Covid-19 overview

The report is presented about the results of covid-19 virus in **193** different countries, considered for **139** consecutive days (from 22nd Jan, 2020 to 8th Jun, 2020). As per the last update, overall **6883989** people got affected by this pandemic virus. Among them 3053604 (**44.36%)** have already recovered and 398030 (**5.78%**) died during this period.

Global Analysis: Appendix1 provides a brief description about worldwide Covid-19 outcomes. Majority of the plots and figures (Figure1, 2 &3) are clearly indicating the fact that from the end of **March** or the start of **April** the **recovery rate** (Total no. of Cumulative recoveries/ Total Closed Cases) is improving and at the start of the June it is more than **87%**.
Talking about **total no. of daily deaths**, the highest number is **8206** which was occurred on the period of April-May. (Figure 4) However, the death rate was going to deteriorate from the late march and at present it went down to almost **13%** of total infected cased.

Country wise Analysis: Appendix2 gives us clear picture about how to Covid-19 spread all over the world in different countries. I have used "ggmap" package in R to represent last update of the total number of confirmed cases and number of deaths in different countries based on the given longitude and latitude in the data. It is quite certain from the **Figure5** that the no. of confirmed cases in USA is more than 15,00,000 as par the data of 8th June, 2020. Moreover, other South American countries contain almost 10,00,000 covid-19 patients. In death measures (**Figure6**), America is leading with more than 1, 00,000 deaths followed by Brazil and other European countries like UK, Italy, Spain. Overall African countries contain lesser number of deaths as well as confirmed Covid-19 cases compare to the other continents like America, Europe and Asia.

Correlation results: The Government Response Stringency Index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescal ed to a value from 0 to 100 (100 =strictest response). So it is desirable that there must be a correl ation between this daily stringency index and the number of daily confirmed cases (or the no. of deaths). As the total number of countries in the data is 193, it will be very difficult to analyze the correlation for individual countries. That's why we have to merge the daily data over all countries to get an overall measure of correlation. **Appendix3** produces an overall idea about the correlation measure. We have calculated ***Pearson product moment correlation***(r) to measure the association between two continuous variables and the significance of the correlation will be visualized by the linear regression plots (**Figure7 & 8**) .Consequently, large sample **t-test** also pe rformed to check the statistical significance of the correlation measures. Briefly speaking, the cor relation between global infections per day is highly positively correlated with the average stringe ncy index per day. (**r**= 0.9205, **95% Confidence Interval**: (0.8903, 0.9427) & **p-value**<<0.001). Number of deaths per day also significantly (**p-value**<<0.001) associated with the same index with correlation measure **r**=0.9239, which practically quite understandable and focuses the positive Govt. response in this global crisis.

Note: As far as I am concerned, the data, which was provided to me, contains the columns of **cumulative** values of confirmed, recovered, deaths for each row. So to get **exact** the number of cases instead of **cumulative,** I have to use "**diff()**" function on the corresponding variables in R. And for both cases I have to exclude the last observations of the diff() output to get the desired results. Figure2, 4, 5, 6, 7, 8 and 9 are computed based on the above concept.

Appendix1

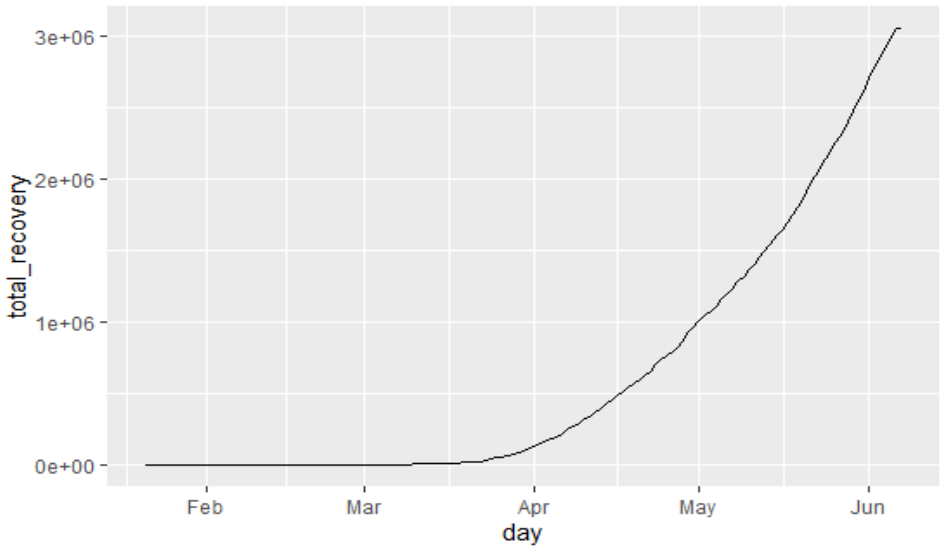


Figure1. Cumulative plot of total number of recoveries

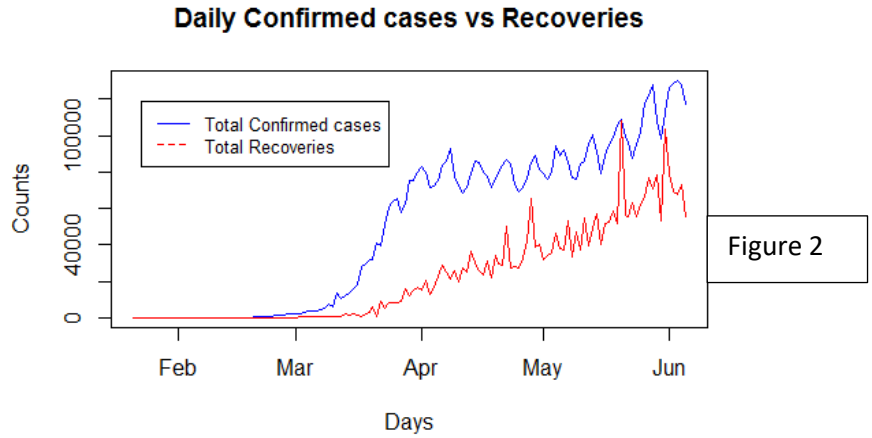


Figure 2

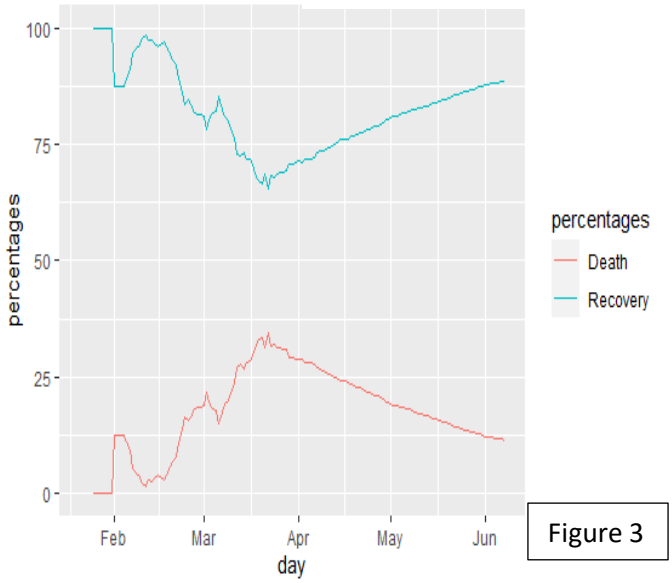


Figure 3

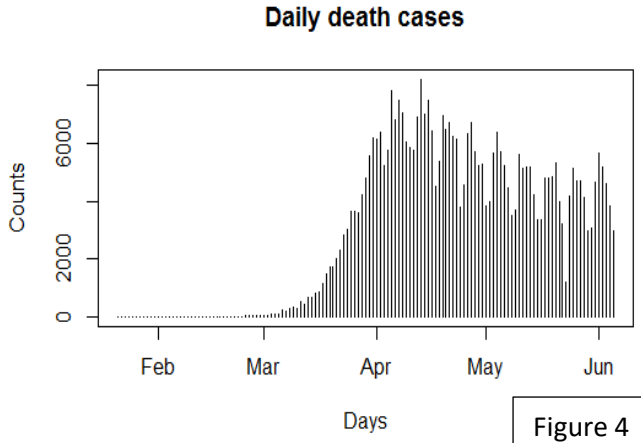


Figure 4

Appendix2

Figure5. Total number of Covid-19 infected patients in different countries

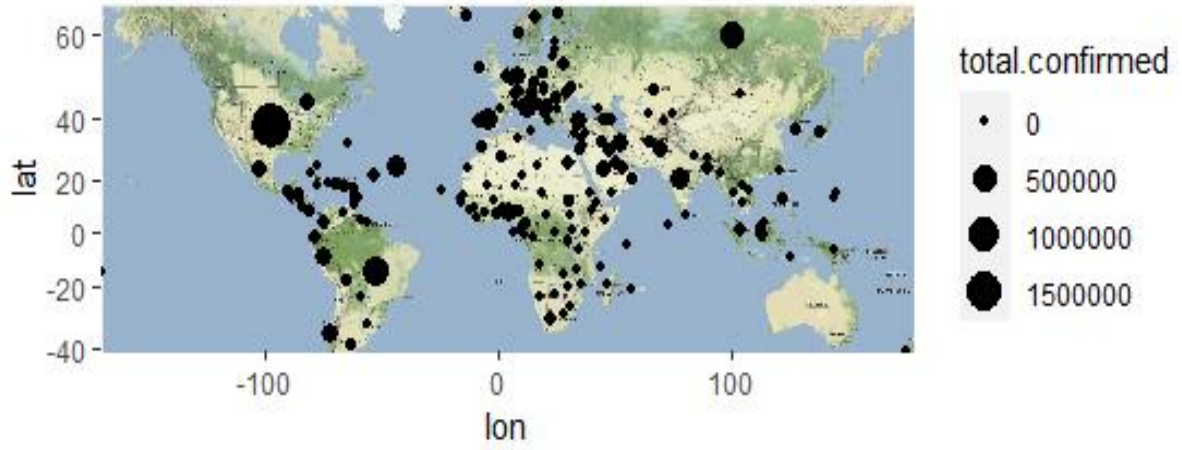
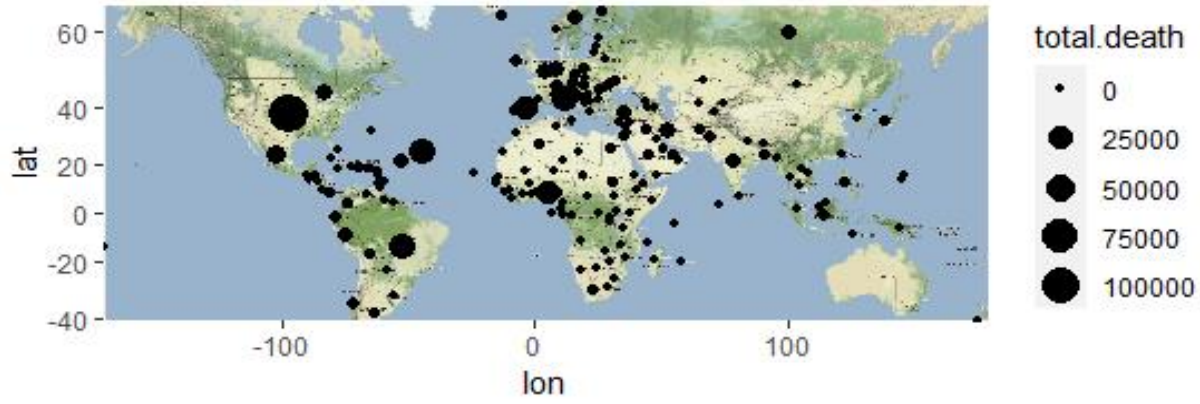


Figure6. Total no. of deaths in different countries



Appendix3

Figure7. Correlation between total infections per day with average Stringency index per day

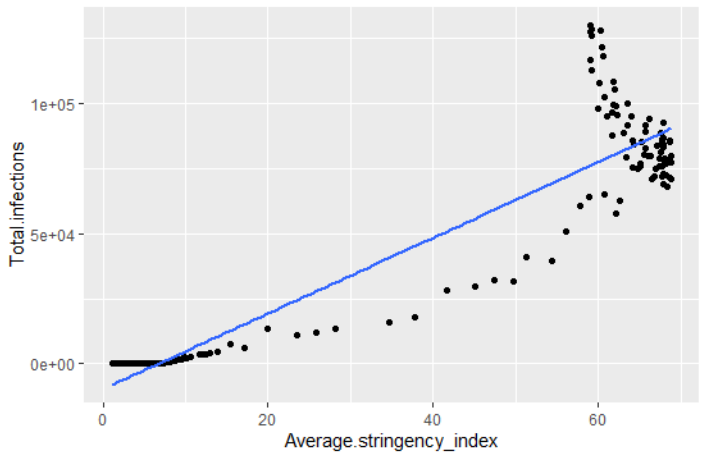


Figure8. Correlation between total deaths per day with average Stringency index per day

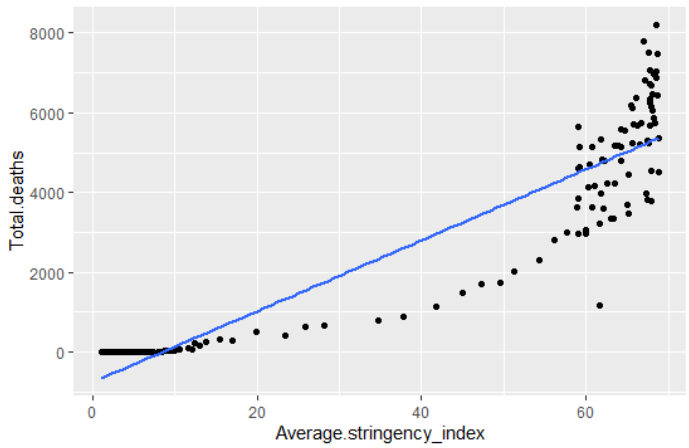


Figure9. Test to check the significance of correlation between total no. of infections (/ deaths) and stringency index

```
> cor.test(diff(Total.confirmed$confirmed)[-138],overall.stringency_index$s.index[-c(138,139)])

        Pearson's product-moment correlation

data:  diff(Total.confirmed$confirmed)[-138] and overall.stringency_index$s.index[-c(138, 139)]
t = 27.384, df = 135, p-value < 2.2e-16
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.8903024 0.9427273
sample estimates:
      cor
0.9205619

> cor.test(diff(Total.death$total.deaths)[-138],overall.stringency_index$s.index[-c(138,139)])

        Pearson's product-moment correlation

data:  diff(Total.death$total.deaths)[-138] and overall.stringency_index$s.index[-c(138, 139)]
t = 28.066, df = 135, p-value < 2.2e-16
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.8949164 0.9452002
sample estimates:
      cor
0.9239543
```