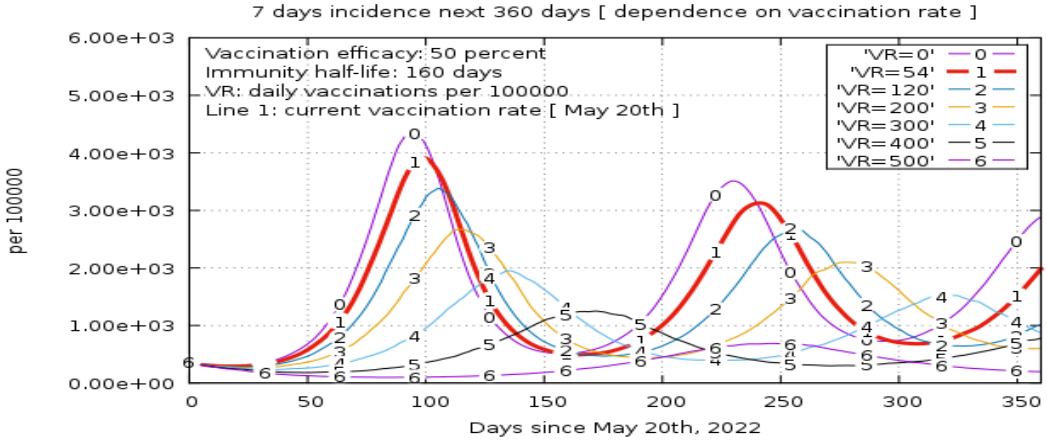
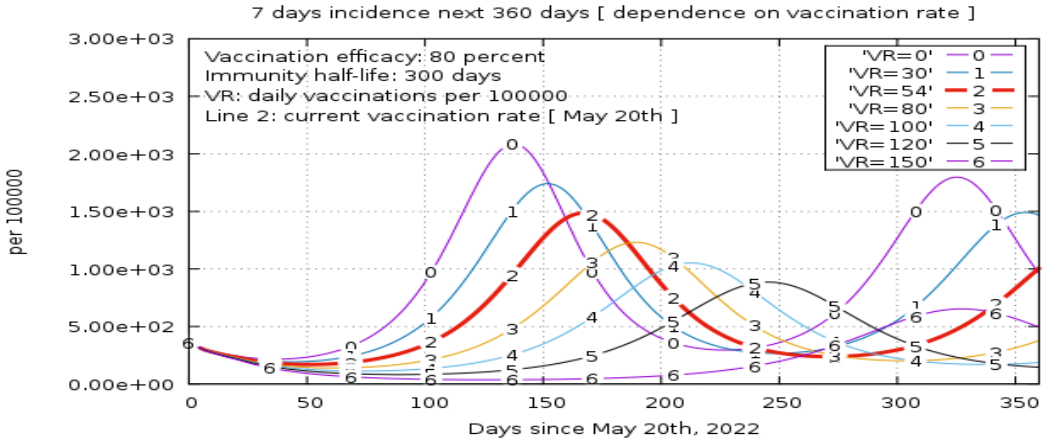
What to expect from the vaccination ?

Exact predictions about the further course of the Covid-19 pandemic must fail from the outset due to the large number of incalculable random factors that widely determine the development. Unpredictable are, for example, singular spread events or the emergence of new virus mutants whose properties can give the pandemic a completely different dynamic. But using model calculations, the influence of individual parameters on the pandemic spread can be studied, even without knowing all future conditions (similar to how the contribution of one component of the electricity bill can be determined without knowing all of them).

We were particularly interested in the effect of the vaccination, but for once less on protecting individuals from severe courses than on the spread of the pandemic. To this end, we studied the 7-days incidence of the next 360 days in relation to the daily vaccination rate and to the mean duration (half-life) of the immunity..

The graphics summarize possible scenarios, starting out from the number of cases and the R-factor in Germany on May 20th, 2022 [1]. You can see the impact of vaccinations that are 50 and 80 percent effective, for varied vaccination rates (parameter VR; maintained over time). Following Khoury et al. [2], immunity half-lives of 160 and 300 days are assumed for vaccinations of initial efficacy of 50 and 80 per-cent, respectively. Note that the waves are an effect of waning immunity. Seasonal influences are not taken into account.





The calculations were carried out on the basis of model [3] using the AMADEUS program [4].

References

[1] https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Situationsberichte/Mai_2022/2022-05-20-en.pdf

[2] D.S. Khoury et al., Neutralizing antibody levels are higly predictive of immune protection from symptomatic SARS-CoV-2 infection, https://www.nature.com/articles/s41591-021-01377-8.pdf

[3] S. Hein, Exponential derivatives and generalized reproduction factors, Appendix: A ‘real world‘ problem, https://archive.org/details/shein_20210223/exponential_derivatives/

[4] AMADEUS, A numerical Model Approximating the Development of Epidemics Under homogeneous conditions of Spread; https://github.com/SteffenHein/amadeus.git