Full name: Jiayu Han

Student ID: 1164280

Model Report

1. Question
   This model is intended to find how wearing mask can affect the spread of COVID-19 by adjusting the rate-of-wearing-mask within fixed population as a proof of feasibility of wearing mask policy.

2. Background
   The initialized data used to mimic COVID-19 include: death-rate (0.02), recovery-chance (0.97) and average-recovery-time (28 days). All these data are found from online whose source are attached in reference. Population is set as 5000 in purpose of aligning with real life.

3. Experiment design
   This model initialized infectious people and people who choose to wear mask all the time at the beginning. Rate-of-wearing-mask and infection-chance can be manipulated by sliders. People under different status (susceptible, cured, infected, death, wearing-mask) are distinguished by colours and shapes (details are included in comments of assign-color function). All individuals move randomly and have a chance to get infected by their neighbours. If some of their neighbours is wearing masks, a lower infection-chance will be assigned to this person.

   During the experiment, we can see how infection and cured situation change after adjusting rate-of-wearing-mask and also acquire the trends of data by plotting. Reproduction number is also calculated to reveal difference directly.

4. Results
   Three plots are drawn include: cumulative infected and recovered, infection and recovery rates and different population (infected, cured, dead).

   In order to see clear difference of how rate-of-wearing-mask affect, this experiment used two groups of parameters with large gap on rate-of-wearing-mask: A) infection-chance: 0.3, rate-of-wearing-mask: 0.01 and B) infection-chance as 0.3, rate-of-wearing-mask as 0.99. Below are the outputs.

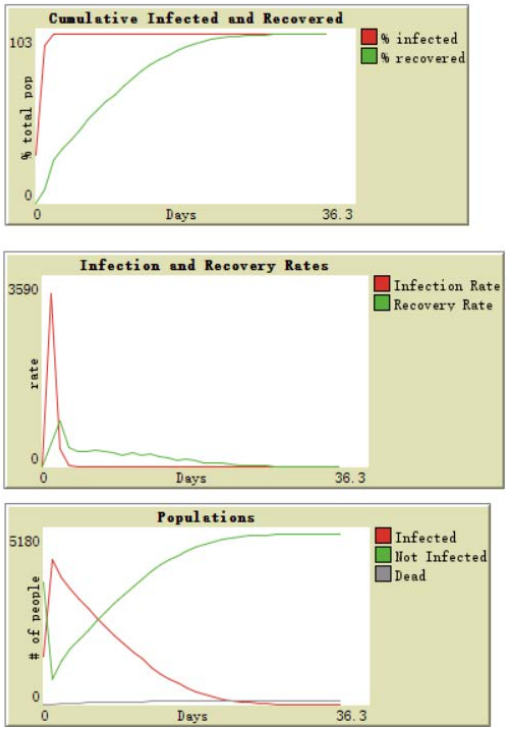

Fig 4.1 group A three plots

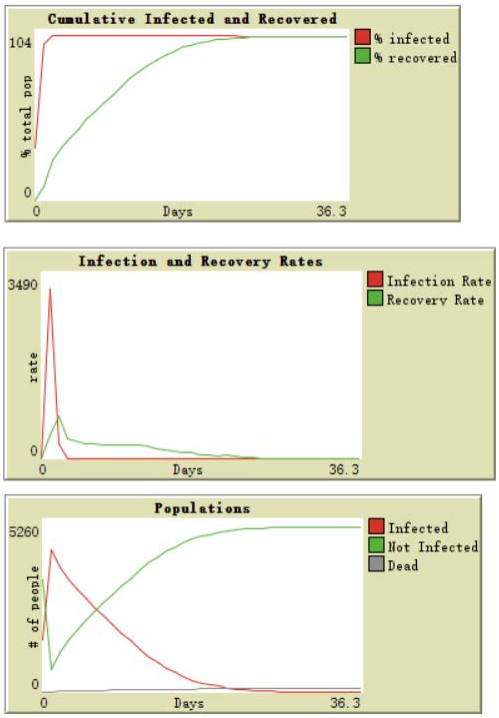

fig 4.2 group B three plots

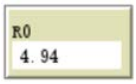

Fig4.3 R_0 of group A

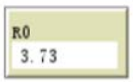

Fig 4.4 R_0 of group B

5. Discussion

It is obvious that when rate-of-wearing-mask is lower, reproduction number will be higher than the opposite situation. Although trends of three plots for both group A and B are the same, there is still differences on the peak of Infection Rate and Infected Population, where group A has slightly higher peak than group B, indicating lower rate-of-wearing-mask may result in higher infection consequence.

This experiment shows the feasibility of wearing mask during epidemic. With a lower population of infection and relatively less reproduction number, it is proven that wearing mask is an effective way to reduce the spread of COVID-19 no matter you are infected, cured or susceptible.

6. Reference

Hansa, D. (7 August 2020). *Coronavirus Recovery*. https://www.webmd.com/lung/covid-recovery-overview#1

Australian Government Department of Health. (14 May 2020). *Australian Health Protection Principal Committee (AHPPC) coronavirus (COVID-19) statements on 14 May 2020.*

https://www.health.gov.au/news/australian-health-protection-principal-committee-ahppc-coronavirus-covid-19-statements-on-14-may-2020#:~:text=The%20median%20incubation%20period%20for,14%20days%20of%20infection.