

# *Team 5' 4" 3" 2": Covid SEIR Model*



5'4"



5'3"



5'2"

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Question: How does social distancing affect the rate of spread of a virus?

# Goals and Process

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- We coded a program in python to simulate a virus spreading through a population, and at the end of each day in the simulation, we counted the data: so, number sick, number recovered, and number susceptible.
- Since we are modeling socially distancing, the chance that someone is likely to get sick depends on their proximity to an infected person
- After six units people don't interact, so this means that in our simulation people don't move
- We summarized our results by creating a visualization of each simulation
- And we then compared the data of not socially distancing, socially distancing, and real life from 2019

# Equations

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Sickness Rate Formula:

$$\text{sickness rate} = \text{base rate}/\text{distance}$$

Distance Calculation:

$$\text{distance} = \min (|x_1 - x_2|, |y_1 - y_2|)$$

# Driving Logic and Code

**distance** between two people's location is less than the **radius of infection** (example: 6 feet), make them **interact**

Use a **random number generator** on everyone who was in contact to **determine if they get sick**.

```
for person1 in self.People:  
    person1.Interaction = []  
  
for person2 in self.People:  
    person2.Interaction = []  
  
    x_distance = (abs(person1.location[0] - person2.location[0]))  
    y_distance = (abs(person1.location[1] - person2.location[1]))  
    distance= min(x_distance, y_distance)  
    person1.set_sickness_rate(distance)  
    person2.set_sickness_rate(distance)  
  
    if ((x_distance< person2.radius) or (y_distance< person2.radius)) :  
        person1.Interaction.append(person2)  
        person2.Interaction.append(person1)
```

# Results

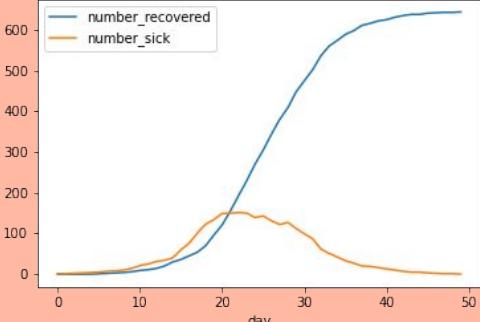
SD= Social Distanced,

NSD= Not Social Distanced

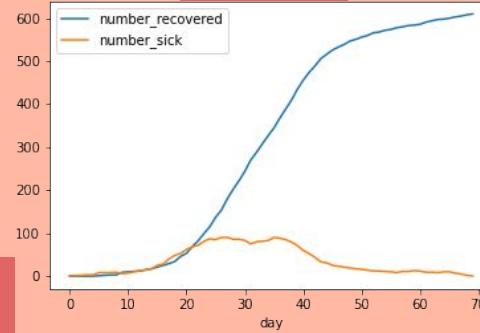
| Trial   | Number of Days |             | Recovered    |              | Never Got Sick |             |
|---------|----------------|-------------|--------------|--------------|----------------|-------------|
|         | SD             | NSD         | SD           | NSD          | SD             | NSD         |
| 1       | 54             | 22          | 605          | 965          | 396            | 36          |
| 2       | 54             | 18          | 633          | 948          | 368            | 53          |
| 3       | 50             | 18          | 557          | 976          | 444            | 25          |
| 4       | 49             | 20          | 644          | 972          | 357            | 29          |
| 5       | 69             | 18          | 610          | 977          | 391            | 24          |
| Average | <b>55.2</b>    | <b>19.2</b> | <b>609.8</b> | <b>967.6</b> | <b>391.2</b>   | <b>33.4</b> |

# Socially Distanced (SD)

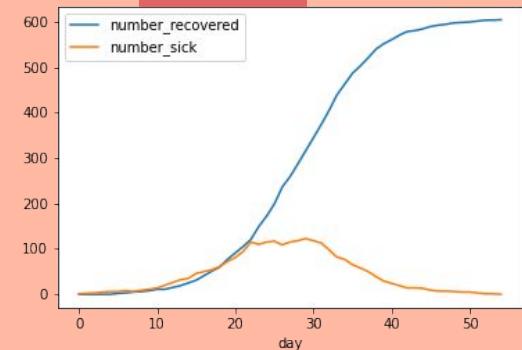
Trial 1



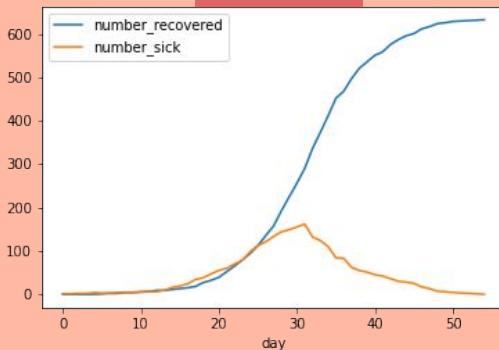
Trial 2



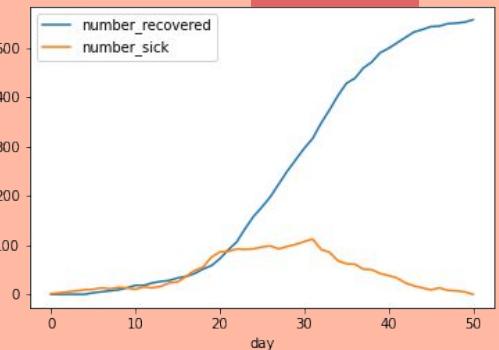
Trial 3



Trial 4

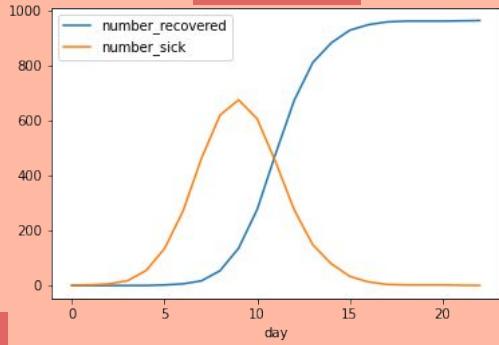


Trial 5

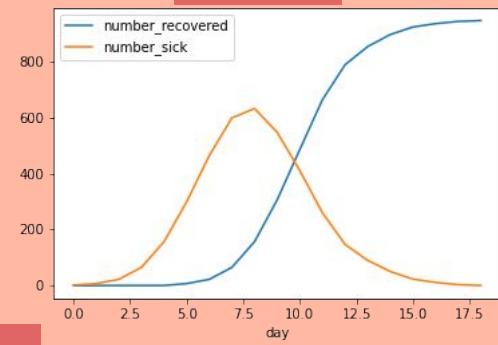


# Non-Socially Distanced (NSD)

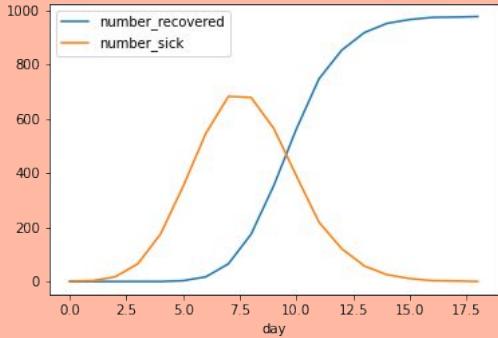
Trial 1



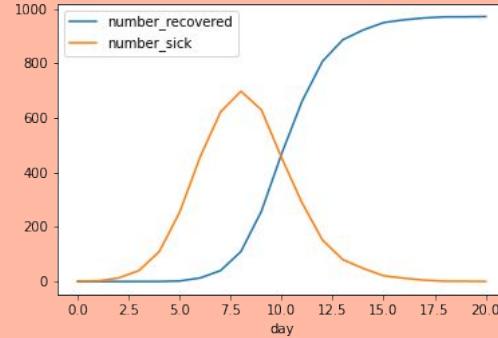
Trial 2



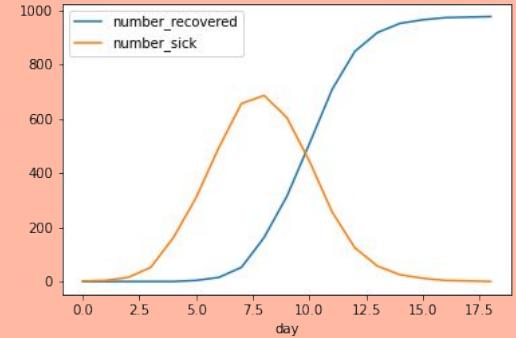
Trial 3



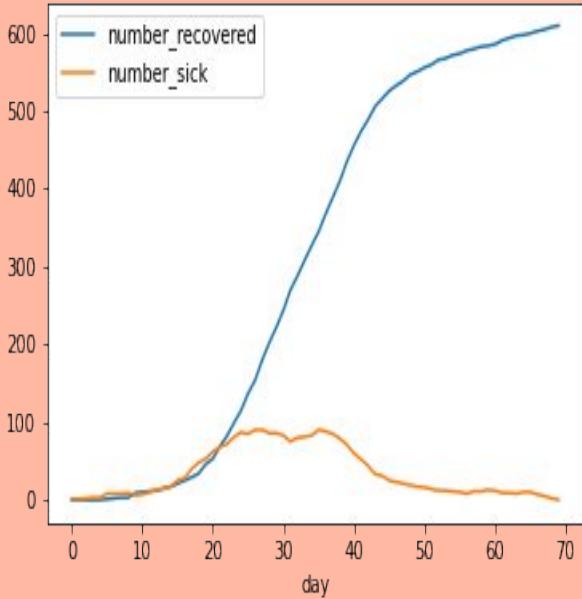
Trial 4



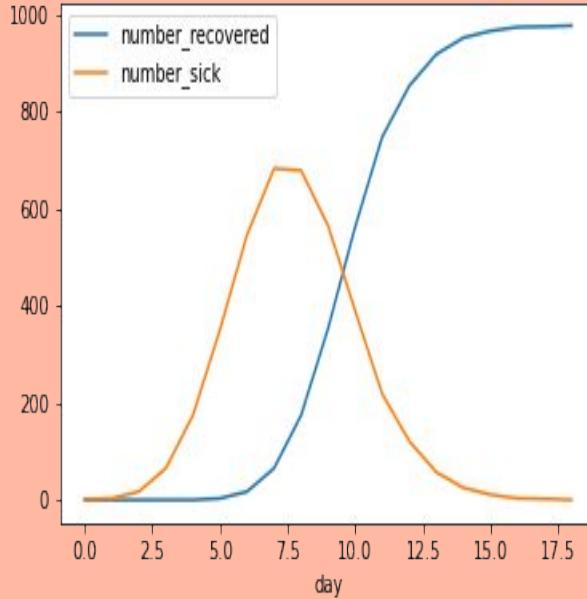
Trial 5



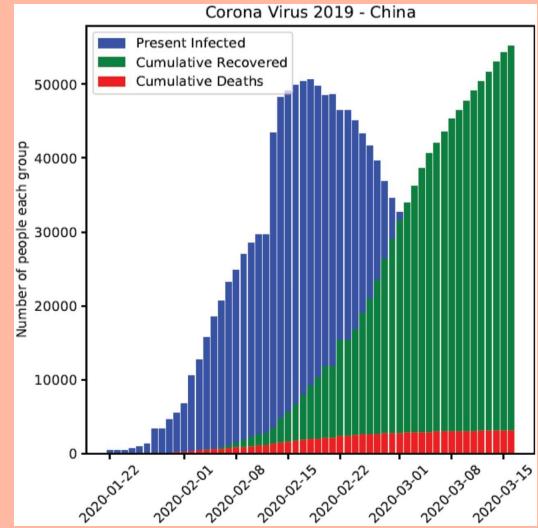
## Socially Distanced



## Non Socially Distanced



## Actual COVID Model



Source : medRxiv

<https://www.medrxiv.org/content/10.1101/2020.05.23.20111500v1>

# Thanks for Listening!

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