The Lancet Regional Health - Europe 10 (2021) 100214

Contents lists available at ScienceDirect

The Lancet Regional Health - Europe

journal homepage: www.elsevier.com/lanepe

Commentary

Why we may need to rethink future SARS-CoV-2 vaccination strategies

Peter Klimek[a,b]

[a] Section for Science of Complex Systems; CeMSIIS; Medical University of Vienna. Spitalgasse 23, A-1090 Vienna, Austria
[b] Complexity Science Hub Vienna. Josefstädter Strasse 39, A-1080 Vienna, Austria

ARTICLE INFO

Article History:
Received 19 August 2021
Accepted 20 August 2021
Available online 11 September 2021

As European countries prepare for the next seasonal SARS-CoV-2 wave, an increasing number of countries start their third round of vaccinations. With the virus transitioning to endemicity, this might not be the last one. In a recent modelling study, Li, Bjornstad and Stenseth show that we might have to rethink how to approach such upcoming campaigns [1].

When countries prepared their first emergency vaccination campaigns, the question of whom to prioritize was soon settled in favour of the vulnerable and elderly population. While it makes intuitive sense to focus vaccination efforts on those that are most at risk, from a modelling perspective, the situation is less clear. Virus transmission is typically driven by younger and more contact-friendly population groups. An average 30y old European has 80% more contacts per day compared to the average 70y old individual [2], implying that vaccinating a 30y old individual can prevent 80% more infections too. As people preferentially meet with people of similar age [3], this effect further multiplies along infection chains, suggesting that less people need to be vaccinated to reach a hypothetical threshold for population immunity. Nevertheless, an influential modelling study confirmed that for a wide range of assumptions, the optimal age-based strategy is prioritization of older people unless (i) vaccines would block transmissions with a probability of more than 80%, (ii) the vaccine would have very low efficacy for people aged >60y, or (iii) vaccine supply would be limited to at most 25% of the population [4].

How do these assumptions hold up, now that we have more real-world data on vaccine efficacy? Data from Israel suggests that people above the age of 60y were three times more likely to be tested positive with a PCR test if they received their vaccinations more than 146 days ago compared to their peers vaccinated less than 146 days ago [5]. Preliminary data from Singapore further reveals that hospitalized people with vaccine breakthrough infections showed a significantly faster decline in viral RNA load compared to their unvaccinated counterparts, suggesting that fully vaccinated yet infected people might be substantially less likely to pass on the virus [6]. Even if these results may not immediately change an assessment of the best allocation strategy for the initial rollout, the picture could well change for upcoming campaigns.

Enter Li, Bjornstad and Stenseth [1]. They use a sophisticated epidemiological model to study whether future campaigns are more effective in reducing overall infections and COVID-related mortality when they prioritize by age or by potential for onward transmission. Surprisingly the answer is not an "either—or", but an "and". A switching strategy performed best in which an initial prioritization by age is followed by a prioritization by transmissibility in the next year followed again by a focus on older age groups in the year thereafter. Such an alternating strategy could lead to approximately 10% fewer infections compared to other allocation schemes. The authors explain this finding by their strategy, maximizing both the direct and indirect benefits of age and transmissibility focussed vaccination campaigns.

Before health authorities start to overthrow their vaccination schedules, a few limitations of this study need to be discussed. First, there is still much that we do not know about how the pandemic will play out over the next couple of years. A recent expert consultation [7] identified the main factors driving this uncertainty as the missing long-term strategy of many European countries, vaccination coverage, constraints in organizing mass vaccinations, our ability to engineer controls to reduce airborne transmission, as well as waning immunity and the future evolution of SARS-CoV-2. These are a lot of uncertainties and each one has the potential to invalidate some key assumptions used by Li et al. An important caveat to consider in this study is that their model is explicitly calibrated to Norway and the authors do not study how their results might change in countries with other demography, infection fatality rates, and public health infrastructure.

The above limitations are accentuated by the fact that epidemiological models are notorious for their sensitivity to input parameters. During the pandemic, we have repeatedly observed predictions from such models being off by orders of magnitude after only a few weeks. The 10% reduction in infections could very well drown in statistical noise. The authors are careful in describing their findings as specific

DOI of original article: http://dx.doi.org/10.1016/j.lanepe.2021.100200.
E-mail address: peter.klimek@meduniwien.ac.at

https://doi.org/10.1016/j.lanepe.2021.100214

scenarios with limited generalizability. This claim cannot be emphasized enough; readers should keep in mind that these scenarios come with undefined levels of certainty.

Still, countries not only need to properly monitor the effectiveness of their vaccination campaigns, but can gain a lot by thinking about smart allocation strategies for upcoming campaigns. A focus on population groups with an increased potential for onward transmission of the virus could be a key ingredient of such campaigns if the models are to be believed.

Contributors

PK interpreted the data and wrote the comment.

Declaration of Interests

None declared.

References

[1] Li R, Bjornstad ON, Stenseth NC. Prioritizing vaccination by age and social activity to advance societal health benefits in Norway: a modelling study. The Lancet Regional Health Europe 2021.

[2] Mossong J, Hens N, Jit M, Beutels P, Auranen K, Mikolajczyk R, Massari M, Salmaso S, Scalia Tomba G, Wallinga J, Heijne J, Sadkowska-Todys M, Rosinska M, Edmunds WJ. Social Contacts and Mixing Patterns Relevant to the Spread of Infectious Diseases. PLoS Med 2008;5(3):e74.

[3] Prem K, Cook AR, Jit M. Projecting social contact matrices in 152 countries using contact surveys and demographic data. PLoS Comput Biol 2017;13(9):e1005697.

[4] Bubar KM, Reinholt K, Kissler SM, Lipsitch M, Cobey S, Grad YH, Larremore DB. Model-informed COVID-19 vaccine prioritization strategies by age and serostatus. Science 2021;371(6532):916–21.

[5] Israel A, Merzon E, Schäffer A, Shenhar Y, Green I, Golan-Cohen A, Ruppin E, Magen E, Vinker S. Elapsed time since BNT162b2 vaccine and risk of SARS-CoV-2 infection in a large cohort. medRxiv 2021;2021 08.03.21261496.

[6] Chia PY, Ong SWY, Chiew CJ, Ang LW, Chavatte J-MMT-M. Virological and serological kinetics of SARS-CoV-2 Delta variant vaccine-breakthrough infections: a multicenter cohort study. medRxiv 2021;2021 07.28.21261295.

[7] Iftekhar EN, Priesemann V, Balling R, Bauer S, Beutels P, Valdez AC. A look into the future of the COVID-19 pandemic in Europe: an expert consultation. The Lancet Regional Health Europe 2021;000(100185).