

Advanced epiDEM Model Report

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In this experiment, we explored the effect of isolation treatment on the time to eliminate the virus (every person is susceptible or cured).

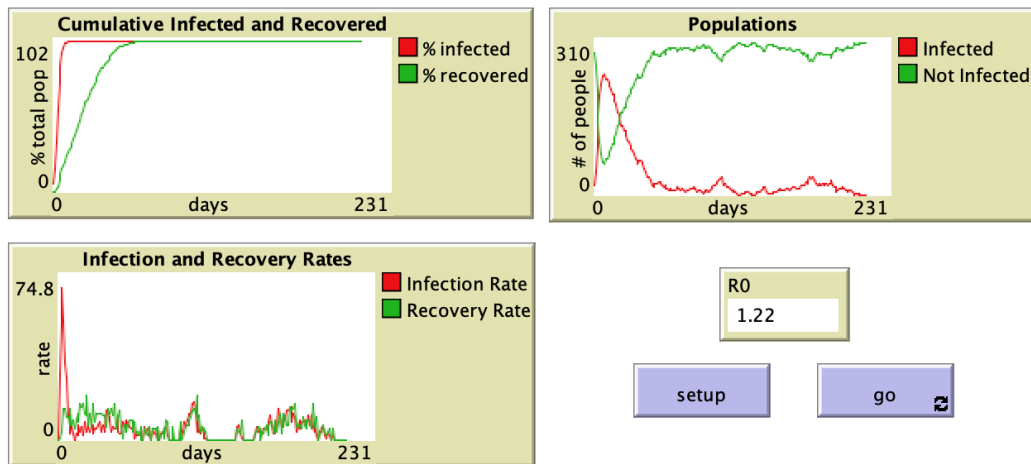
From the end of 2019 to the present, COVID-19 is still widespread all over the world. I have observed that this virus has a certain incubation period. The patient may continue to be infected after being cured. Therefore, I modified some functions of epiDEM basic, hoping to use a more realistic model to evaluate and simulate the spread of COVID-19 in closed populations.

At first, I divide the people into 4 categories. Susceptible represents people who have never contracted the disease or who have been cured after getting the disease but who have passed the immunization period. Suspected is the people who is infected but not confirmed. Confirmed means the confirmed cases. Cured is the person has lived through an infection. We assume that 50% of suspected patients receive nucleic acid testing and are diagnosed every day. We observe changes in the epidemic situation by changing the movement status of confirmed patients.

Here are some arguments is my experiments:

Arguments	Meaning	Default value
recovery-chance	The probability of changing from suspected or confirmed to cured after recovery time.	40%
Infected-chance	The probability of changing from susceptible to suspected nearby a infected people	50%
average-recovery-time	The average recovery time for all persons	60(2 months)
average-immunization-time	The average immunisation time for all persons after cured	183(half year)
susceptible-chance	The probability of changing from cured to susceptible after immunisation period.	50%
initial-people	The initial people in this closed environment.	300

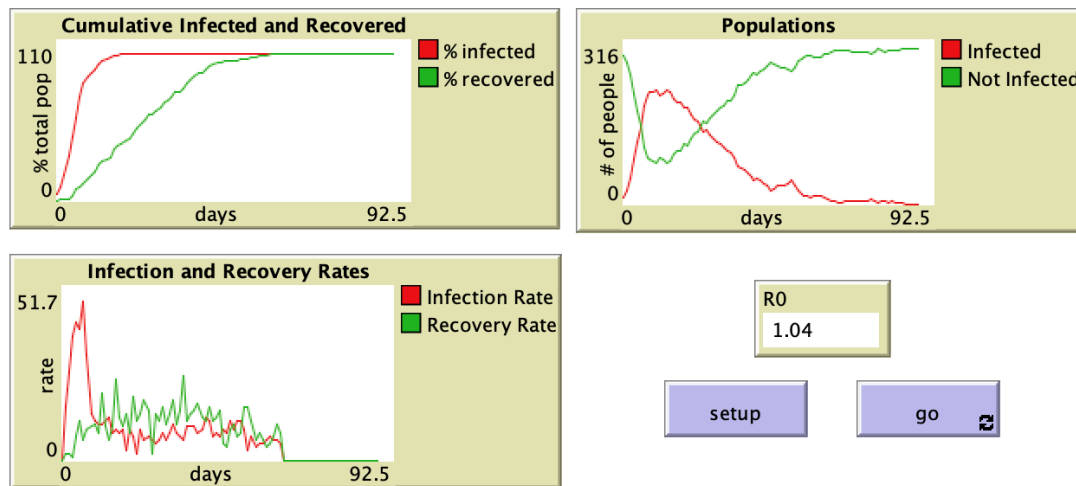
At the beginning, we assumed that everyone can move randomly, including confirmed cases. The experimental details are shown in the figure below:



We found that almost all people were affected by the epidemic. The epidemic lasted for 231 days in total. During the entire period, the number of infected patients rebounded many times.

Then, we made a naive hypothesis for our experiment that everyone (including suspected cases) can move normally except for confirmed patients. Confirmed patients will be **isolated** on the spot.

We found that the epidemic only lasted 92 days. At the peak of cases, only 70% of the population was affected. R_0 is reduced by 0.18 which is not changed too much.



In this experiment, the isolation of the confirmed population reduced the duration of the epidemic by 60.2%. We can conclude that the isolation of confirmed patients can significantly reduce the duration of the epidemic.

Reference:

- Yang, C. and Wilensky, U. (2011). NetLogo epiDEM Basic model. <http://ccl.northwestern.edu/netlogo/models/epiDEMBasic>. Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL.
- Wilensky, U. (1999). NetLogo. <http://ccl.northwestern.edu/netlogo/>. Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL.