases were few.

Also, as COVID-19 cases increase, resources available to other diseases. Many elective procedures are already being postponed in many trusts. Non-COVID-19 acute services will also be impacted when demand for COVID-19 care is very high.

There may be no clear limit to this elasticity. Oxygen supplies have run low at several hospitals, resulting in major incidents, but these are treated as temporary local issues. Patients are being treated in ambulances for prolonged periods and the police and fire services are helping to bring people to hospitals.

Current policies

As well as vaccination and social distancing, the UK is currently deploying many different interventions against the transmission of SARS-CoV-2, e.g. improved hygiene through public information; PCR-testing; interview-based tracing and contact tracing; app-based tracing and contact tracing; lateral flow testing of high risk individuals. These are likely to continue for the foreseeable future and so not appear to present immediate strategic policy questions.

Vaccines are being rolled out as quickly as possible to healthcare and care home workers and the most at-risk individuals. We are starting to see debate about whether to prioritise

somewhat based on risk of infection. However, until there are high coverage rates in these initial groups, there does not appear to be immediate strategic policy options.

We are currently in a third national lockdown in England, with similar restrictions in place for the majority of people in Wales, Scotland and Northern Ireland. Although the efficacy of the current lockdowns is not yet clear, its impact on mobility appears to be in-between the 1st and 2nd lockdowns. Given the increased transmissibility of the new variant, a resulting R close to 1 seems likely. Also, analyses of lockdowns 1 and 2 suggests that their efficacy wanes gradually after their initial impact on behaviour.

Feedback from any changes to the current lockdown

We should assume that the current lockdown can be modified by: extending or shortening its duration, or by increasing or decreasing its efficacy. Although it would be challenging to increase efficacy, if we do not assume it is possible, there are no other short term options to reduce incidence. Efficacy could be increased either by increased stringency of the policy or facilitating increased compliance.

It takes a substantial amount of time for the efficacy of any changes to become apparent in the case data or community infection data. Therefore, there are few opportunities to modify policy within the vaccine rollout timeline.

Impact of reducing prevalence

If the current version of lockdown 3 is resulting in transmission around $R=1$, and is judged to be sustainable for a period of months, there may be substantial benefits to a circuit-breaker-type increase in stringency for a fixed term to reduce incidence of infection. With a very clearly outlined exit point from vaccine roll-out and currently high prevalence, the rate of deaths and average hospital occupancy are determined primarily by the initial incidence of infection.

If R is not already substantially below 1, if possible, an “expensive” fixed-term intervention to bring down incidence in the short term is likely more justifiable now than at previous times during the pandemic.

Post-vaccine scenario is not guaranteed

Although there are many reasons to be optimistic about the state of the epidemic in the UK in 6 months time, there are no guarantees that we will be able to return to near-normal life. The impact of the vaccine program will be impacted by: logistical efficiency, uptake, real-world efficacy against disease, real-world efficacy against transmission, possible antigenic changes in the virus, waning of natural immunity, and waning of vaccine immunity. As we assess the ongoing efficacy of vaccination, lower levels of transmission will give us “headroom” to respond and consider alternative policy objectives if required.

If the current lockdown is successful in maintaining R below 1 and reducing prevalence, the release of lockdown would present a new set of risks. The accumulation of immunity from infections is also likely to have a major impact on disease dynamics over that period, but at the cost of many severe infections.