How quarantine flatten the curve?

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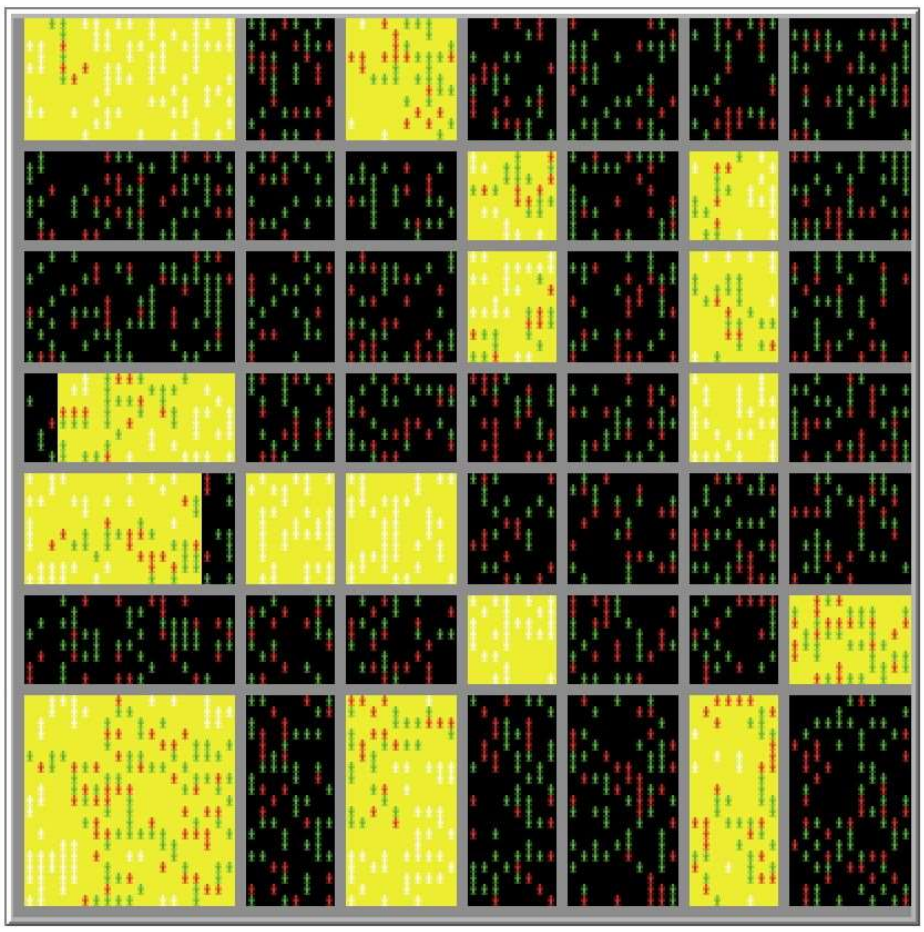
In this project, I tried to explain the effect of quarantine measures with the help of Agent-Based Modeling. Quarantine and closed borders really make a great difference, and people tend to be infected less frequently even in the communities where the virus was spotted.

What model shows

Communities that have closed their borders, so nobody in, nobody out in model sence, but in real world sense people that could transfer between communities have high guarante of not having a virus, so the will not infect others

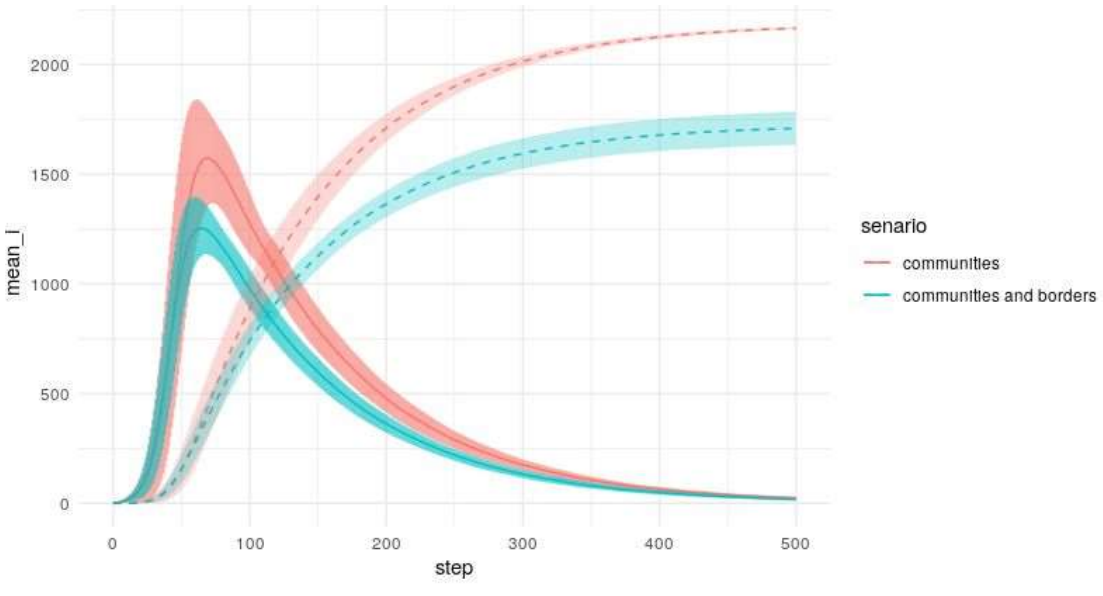


Model field. white people have not been infected, red agents are infected, green agents have been infected and developed and immunity. Yellow rectangles are areas with quarantine.

1000 runs of model

Outputs shows results of 1000 runs of 2 possible scenarios:

1. No quarantine measures and red color of a graph
2. Late stage quarantine — turquoise colour

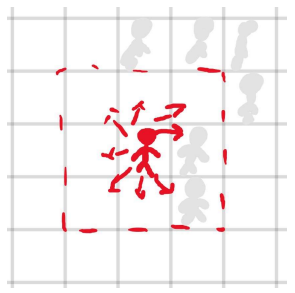


Thus, late stage response, when 15% of the whole population was infected, closing borders will significantly flatten the curve.

Future work

- More scenarios: borders and quarantine could be separated
- Add networks to model communities
- Use R0 of actual virus and population density from real world data

How model works



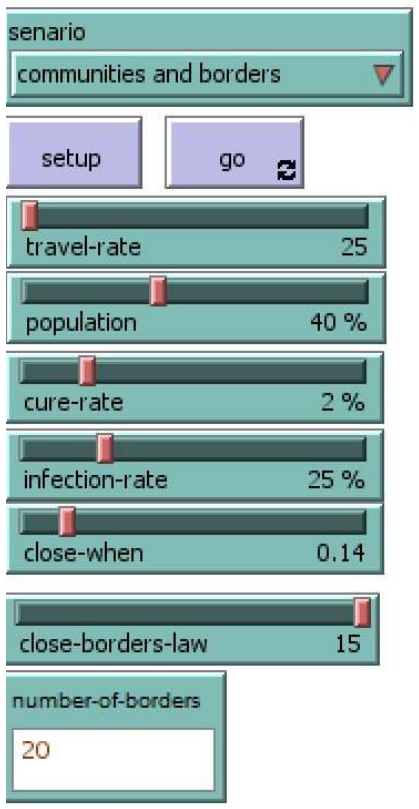
The virus spread from infected (red) to neighneighbor8, agents that stay at patches nearby.

We could think about the agents as a households.

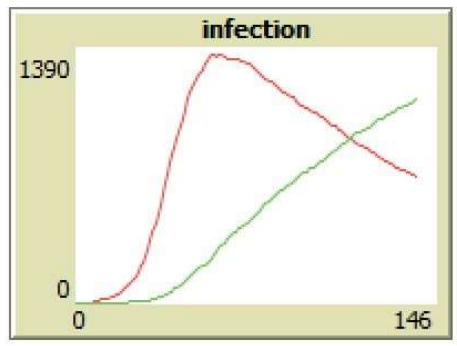
When somebody was infected, after 20 ticks it could be cured with a cure-rate%

1. Communities, where agents with the probability of travel rate/10 could move to any free path in area that has not quarantine. So an agent could move to both: same community, of any other community with available psthes.
2. Same communities, but when close-when of a population infected, some communities prohibit travelling.

Things to try



1. Travel rate from 0 to 1000 is a chance divided by 10 for each agent to travel. *In Russia 12% of population could travel abroad and 38% could travel to a different region by data from "Росстат".*
2. Population is a slider that represent density: 0% all patches are free, 100% there are no free patches. 40% — each household have 2.5 around neighbors.
3. Cure-rate - chance to be cured
4. infection rate - R0 rate, for a regular flue it will be around 8%
5. close-when — The percent of population that needs to be infected to close borders. *0.00004% of population infected with COVID-19*
6. number-of-borders — number from 0 to inf, if more, than more communities will close their borders. Does not have meaningful interpretation.



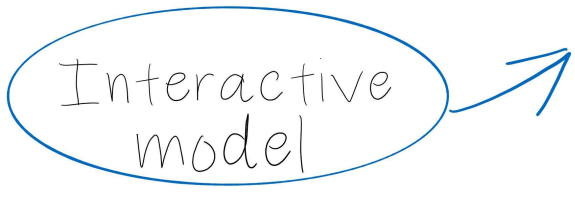
Red line shows number of infected household, green line represents people that were cured.

How to Play with the Model

- Think about hypothesis in your head: What will happen if something will increase or decrease.
- Conduct an experiment by changing values of sliders
- Keep records

Your experiments — bit.ly/COVID-19-ABM

Name:_____H1:_____
Result_____
_____
Name:_____H2:_____
Result_____
_____



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