**Results**

A total of 6,166,946 million cumulative confirmed cases and 368,944 deaths had been documented globally as of May 31, 2020. United States, Brazil and Russia were the three countries with the most cases of COVID-19. Moreover, United States, United Kingdom and Italy had the most deaths of COVID-19. Distribution of worldwide total deaths (per million) of COVID-19 are presented in Fig. 1. Distribution of worldwide daily total deaths and cases (per million) of COVID-19 from January 1, 2020 to May 31, 2020 are presented in Fig. 2.

|  |
| --- |
|  |
| **Fig. 1. As of May 31st 2020, distribution of total deaths (per million) of COVID-19 worldwide** |

|  |  |
| --- | --- |
|  |  |
| **Fig. 2. Worldwide distribution of daily deaths and cases of COVID-19 in 2020** | |

**Table 1. Variance inflation factor (VIF) value to examine multicollinearity in the data set**

|  |  |
| --- | --- |
| Variables | VIF |
| Total deaths per million | 2.36 |
| Total Cases per million | 2.70 |
| Population Density (per square Kilometre) | 1.16 |
| Population ages 65 and above (% of total population) | 4.79 |
| Global Health Security Index | 3.38 |
| Gross Domestic Product (per million) | 1.46 |
| Human development Index | 15.63 |
| Social Progress index | 15.09 |
| Social Mobility Index | 19.56 |
| Worldwide Governance Indicators | 9.91 |
| Days | 1.58 |

\*\* VIF: 10

**Table 2. Overdispersion Test of the Poisson model**

|  |  |
| --- | --- |
| Dispersion ratio | 121.54 |
| Pearson's Chi-Squared | 20783.30 |
| p-value | < 0.001 |

\*\*If the dispersion ratio is close to one, a Poisson model fits well to the data. Dispersion ratios larger than one indicate overdispersion, thus a negative binomial model or similar might fit better to the data. A p-value < .05 indicates overdispersion

**Table 3. Variance inflation factor (VIF) value to examine multicollinearity in the final model (NB)**

|  |  |
| --- | --- |
| Variables | VIF |
| Total Cases per million | 1.70 |
| Population Density (per square Kilometre) | 1.42 |
| Population ages 65 and above (% of total population) | 3.19 |
| Global Health Security Index | 3.78 |
| Gross Domestic Product (per million) | 1.58 |
| Worldwide Governance Indicators | 4.51 |

\*\* VIF: 5

**Table 4. Influence of factors associated with total deaths using negative binomial regression analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | IRR | 95%CI | P-value |
| Gross Domestic Product (per million) | 1.01 | 1.01-1.02 | <0.001 |
| Population Density (per square Kilometre) | 1.01 | 0.99-1.01 | 0.736 |
| Latitude | 1.11 | 1.06-1.16 | <0.001 |
| Diabetes (% of total population) | 1.01 | 0.99-1.03 | 0.207 |
| Global Health Security Index | 0.99 | 0.99-1.00 | 0.034 |
| Worldwide Governance Indicators | 0.76 | 0.54-1.07 | 0.085 |
| Total test (per million) |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

\*\*We might be interested in looking at incident rate ratios (IRR) rather than coefficients. To do this, we can exponentiate our model coefficients. The same applies to the confidence intervals.

Ref: <https://stats.idre.ucla.edu/r/dae/negative-binomial-regression/>

**The output above indicates that,**

1. The percent change in the incident rate of total deaths is a 0.01% increase in per million people for every unit increase of total cases in per million people.
2. The percent change in the incident rate of total deaths is a 0.01% increase in per million for every unit increase of population density in per square kilometre.
3. The percent change in the incident rate of total deaths is a 11% increase in per million for every unit increase of population ages 65 and above in total population percentage.
4. The percent change in the incident rate of total deaths is a 0.01% increase in per million for every unit increase of global health security index.
5. The percent change in the incident rate of total deaths is a 1% decrease in per million for every unit increase of Gross Domestic Product in per million.
6. The percent change in the incident rate of total deaths is a 24% decrease in per million for every unit increase of worldwide governance indicators.