

# FINAL PROJECT

## SARS-CoV2 VIRUS SIMULATION

### PRE-INFORMATION

#### SIR MODEL

**Suspicious:** People who have not yet catch the disease, represented by 

**Infectious symptomatic:** People who infected and show symptoms, represented by 

**Infectious asymptomatic:** People who infected but does not show symptoms 

**Recovered:** People who recovered, represented by 

**Died:** People who died because of disease, represented by 

**Quarantined:** People whose test positive or quarantined via contact tracing. 

**Wearing Mask:** People who wear mask. If two sides wear masks, virus may have tiny effect. 

#### R Value

The basic reproductive number ( $R_0$ ) of the virus causing covid-19 is estimated to be 2.3, meaning that each person infected with the virus will spread it to 2.3 others, on average, over the course of their illness. **If R is larger than one, the number of people with the disease is increasing.** The target for control strategies, including lockdown, self-isolation and masks wearing, is to bring **R below one and thereby reduce the number of people with the disease.** [9]

#### Incubation period

The incubation period for COVID-19 has been **estimated to range from 1 to 14 days**, with a median being 5-6 days from exposure to symptom onset. Most individuals (97.5%) develop symptoms within 11.5 days of exposure.[1]

#### Asymptomatic Presentation

Research early in the pandemic suggested that the rate of asymptomatic infections could be as high as 81%. But a meta-analysis published last month, which included 13 studies involving 21,708 people, **calculated the rate of asymptomatic presentation to be 17%.** [2]

The analysis defined asymptomatic people as those who showed none of the key COVID-19 symptoms during the entire follow-up period, and the authors included only studies that followed participants for at least seven days. Evidence suggests that most people develop symptoms in 7–13 days.

## **Effects of wearing mask**

A range of new research on face coverings shows that **the risk of infection to the wearer is decreased by 65 percent [3]**, said Dean Blumberg, chief of pediatric infectious diseases at UC Davis Children's Hospital. [4]

## **Super Spreading and K Value**

A recent paper found that in Hong Kong, which had extensive testing and contact tracing, about 19 percent of cases were responsible for 80 percent of transmission, while 69 percent of cases did not infect another person. This finding is not rare: Multiple studies from the beginning have suggested that as few as 10 to 20 percent of infected people may be responsible for as much as 80 to 90 percent of transmission, and that many people barely transmit it. [5] [6]

## **Asymptomatic transmission rate**

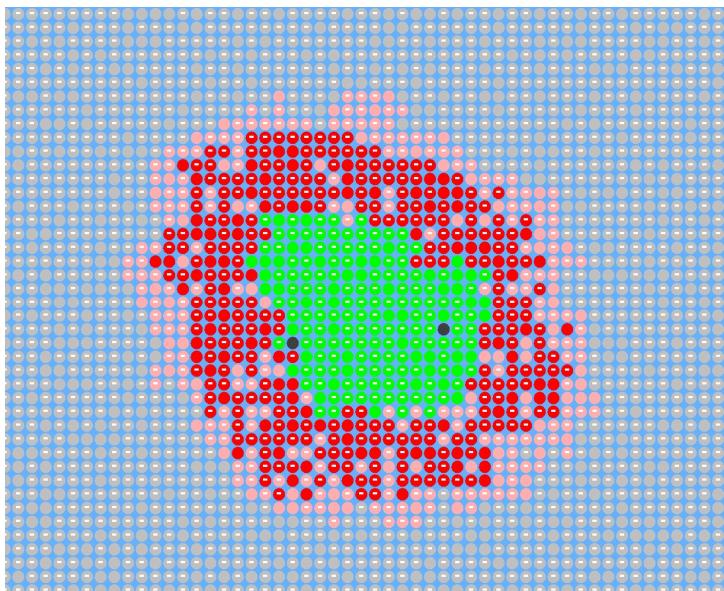
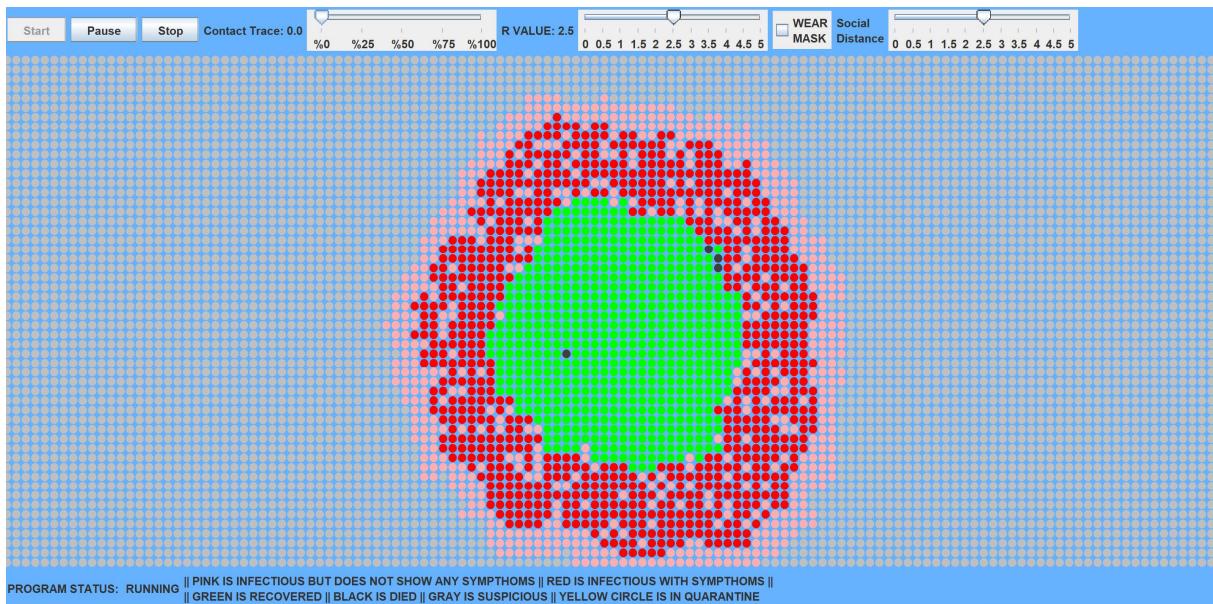
Byambasuren's review also found that **asymptomatic individuals were 42% less likely to transmit the virus than symptomatic people.** [7]

## **Social Distancing impact on transmission rate**

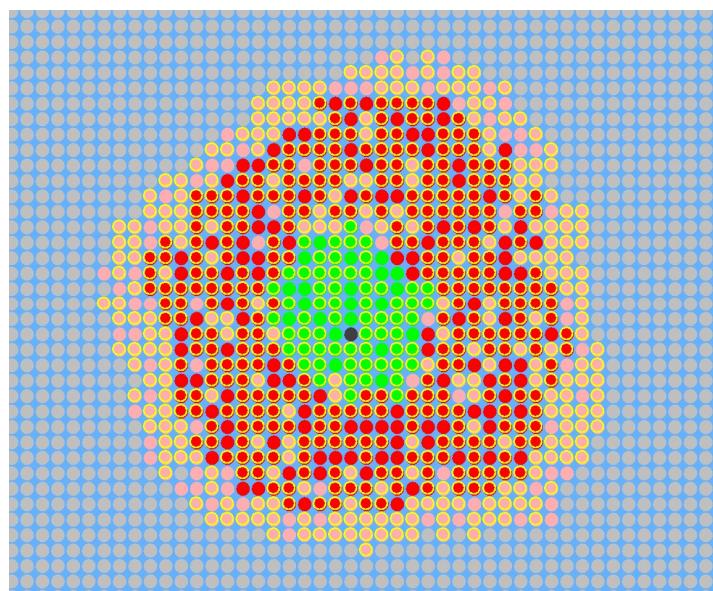
While a rating of A- or higher may be necessary to reduce  $R(t)$  below 1 (and hence stop viral transmission), moderate levels of social distancing, corresponding to Unacast grades of C- or higher, appear to have dropped  $R(t)$  below 1.5. [8]

Social Distancing	R value
5.0 = A	0.5
4.7 = A-	
4.3 = B+	1.0
4.0 = B	
3.7 = B-	
3.3 = C+	1.5
3.0 = C	
2.7 = C-	
2.3 = D+	2.0
2.0 = D	
1.7 = D-	
1.3 or lower = F	3.0

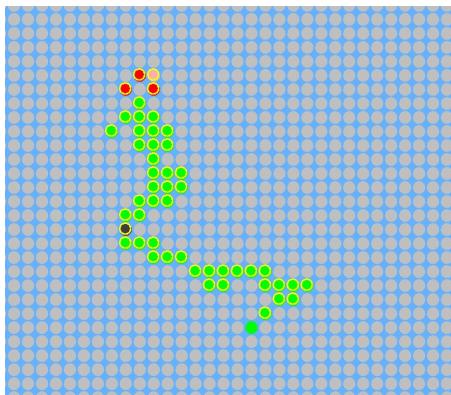
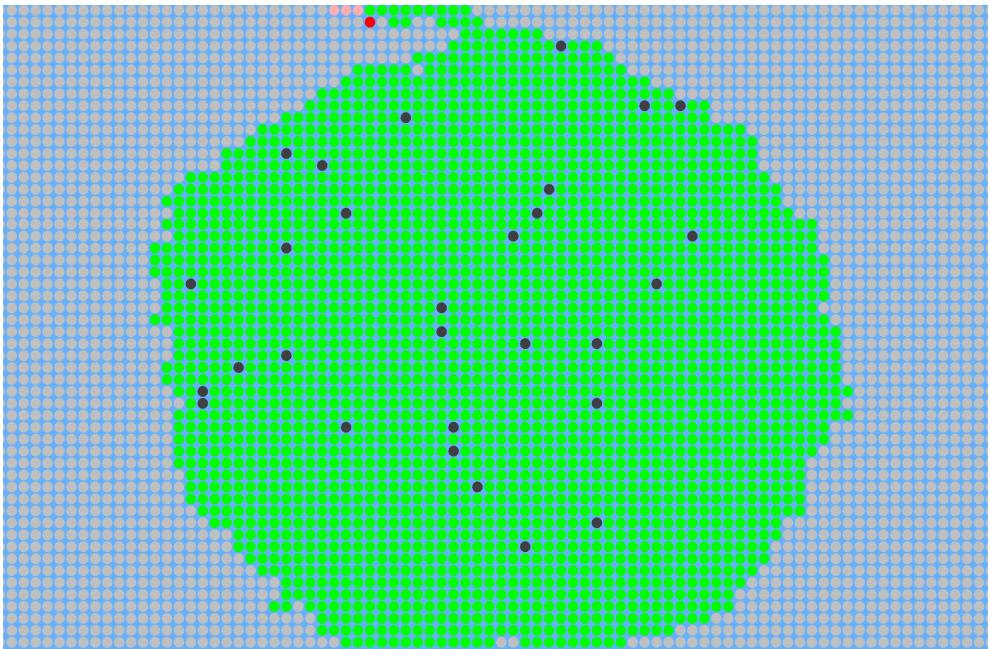
## SCREENSHOTS



%75 Wearing Mask



%75 Contact Tracing



While contact tracing is %100, transmission is very low.

## CITIATIONS

- [1] <https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/guidance-documents/signs-symptoms-severity.html>
- [2] <https://www.nature.com/articles/d41586-020-03141-3#ref-CR1>
- [3] [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)31142-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31142-9/fulltext)
- [4] <https://www.ucdavis.edu/coronavirus/news/your-mask-cuts-own-risk-65-percent/>
- [5] <https://www.theatlantic.com/health/archive/2020/09/k-overlooked-variable-driving-pandemic/616548/>
- [6] D. C. Adam, *et al.* (2020). Clustering And Superspreading Potential Of Sars-Cov-2 Infections In Hong Kong. *Nature Medicine*, sf: 1-6. doi: 10.1038/s41591-020-1092-0.
- [7] <https://www.nature.com/articles/d41586-020-03141-3>

[8][https://journals.lww.com/jphmp/Fulltext/2020/11000/Social\\_Distancing\\_Metrics\\_and\\_Estimates\\_of.17.aspx](https://journals.lww.com/jphmp/Fulltext/2020/11000/Social_Distancing_Metrics_and_Estimates_of.17.aspx)

[9] <https://theconversation.com/is-the-k-number-the-new-r-number-what-you-need-to-know-140286>