CYBORGS

SIR MODEL

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OBJECTIVES

TO DETERMINE HOW USE OF MASK AND THE PERCENTAGE OF PEOPLE WEARING MASKS AFFECT THE INFECTION RATE OF COVID-19

SIR Model Keywords and Assumptions

Keywords:

- Susceptible: they are healthy but liable to be infected with COVID-19;
- Infected: infected with COVID-19 and a carrier of the infection;
- Recovered: recovered from COVID-19 and are no longer at risk of infection;
- Masked up: Individuals can reduce their COVID-19 infection rate by wearing a protective mask.
- Infection rate: the likelihood that an individual will become infected with COVID-19.

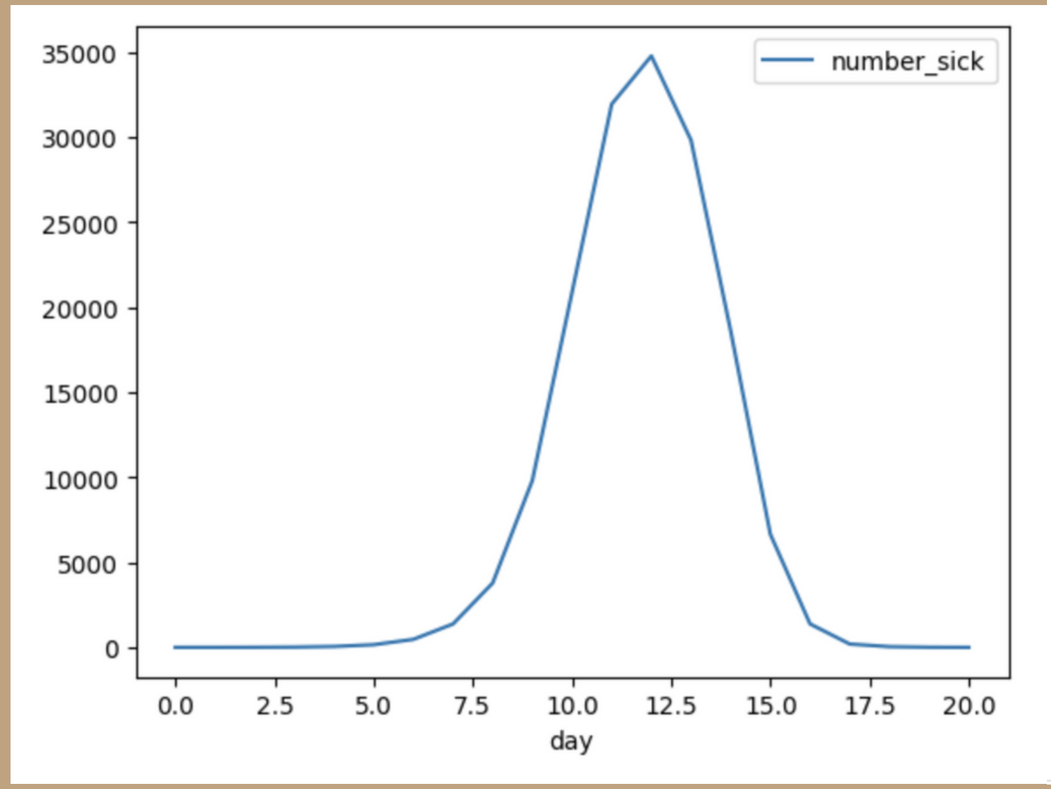
Assumptions:

- When a susceptible person interacts with an infected person the susceptible person then has a 10% chance of becoming sick themselves.
- Each person interacts with the same constant number of people
- A person stays infected for 14 days
- Infection rate without a mitigant is 10%
- Infection rate reduces by 70% when an individual practices social distancing.

Infection Rates and no Mitigants

0% mask wearers

Without the mask, the number of infected people peaked on the 12th day, with 34, 769 people infected; the number of sick people rose quickly, from one to fifty on the fourth day.

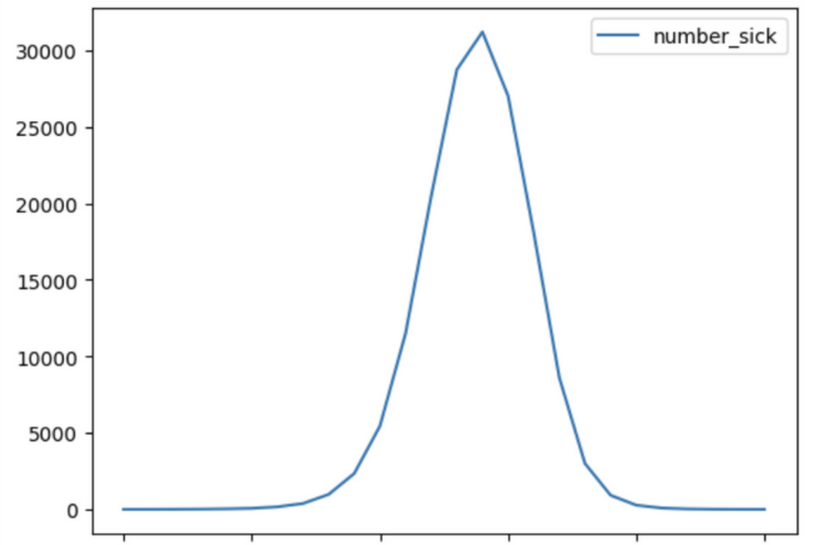


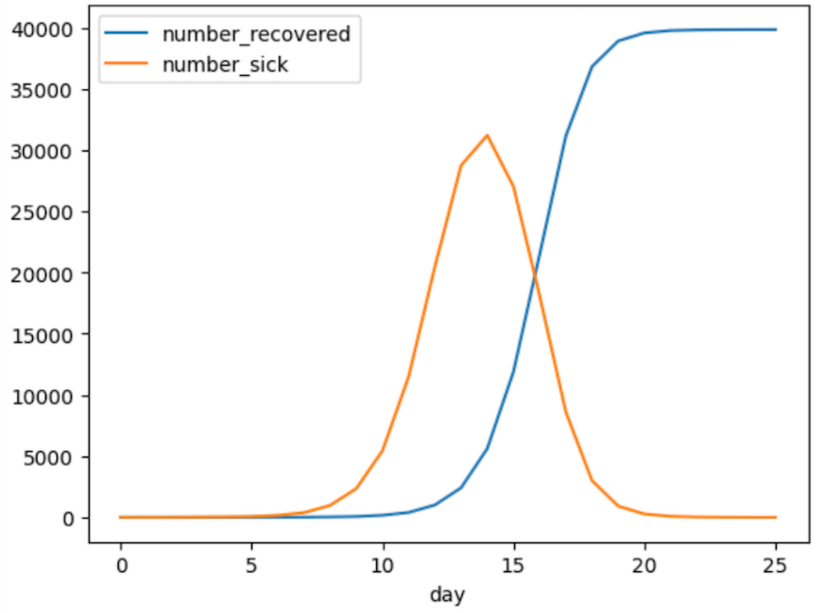
	day	number_sick	number_recovered
0	0	1	0
1	1	1	0
2	2	5	0
3	3	15	0
4	4	50	0
5	5	154	1
6	6	469	5
7	7	1373	15
8	8	3779	50
9	9	9809	155
10	10	20865	474
11	11	31933	1388
12	12	34769	3829
13	13	29817	9964
14	14	18597	21339
15	15	6646	33321
16	16	1377	38598
17	17	194	39781
18	18	39	39936
19	19	8	39967
20	20	0	39975

Results of the Model with Mitigant: Masks

Percentage of mask wearers: 82%

With masks, the number of infected people peaked on the 14th day, with 31,200 people infected, showing that with some type of mask, it took longer for a larger part of the population to be infected compared to when no one wore a mask; the number of sick people rose slower, from two to thrity-three on the fourth day.





	day	number_sick	number_recovered
0	0	1	0
1	1	2	0
2	2	6	0
3	3	15	0
4	4	33	0
5	5	65	2
6	6	163	6
7	7	381	15
8	8	975	33
9	9	2345	67
10	10	5440	169
11	11	11487	396
12	12	20455	1008
13	13	28730	2412
14	14	31200	5609
15	15	27021	11883
16	16	18096	21463
17	17	8607	31142
18	18	2996	36809
19	19	920	38904
20	20	271	39559
21	21	83	39749
22	22	27	39805
23	23	8	39824
24	24	2	39830
25	25	0	39832

Conclusion

The use of masks slowed the spread of COVID-19 by reducing the infection rates. The infection rate was 10% at the start, but mask-wearing reduced it by 84%. Wearing a mask contributed to this reduction by 70%, it also did create some resistance for the individual in contacting the infection.

Mask wearing reduced the numbers, demonstrating how effective it was in reducing the numbers compared to those who did not wear one.

Questions?