Effectiveness of age-specific vaccination regimes

Calibration and adaption of the agent-based simulator Covasim to evaluate local interventions for an example region in Germany.

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Introduction

Since the beginning of the pandemic, epidemiologists have been using computer simulations to meet the demands of decision-makers for scientific assessment of political options and forecasts on the development of the pandemic. A variety of models with different approaches have been adapted or newly developed *[1]*. Agent-based models have proved to be capable of representing the complexity of the pandemic in some detail, including public health interventions, such that the number of available models grew rapidly *[2]*. Using one of these publically available models, our research is aimed at illustrating the effectiveness of different vaccination regimes for controlling the number of critical COVID-19 cases in the city of Aschaffenburg, Germany.

Methods

- usage of the open-source agent-based epidemiological simulator Covasim *[3]*
- generation of a synthetic population for the city of Aschaffenburg based on real data
- calibration of Covasim to the course of the Covid-19 pandemic until the end of August 2021
- adaption of the software Covasim to handle booster vaccinations
- definition and comparison of future vaccination scenarios (VSC) using the same number of vaccination doses for VSC1 to VSC4:
  - ▶ **VSC0** : no further vaccinations
  - ▶ **VSC1** : vaccinate adolescents aged 12 to 17 years
  - ▶ **VSC2** : booster vaccinations for elderly
  - ▶ **VSC3** : 50 % each mixture of VSC1 and VSC2
  - ▶ **VSC4** : vaccinate unvaccinated people prioritized by age

Aschaffenburg

City in Bavaria, Germany
71,000 inhabitants
Frankfurt metropolitan region

Results

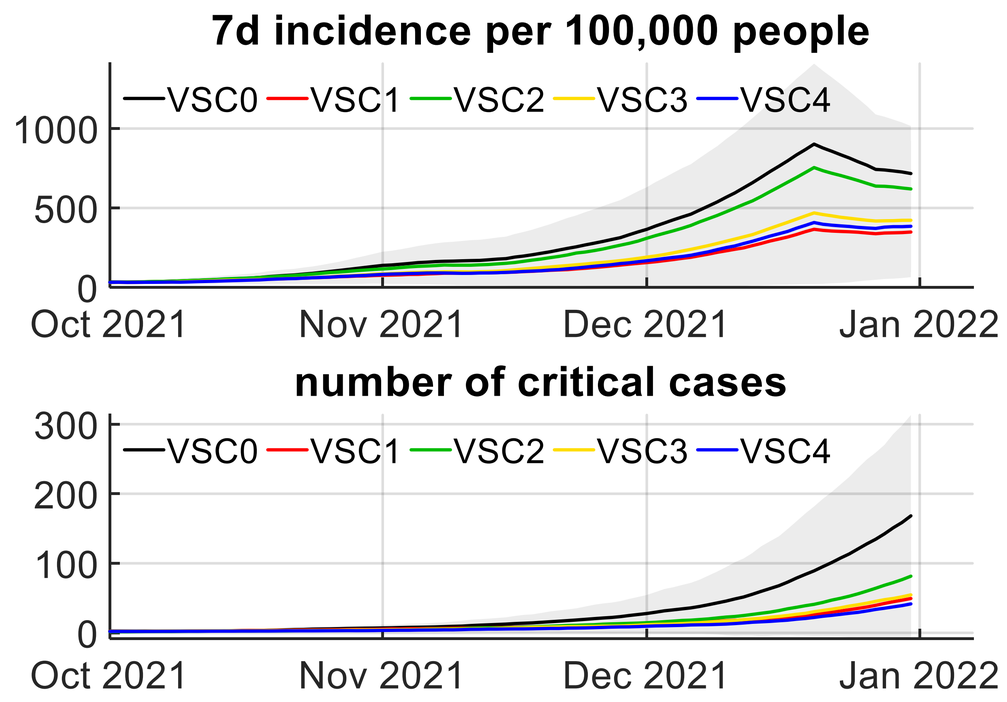

Figure 1: Simulated results from October till the end of December 2021 (detailed results in *[4]*, scan QR code)

Conclusions

- further vaccinations are necessary to keep the number of severe and critical cases low
- vaccinations of unvaccinated people are more effective than booster vaccinations
- applies even to young people who are not at risk of becoming seriously ill since their immunization indirectly protects vulnerable age groups
- strategies to minimize individual health risks may no longer coincide with those to minimize the number of severe and critical cases

References

[1] Panovska-Griffiths et al. "Mathematical modeling as a tool for policy decision making: Applications to the COVID-19 pandemic." Handbook of Statistics (2021).
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[4] Krebs et al. "COVID-19 scenarios for comparing the effectiveness of age-specific vaccination regimes, exemplified for the city of Aschaffenburg (Germany)." medRxiv (2021).

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