# Click [HERE](https://lucid.app/lucidchart/97b4833c-0094-4b91-a157-18c97cc9bd2d/edit?viewport_loc=55%2C-192%2C2488%2C1144%2C0_0&invitationId=inv_eb6a5c5f-b089-4130-b0f3-b99bc6f39ad2) for the diagram.

| Controls | Remarks |
| --- | --- |
| Sliders | |
| vaccinate-rate | This is a constant which specifies the number of people that will be vaccinated per day.  Criteria for vaccination (must satisfy both):  1. Not sick  2. Has been vaccinated but has lost immunity (think of it as booster shot)  OR  Has immunity but not vaccinated (think of it as recovered but not vaccinated)  OR  Has no immunity and not vaccinated  Effects:  Immune individual's chance to be infected or develop symptoms (any severity) = original / immunity- constant  Assumptions:  Vaccine deaths are ignored (insignificant and not part of our investigation)  Recovering from an infection and receiving vaccination confers turtles with the same immunity and immune period |
| Initial-infected | This is the amount of infected individuals at the start. They are considered as exposed inviduals.  Assumptions:  All exposed individuals are infectious from the start (simulate asymptomatic spread) |
| chance - symptoms | This is the chance for a turtle to develop symptoms. |
| Incubation Period | The exposed will only be symptomatic after the incubation period. A RNG check will run after the incubation period to determine this.  Assumptions:  All symptomatic turtles will be tested |
| Quarantine Period | The period of quarantine.  Assumptions:  While in quarantine, agents will continue to move around but will not be able to infect others or be infected by others. |
| Immune time | Period of time (in days) before immunity disappears.  - Immune time increases by 1.2 with every reinfection |
| Infectiousness-init | This is the infectivity of the disease.  Note that a separate "infectiousness" global variable has been defined in the code and it copies the value of infectiousness-init OR the value of (infectiousness-init)\*(mask-effect) if "mask" is on.  This is done to fix the auto-reducing bug which occurs when Set-up is clicked in succession when "mask" is on.  Assumption:  We assume that this will stay constant, and no other variant will appear. |
| Duration | This is the duration of sickness.  At the end of the duration, turtles will go through a RNG check to see if they died from the disease AND/OR suffered severe symptoms AND/OR were hospitalised for mild symptoms AND/OR recovered from the disease.  Assumptions:  Turtles must follow the following order:  Asymptomatic → Symptomatic → Mild symptoms → Severe Symptoms → Death  Turtles may recover at any stage before death. But turtles cannot skip stages. |
| Buttons | |
| Mask | This is a boolean value. True = mask-wearing policy in place, False = otherwise.  Assumptions:  A boolean value assumes absolute compliance to said policy. |
| Sdm | This is a boolean value. True = sdm-wearing policy in place, False = otherwise.  Assumptions:  A boolean value assumes absolute compliance to said policy. |
| Super-spreader | All initials infected turtles are super spreaders. Super spreaders have 100% infectiousness (not reduced by vaccine) and have twice the mobility.  All other behaviors of the super-spreader are identical to normal turtles. |
| Inputs  Values here can be floats. | |
| mobility | Mobility affects the amount of grid space a turtle can move per day.  This is a very crude way of modelling sdm where we vary mobility directly. A better approach is to do a density check before moving to a grid.  Research needed to determine mobility value. |
| chance-mild | Probability of developing mild symptoms. Affected by immunity.  Assumptions:  This is an aggregated value. We are ignoring age groups here. |
| chance-severe | Probability of developing severe symptoms. Affected by immunity.  Assumptions:  This is an aggregated value. We are ignoring age groups here. |
| chance-death | Probability of death. Affected by immunity.  Assumptions:  This is an aggregated value. We are ignoring age groups here. |
| People | The total population in the model.  On a laptop with 16GB RAM, simulation speed becomes slow at >8000 population.  A good number is 1000. |
| Mask-effect | The effect of wearing masks.  This is a constant value between 0 and 1. It affects infectiousness. |
| immunity-constant | The amount of protection immunity provides.  This number is >= 1. This is because we will divide the RNG value by immunity constant when comparing it against the chance of develop symptoms / being infected.  **Immunity-constant is multiplied by 1.2 with every re-infection / booster shot administered**  Assumptions:  This constant is not varied by age group (or rather turtles are assumed to be ageless). Both vaccinated and recovered population have the same immunity-constant. |
| Trace radius | Test is triggered by symptomatic turtles.  Every agent within this radius will be tested. Sick turtles (regardless if they are exposed, symptomatic or asymptomatic) will be sent to quarantine.  Assumptions:  1. Tests are 100% effective  2. All symptomatic turtles will report sick and trigger a test |
| Transport-boost | When a turtle steps on an orange transport patch, its mobility will be multiplied by "transport-boost"  Assumption:  - The direction of travel is random and not planned |
| Reinfect-boost | With every re-infection or booster shot, the immunity ('immune-count') of individuals is multiplied by this constant  Assumptions:  - The multiplier is a constant. May not be the case since immunity may not follow a linear trend. |
| trace-delay | To simulate the actual delay between getting tested and going into quarantine. Turtles can still move around and infect others during the interim |
| test-rate | The success rate of testing, simulating type 1 error |