Singapore Migrant Worker Dormitories

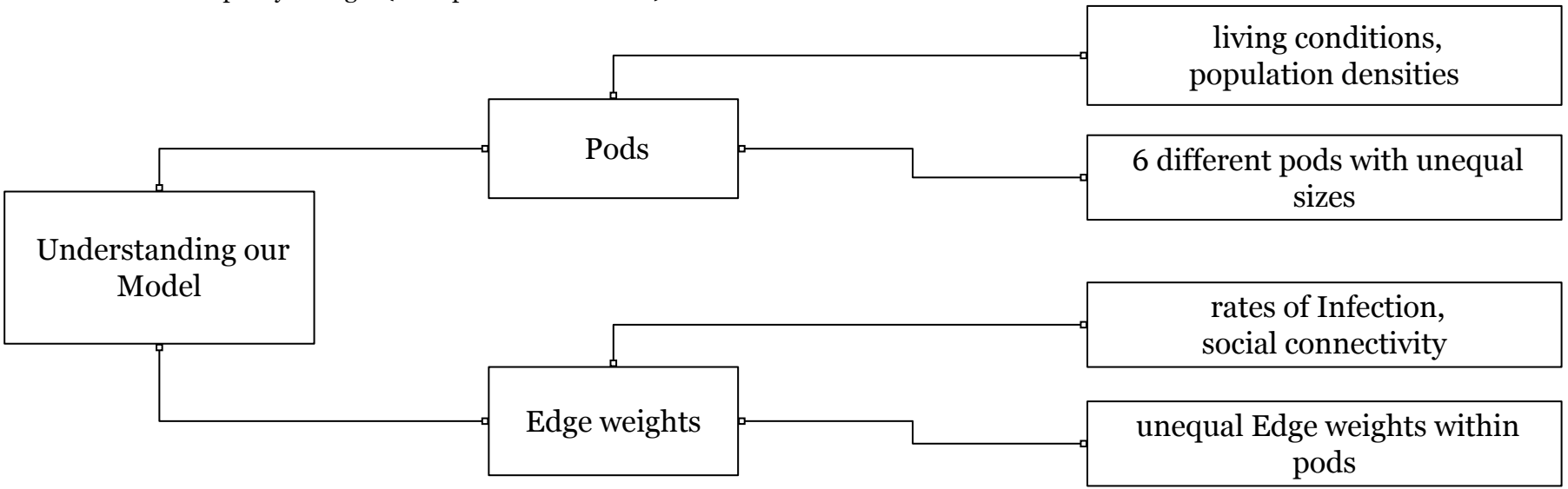
Team 3-Irises: Sparsh Gupta, Belén Hutchins, Swasti Jain

How do different policies, movements, and interactions as factors of social connectivity in migrant workers' dorms affect the transmission of disease?

What makes it <u>interesting</u> and <u>important</u>?

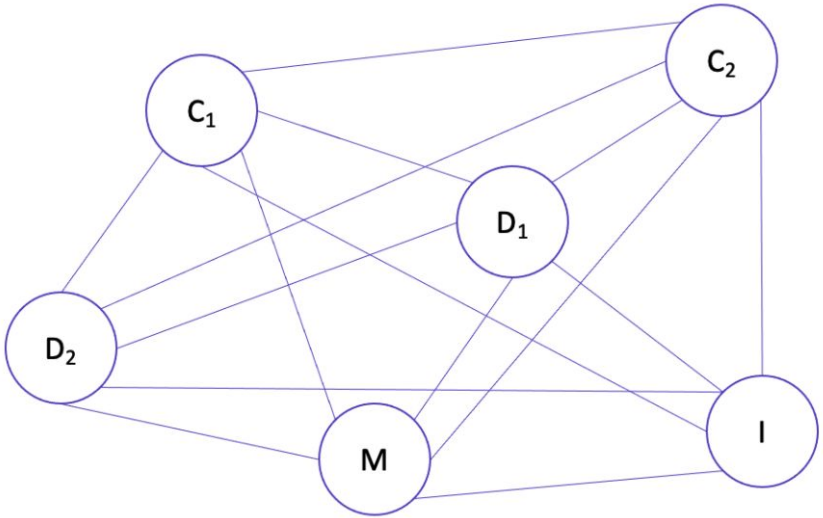
- Based on the case-study of migrant workers' dorms in Singapore during COVID-19
- Factors of social connectivity
- Government policy changes (example: isolation areas)

Explanatory Question



Agent-based SIR Model

The social connectivity digram for the podded-agent-based SIR model



The pods used in the model are:

- D_1: overcrowded dorm (higher infectivity)
- D_2: normal dorm (normal infectivity)
- C_1: outbreak-center construction site (higher infection rates)
- C_2: construction site (normal infection rate)
- *M*: mall (higher infection rates.)
- *I*: isolated area/site (lowest infectivity)

Update state Equations

$$I = I \mid v_{infect} \;\&\; (\sim R)$$

$$R = R \mid (I \;\&\; v_{recover})$$

$$I = I \;\&\; (\sim R)$$

$$\text{dim} = \text{length}(I_{v_0})$$

$$I_h = \text{zeros}(\text{dim}, \text{T})$$

$$R_h = \text{zeros}(\text{dim}, \text{T})$$

$$S_h = \text{ones}(\text{dim}, \text{T}) - I_h - R_h$$

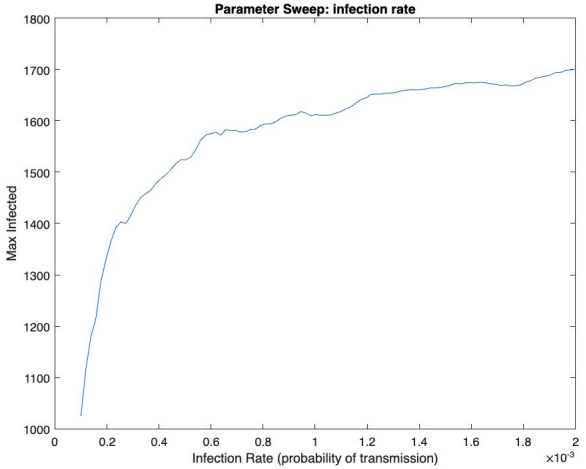
Edge weights used in the model:

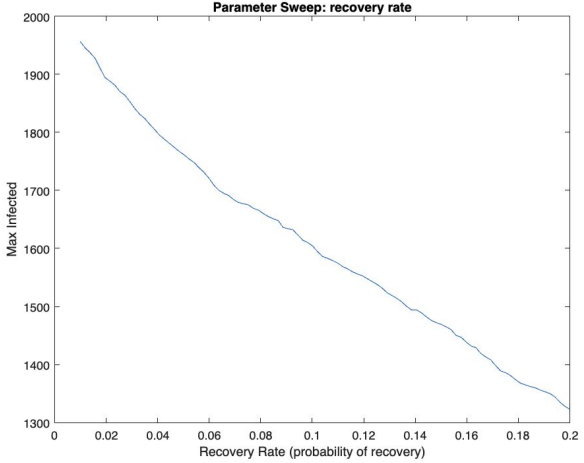
- n_(D_1): very high infection rate
- n_(D_2): normal infection rates of COVID-19
- n_(C_1): high infection rate
- n_(C_2): normal infection rates of COVID-19
- n_(M): high infection rate
- n_(I): very low infection rate

Model Values:

```
D_1 = 1000; n_d1 = 10;    D_2 = 390; n_d2 = 5;  C_1 = 150; n_c1 = 7;
C_2 = 200; n_c2 = 6;      M = 160; n_m = 6;     I = 100; n_i = 1;
```

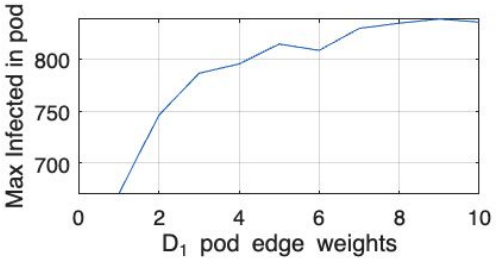
Results - Parameter Sweeps

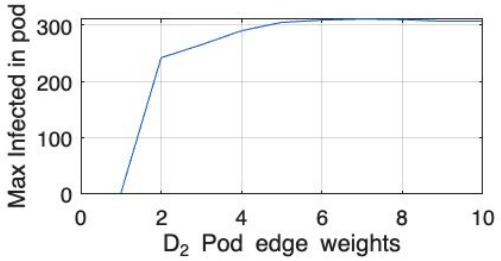


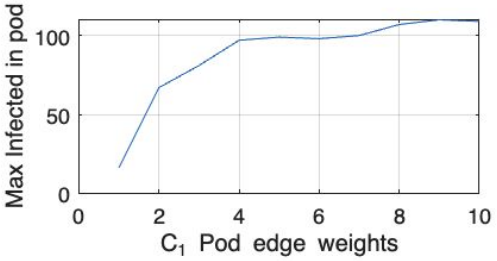


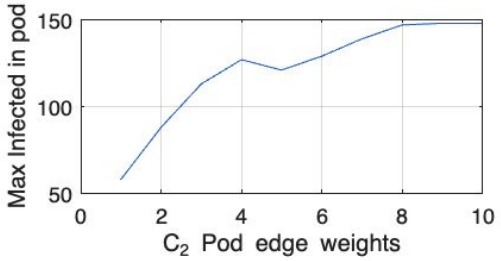
Edge weights vs Total infections (per pod)

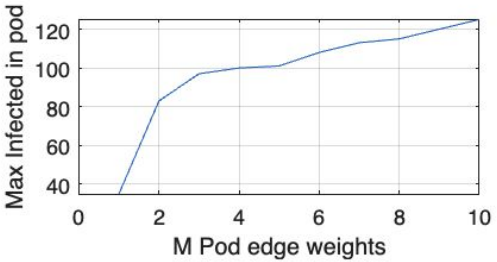
Interesting trend: When the cases were increasing and the edge weights are increased, the maximum infections start to decrease after a peak threshold value.
For example, in pods D_1, D_2, and I.

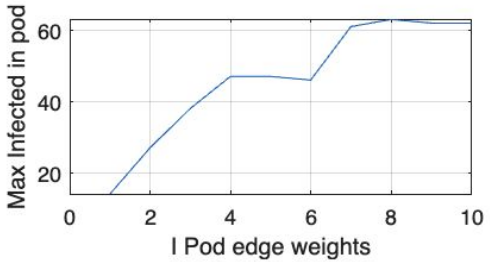






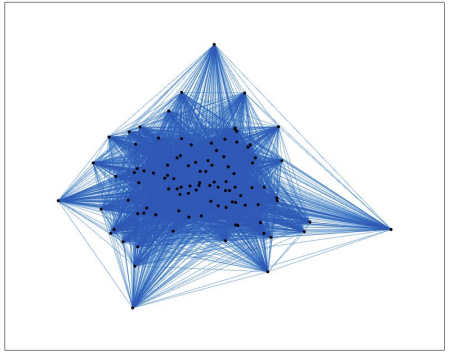




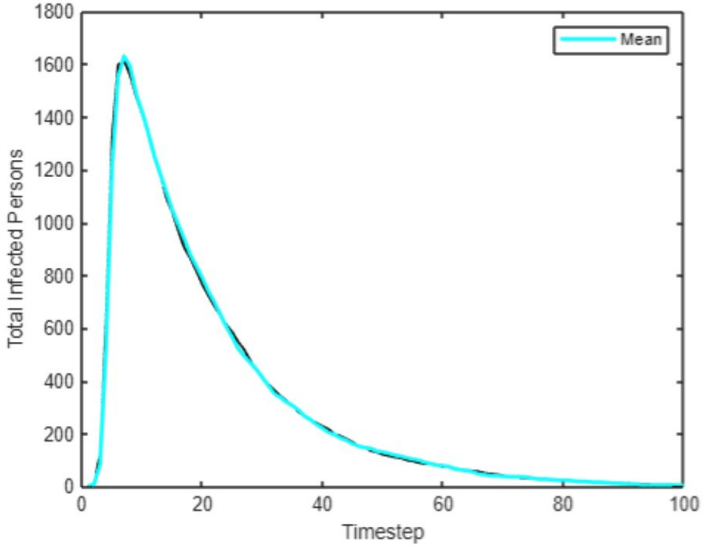


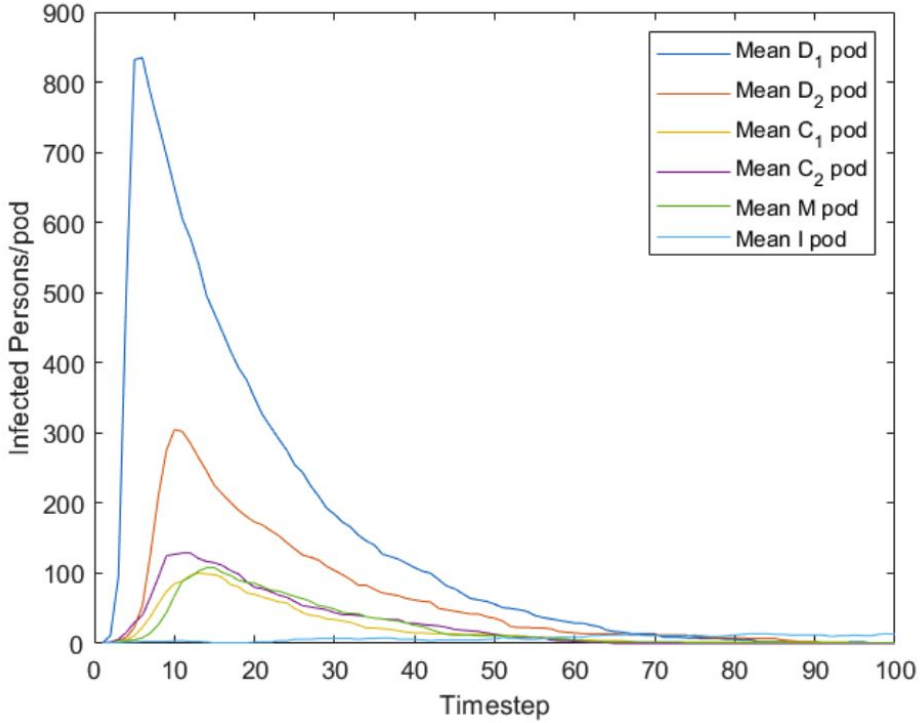
Results - Model

Graph of podded model



- Mean Total Infections
- Mean infected individuals in each pod
- 100 simulations and 100 replications





Interpretation

Results:

- Maximum intensity of peak infections is affected directly by adjusting the infection rate (probabilistic), recovery rate (probabilistic), and edge weights within the pods
- Desired results achieved by using unequal pod sizes & different edge weights

Limitations:

- Interactions with only individuals inside the migrant workers' model
- Not having unequal edge weights for individuals across different pods
- Individuals bound to be in the same pod all throughout the simulation

Next steps:

- Include pods for the general population
- Hybrid model