
MERCURY GROUP, PROJECT 2

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The purpose of this project is to prove or disprove conjectures regarding COVID-19 spread based on population density, Gross Domestic Product (GDP), and testing data. For each conjecture, data visualization of COVID-19 data was performed, and the results were analyzed in this report.

Conjecture 1: Dense areas lead to more face-to-face interaction among residents, which makes them potential hotspots for the rapid spread of pandemics.

Density can be described as the number of people in a geographic place. Figure 1 depicts the Top 10 US states with total cases on 10/03/2020 and the Population Density of each state. The densely populated states such as New Jersey and New York have a higher infection and had speedy spread initially. However, the data also shows that density is not significantly related to the infection rate, possibly due to more adherence to social distancing guidelines. The states with lower densities also have a drastically higher infection and make them potential hotspots as well. Arizona, Texas, and Tennessee on the other hand have much lower population densities comparatively and still have a rapid spread of infection. The conjecture that higher population density causes increased infection rates is disproven since the data suggest quite the opposite.

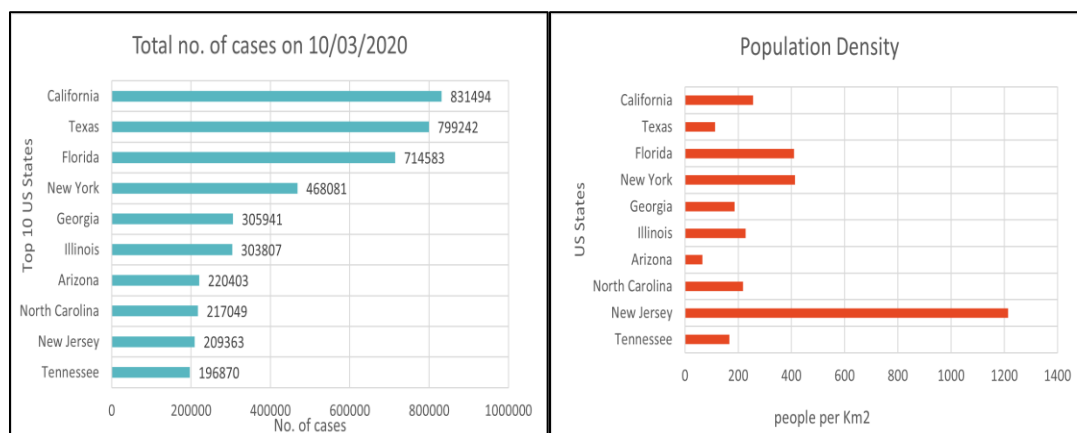


Figure 1. Top 10 U.S. COVID-19 States (left) and Their Population Density (right)

Conjecture 2: A nation's economic ability has a great influence on the fatality due to the medical treatment of patients in pandemic circumstances and a highly developed country realizes better access to health care facilities.

Figure 2(a) below shows that Nation's economy does not have a great influence on the fatality rates during the pandemic because the graph shows that in most of the cases nation's with higher economy have more fatality rates than nation's with lower economy. In case of Japan and USA, USA has more

economy than Japan, but fatality rate is less in Japan (Figure 2(a)). Similarly, in the case of India and Germany, India has low fatality rate as compared to Germany whereas Germany has higher economy. The same comparison can be made among Australia and Canada, Canada and Italy.

In addition to this, the conjecture also says highly developed nations have better health care system, but the data shows that the countries having low economy have better health care rank as compared to the countries having High Economy. From the Graph (Figure 2(b)), comparing Italy and USA, the USA has high economy almost 10 times more than Italy, but Italy has Healthcare rank much better than the USA. Similarly, Comparing France and Japan, Japan has higher economy than France, but France has world's best health care system.

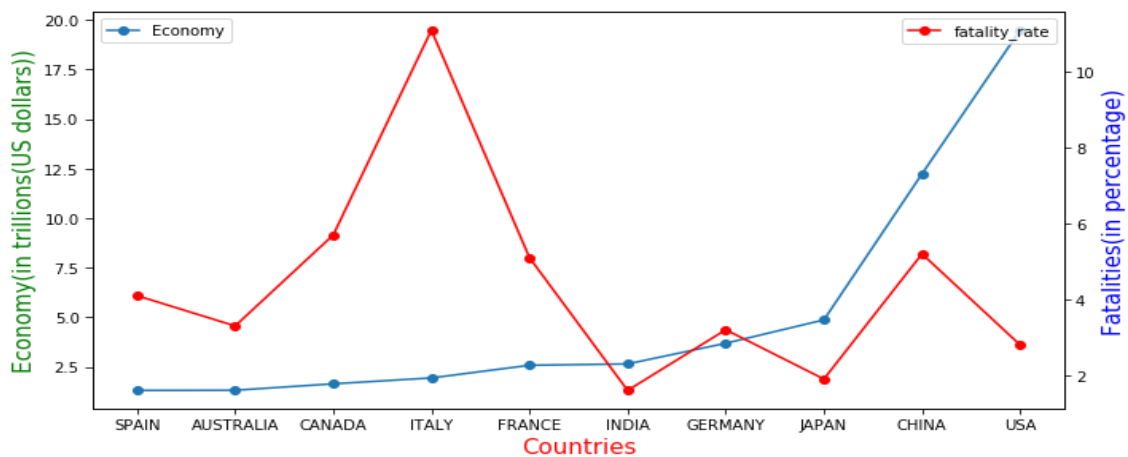


Figure 2(a). Economy trend in blue line and Fatalities in red line country wise

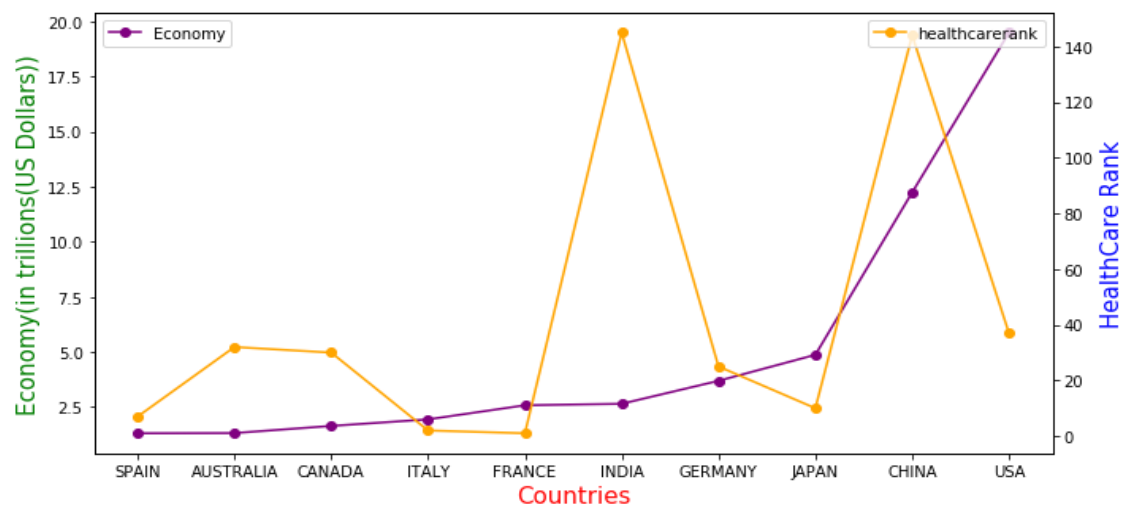


Figure 2(b). Economy trend in blue line and healthcare Rank in orange line country wise

Conjecture 3: Aggressive test results in increasing positive cases, but decreasing death rate, because it can help to identify positive cases earlier and to take action to relieve the situation.

Figure 3 below shows separate plots of total number of cases vs total number of tests and death rate vs total number of tests. Death rate is defined as the total number of deaths divided by the total number of confirmed cases. Each point on the graphs represents the data for an entire country. For total cases (plotted on the left), the linear regression trendline shows an increase in case count as testing is increased. This is in line with the posed conjecture. However, the linear regression trendline in the plot on the right does not show death rate decreasing with increasing testing. It is, therefore, possible that the causation relation is the inverse of the conjecture: increased number of cases causes an increase in testing but would not necessarily cause a decrease in death rate.

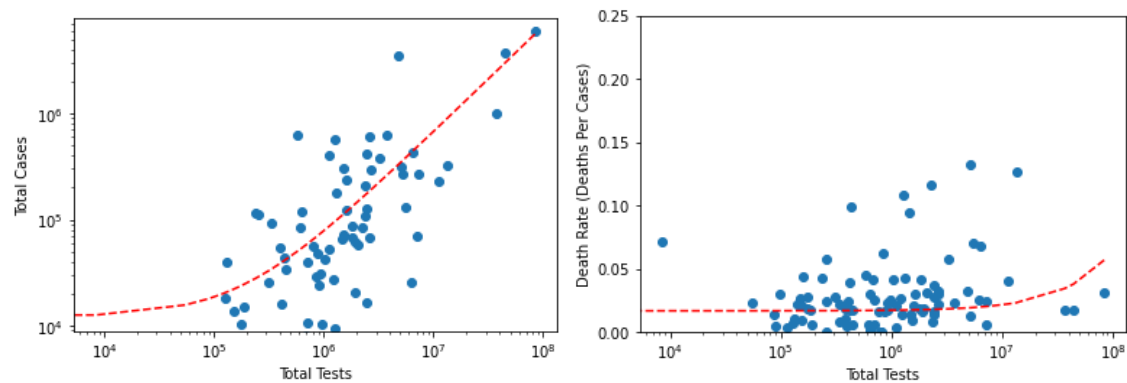


Figure 3. Total Cases vs. Total Tests (left) Total Deaths vs. Total Tests (right)

References:

1. <https://github.com/nytimes/covid-19-data.git>
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3. <https://ourworldindata.org/coronavirus-source-data>
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