

# Modeling the impact of mandatory isolation on sick leave using individual-based modelling

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## Summary

In this note, we present results of scenarios based on the previous IBM report published on the 26<sup>th</sup> of January<sup>1</sup> where we have varied the number of days people stay in home isolation after testing positive for COVID-19. The model shows that if people with symptoms on average are absent from work for 2 days due to actual sickness, removing self-isolation practice of 4 days can reduce work absence by 47%. Assuming that if people on average would stay at home from work for 2 days due to actual sickness, we can reduce the fraction of individuals who need to stay at home during the epidemic peak to 47.4 % by removing self-isolation. Removing self-isolation, such that people stay home 2 days instead of 4, will only have a modest effect on the peak in hospitalizations with a 3% increase. In the simulations it was assumed that isolation starts the day after symptom onset and that isolated individuals can still infect members of their household. There is also uncertainty in how well the model captures the duration of infectiousness. These factors probably mean that the model somewhat underestimates the transmission-blocking effect of self-isolation. The model also shows that isolation the first days after onset of symptoms have a clear effect on transmission.

## Methods

Based on the earlier report published on 26<sup>th</sup> of January 2022 we consider various scenarios and strategies to evaluate the number of sick leave among working-age adults (aged 20-60 years). Sick leave in this group comprises absence due to own illness and isolation, and absence caused by their children (aged 0-12 years). We assume that one adult needs to be at home tending to a sick or isolating child. We do not differentiate between weekdays or weekends and the model runs with time steps of 1 day. Therefore, all counting days refer to calendar days. Which days one is in isolation after symptom onset is illustrated in Table 1 in the appendix.

We consider the following changes to the scenarios in the report of 26<sup>th</sup> of January.

- Reduction levels of interventions implemented from 10<sup>th</sup> of December 2021:
  - 50% reduction
- Reopening strategies from 1<sup>st</sup> February of 2022
  - No reopening, i.e., the constant scenario
  - Smaller scale reopening: 60% of the situation before 3<sup>rd</sup> of December 2021
  - Larger scale reopening: 80% of the situation before 3<sup>rd</sup> of December 2021

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<sup>1</sup> <https://www.fhi.no/contentassets/e6b5660fc35740c8bb2a32bfe0cc45d1/vedlegg/nasjonale-og-regionale-rapporter/modelling-scenarios-for-the-sars-cov-2-omicron-voc-26.01.2022.pdf>

- Full reopening: 100% of the situation before 3<sup>rd</sup> of December 2021
- Isolation strategies
  - 70% adherence rate of symptomatic infections<sup>2</sup>
  - On or before 14<sup>th</sup> of February 2022 the duration is 6 days.
  - On or after 15<sup>th</sup> of February 2022 the duration is 0-6 days.

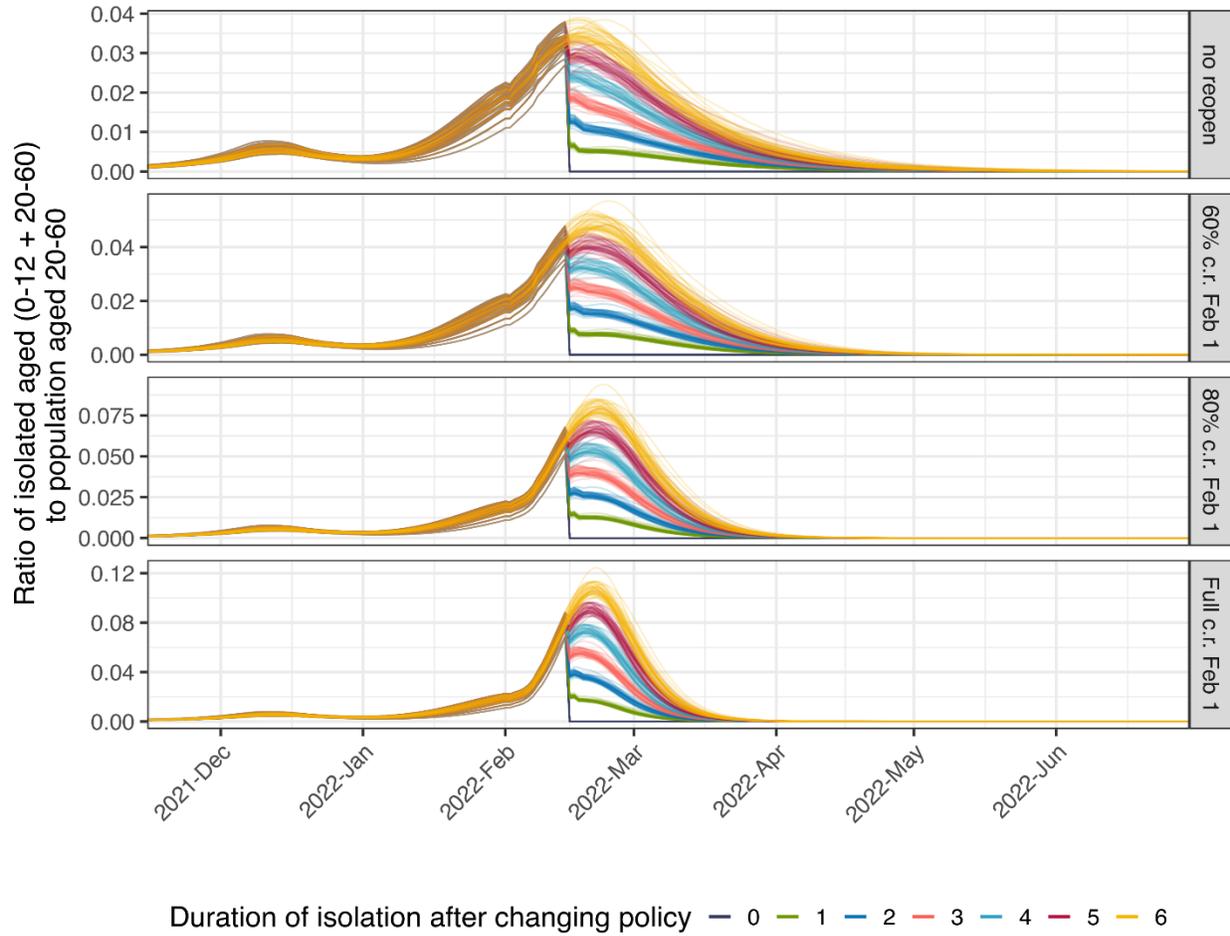
## Results

We present the fraction of the working-age population that has to stay home from work due to isolation or illness, including absence related to their children in Figure 1A. In figure 1B we show the total incidence of hospitalizations for all ages. We see that reduced isolation gives a clear decrease in sick leave and just a modest increase in hospitalizations. Each scenario consists of 40 stochastic simulations.

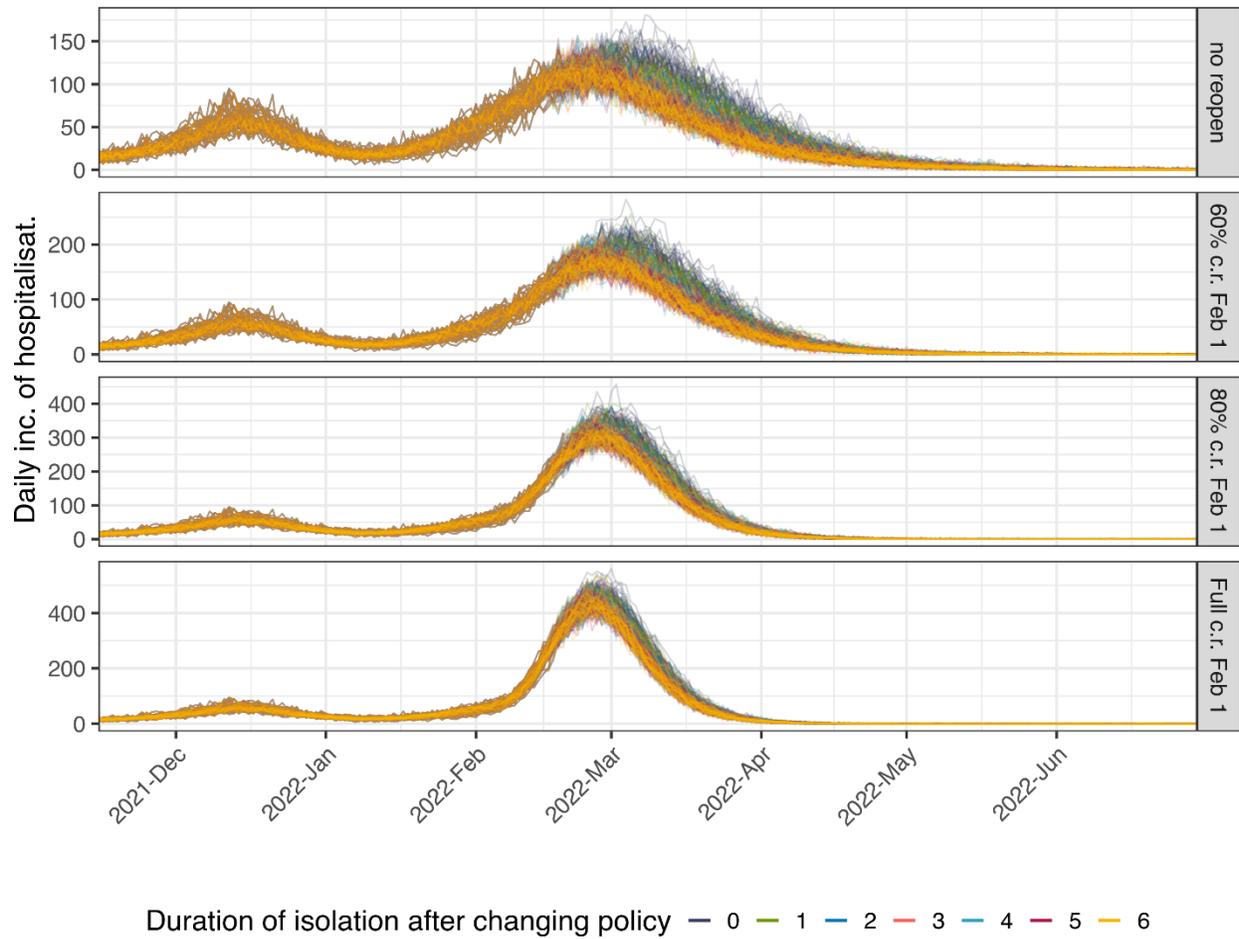
In figure 2A and 2B we show the corresponding values at the peak of the epidemic after changing policy from 15<sup>th</sup> of February 2022 to illustrate the difference between alternative strategies under various scenarios. Figure 3 shows the cumulative number of infections for the different reopening and isolation policies.

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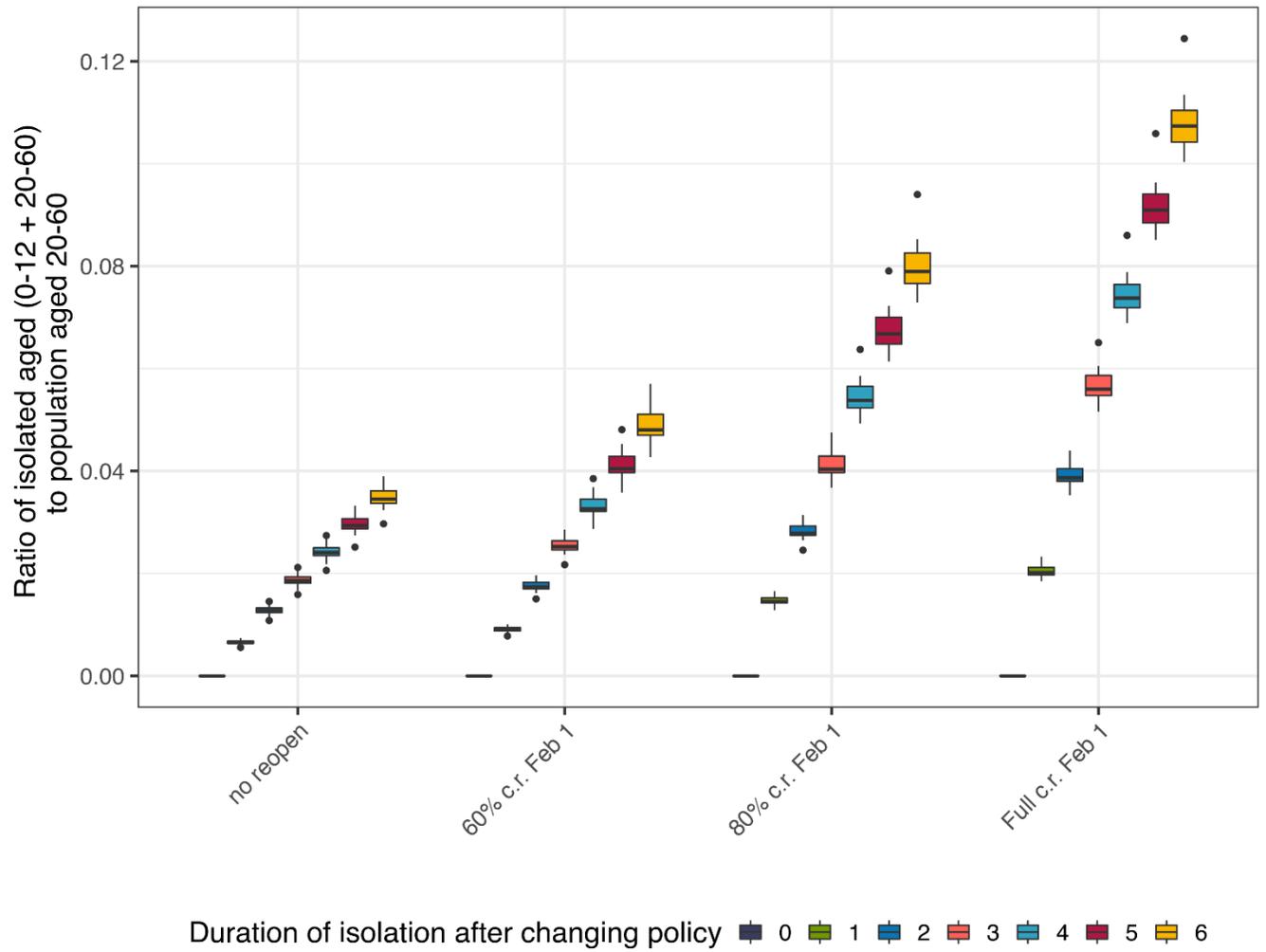
<sup>2</sup> <https://www.fhi.no/hn/statistikk/symptometer/om-symptometer/>



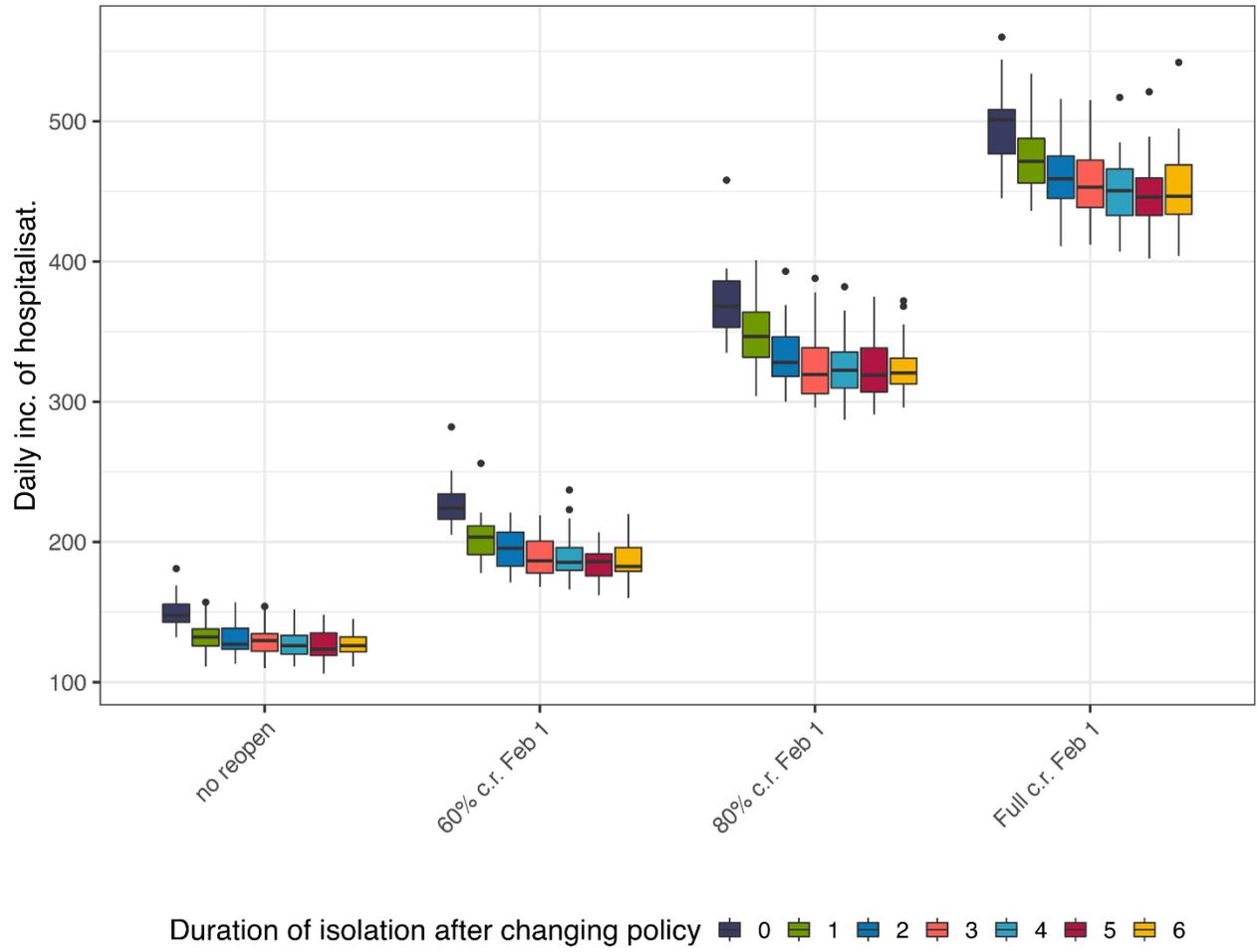
**Figure 1A:** The proportion of isolated people aged 0-60. This also includes isolation due to an infected child.



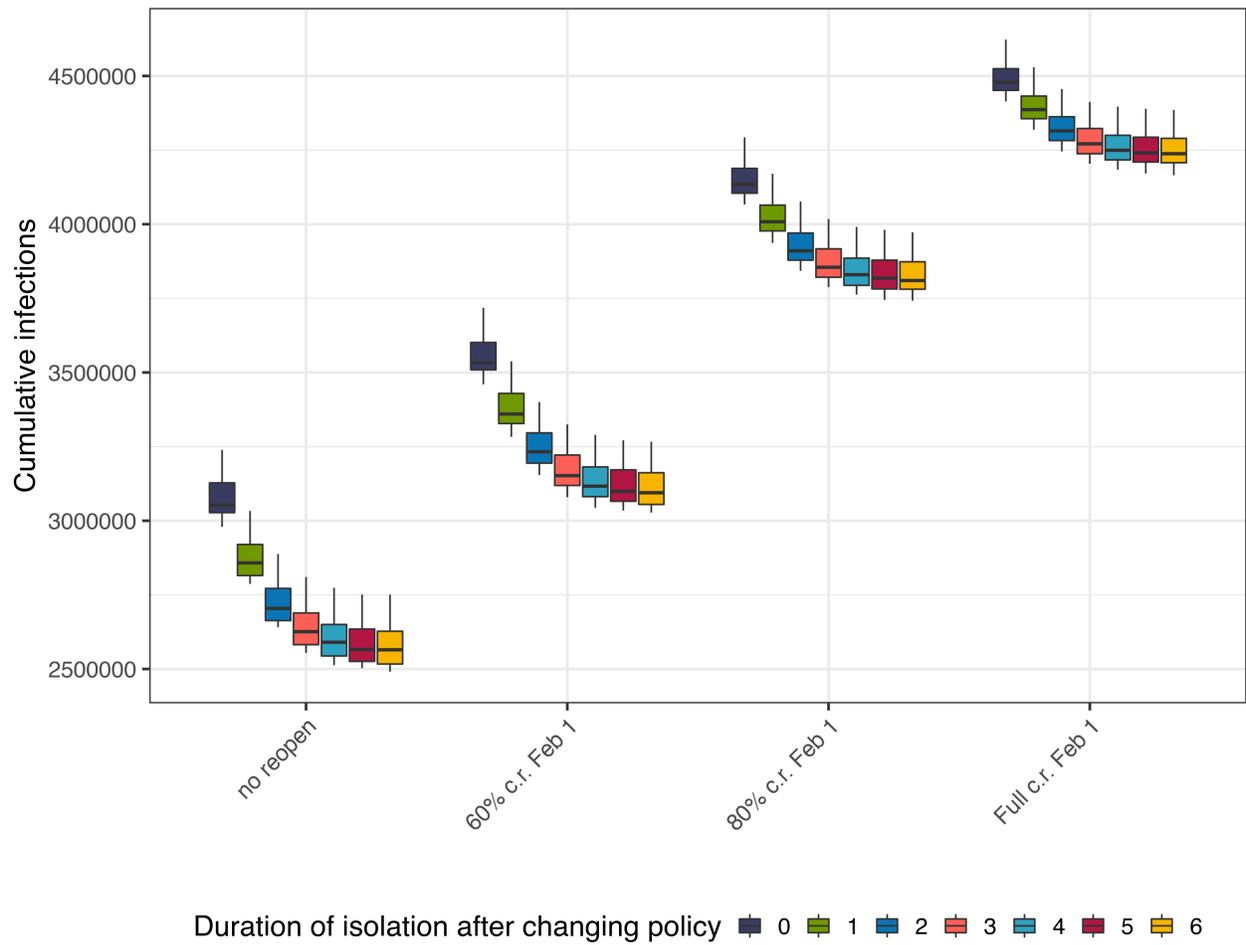
**Figure 1B:** Daily incidence of hospitalization with varying policy for isolation.



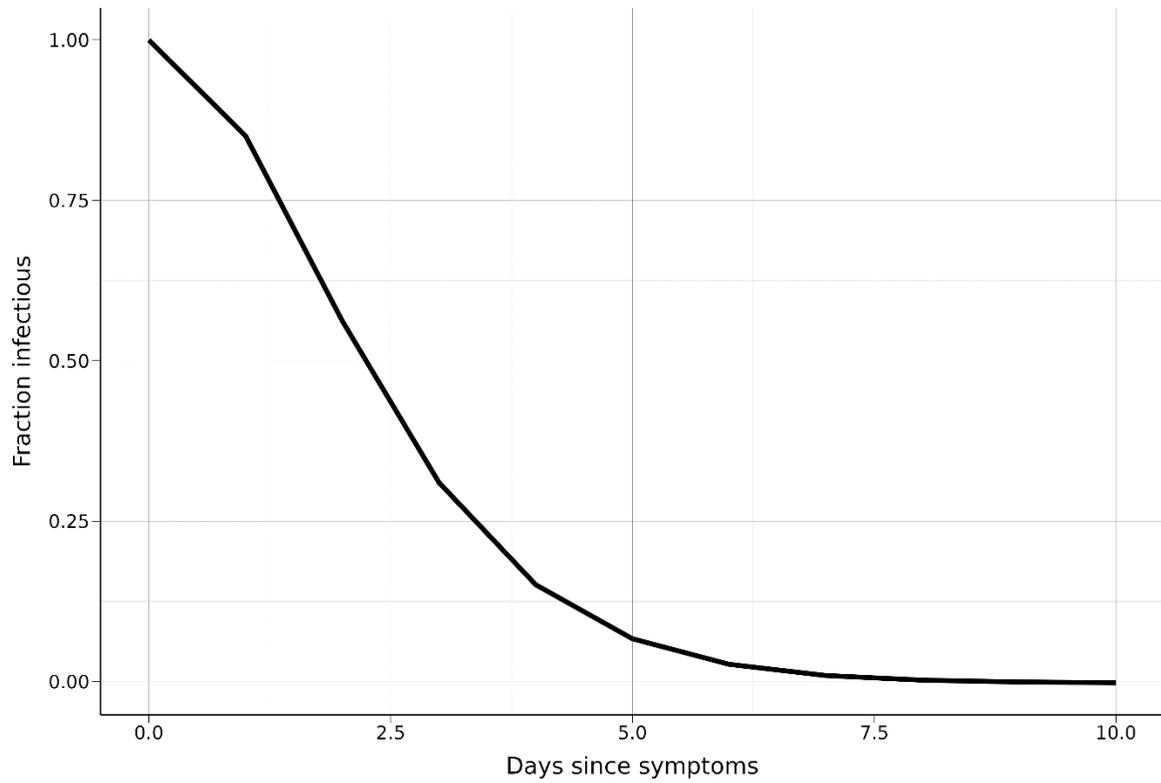
**Figure 2A:** The proportion of isolated people at the peak (around late February 2022). Given different policies, the proportion ranges from 0 to 10% of the population.



**Figure 2B:** The daily incidences of hospitalization at the peak (around late February or early March 2022).



**Figure 3:** The total number of infections.



**Figure 4:** The fraction of people remaining infectious after developing symptoms. It follows a gamma distribution with shape and scale parameters being 3.75 and 0.8, respectively.

## Conclusion and discussion

In this report, we found that shortening the isolation period from 4 days to 2 days would largely affect the prevalence of isolated people but not significantly affect the incidence of hospitalization.

- We assume that people are isolated from the day after developing symptoms. Before isolation, they are infectious for a total of 3 days: 2 days pre-symptomatic (30% more contagious compared to symptomatic) and one day symptomatic. In this period, they can transmit the infection to others in the community. During isolation, they might still infect others in the same household.
- The fact that people are not isolated the first day of symptoms makes the comparison to real-life isolation strategy somewhat difficult, but we think the comparison between 4 and 2 days is the best.
- The fraction of people who are still infectious after a given number of days after symptom onset is given in Figure 4.
- In the model, 70% of symptomatic people self-isolate and isolated individuals can still infect members of their own household.
- The results in this report are based on the parameters calibrated and used in the previous report published on 26<sup>th</sup> of January 2022. Recalibrating the model using the data from the recent weeks would change the overall trajectories somewhat, but the comparison should be robust to this change. We assume that we have not already reached the peak, changing the policy after the peak would have a smaller effect on the total burden of disease.

## Appendix

Table 1 illustration of sick-leave policy. We assume symptom onset on a monday. The green and red color represents non-isolation and isolation status.

Isolation strategy	Monday (symptom onset)	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
0 days	Green	Green	Green	Green	Green	Green	Green
1 day	Green	Red	Green	Green	Green	Green	Green
2 days	Green	Red	Red	Green	Green	Green	Green
3 days	Green	Red	Red	Red	Green	Green	Green
4 days	Green	Red	Red	Red	Red	Green	Green
5 days	Green	Red	Red	Red	Red	Red	Green
6 days	Green	Red	Red	Red	Red	Red	Red