UNCOVER

Usher Network for COVID-19 Evidence Reviews

Summary: How have population-level non-pharmaceutical interventions [NPIs] to reduce SARS CoV-2 transmission been related in time to the reproduction number (R) and have countries used measures of R in making decisions about the application of these

Date: 29 April 2020 Version: 006-01

THE UNIVERSITY of EDINBURGH | usher institute

Title: How have population-level non-pharmaceutical interventions [NPIs] to reduce SARS CoV-2 transmission been related in time to the reproduction number (R) and have countries used measures of R in making decisions about the application of these interventions?

Summary answer:

Most countries have imposed severe restrictions and "lockdown" at a population level as part of a suppression strategy to reduce the transmission of SARS CoV-2 and reduce COVID-19 cases. Some countries have now begun relaxing these severe restrictions. However, there is limited evidence in the public domain on what criteria were used to relax restrictions / lift "lockdowns".

- Of all the non-pharmaceutical interventions (NPIs) introduced at a population level in countries affected by COVID-19, including school closure, public events ban, social distancing and "lockdown", lockdown contributed most and [separate] school closure the least to reduction in R.
- By enforcing lockdown, most countries managed to reduce R to less than 1.
- Evidence from Austria, the Czech Republic, Denmark, Finland, Germany, Italy, Norway, Spain, Hongkong and Wuhan, China reveal that there are variations in the restriction measures and their sequencing that have been relaxed in each country. However, all countries appear to be adopting a cautious approach and relaxing restrictions in a phased manner. Most countries continue to ban public gatherings for the immediate future.
- Only Denmark and Norway Governments [1,2] seem to have referenced transmission rate (R) in the announcement of controlled re-opening and this was in reference to a value of R<1. Germany referenced epidemiological data from the Robert Koch Institute which included estimated R of 0.9 [3].
- For other countries, the estimated R (based on two different models by Imperial College London [4] and the model by LSHTM [5]) at the beginning of April are available, and these were all <1.
- Based on a range of sources, the latest R estimated for UK could be in the range of 0.62-0.9.
- R is a fundamental infectious disease dynamics metric and is often assumed to have a straightforward interpretation. However, in practice, estimating R during an ongoing outbreak is complicated and associated with substantial uncertainty.
- During an ongoing outbreak, a robust estimate of R at time T requires incidence data from times later than T, leading to a delay in obtaining "real-time" R.
- Due to the lack of granularity in data, all R estimates in the report are at national level whereas transmission dynamics might vary by region [and so R would not be able to inform any or most regional decision-making].
- For these reasons, decisions on enforcing and lifting NPIs need to balance information from R and other key parameters and cannot not be based on R alone.
- Estimating R for specific sectors (e.g. care homes or hospitals) is extremely challenging given the paucity of underlying data (see appendix 1 for details).

Methods:

We focussed on a limited number of countries in Europe and Hong Kong and Wuhan in China. We searched public websites including those of government, ministry of health; newspaper articles, press releases and social media platforms. We collected a timeline of the non pharmaceutical interventions (NPIs) that were adopted by each country. We grouped these NPIs into four categories for better comparison, namely school closure, public events ban, social distancing and lockdown. For

each country, we grouped the timeline into different stages based on timing of countries introducing these interventions. We considered the stage where no interventions were introduced as the baseline. We collected estimates of R from public websites and publications (see "key references" below). For each country, we calculated the average R during each stage. Additionally, we calculated the average R since April for each country to present the most recent estimate of R.

Link to full review and any relevant updates:

https://uoe.sharepoint.com/sites/COVID-19RapidReviewsGroup/Shared%20Documents/Forms/AllItems.aspx?viewid=095b8a95%2D0eb7%2D45ee%2D99fa%2Db015633bccc6&id=%2Fsites%2FCOVID%2D19RapidReviewsGroup%2FShared%20Documents%2FPublished%20reviews%20on%20website%2FFull%20Reviews%20and%20Updates%20%2D%20Lockdown%20R0

Date completed:

29 April 2020

Contact details of lead reviewers:

Dr You Li (you.li2@ed.ac.uk); Prof Harish Nair (Harish.Nair@ed.ac.uk); Durga Kulkarni, Rima Nundy, Alice Harpur, Marshall Dozier, Prof Harry Campbell.

Key references:

1. Danish Police, 2020. Controlled Reopening of The Danish Society | | Danish Police. [online] Available at: <https://politi.dk/en/coronavirus-in-denmark/covid19-first-step-of-controlled-reopening-of-the-danish-society> [Accessed 22 April 2020].

2. Health Norway, 2020. Coronavirus in Norway: Travel Advice - Helsenorge.No. [online] Available at: <https://helsenorge.no/koronavirus/travel-advice> [Accessed 22 April 2020.]

3. Robert Koch Institut. Daily situation report of COVID-19. https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Situationsberichte/Gesamt.html (last accessed on 20-04-2020)

4. Flaxman S, Mishra S, Gandy A, et al. Estimating the number of infections and the impact of nonpharmaceutical interventions on COVID-19 in 11 European countries. Imperial College London (2020), doi: https://doi.org/10.25561/77731 (last accessed on 20-04-2020)

5. London School of Hygiene and Tropical Medicine. Temporal variation in transmission during the COVID-19 outbreak. https://epiforecasts.io/covid/contributors.html (last accessed on 20-04-2020)

6. University of Hong Kong. Real-time dashboard. https://covid19.sph.hku.hk/ (last accessed on 20-04-2020)

7. Jarvis CI, Van Zandvoort K, Gimma A, et al. Quantifying the impact of physical distance measures on the transmission of COVID-19 in the UK. medRxiv (2020). doi: https://doi.org/10.1101/2020.03.31.20049023