Corona Spread Calculator

Background

This model separated to two parts:

1. Behavior of the disease in those who become infected: based on data of recovering and death from the ministry of health in Israel. The main factor in these statics is the age of the infected, which represent a complex of the health situation.
2. The spread of the disease according to behavior of people

General characteristics of the spread of the disease

According to the data of ministry of health we got that the dependent between the number of deaths to the people's age is exponential. We got that the probability to recovery is:

$$F(x) = 1 - 14.77 \cdot 10^{-5} \cdot e^{11 \cdot 10^{-2} \cdot x}$$

When x is the age/10 of the agent. The complete to 1 is the probability to not overcome the disease. We got too the mean of days to stop be ill by recovery or the opposite option according to the age of the agent. Let us mark it in $d(age)$. The probability of seek agent to finish with the disease is:

$$F(age) \cdot \frac{1}{d(age)}$$

Namely geometric distribution. This formula based geometric distribution expected value and conditional expectation.

Unfortunately, the data is miss and adjustment level of the function $F(x)$ is not sufficiently suitable for data, but it supposed to be good for the simulation.

User parameters

These the parameters that external user can enter and effect the simulation:

1. Chance the infection:
    a. Without mask
    b. With one mask
    c. With two masks
    d. The optional infected agent is recovery
2. Behavior of people:
    a. Wearing mask as linear function of age, socioeconomic status, health status, social influence, police presence, government policy
    b. Moving as linear function of the same except social influence. More details below.
3. Crowding: how much agents and how big the area is?
4. Importing of disease from abroad:
    a. The percent of going out every day
    b. The probability to back with disease
5. Government policy:
    a. Government policy as linear function of number of ills, R coefficient and economic status at country.

    b.   The R coefficient take as average on number of time units that choose by the user.

    c.   Enforcement level: how much cops per one agent.

When we write "linear function of…" it means that the user decides the level of effecting of each factor.

For each of above there are default values.

Clarifications and assumptions

1. At each text box appears the default value of the parameter. If nothing appears the default value is 0.
2. Infection can occur from distance of 1 at most.
3. The effect of background diseases included in the age.
4. Socioeconomic status distribution $\sim N(0.5, 0.25)$
5. Homogeneous space. (Not considering of close places etc.)
6. Wearing mask probability depends only on the factors mentioned above. The probability is an increasing function of these parameters.
7. Social influence means: if the most of agent in the close area (radius 3) wearing mask there more chance to wear mask. Else it decreases the chance to wear mask.
8. Police presence means that there is at least one cop in radius 5 of the agent. The number of cops in this area does not matter.
9. Crowded means the number of people in radius 5.
10. The maximum distance that agent go in one time unit is according to $\sim N(30, 15)$ distribution. The idea is that very young agent (like babies) and very old agent moving less.
11. The maximum distance moving for each agent is decreasing function of all factors mentioned above except crowded: if there are too many agents in the close area the agent will prefer to get far from there.
12. The linear combination of factors of wearing mask, government policy and moving distance, enter as argument to logistic function:

$$t = \vec{W} \cdot \vec{X}$$

$$f(t) = \frac{1}{1 + e^{-\frac{t-0.5}{0.1}}}$$

    When $\vec{X}$ is the factors them self and $\vec{W}$ is weight that declare by the user. $\vec{W}$ Vector undergoes normalization, so the user can use not normalized vector. This function returns legal probability value.

13. The economic status of country starts with 100%. This is arbitrary value. The user can decide the effect of different policies: open, mask and distance, partial closure, and closure on the economic status.
14. At the graph of government policy 0 means open, 1 means mask and distance, 2 means partial closure, and 4 is closure.