

The Spread of Airborne Diseases by Socially Disobedient People

New Mexico Supercomputer Challenge

Final Report

April 7, 2021

Team 22

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Executive Summary

The closure of the school buildings across the nation in the middle of March 2020 due to the pandemic caused by SARS-CoV-2 resulted in an unprecedented change in everyone's lifestyles. Everyone is mandated to wear facial covering when in public as the cases went up across the globe.

Since the transmission and infection of COVID-19 is still yet to be completely understood, the group members of this team have decided to study how different precautionary measures can affect transmission and infection of COVID – 19 to retail workers, particularly cashiers in a grocery store. The team has decided that NetLogo will be used as the programming language to simulate the environment in a grocery store and how wearing of masks and setting a plexi glass shield in front of a cashier now common in most stores across the country can reduce the transmission and infection rate of COVID – 19 to cashier employees.

Using the code written, the researchers run it through the BehaviorSpace feature of Netlogo and showed 169 infected scenarios out of 8640, which yields 1.95% infection rate. This shows that the wearing of mask lowers the transmission rate of COVID – 19. Data used in the codes were obtained from current numbers from CDC.org.

Introduction

Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) emerged in the later 2019 (*G.Santos, 2020*) and is responsible for the global COVID-19 pandemic. Since October of 2020, the Center for Diseases Control (CDC) has continuously published that COVID-19 can spread through close contact between people who are physically near each other specifically within about 6 ft.

The goal of this study is to show that the use of personal protective equipment (PPE) such as a facial mask can prevent the transmission of SARS – CoV – 2, the virus that is responsible for the COVID-19 pandemic. Since the topic of the study is happening in real time, the data that is being used as a reference for the written code is constantly changing, thus poses great confusion and numerous changes in the codes.

Description

This model shows the direct interaction between an employee and a customer. It is a closed system that does not consider multiple people in a line and only the cashier and one customer. The model can test effectiveness of cloth, surgical, and N95 masks on employees, how much non-mask-compliant customers can change infection chance of employees, and infection chance based on age.

Results

Using the code written, the researchers run them through the BehaviorSpace feature of Netlogo and showed 169 infected scenarios out of 8640, which yields 1.95% infection rate in all possible combinations of scenarios (wearing of masks and presence of a plexi glass between employees and costumers). This shows that the wearing of mask lowers the transmission rate of COVID – 19.

Below is a screen shot (Figure 1) of the BehaviorSpace and the result when a total test of 8640 was run through the space, yielding a result of 8471 healthy individuals and only 169 total infected cases where majority of the possible combinations of scenarios involved the use of masks.

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BehaviorSpace results (NetLogo 6.2.0),,,,,,,,,,
Supercomputing.nlogo,,,,,,,,,
COVID,,,,,,,,,
04/11/2021 16:25:38:440 -0600,,,,,,,,,
,,,,,,,,,
Total tests = 8640,,,,,,,,,Total tests healthy = 8471,Total tests infected = 169
Test #,Divider,Is the customer wearing a mask?,Age,Type of Mask,Effectiveness-of-cloth,Infection-chance,# of cus
1,FALSE,FALSE,13,surgical mask,50,80,80,0,1,0
2,TRUE,TRUE,20,surgical mask,50,80,80,0,1,0
3,FALSE,TRUE,25,surgical mask,50,80,80,0,1,0
4,TRUE,FALSE,20,surgical mask,50,80,80,0,1,0
5,FALSE,FALSE,20,surgical mask,50,80,80,0,1,0
6,FALSE,FALSE,25,surgical mask,50,80,80,0,1,0
7,FALSE,TRUE,13,surgical mask,50,80,80,0,1,0
8,TRUE,TRUE,13,surgical mask,50,80,80,0,1,0
9,TRUE,TRUE,25,surgical mask,50,80,80,0,1,0
10,TRUE,FALSE,13,surgical mask,50,80,80,0,1,0
11,TRUE,FALSE,25,surgical mask,50,80,80,0,1,0
12,FALSE,TRUE,20,surgical mask,50,80,80,0,1,0
13,FALSE,FALSE,25,surgical mask,50,80,80,1,1,0
14,TRUE,TRUE,30,surgical mask,50,80,80,0,1,0

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Figure 1. Screenshot of the BehaviorSpace result.

Conclusion

Based from the result from the BehaviorSpace and the data that was incorporated in the codes, the use of facial protection such as mask and a plexi glass between the employee and costumers significantly decreases COVID – 19 transmission as it separates the individuals involved in the scenario.

Recommendations

It is suggested that everyone should continuously wear masks in public places to decrease the spread of COVID – 19 and other related respiratory infections.

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