Over the past two weeks, utilizing Python and Machine Learning libraries, I have observed patterns in COVID-19 in most country and state death rates. Recently I shared my findings on countries specifically and people seemed interested. Therefore, I decided to share my findings on states' death rates as well. A quick re-cap, the death rate is the number of deaths due to COVID-19, divided by the number of confirmed cases. I included the model again (figure 1) just in case people forgot or haven't seen it. Skip to the next page for the breakdown of the states.

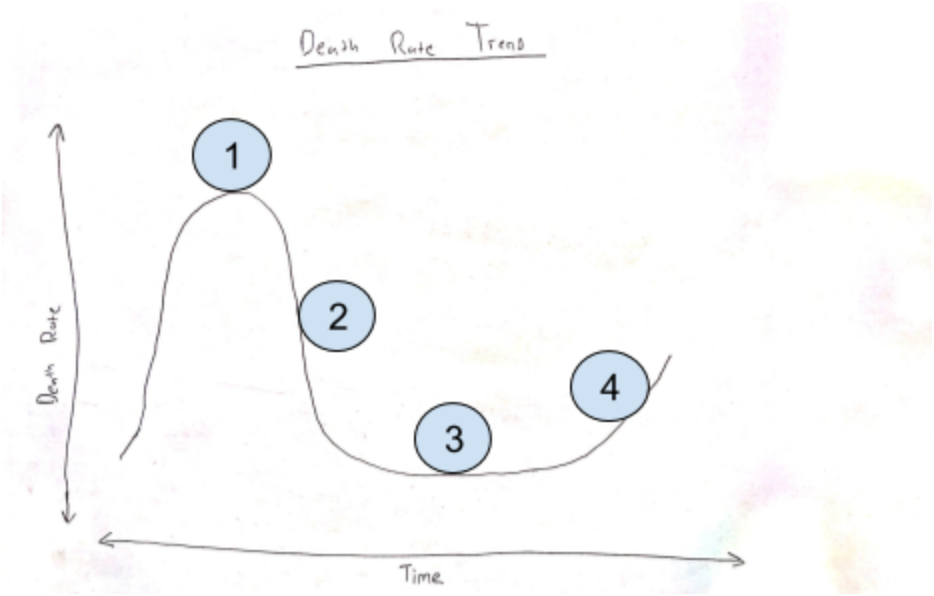

Figure 1. Death Rate Model

Stage 1: Initial spike in death rates

- This occurs due to the lack of testing within a country. This causes the death rate to be artificially high, as testing is only being done in severe cases.

Stage 2: Decrease in country's death rate

- This occurs due to the increase in testing. The more people tested, the higher the number of confirmed cases thus lowering the death rate.

Stage 3: The approximate one to two week plateau

- This plateau in death rate occurs because of the delayed effect of the onset of severe disease and death.

Stage 4: Increase in hospitalization and deaths

- The true destructive impact of COVID-19 is displayed here.
- This is where sick patients start to overload the hospitals, and death rate increases.

After Stage 4: What happens next is dependent on a country's prior methods to soften the impact of COVID-19.

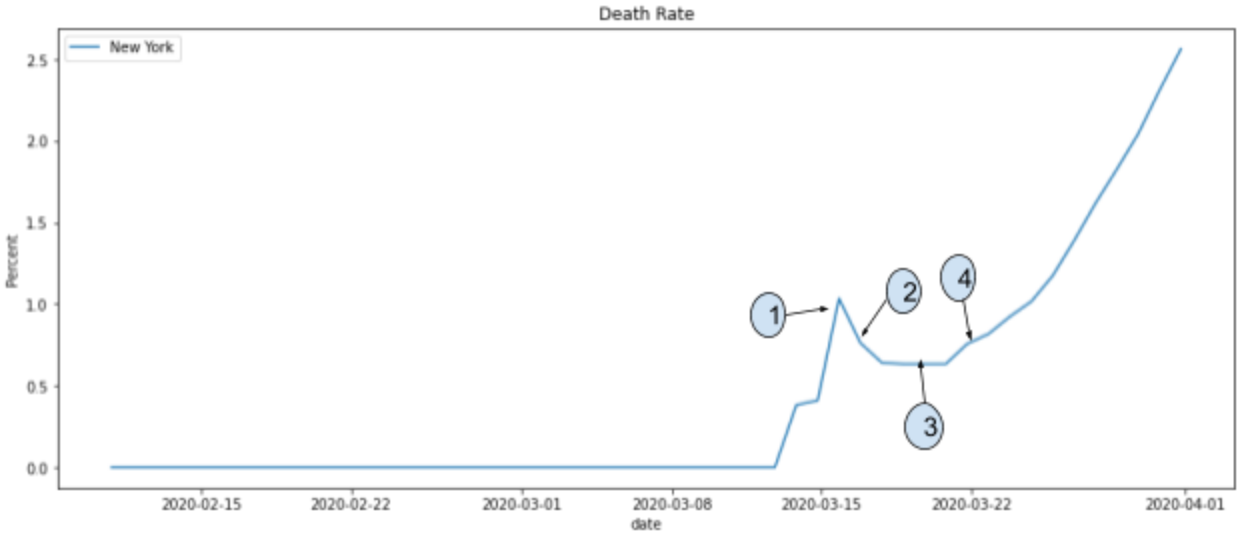

Figure 2. New York's Death Rate

New York's death rate in stages

Stage 1: Initial spike in New York's death rate

- New York's graph shows an initial spike in death rates.
    - This is due to the initial testing only in serious cases

Stage 2: Decrease in New York's death rate

- In figure 2, it is clear that after the initial spike, the death rate in New York has a sharp decline toward stage 3.
    - This is once again due to the increase in testing

Stage 3: There is a short approximate week-long plateau in New York death rate

- Stage 3 is shorter here than the model because of the late testing in New York.
    - We know of the late testing because stage 3 is the time it takes for the majority of people tested in stage 2 to get to more lethal stages of COVID-19 which should take around two weeks.

Stage 4: New York sees a sharp increase in death rate

- Governor Cuomo orders lockdown, shuts down non-essential businesses (March 20th)

Takeaways: From the data, it is clear that New York had a late start in testing and detecting COVID-19. However, Governor Cuomo got to work quickly and saved us from a potentially much worse fate. The lockdown (stoppage of non-essential business) was put into place a little less than two weeks after stage 1, which is on the quicker side. If it weren't for the late detection New York would have been in a better place. **It is important that we all do our part now more than ever. Stay inside and listen to Governor Cuomo.**

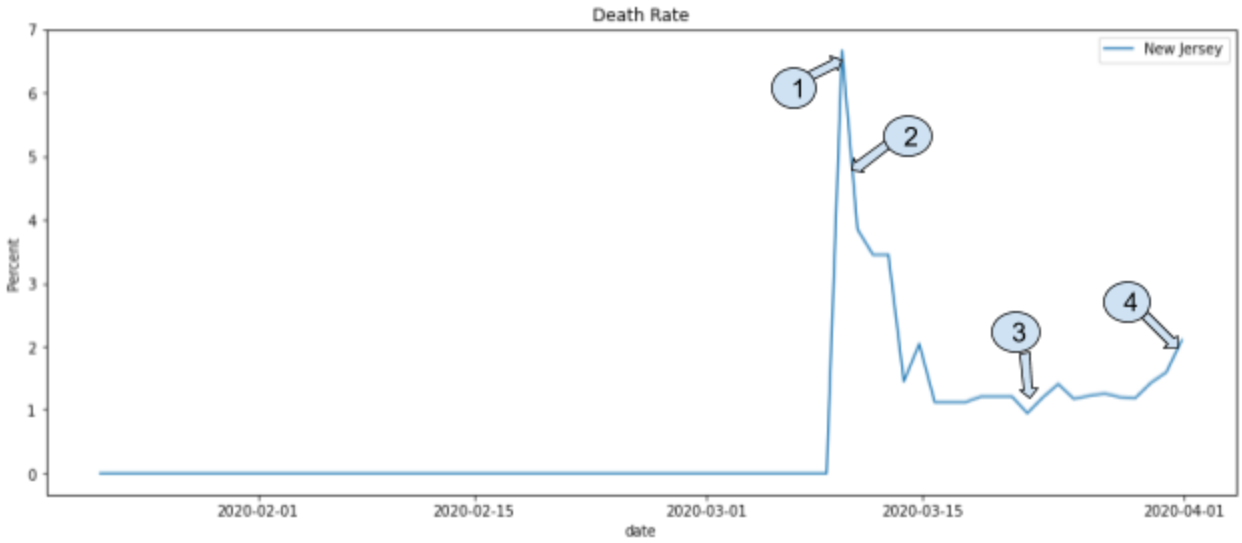

Figure 3. New Jersey's Death Rate

New Jersey's death rate in stages

Stage 1: Initial spike in New Jersey's death rate

- New Jersey's graph shows an initial spike in death rates.

Stage 2: Decrease in New Jersey's death rate

- In figure 3, it is clear that after the initial spike, the death rate in New Jersey has a sharp decline toward stage 3.
- End of this stage, New Jersey closed schools (March 15th)

Stage 3: There is a two week plateau in New Jeresey's death rate

- Figure 3 shows an approximate two week period in which the death rate remains around the same, with little variance.
- New Jersey closed non-essential businesses (March 20th)

Stage 4: New Jersey sees a sharp increase in death rate

- New Jersey has recently entered this stage
- We will soon see if New Jersey's attempts to soften the blow in stages 2 and 3 were effective.
- In the coming week, if New Jersey follows the popular trend, we will see the death rate continue to shoot up, due to the deaths per day increasing as well.

Figure 4 below shows a few other states that are also going through the stages of the COVID-19 death rates. It is too early to say how accurate this model is, because a lot of states do not have reliable data, as they are just entering the fight against COVID-19. I will keep researching and updating my models.

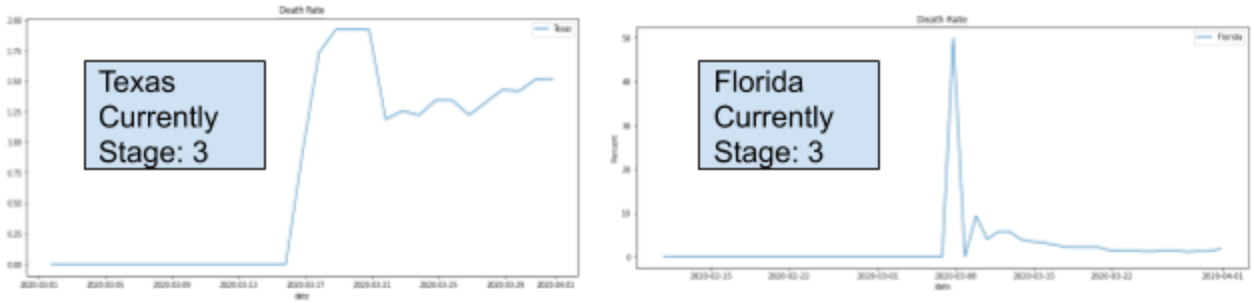

Figure 4. Texas and Florida'S Death Rate

References

1. All of the data used in my algorithm is taken from JHU and pulled from this github repository: https://github.com/CSSEGISandData/COVID-19
2. List of US states and their current precautions: https://www.nytimes.com/interactive/2020/us/coronavirus-stay-at-home-order.html?auth=login-email&login=email
3. Cuomo orders lockdown, shuts down non-essential businesses: https://nypost.com/2020/03/20/coronavirus-in-ny-cuomo-orders-lockdown-shuts-down-non-essential-businesses/
4. How a Failure to Test Blinded the U.S. to COVID-19: https://www.nytimes.com/2020/03/28/us/testing-coronavirus-pandemic.html
5. New Jersey school closings for coronavirus: https://www.nj.com/coronavirus/2020/03/new-jersey-school-closings-for-coronavirus-updated-map-of-covid-19-cases-as-of-sunday-march-15.html
6. Non-essential businesses will be shut down in N.J. due to coronavirus outbreak: https://www.nj.com/coronavirus/2020/03/nonessential-businesses-will-be-shut-down-in-nj-due-to-coronavirus-outbreak-gov-murphy-says.html