COVID-19 STATISTICS and ANALYSIS
Data as of 19th April 2020
Cluster Analysis as of 13th April 2020

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Latest Statistics on the COVID-19 Pandemic and Related Discussions

This document summarizes the statistics on the COVID-19 pandemic. It is updated regularly, often daily, and is circulated to all interested parties. More charts, tables, text and opinions will be added over time as information becomes available.

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2. SCOPE OF THIS REPORT AND INTENDED USE

2.1. Data Source, Reliance, Limitations and Responsibility

The data contained in this report is publicly available through the John Hopkins University Center for Systems Science and Engineering (https://systems.jhu.edu). The data can also be corroborated against a multitude of other sources. Eckler and QED take no responsibility for the accuracy of the data. We have simply distilled the data and displayed it visually in various charts. Our source data currently contains over 220,000 datapoints.

2.2. Intended Users of This Report

This report is intended for professionals familiar with statistical analysis such as actuaries, statisticians, and business analysts. It is expected that such professionals will understand the limitations of statistical analysis such as the credibility of the data as a function of the number of datapoints observed. For instance, if the number of deaths in one country has increased in 24 hours from one to two, implying that the rate of death has doubled overnight would be the wrong conclusion.

2.3. Purpose of This Report

The amount of available data online and from other direct sources is vast. Very often, the data is simply delivered in raw format and not suitable for easy consumption to quickly discern its meaning. The main purpose of this report is to condense the available data into a format that is easy to understand and from which to make comparisons between countries and regions.

Since the data is only as good as its source and how it was gathered, readers should remain critical as to the reliability of the data. For instance, if Country A has relatively more confirmed COVID-19 cases than Country B, it does not necessarily imply that the real rates of infection are higher for Country A. It may be that Country A has done twice as many COVID-19 tests than Country B, and that consequently the real rates of infection are in fact closer to one another than first thought.

The same caution should be extended to the Case Fatality Rate (CFR). The CFR is defined as the number of deaths due to COVID-19 to the number of confirmed COVID-19 cases. If Country B under-reports its confirmed COVID-19 cases because it has conducted fewer COVID-19 tests, the CFR will of course appear to be larger than what it should be had all cases been reported accurately and in a consistent matter as other countries.

Current data does not give any indication of the extent of under-reporting.

2.4. Assumptions and Methodology, and Rationale

This is not an actuarial report, such as a pricing or valuation report. There are no actuarial assumptions made to derive the results. The methodology is simple in that the data are simply analyzed and displayed in graphical form. We make no projections of future rates of infection, crude death rates, or CFRs, unless it is clearly defined. The latter would require a certain and defined methodology.
2.5. Use of this Report

This report and the information it contains should not be used in isolation of other findings and research. The COVID-19 pandemic is continuing to evolve and will likely be with us as a Pandemic for a few more months, at which time it may be under control but still present a threat in one form or another. Until the general population develops some natural immunity to it or the health services develop a vaccine and an effective cure for the virus, we will need to consider this risk in life and health insurance.

The findings in this report cannot be used blindly to develop insurance products. They may form the basis to develop insurance products, but this endeavour must be performed by qualified actuaries. Eckler and QED have qualified actuaries on staff to help insurance organizations to develop a deep understanding of the findings and use them to design and price insurance products. In fact, in April 2020, Eckler has already developed such a product for one of its life insurance clients.
The COVID-19 pandemic is an event that most of the 7.8 billion people on earth will remember for the rest of their lives. It is unprecedented in that manner alone. The world of course has seen other pandemics, such as the Black Plague in medieval times and the Spanish Flu in 1918. There have been more recent pandemic events as well, including SARS, H1N1 and MERS-CoV.

So why is COVID-19 suddenly so scary? We are not epidemiologists and do not claim to make sense of the virus, how it spreads and so forth. We will leave this to the specialists. However, we are actuaries and we can scrutinize data to make sense of it and determine some truths and some misconceptions.

To start this discussion, we will make a comparison between various pandemics or pandemic-like situations. When exact statistics were not available, we used averages. The exact number is not really that important because the scale of the differences is so large.

The graphs on the next page show the comparison of the infection rates and the crude death rates per million, respectively. The crude death rate per million is simply the number of deaths divided by the world population at the time, and similarly for the infection rates.

The data in this section, as well as the subsequent sections until we report specifically on the Americas and other regions, are not necessarily the latest data available. They were taken at one point in time in order to illustrate the data in a graphical format to explain how to read the graphs.
Chart 1

COVID-19 - INFECTIONS Rates (01-Apr-2020 - Day 70) - Eckler1 — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

Chart 2

COVID-19 - CRUDE DEATH RATE /1,000,000 (01-Apr-2020 - Day 70) - Eckler1 — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd
The overall infection rate of COVID-19 as of the date shown on the graph (Chart 1) is 0.0120% (As of April 13th, it was 0.0246%). Comparatively, the Swine Flu in 2009-10 had an infection rate of 15.4% or 1,283 times greater. Of course, the COVID-19 pandemic is not over yet, and has not reached its peak. Nonetheless, matching the 1,283 factor of Swine Flu may be a tall order, especially given the extent of government reactions, such as lockdowns, intended to limit the spread of the virus.

The crude death rate per million (Chart 2) compares at six per million for COVID-19 (15.33 as of April 13th) versus 53.31 per million for the Swine Flu, a factor of 8.9. Compared to the Hong Kong Flu at 281, it is a factor of 47. The Avian Flu has a comparative factor of 115. On the other hand, the final death rates for COVID-19 are still unknown. So, one might wonder, why does the world need to shut down due to COVID-19?

3.1. Case Fatality Rate

The culprit is the Case Fatality Rate or CFR. The CFR is basically the death rate “if” you get infected in the first place. The following graph shows us the comparison:

[Chart 3: COVID-19 - CASE FATALITY RATE (01-Apr-2020 - Day 70) - Eckler1 — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd]

Again, the data presented in these first few charts is intended for demonstration purposes only and may not always reflect the most current data available.
If a person gets infected with COVID-19, there is an overall 5% chance that they will die as a result. The Swine Flu, the Hong Kong Flu, and the Avian Flu had a corresponding death rate of 0.03%, 0.20%, and 0.21%, respectively. The ones who died may have already been compromised from a health standpoint. The CFR for SARS was large at 9.56%, but the infection rate was actually 0.0001% (1 in a million). MERS-CoV was deadly at 34%, but it was not a global pandemic and localized in the Middle East, and with an infection rate of 0.00003% (3 in a million).

Moreover, the COVID-19 CFR shows huge differences between countries and continents. For example, the CFR in Italy is almost 12.5% compared to Germany at 1.75%. The difference is hard to explain and many theories are circulating on the Internet. One recent theory involves the prevalence of vaccinations for other diseases, or the possibility of different strains of the virus. Other possibilities are different age structures of the population, with Italy being noted as having a relatively high average age, or the speed with which a country’s public health officials intervened. Regardless, a 12.5% chance of dying, if infected, is a poor prospect.
3.2. The Ultimate Risk

The ultimate risk in a pandemic scenario such as COVID-19 is death. Beyond death there is no return. If the infection rate is high and the CFR is low, then it is mainly an annoyance, like having the common flu every year, or a simple cold. If infected individuals are expected to be cured in a reasonable period of time, it may still be serious but not fatal in most cases. If the infection is very low and the CFR very high, like SARS with an infection rate of one in a million and a CFR of 9.56%, it is bad odds for those infected but is not a worldwide pandemic.

However, if the infection is reasonably high, like COVID-19 at about three times of infecting others than the common flu is, and the CFR is high at least in countries like Italy, Spain, and France, then this results in rational and reasonable panic. Hence, the movement by countries to initiate social distancing. Social distancing and containment are implemented to flatten the curve of infection. This means the total infections will be somewhat longer in emerging but potentially lower in severity, helping to reduce the strain on the healthcare systems and hopefully allowing them to cure more people to reduce the CFR.

This is where the following graph comes in. It shows the severity of the infections in function of the number of days it took to get there.

This graph shows that China was able to flatten the curve at about day 34 (from January 22nd), South Korea managed it as well around day 39, albeit at a much lower level. However, the rest of Asia continues to increase.
Let us examine the situation in Europe?

In this graph we see Europe shooting up exponentially. Spain and Italy are contributing to this trend at a rapid rate. France and the United Kingdom are not far behind. Let us compare this to the Americas, particularly with the US with 331 million people.
The response from the US has been relatively slow when compared to some European countries. The rate of infection is also increasing exponentially. Because of its large population, it is possible that the number of infected people may reach one million. Canada has not yet reached the exponential growth. And the rest of the countries in the Americas are not yet as affected.

3.3. Some of the Other Risks

Some researchers have found that people who have recovered from COVID-19 have lung damage, which could turn out to be permanent. Others have observed that some patients may have neurological symptoms such as loss of taste or smell.

For life insurers, there may be potential for long-term financial risks related to morbidity risks rather than mortality risks.
4. RELIABILITY OF DATA AND PROJECTIONS

There have been many efforts to project the infections and deaths under COVID-19, generally with very large confidence intervals around the best-estimate. For instance, on April 3rd, the Ontario government released projections of anywhere from 3,000-5,000 to 80,000-100,000 deaths before the end of the pandemic. Whereas projections such as these might invoke public health responses, from an actuarial point of view, making projections that will be more than ±10% to ±20% is highly speculative, and in our view, not yet fit for purposes such as solvency projections or own risk analyses. In fact, we would rather recommend scenario analysis. Public health experts, and others with epidemiological modelling skills, do not know exactly how this will pan out at the end. Nor do we. We can take Europe as an example, where the virus may have peaked and consider the efficacy of mitigation strategies such as lockdowns:

Chart 8

The infection rate goes from a low of 0.0117% for Poland and 0.0168% in Greece to a high of 0.4542% in Luxembourg and 0.2923% in Spain. There might of course be some under-reporting. But even so, there is a large difference.
Here we speculate on what we believe to be “true” reporting, albeit arbitrary reporting, and examine the “ratios” of the infection rates in Europe shown in the following graph, compared to Europe as a whole (the y-axis shows this ratio).

Let us assume that we trust the reporting of some countries more than others, in particular the European countries shown above.

The above numbers, excluding Europe as a whole, have an average of 1.52 infection rate and a standard deviation of 1.19. With this type of relationship, the data cannot be relied upon to represent Europe as a whole. The ratios of the rates of infection in Europe of “reliable” countries vary from a low of 0.13 in Poland to a high of 5.03 in Luxembourg, as compared to the average of Europe, a ratio of 37 to 1. It is clearly not a matter of the virus alone but more importantly the countries’ readiness and reaction to the virus. Consequently, at this stage, we reckon that it is impossible to reliably project the infection rates, let alone the CFR, without taking into account some kind of multiplier or index based on the country. This multiplier or index has, at this stage, not been identified.
Turning to death rates, some observers have noted that the increase in deaths occurring in recent weeks cannot all be attributed to COVID-19. Instead, in some cases, more general respiratory ailments may be the cause. Thus, even the death rate figures presented should be treated with some caution by anyone who wishes to use these figures.

The COVID-19 pandemic is being tracked in a huge amount of detail. We try to make sense of it in the next sections, but before the data is put to use, some potentially serious shortcomings must be acknowledged.

The following sections contain analyses of the COVID-19 data using clustering analysis and regression modelling. The document then provides charts for different regions, namely The Americas, The Caribbean, Europe, Asia and Africa.
5. CLUSTERING ANALYSIS

A relatively large amount of data covering infection rates and Case Fatality Rates for many countries is now available. How can we make sense of this mass of data? In this section, we try to provide some answers based on clustering analysis. Clustering analysis tries to group similar observations into the same groups, and then by understanding the general characteristics of each group, we can get a better sense of the underlying data, and compare similar (and different) countries.

We present two sets of analysis in this section. The first analysis considers the last 20 days of the pandemic and clusters together countries with similar rates. The second analysis considers the data since countries first recorded 10 infections, which, in some countries, was over two months ago. For the technical details of how this analysis was produced, please contact the authors of this report.

5.1. Analysis 1

In Chart 10, we present an analysis of the infection rates for the past 20 days. The infection rates were “distilled” in a simpler two-dimensional representation. These points are then clustered into groups which contain nearby observations. Representative infection rates for each cluster are shown in Chart 11 and the mean for each cluster is shown by a dashed line. See the annotations on the plots for interpretation.
Chart 10

PCA and K-means analysis of last 20 days of infection rates

See caption for interpretation

As one moves from the left of the chart to the right, the countries represented have reported more cases per 1 million people.

As one moves from the top of the chart to the bottom, the countries represented have increasing cases over the past 20 days.
Chart 11
Mean infection rates and representative country infection rates in each K-mean cluster
See caption for interpretation

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Of note are clusters 3 and 6, which contain countries with the most advanced spread of COVID-19 among all countries. Cluster 8 contains countries with the highest infection rates. Other clusters contain countries with lower infection rates than clusters 3 and 6.
5.2. Analysis 2

In Chart 12, we present an analysis of the infection rates for all countries that have registered 10 or more infections. Similar to Analysis 1, the infection rates were “distilled” into a simpler two-dimensional representation. These points are then clustered into groups which contain nearby observations. Infection rates for each country are shown in Chart 13, split by the clusters shown in Chart 12, with representative countries labelled in this chart. Chart 12 is harder to interpret by itself, but we can gain some insight from Chart 13. See the caption of Chart 13 for this interpretation.
Chart 13

Country infection rates and representative labels in each K-mean cluster since 10 infections were recorded

See caption for interpretation

K-mean cluster

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Countries are color-coded according to the K-mean cluster they belong to:

- **Red**: High growth rate
- **Green**: Moderate growth rate
- **Blue**: Low growth rate
- **Purple**: Very low growth rate

**Groups and Analysis**

- **Group 1**: Countries that have had an extended period of sluggish growth in cases, including the United States, but have subsequently now experiencing higher growth.
- **Group 2**: Countries that have seen a steady rise in cases, mostly from day 1 and are now leveling off somewhat.
- **Group 3**: Countries that have seen a sharp increase in cases, mostly from day 1 and are now leveling off somewhat.
- **Group 4**: Countries that have seen an initial rise in cases, followed by a decline, and are now facing a renewed increase.
- **Group 5**: Countries that have seen a steady increase in cases, mostly from day 1 and are now leveling off.
- **Group 6**: Countries that have seen a sharp increase in cases, mostly from day 1 and are now leveling off.
- **Group 7**: Countries that have seen an initial rise in cases, followed by a decline, and are now facing a renewed increase.
- **Group 8**: Countries that have seen a steady increase in cases, mostly from day 1 and are now leveling off.

Days since 10 infections
6. CORRELATION ANALYSIS

6.1. Infection Rates and Case Fatality Rate

Let us consider the correlation between infection rates and CFRs. In other words, if a country reports more infections, does that imply that more deaths will follow? Although intuitively the answer is yes, the numbers say otherwise. If we examine closely the infection rate and CFRs datasets, it is likely that reporting of death rates is relatively more accurate than infection rates. For example, an unintentional under-reporting of infection rates could occur in a country that has performed a large number of COVID-19 tests, focusing on people with symptoms of COVID-19. Considering that many cases are reported to be asymptomatic or with only mild symptoms, the persons affected may just stay at home and not report their case. In short, if you do not test, you cannot report.

On the other hand, if a person dies due to complications of COVID-19, it is more likely that they would have been diagnosed and in a hospital, or were diagnosed after the fact. Although, even then there are reports that some deaths due to respiratory ailments similar to COVID-19 have not been reported. In a sense, death rate reporting may be less misleading than infection rate reporting which probably varies from relatively accurate in some cases to quite inaccurate in others. The following chart illustrates clearly the lack of correlation, in this case for Europe with a $R^2$ factor of only 0.0336, showing that reported death rates are not easily predicted by reported infection rates.

![Chart 14](chart.png)
6.2. Infection Rates and Testing Rates

The following chart shows a similar relationship, but between infection rates and testing rates. For this illustration, we chose the Americas as the region to analyze.

This shows a relatively strong relationship with a $R^2$ factor of 0.7008. Unfortunately, the testing data is still not as reliable as the infection rates or death rates. So there are many countries where the data is not available, like Spain, or may be even unreliable because it is not reported frequently. Some countries, like France, are reporting on a weekly basis, so the curves are not as smooth as they would be in a perfect world.

We can make some other observations, at least with respect to the above chart, the Americas. It should be expected that Canada and the US will have a similar profile. While Canada is has a testing rate of 12/1000 and an infection rate of 0.72/1000, the US has a much testing rate of 9.31/1000 and a higher infection rate of 1.84/1000.

On the other hand, the selected South American countries have both very low testing rates and lower infection rates than that of Canada (except Panama, marginally). There may be a strong correlation there. However, we should be critical of other possible factors that may be involved and that we have not yet discovered.
7. COUNTRY TO COUNTRY ANALYSIS

We can also analyze the various metrics by comparing one country against another, or more than two countries, at a time. Here we examine the United States, Italy and Spain against the world for infections and infection rates, as of April 10th:

Chart 16
Comparison Analysis between TOTAL INFECTIONS in ABSOLUTE Numbers (from 22-Jan-2020 to 10-Apr-2020 - Day 79) — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

Chart 17
Comparison Analysis between TOTAL INFECTION RATES in ABSOLUTE Numbers (from 22-Jan-2020 to 10-Apr-2020 - Day 79) — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd
The patterns are different of course. The charts show that the rate of infection for Spain has reached a level significantly higher than the entire world. It also shows how quickly Spain overtook Italy in terms of rates of infection.

Although the following chart has the same pattern as Chart 16, we have normalized the number of infections as if the country had the same population as the world:

This shows that instead of 1.7 million infections in the world, there would be over 26 million infections if the rates of infections for Spain were in effect for the entire world. Applying the rates from Italy would bring this number to approximately 19 million. And using the US rates, the total would be 11.7 million infections.

In comparison, the Spanish Flu in 1918-19 infected approximately 500 million people around the world. A decade ago, the Swine Flu affected approximately one billion people.
However, examining the death rates might be even more compelling in terms of judging the severity of COVID-19.

As of April 10th, there were 102,511 reported deaths in the world. However, if the rate of deaths from Spain were to apply, there would be 2.7 million deaths.

In comparison, the Spanish Flu in 1918-19 caused the death of approximately 70 million people around the world (with an estimated range from 40 to 100 million). A decade ago, the Swine Flu caused the death of approximately 362,000 people (with an estimated range from 150,000 to 575,000). However, the Avian Flu of 1957-58 killed approximately two million people and the Hong Kong Flu of 1968-69 killed approximately one million people.

We conclude again that although the COVID-19 CFR is most definitely severe, the world has seen worse pandemics in terms of infections and deaths. However, this pandemic is not over, and the numbers will definitely increase.
In this section we compare the four most populous countries:

As of April 10th, the US has reported 500,000 infections, now the highest in the world. If the US had the population size of China, there would be 2.2 million infections. The number of deaths would be almost 81,000 instead of 18,586.
8. SIGNS OF SLOWING DOWN OR ACCELERATING — INFECTION SPEED

8.1. Introduction

The COVID-19 pandemic may remain with us for sometime. However, three major breakthroughs may happen.

(1) The first one is the creation of a vaccine that will help immunize the population.

(2) The second one is the flattening of the curve, or essentially achieving a stable position with no significant movement of the rates of infection and/or the rates of death. We can observe these changes in some countries but not in others. The series of graphs in this section illustrate these characteristics.

(3) The third one is an effective cure for those affected. This could be a regime of drugs, lung exercises, or other combinations.

The x-axis represents the change in the average number of new infections or deaths. The y-axis represents the total number of infections or deaths. At the beginning of a pandemic, the number of new infections (x-axis) increases rapidly as the total number of infections (y-axis) keeps increasing. This means the curve will go from the bottom left of the graph towards the top right side of the graph.

A smoothing mechanism has also been used to make the graph more useable by combining the data over a number of days, from day one to day five. This approach is an educated guess based on the final results. We have found that, in general, using a three-day average works best. To illustrate this, we compare four countries in the Americas. The US is so large, of course, that it is virtually the only distinguishable curve. But it illustrates well the smoothing effect.
These charts show the infections and deaths using single day observations:

Here are the infections and deaths using 5-day average observations:

In Charts 20 and 21, we see some clear evidence of a zigzagging effect. Obviously, people get infected or die at a continuous speed. Since the data gathering is daily, it follows that there will be more fluctuations from day to day.

Detailed charts on the various continents and specific countries are included later in this report. Next in this section, we highlight the Infection Speed of some key countries.
8.2. Some Key Countries

In this comparison of four key countries we are able to illustrate well the differences:

We can immediately distinguish the great differences between the US and the other three countries. China has completely turned the situation around. Their one-party system has helped to lock down the country and force social distancing, which reinforces the point that controlling a pandemic is doable in some cases. The data show that the US still has a way to go before they reverse their position.
Let us examine all the major countries in the world in terms of number of infections and deaths.

![COVID-19 Most Infections Chart]

- US (32%)
- Rest of the World (13%)
- Spain (8%)
- Italy (7%)
- France (6%)
- Germany (6%)
- United Kingdom (5%)
- Turkey (4%)
- China (3%)
- Iran (3%)
- Russia (2%)
- Brazil (2%)
- Belgium (2%)
- Canada (1%)
- Netherlands (1%)
- Switzerland (1%)
- Portugal (1%)
- India (1%)
- Peru (1%)
- Ireland (1%)

![COVID-19 Most Deaths Chart]

- US (25%)
- Italy (14%)
- Spain (12%)
- France (12%)
- United Kingdom (10%)
- Rest of the World (6%)
- Belgium (3%)
- Iran (3%)
- China (3%)
- Germany (3%)
- Netherlands (2%)
- Brazil (1%)
- Turkey (1%)
- Canada (1%)
- Switzerland (1%)
- Portugal (0%)
- Ireland (0%)
- India (0%)
- Peru (0%)
- Russia (0%)
[J1] Correlation Analysis between Case Infection Rate and Case Fatality Rate for (19-Apr-2020 - Day 92) - Americas — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

\[ y = 0.0076x + 0.0347 \]
\[ R^2 = 0.043 \]

[J2] Correlation Analysis between Case Infection Rate and Testing Rate for (19-Apr-2020 - Day 92) - Americas — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

\[ y = 5.5392x + 0.2601 \]
\[ R^2 = 0.7077 \]
9.1. Infection Speed in the Americas

Here is a sample for some countries in the Americas. The US is included in the first chart. However, it clearly eliminates any details of the other three countries, Canada, Mexico and Brazil. We added Peru in the second chart.

While Canada and Brazil to some extent seem to be reversing, Mexico and Peru have not yet reached this stage.
9.2. Emphasis on the US States

Let us focus on the differences in US States,

The rate of infections in New York State is 1.3%. This is by far the highest in the world when compared to other countries. Luxembourg is at 0.57% and Spain at 0.43%. Even New Jersey is at 0.95%. And Massachusetts is at 0.55%.

Let use examine the speed of infection.
The State of New York eclipses all other states. There is however some silver lining in that the speed of infection seems to slow down a little. Nonetheless, the next 12 states show some slowing down as well, but it is not yet very definite.
In this last chart, the state of Ohio seems to be running out of control.
9.3. States Comparison

The following chart clearly shows the high disparity across the states.

New York State and New Jersey, a neighbouring state, have a combined 44% of all infections in the United States.
9.4. Emphasis on the Canadian Provinces

The Canadian Provinces also show some different trends.

The province of Québec is definitely showing a much greater rate of infection than the other provinces, almost three times that of Ontario. Alberta and Nova Scotia are also very high. Of course, these rates pale in comparison to those in Europe.
Québec and Ontario seem to slow down a little. Canada as a whole seems to hesitate and keeps increasing, partly due to Alberta as the next chart shows.
With respect to the maritime Provinces, Nova Scotia seems to be the one pushing out further.
9.5. Provinces Comparison

The following chart clearly shows the high disparity across the provinces.
10. The Caribbean

<table>
<thead>
<tr>
<th>Country</th>
<th>INFECTIONS RATE (19-Apr-2020 - Day 92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua and Barbuda</td>
<td>0.0235%</td>
</tr>
<tr>
<td>Bahamas</td>
<td>0.0140%</td>
</tr>
<tr>
<td>Barbados</td>
<td>0.0261%</td>
</tr>
<tr>
<td>Belize</td>
<td>0.0045%</td>
</tr>
<tr>
<td>Cuba</td>
<td>0.0091%</td>
</tr>
<tr>
<td>Dominica</td>
<td>0.0000%</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>0.0431%</td>
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<tr>
<td>El Salvador</td>
<td>0.0124%</td>
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<tr>
<td>Grenada</td>
<td>0.0083%</td>
</tr>
<tr>
<td>Haiti</td>
<td>0.0004%</td>
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<td>Jamaica</td>
<td>0.0058%</td>
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<tr>
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<tr>
<td>Puerto Rico</td>
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<tr>
<td>Saint Lucia</td>
<td>0.0017%</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>0.0017%</td>
</tr>
<tr>
<td>Virgin Islands</td>
<td>0.0021%</td>
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</table>


<table>
<thead>
<tr>
<th>Country</th>
<th>CRUDE DEATH RATE /1,000,000 (19-Apr-2020 - Day 92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua and Barbuda</td>
<td>30.0</td>
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<tr>
<td>Bahamas</td>
<td>27.0</td>
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<tr>
<td>El Salvador</td>
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<td>Grenada</td>
<td>5.00</td>
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<tr>
<td>Haiti</td>
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<tr>
<td>Jamaica</td>
<td>1.00</td>
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<tr>
<td>Martinique</td>
<td>1.00</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>1.00</td>
</tr>
<tr>
<td>Saint Kitts and Nevis</td>
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<tr>
<td>Saint Lucia</td>
<td>1.00</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>1.00</td>
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<tr>
<td>Virgin Islands</td>
<td>1.00</td>
</tr>
<tr>
<td>Latin America and...</td>
<td>23.7</td>
</tr>
</tbody>
</table>

[B] COVID-19 - CRUDE DEATH RATE /1,000,000 (19-Apr-2020 - Day 92) - Caribbean — © 2020 Eckler LTD and QED Actuaries & Consultants (Pty) Ltd
Case Fatality Rate (19-Apr-2020 - Day 92) - Caribbean

CASE FATALITY RATE

No. INFECTIONS (19-Apr-2020 - Day 92) - Caribbean

[© 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd]
[H] COVID-19 - Ratio of DEATH RATES to Latin America and the Caribbean (19-Apr-2020 - Day 92) - Caribbean — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

[I] COVID-19 - Ratio of CASE FATALITY RATES to Latin America and the Caribbean (19-Apr-2020 - Day 92) - Caribbean — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd
CASE FATALITY RATE

INFECTIONS RATE /1,000

[J1] Correlation Analysis between Case Infection Rate and Case Fatality Rate for (19-Apr-2020 - Day 92) - Caribbean — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

TESTING RATE /1,000

INFECTIONS RATE /1,000

[J2] Correlation Analysis between Case Infection Rate and Testing Rate for (19-Apr-2020 - Day 92) - Caribbean — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

\[ y = 0.0603x + 0.0457 \]
\[ R^2 = 0.0373 \]

\[ y = -0.189x + 0.1717 \]
\[ R^2 = 0.0033 \]
[M] Population of Selected Countries for Caribbean — © 2020 ECKLER LTD and QED
Actuaries & Consultants (Pty) Ltd

[AA] No. of Days since Infection Rate ≥ 0 /1,000,000 - Caribbean (19-Apr-2020 - Day 92) — © 2020 ECKLER LTD and QED
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10.1. Emphasis on the Caribbean

There may not be enough data yet to have a reliable profile of the Caribbean. Nonetheless, here is a sample.

This shows a rapid slowing down of infections. This is probably as a result of social distancing implemented early. The numbers are of course small, but they do show a definite trend.
11. EUROPE


[B] COVID-19 - CRUDE DEATH RATE /1,000,000 (19-Apr-2020 - Day 92) - Europe — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd
**[J1] Correlation Analysis between Case Infection Rate and Case Fatality Rate for (19-Apr-2020 - Day 92) - Europe — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd**

Equation: \[ y = 0.007x + 0.0544 \]

**Correlation Coefficient: R² = 0.0464**

**[J2] Correlation Analysis between Case Infection Rate and Testing Rate for (19-Apr-2020 - Day 92) - Europe — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd**

Equation: \[ y = 5.733x + 4.6746 \]

**Correlation Coefficient: R² = 0.5146**
[M] Population of Selected Countries for Europe — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

[AA] No. of Days since Infection Rate ≥ 0 /1,000,000 - Europe (19-Apr-2020 - Day 92) — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd
11.1. Emphasis on the Europe — 1

Here is a comparison of four major European countries among the highest ones affected, using a 3-day average.

While Italy and Spain are two of the most affected countries in the world, a definite trend is emerging in the reduction of new infections and deaths. The same trend is happening for France in terms of infections. In the United Kingdom, where actions such as social distancing and lockdown were implemented much later, we observe that although the trend has slowed down, it has not yet reversed itself.
11.2. Emphasis on the Europe — 2

This comparison looks at four other major European countries:

Germany has reversed the trend with respect to infections, even though the number of infections is quite large. Portugal and Switzerland have also started a reverse trend.
Finally, the following comparison looks at four Nordic countries:

The trend is very clearly a deceleration for Norway, Denmark and Finland. However, for Sweden which is still resisting lockdown or at least more social distancing measures, there is a marked indication that their approach may not be working.
12. ASIA


[B] COVID-19 - CRUDE DEATH RATE /1,000,000 (19-Apr-2020 - Day 92) - Asia — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd
[J1] Correlation Analysis between Case Infection Rate and Case Fatality Rate for (19-Apr-2020 - Day 92) - Asia — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

[J2] Correlation Analysis between Case Infection Rate and Testing Rate for (19-Apr-2020 - Day 92) - Asia — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd
[M] Population of Selected Countries for Asia — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

[AA] No. of Days since Infection Rate ≥ 0 /1,000,000 - Europe (19-Apr-2020 - Day 92) — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

Belgium (1,322)
France (2,361)
Germany (1,733)
Ireland (1,028)
Italy (2,960)
Netherlands (1,916)
Spain (4,249)
Switzerland (3,205)
United Kingdom (1,785)
Europe (1,458)
12.1. Emphasis on Asia

We need to exclude China for these charts as their scale causes some distortions.

Thailand seems to have started a clear reversal trend. However, the Philippines have not yet established a clear one. With a population of 110 million, the tally could increase quickly.
13. AFRICA


[B] COVID-19 - CRUDE DEATH RATE /1,000,000 (19-Apr-2020 - Day 92) - Africa — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

Correlation Analysis between Case Infection Rate and Case Fatality Rate for (19-Apr-2020 - Day 92) - Africa — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

\[ y = -0.0845x + 0.0525 \]
\[ R^2 = 0.0101 \]

Correlation Analysis between Case Infection Rate and Testing Rate for (19-Apr-2020 - Day 92) - Africa — © 2020 ECKLER LTD and QED Actuaries & Consultants (Pty) Ltd

\[ y = 0.314x + 0.2131 \]
\[ R^2 = 0.001 \]
13.1. Emphasis on the Africa

Africa is still developing the COVID-19 trends. However, already it shows sign of control, especially in South Africa for infections.

The trend in new infections is not very clear for Morocco and South Africa, where after some reduction in the speed in infections, the rate has picked up again.
14. MAJOR “HIGHEST” AND “LOWEST” RATES OF INFECTION

Each of the previous graphs usually show major countries within their continent. The y-axis is automatically adjusted to fit the higher limits. So, by design, there is always a country that will reach the upper end of the graph. This is not misleading for what it is intended. However, it hides the fact that one country at the upper end of one continent could actually be at the bottom end of another continent. We continue to look at ways to depict these disparities across all countries. For now, we provide the following graph:

The above graph shows the relative size of the rates of infection across countries. For instance, although the US has a rate of infection compared to, say, Canada, at approximately 2.5 to one, it almost pales in comparison to most countries in Europe. Moreover, from this graph we can discern that Europe is dealing with a major situation, followed by the US individually, and then the Middle East and Canada. As far as Latin America, the Caribbean and Africa are concerned, their levels of infections and deaths are still relatively low.
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