

Covid-19's Economic and Healthcare Correlations to Leading Affected Countries: A Statistical Assessment

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Abstract

In this study, we conducted a statistical assessment of the economic and healthcare issues of leading countries affected due to the Covid-19 pandemic. We sought to consider the pandemic's progressive components, including the total tests, total cases, total deaths, total recoveries, and the total number of active cases. We also investigated the population dispersion, health index, and annual per capita income of the target countries. Real-time information regarding the topics is gathered from reputable institutional websites across the world, then organized and analyzed using statistical techniques. Both the graphical and tabular approaches are employed to present statistical manifestations. While some countries are shown to be in the leading position for most of the target issues, some inconsistencies are observed among a few. Concerning the annual per capita income and health index of the target countries, the Covid-19 components are not very relevant, but there is a slight similarity when looking at the overall population. Interestingly, regions with very low population densities show a higher prevalence of Covid-19. No discernible trend is attained from Bangladesh's perspective.

Keywords: *Covid-19 components; Leading affected countries; Per-capita income, Health index, Population dispersion, Statistical assessment.*

Introduction

Nowadays Covid-19 pandemic is one of the obligatory issues for the interests of public health which has impacted all aspects of our life. According to the report of World Bank Blogs on December 2020, the pandemic has damaged the poor and vulnerable people the most, worldwide and menacing them to propel millions more into poverty.

People have lived on less than \$1.90/day that is reduced the number of people compared to previous decades. Covid-19 has thrust a new 88 million people into severe poverty. Due to the economic fallout, the Debt burden of all low-income countries was increased. For this reason, the World Bank and IMF had opened the Debt Service Suspension Initiative (DSSI) that was to free-up billions of dollars for those countries Covid-19 response [1].

Moreover, the economic activity sector is largely impacted by lockdown and other movability restrictions. As a result, the world economy has increased toward a downturn. The pandemic has caused a short-term financial impact and a long-term monetary impact on people around the world. To restrain the pandemic that involves quarantine, health facilities, infectious cases, and trace contacts including public health resources, human resources, and implementation costs. As a result, the healthcare that provides health facilities to contagious cases and the consumables such as antibiotics, medical supplies, and personal protective equipment expenditure cost is increased. Due to the lockdown and the danger of the outbreak, the production of the necessary goods has declined. The cash flow in the market is decreased and the revenue growth in the economy is abated. Millions of workers have lost

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their jobs because the industries are shut down. That's why the GDP of many countries' economies is impeded [1].

The health impact of Covid 19 has been disrupting the healthcare system worldwide. In the middle of October 2021, 240 million people had contracted the virus and died approximately 4.9 million from it that was a little half of the recorded global Covid-19 infections (47%) and fatalities (44%) [2]. The healthcare facilities around the world mitigates the Intensive Care Units (ICU) beds, ventilators for the patients and reduces personal protective equipment (PPE), N95 respirators, gloves, face-shields or goggles, and full suits or gowns for the healthcare workers. Most of the healthcare did not have sufficient equipment to test the disease at the beginning of pandemic. These shortages were worsened around the world for interrupted the supply chain [3].

The Covid-19 pandemic has extensively impacted on the global labor market and business sectors. At the beginning of pandemic year, consumer reduced dramatically to spent specially in retail and recreation. As a result, the restaurants, cafes, shopping centers, theme parks, museums, libraries, and movie theatres had decreased globally about 60 percent and about more than 80 percent in many European countries and about 15 million airline flights had been postponed, an average of 50,000 per day. As a result, the global passenger reduced by 80% between April and May 2020 contrasted with January and February 2020, and the consequences decline of \$244 billion to \$420 billion in airline revenues [4].

The travel industry was intensively affected; their hotel room was empty about 80 percent. As a result, the tourism sectors were no profit in 2020 and the airline cut their workforce about 90 percent [5]. This crisis has intensively affected the global labor market. According to the International Labor Organization (ILO), approximately 17.3 percent of global working hours will be reduced at the end of 2020. As a result, 495 million full-time jobs were lost.

Finally, global labor income reduced by 8.3 percent in 2020, that was a loss of USD 3.7 trillion, or 4.4 percent of global GDP [2, 6].

The pandemic had also inflicted an extreme effect on the education sector across the world. That's why, Students of schools, colleges and universities have deeply affected. By the report of United Nations Educational, Scientific and Cultural Organization (UNESCO), more than 800 million students was affected worldwide by the pandemic; 1 out of 5 cannot take part in school, 1 out of 4 cannot take part in higher education classes, and the government of more than 102 countries announced to close the educational institution nationwide [3].

The Covid-19 had affected all sectors of society and was a big loss globally. For instance, the different types of functions, such as scientific conferences, business meetings, sports events, fashion shows, and marriage parties was recommended to eschew, that was a big social impact on society. The Umrah (pilgrimage) for the crusaders to Mecca and Medina (the two holiest cities of the Islamic religion) was temporarily prohibited by the government of Kingdom of Saudi Arabia. As a result, the local and global market had affected terribly [7]. By the impact of Covid 19, there was a big loss of world economy and the expert estimated a loss of approximately 2.7 trillion US dollars [4].

Worldwide health officials and connected institutions are working on the analysis of the components connected to the pandemic Covid-19 [8]. Several studies are being conducted all around the world as Covid-19 spreads. Authors in [9] statistically presented a thorough study of the Covid-19 situation in China. The statistical analysis of importance of several Covid-19 infection-related characteristics in Saudi Arabia is provided in [10]. A regression analysis-based prediction approach for Covid-19 infections in India is portrayed in [11]. Real-time data are used to give statistical measurements of the variables influencing Covid-19 community transmission in Pakistan discussed in [12]. Based on statistical information presented in

[13], a comparison of Covid-19-related mortality in urban and rural areas of the United States is explored. Reconstructive transmission dynamics using stochastic modeling technique have recently been explored in [14], based on the entire data of Covid-19 in Thailand. Recently, a detailed analysis of the Covid-19 circumstances, connected components, socio-economic and healthcare aspects, and their descriptive analysis under the situation in Bangladesh is investigated in [15].

The investigation constituted the infection-prone regions, the scale of lethality, the feasibility of the healthcare schemes, and the socio-economic alignment to the contemporary breakout of Covid-19 [16, 17]. The treatment strategies and healthcare policies in most cases are comprised the statistical data analysis based on real-time data and their consequent outcomes. The annual per-capita income is assumed to be one of the key factors for combat against natural calamities, but it is to explore the correlation to the adequacy of empirical healthcare deftness [18]. There is a query that whether the world health index ascertains the accomplishment of the degree of conquest against the contagious Covid-19 [19].

The total number of populations and the population density are two more concerns of the community transmission of Covid-19 and scrutinizing its impact is a momentous segment of the extant studies [20].

Methodology

We have collected real-time data from various global and trustworthy sources. Desired data are sorted, summarized, and presented in tabular form for the Covid-19-related components. The individual number of Covid-19-related occurrences along with their percentages of the global total is shown for the countries which are leading those occurrences over the world. Histograms are used to represent and compare the data for the target components. For the economic and healthcare issues, global stands and numeric values are illustrated for the

countries corresponding to the objective issues. Correlations of the Covid-19-related components with the economic and healthcare issues are investigated altogether. Decisive comments are drawn afterward from the statistical assessments for each part of the study. Finally, a compact brief on Bangladesh is provided for the above-mentioned constituents.

Data Sources

Real-time data is the prime concern of this study and collecting those data is the most challenging task. Availability, authenticity, and proper structure of the data are the basic demand of statistical study. Thus, the desired data is accumulated from some global source, that are beyond the authenticity, for instance, Worldometer, International Monetary Fund, Johns Hopkins Center for Health Security, Statistics Times, and World Population Review. Those sources are utilized to collect data for Covid-19-related components, per-capita income, health index, and information on population, respectively. We have acquired the necessary data by October 20, 2022, and have organized that data in an acceptable setting for analysis and presentation.

Results and Discussion

In this section, we will illustrate the summary of the collected data for the target components and desired respective issues for the leading Covid-19 affected countries. For the Covid-19 related components, tabular form of the data will be shown for the numeric comparison, whereas the histogram and pie-chart will be included for the visual exposition. On the other hand, the tabular form along with the histogram will be incorporated for the exposure economic and healthcare issues.

Analysis of the Covid-19 Related Components

Here, the data for the total test, total cases, total deaths, total recoveries, and active cases, respectively, will be revealed by individual

tables followed by their manifestation through the histogram and pie-chart.

The scenarios of the Covid-19-related components in the leading affected countries

around the globe are disclosed in Table 01 to Table 05. Their figurative manifestation through the histogram and pie-chart are depicted in Figure 01 to Figure 10.

Table 1. Total Tests for Covid-19 in the Leading Countries

Position	Country	Total tests	Total in the world	Percentage
1	USA	1,125,210,672	6,757,550,870	16.651161
2	India	899,627,428		13.3129213
3	UK	522,526,476		7.73248306
4	Spain	471,036,328		6.97051842
5	Russia	273,400,000		4.0458445
6	France	271,490,188		4.0175826
7	Italy	250,948,476		3.71360099
8	Austria	199,308,530		2.9494196
9	UAE	193,544,897		2.86412786
10	Turkey	162,743,369		2.40831881
Rest of the world		2,387,714,506		35.3340219

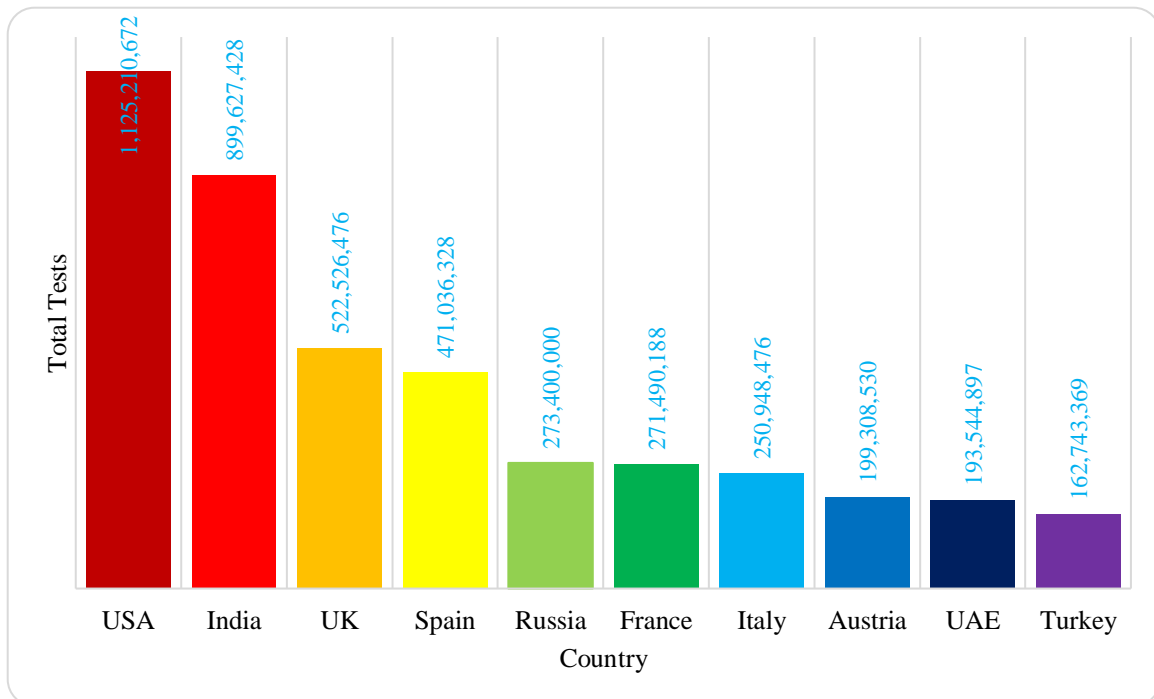


Figure 1. Histogram of Total Tests for Covid-19 in the Leading Countries

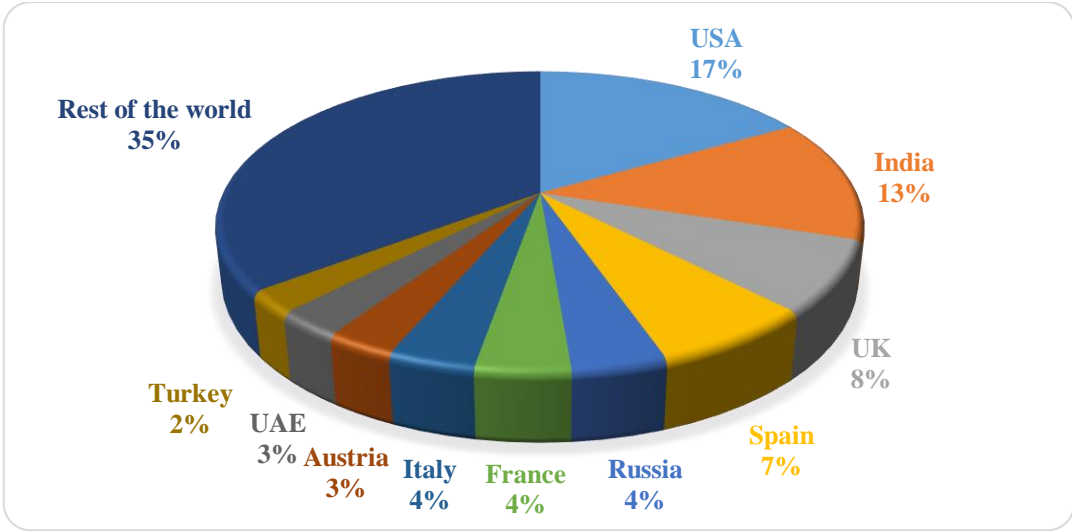


Figure 02. Pie-chart of Total Tests for Covid-19 in the Leading Countries

Table 2. Total Cases for Covid-19 in the Leading Countries

Position	Country	Total cases	Total in the world	Percentage
1	USA	99,037,439	632,027,552	15.6697977
2	India	44,638,636		7.06276742
3	France	36,475,518		5.77119113
4	Germany	35,098,062		5.55324873
5	Brazil	34,818,774		5.50905952
6	S Korea	25,219,546		3.99026054
7	UK	23,855,522		3.77444336
8	Italy	23,254,633		3.67937014
9	Japan	21,894,638		3.46419043
10	Russia	21,345,154		3.37725055
	Rest of the world	266,389,630		42.1484205

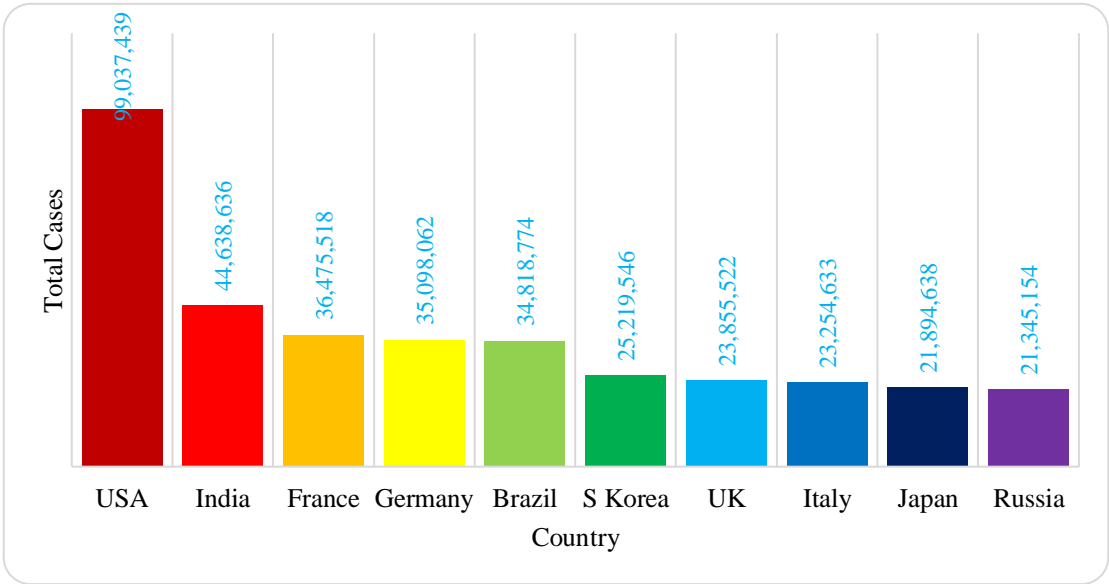


Figure 3. Histogram of Total Cases for Covid-19 in the Leading Countries

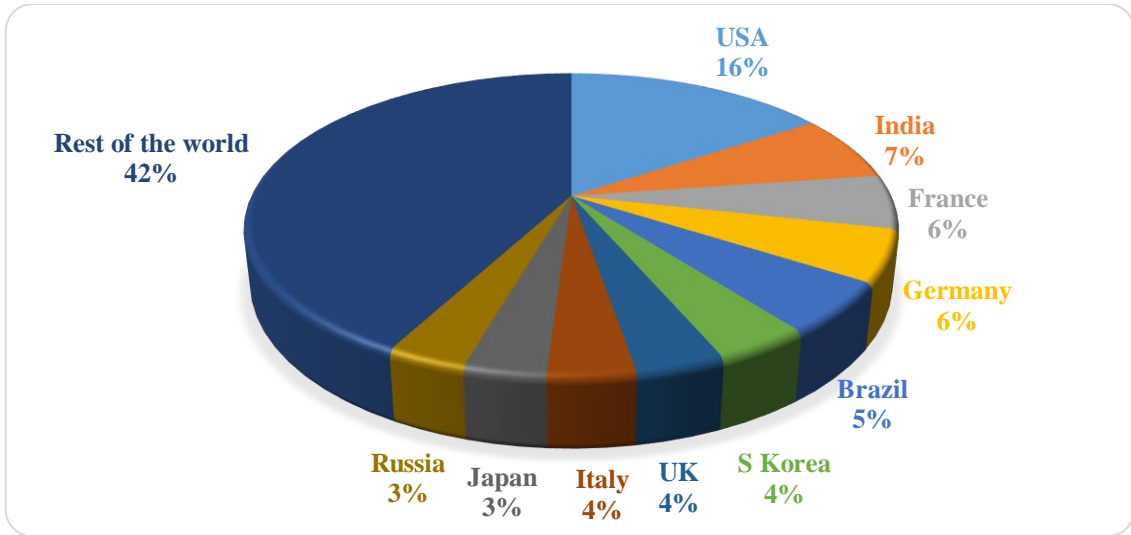


Figure 04. Pie-chart of Total Cases for Covid-19 in the Leading Countries

Table 3. Total Deaths for Covid-19 in the Leading Countries

Position	Country	Total deaths	Total in the world	Percentage
1	USA	1,092,409	6,579,793	16.6024828
2	Brazil	687,544		10.4493257
3	India	528,953		8.03905229
4	Russia	389,266		5.91608277
5	Mexico	330,305		5.01999075
6	Peru	216,877		3.29610673
7	UK	192,682		2.92839
8	Italy	178,359		2.71070838
9	Indonesia	158,380		2.40706661
10	France	156,256		2.37478595
	Rest of the world	2,648,762		40.2560081

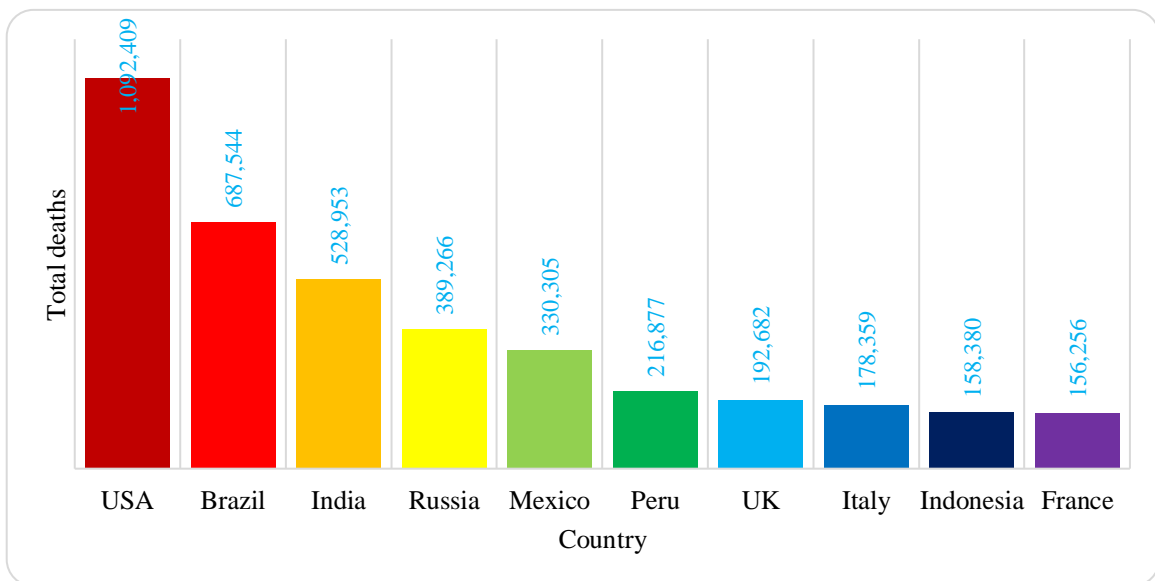


Figure 05. Histogram of Total Deaths for Covid-19 in the Leading Countries

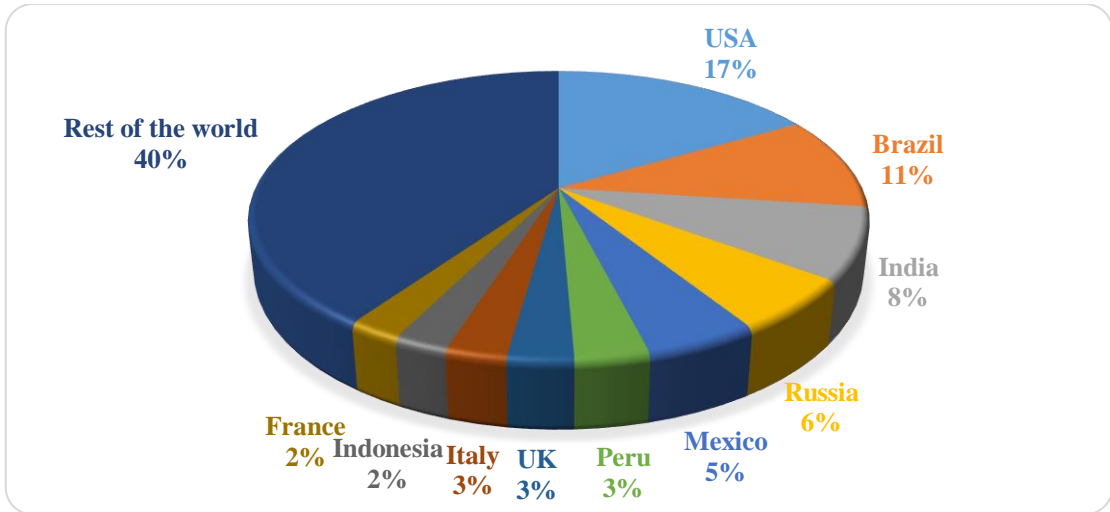


Figure 06. Pie-chart of Total Deaths for Covid-19 in the Leading Countries

Table 4. Total Recoveries for Covid-19 in the Leading Countries

Position	Country	Total Recoveries	Total in the world	Percentage
1	USA	96,395,778	610,733,490	15.7836077
2	India	44,084,646		7.21831154
3	France	35,235,024		5.76929619
4	Brazil	33,993,798		5.5660609
5	Germany	33,181,900		5.43312272
6	S Korea	24,790,712		4.05917023
7	UK	23,442,763		3.83846037
8	Italy	22,541,598		3.69090583
9	Russia	20,677,821		3.38573557
10	Japan	20,457,618		3.34968007
	Rest of the world	255,931,832		41.9056489

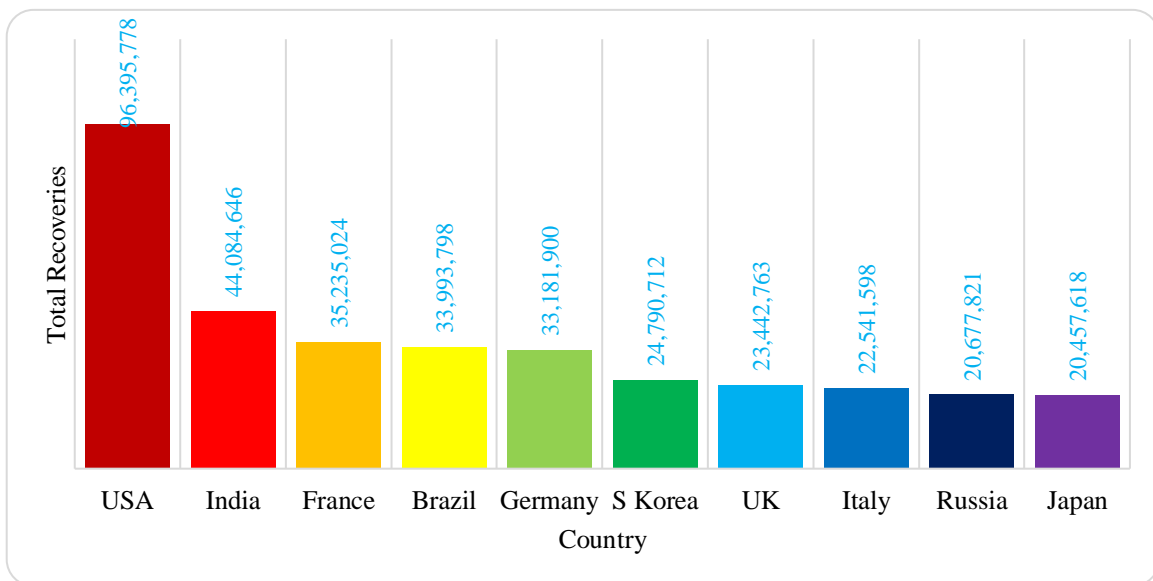


Figure 07. Histogram of Total Recoveries for Covid-19 in the Leading Countries

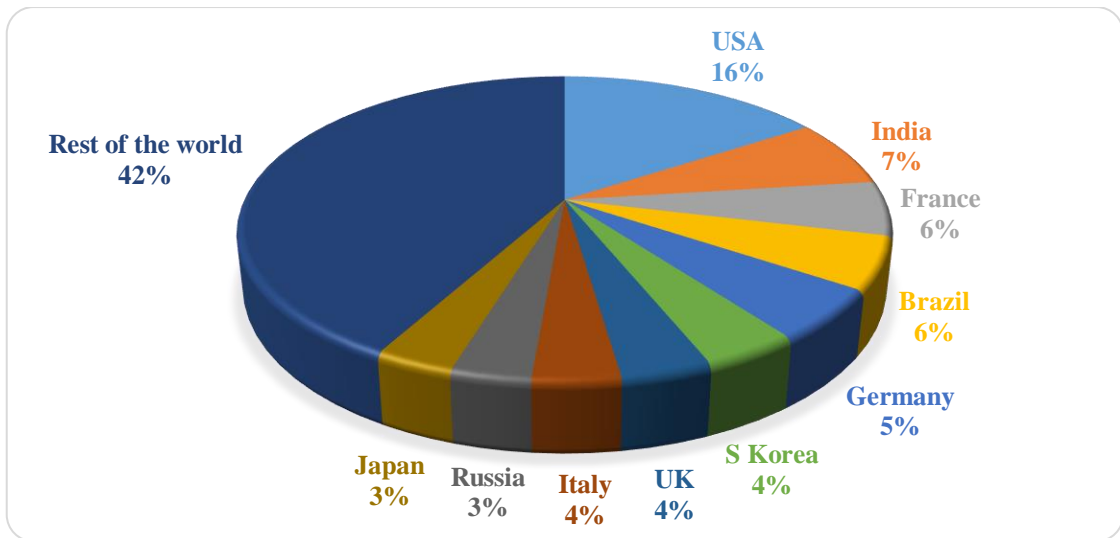


Figure 08. Pie-chart of Total Recoveries for Covid-19 in the Leading Countries

Table 5. Covid-19 Active Cases in the Leading Countries

Position	Country	Active Cases	Total in the world	Percentage
1	Germany	1,763,884	14,714,269	11.9875748
2	USA	1,549,252		10.528909
3	Japan	1,390,935		9.45296705
4	France	1,084,238		7.36861614
5	Taiwan	880,537		5.98423884
6	Poland	878,491		5.97033397
7	Vietnam	852,389		5.79294153
8	Italy	534,676		3.63372452
9	S Korea	399,912		2.71785163
10	Mexico	396,714		2.69611763
	Rest of the world	4,983,241		33.8667249

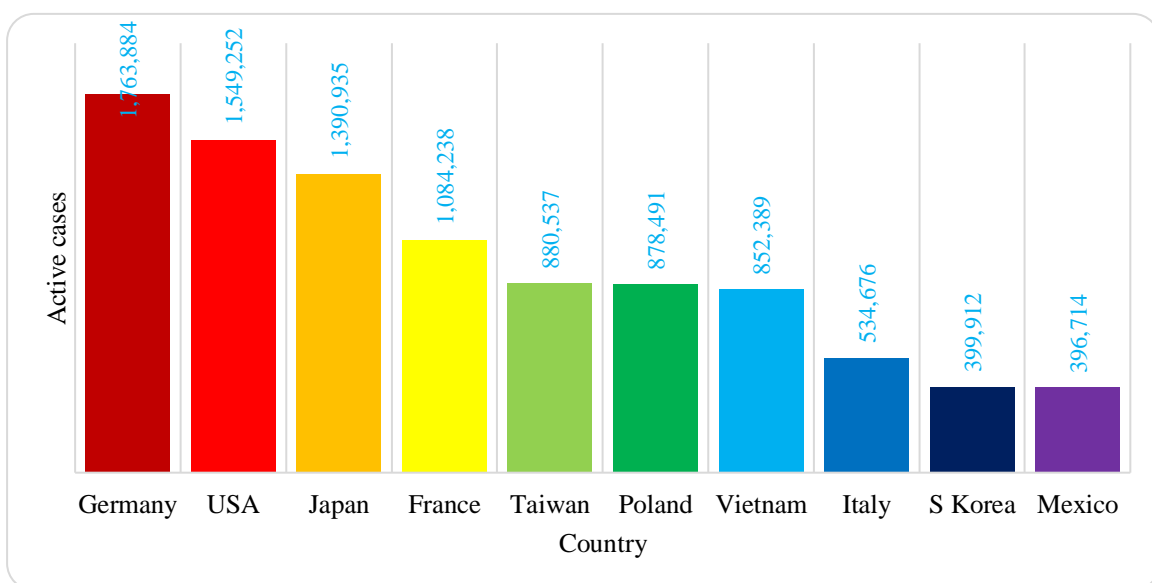


Figure 09. Histogram of Total Tests for Covid-19 in the Leading Countries

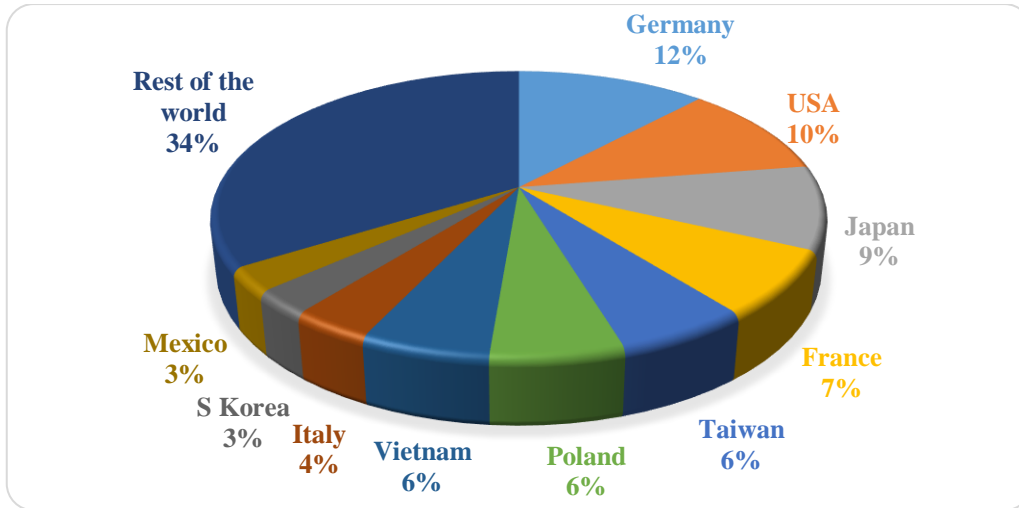


Figure 10. Pie-chart of Covid-19 Active Cases in the Leading Countries

From representation of the collected data, it is obvious that the United States of America (USA) secured the superior position for the total number of tests, cases, deaths, and recoveries, whereas Germany at the top in active cases followed by USA. India followed the USA for the total number of tests, cases, and recoveries, but Brazil did this for the total number of deaths having India just behind them. France placed 3rd for total cases and recoveries, whereas the United Kingdom (UK) and Japan hold the same for the total number of tests and active cases, respectively. The ten leading Covid-19 affected countries acquired about 65%, 58%, 60%, 58%, and 66% of the total number of tests, cases, deaths, recoveries, and active cases, respectively, in the world. So, it is evident that

about three-fifths of the Covid-19-related components commenced in those countries.

Analysis of the Economic and Healthcare Issues

Detailed analysis of the data on the economic and healthcare issues will be discussed here. We aim to discuss the per capita income, health index, total population, and population per square kilometer in the leading countries affected by the Covid-19. Data of economic and healthcare issues are delineated in Table 06 to Table 09 for the above-mentioned countries. Figurative exhibitions of those issues are portrayed via the histogram in Figure 11 to Figure 14.

Table 6. Per capita Income (in Thousand USD) in the Leading Countries

Position	Country	Per capita Income (in Thousand USD)
7	USA	75.18
15	Austria	52.06
19	Germany	48.40
20	UAE	47.79
22	UK	47.32
25	France	42.33
29	Taiwan	35.51
30	Japan	34.36
31	Italy	33.74
33	S Korea	33.59
40	Spain	29.20

56	Poland	19.02
67	Russia	14.67
75	Mexico	10.95
81	Turkey	9.96
85	Brazil	8.86
91	Peru	7.00
115	Indonesia	4.69
119	Vietnam	4.16
140	India	2.47

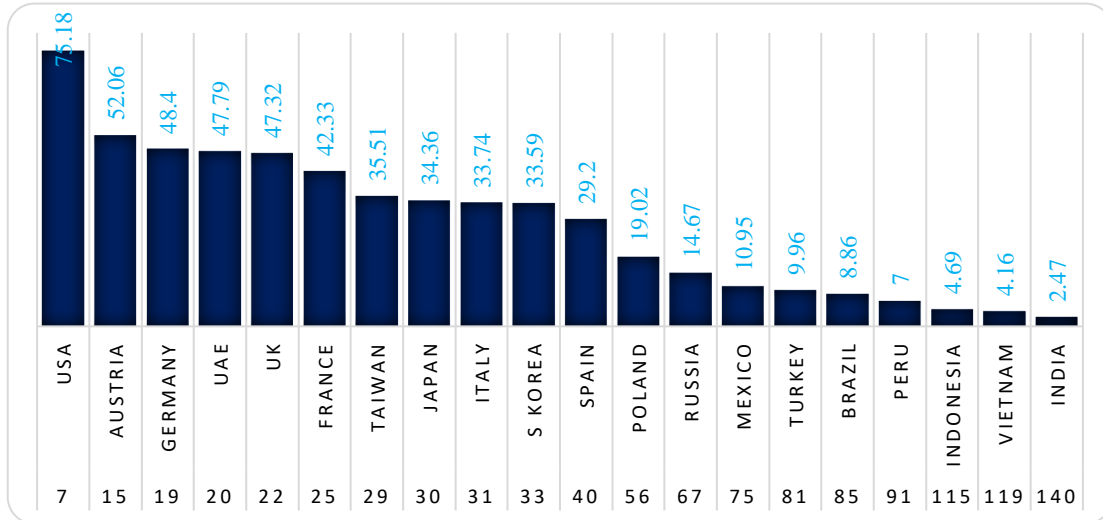


Figure 11. Histogram of Per capita Income (in Thousand USD) in the Leading Countries

From the per capita income scenario of the observed countries, it is seen that the USA, Austria, and Germany are at the top with 7th, 15th, and 19th position, respectively, whereas

Indonesia, Vietnam, and India are at the bottom with 115th, 119th, and 140th position, respectively.

Table 7. Health Index in the Leading Countries

Position	Country	Health index
1	Germany	78.9
2	S Korea	75.6
3	Russia	73.5
7	USA	70.5
11	UK	65.1
12	Japan	63.8
19	Mexico	57.7
23	France	56.3
36	Spain	49.2
38	Brazil	48.4
49	UAE	44.6
50	Taiwan	44.5
52	Turkey	42.5

59	Austria	41.4
60	Peru	39.7
71	Indonesia	37.2
74	India	36.9
86	Poland	34.8
90	Italy	32.9
111	Vietnam	22.5

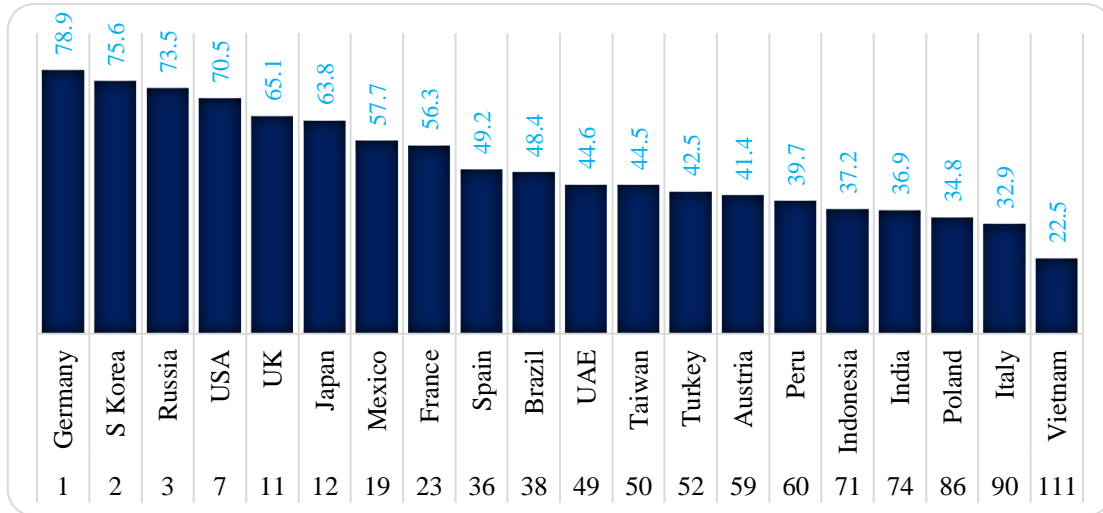


Figure 12. Histogram of Health Index in the Leading Countries

In the case of the health index, Germany, South Korea, and Russia have the 1st, 2nd, and 3rd, respectively. But Poland, Italy, and Vietnam are at the 86th, 90th, and 111th, respectively.

Among those statistical aspects, it is apparent that transmission of Covid-19 is not conspicuously connected to financial ability or the healthcare infrastructure.

Table 8. Total Population (in Million) in the Leading Countries

Position	Country	Total population (in Million)
2	India	1444.21
3	USA	332.92
4	Indonesia	276.36
6	Brazil	213.99
9	Russia	145.91
10	Mexico	130.26
11	Japan	126.05
15	Vietnam	98.17
17	Turkey	85.04
19	Germany	83.90
21	UK	68.21
22	France	65.43
24	Italy	60.37
28	S. Korea	51.31
31	Spain	46.75

39	Poland	37.80
44	Peru	33.36
57	Taiwan	23.86
93	UAE	9.99
98	Austria	9.04

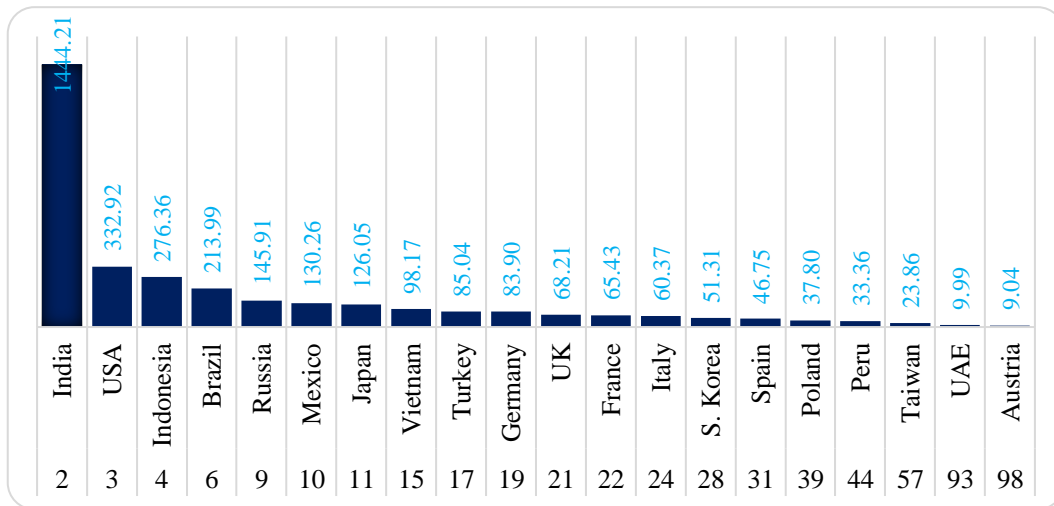


Figure 13. Histogram of Total Population (in Million) in the Leading Countries

The total population was observed worldwide and found that among the countries in the target classes, India, USA, and Indonesia at 2nd, 3rd, and 4th places, respectively, whereas the bottom layer

countries Taiwan, United Arab Emirates (UAE), and Austria are at 57th, 93rd, and 98th places, respectively.

Table 9. Population Per Square Kilometer in the Leading Countries

Position	Country	Population per square kilometer
17	Taiwan	673.7
25	S. Korea	527.7
29	India	468.7
39	Japan	345.8
44	Vietnam	316.6
51	UK	281.9
61	Germany	240.7
74	Italy	205.2
82	Indonesia	152.6
95	Poland	123.4
97	UAE	119.5
98	France	119.5
104	Turkey	110.5
106	Austria	109.7
121	Spain	93.72
149	Mexico	67.01
177	USA	36.39

187	Peru	26.06
190	Brazil	25.6
217	Russia	8.91

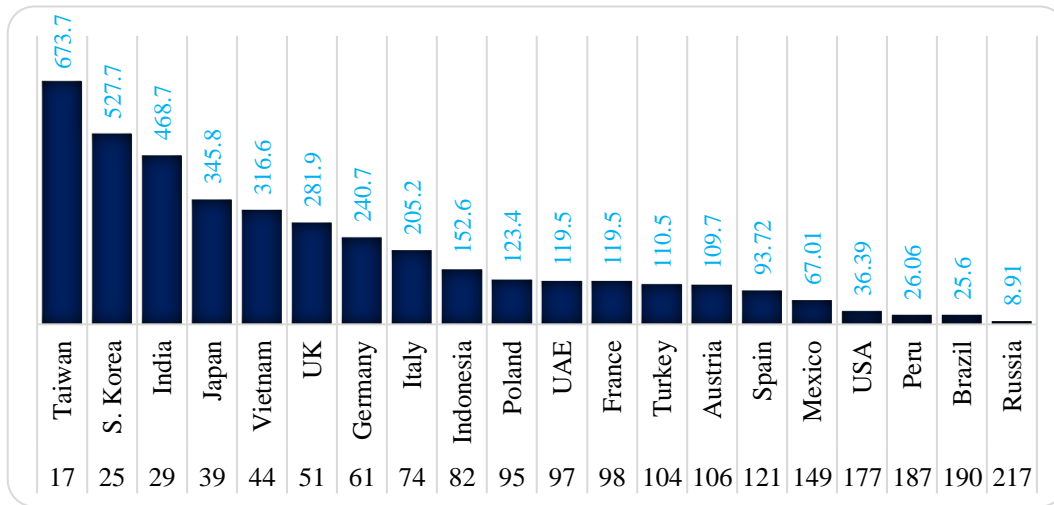


Figure 14. Histogram of Population Per Square Kilometer in the Leading Countries

For the population per square kilometer, Taiwan, South Korea, and India attained 17th, 25th, and 29th global stands with 673.7, 527.7, and 468.7 people, respectively, whereas Peru, Brazil, and Russia stand at 187th, 190th, and 217th with 26.06, 25.6, and 8.91 people, respectively.

Thus, it can be postulated that Covid-19 spreading is somewhat correlated to the total population but oppositely relational with the population density.

Regression Analysis of the Target Ingredients

To make comprehensible relations among the target ingredients of Covid-19, statistical analysis via correlation is indispensable. Since the information of the countries for all those ingredients are not numeric and scales of measures are dissimilar, rank correlation is the only way to explore their interaction. Table 10 interprets a synopsis of the rank correlations of the Covid-19 related components with economic and healthcare issues.

Table 10. Rank Correlation of the Target Ingredients

	Per Capita Income	Health Index	Total Population	Population per square kilometer
Total tests	0.0424	0.3455	0.6000	-0.0606
Total cases	0.2364	-0.0546	0.3697	0.0546
Total deaths	-0.0303	0.3333	0.5879	-0.3939
Total recoveries	0.1152	-0.1030	0.4182	-0.0788
Active cases	0.8182	0.4061	0.2121	-0.0667

From Table 10, it is perceptible that Covid-19-related components are strongly connected to the total population and weakly connected to the per capita income. With some irregularities,

those components are very weakly connected to the health index and the connection with the population per square kilometer is negative with a very tiny magnitude.

Situation of the Target Ingredients in Bangladesh Perspective

Now, the situation of the target ingredients will be scrutinized in the perspective of

Bangladesh. The following Table 11 is the indicator of the aforesaid ingredients for Bangladesh.

Table 11. Situation of the Target Ingredients in Bangladesh Perspective

Component	Position	Position
Total tests	14962375	51
Total cases	2033662	44
Total deaths	29411	35
Total recoveries	1976285	32
Active cases	27966	42
Per capita income	2.73 thousand USD	139
Health index	35.6	81
Total population	166.30 million	8
Population per square kilometer	1278	10

From the perspective of Bangladesh, it can be said that the situation of Covid-19 ingredients has no conspicuous interconnections but rather some scattered positioning.

Conclusion

We gathered and statistically examined real-time data arising from the Covid-19-related components, then explained the results drastically. The interrelation between the per capita income and health index is not indisputably revealed except in the active case that is positively correlated with the target issues. The link-up between the total population and Covid-19 is only mildly positive, but the correlation between the population density and the total population is somewhat negative. In Bangladesh's scenario, there is no discernible trend.

We can assume that people in high-income countries are significantly affected due to the extraordinary dependence on their productivity, and overconfidence in their healthcare facilities acted negatively for them as well. Overpopulated countries faced noticeable

troubles due to the lack of isolation and quarantine feasibilities, whereas less population density encouraged the concerned people to free movement and enhanced the transmission the Covid-19 among them.

Data Availability

The data used in this work can found below: <https://github.com/mu2mahmud/Statistical-assessment-of-the-Covid-19-related-ingredients>.

Consent

Informed consent was obtained from all individuals included in this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

All authors have accepted responsibility for the entire content of this article and approved its submission.

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