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Dr. Jonas Gomes da Silva

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Since the end of 2019, the world has become aware of a new virus that has emerged in China, which in February 2020 was called by the World Health Organization (WHO, 2019) as Coronavirus disease (COVID19). Due to its fast transmission, at 18:32 (GMT) on March 29, 2020, the world has officially accounted for about 710,950 new confirmed cases with 33,553 deaths and 150,734 recovered cases (Worldometers, 2020). The pandemic has become the newest challenge for several nations, especially the USA, Italy, China, Spain, Germany, Iran, for being the most affected, and since Brazil is a continental country with disabilities in its Unified Health System, it could be in the next two months among the five most affected. Thus, the main objective of the research is analyze the evolution of new cases of COVID19 in 16 countries to present short-term scenarios and recommendations for Brazil to face the pandemic. The research is applied, as its results and recommendations can be applied with adaptation by government authorities, business managers and citizens. The research is descriptive, with a qualitative and quantitative approach, based on bibliographic and documentary research, involving the study of articles, reports, manuals and other technical documents related to the subject. For the creation of scenarios, data collection focused on the number of new cases registered in 16 countries, including Brazil, as well as in the development of an approach using metaphorical analysis of the Board, the Inverted Pyramid and Papyri. *The main conclusion is that even though no country is prepared to face epidemics and pandemics (*NTI, JHU and EIU, 2019*), among the 16 countries investigated, Thailand, Finland, Australia, South Korea, Denmark and Sweden are benchmarks that Brazil could study in order not to repeat the scenarios of China, USA, Italy and Spain. At the end, ten recommendations are made for future research and also to public and private managers.*

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Abstract

Since the end of 2019, the world has become aware of a new virus that has emerged in China, which in February 2020 was called by the World Health Organization (WHO, 2019) as Coronavirus disease (COVID19). Due to its fast transmission, at 18:32 (GMT) on March 29, 2020, the world has officially accounted for about 710,950 new confirmed cases with 33,553 deaths and 150,734 recovered cases (Worldometers, 2020). The pandemic has become the newest challenge for several nations, especially the USA, Italy, China, Spain, Germany, Iran, for being the most affected, and since Brazil is a continental country with disabilities in its Unified Health System, it could be in the next two months among the five most affected. Thus, the main objective of the research is analyze the evolution of new cases of COVID19 in 16 countries to present short-term scenarios and recommendations for Brazil to face the pandemic. The research is applied, as its results and recommendations can be applied with adaptation by government authorities, business managers and citizens. The research is descriptive, with a qualitative and quantitative approach, based on bibliographic and documentary research, involving the study of articles, reports, manuals and other technical documents related to the subject. For the creation of scenarios, data collection focused on the number of new cases registered in 16 countries, including Brazil, as well as in the development of an approach using metaphorical analysis of the Board, the Inverted Pyramid and Papyri. *The main conclusion is that even though no country is prepared to face epidemics and pandemics (*NTI, JHU and EIU, 2019*), among the 16 countries investigated, Thailand, Finland, Australia, South Korea, Denmark and Sweden are benchmarks that Brazil could study in order not to repeat the scenarios of China, USA, Italy and Spain. At the end, ten recommendations are made for future research and also to public and private managers.*

Keywords: COVID19; New cases; WHO; Board; Inverted Pyramid; Papyri; Transparency; Scenarios.

1. Introduction

The world is not the same since the end of 2019, when a new virus spread in China that later came to be called by the World Health Organization (WHO, 2020a) the Coronavirus disease, popularly known as COVID19.

It is still unclear who the zero patient was. Although the World Health Organization (WHO, 2019) Office located in China reported on December 31, 2019, the occurrence of people suffering from unknown pneumonia in the city of Wuhan in China's Hubei Province, Huang et al (2020 p 500) states that the first case was identified on December 1, 2019, a man working in the Seeuan market in Huanan, in the Wuhan district. In an article published by the South China Morning Post, on March 13, 2020, author Ma (2020) argues based on access to government data from China, that patient zero was registered much earlier, on November 17, 2019, a 55-year-old from Hubei province. Although the Chinese government did not release the facts until the end of December 2019, there were about 266 contagions, increasing the number of new cases to 381 on January 1, 2020.

Regardless of who was patient zero, the fact is that then-unknown pneumonia crossed the borders of several cities in China, getting out of control and reaching not only nearby countries but other continents.

Currently, there are several websites for monitoring the evolution of covid19 in the world, containing statistics on new cases and also the number of daily deaths. Among these sites, there is the World Health Organization <https://bit.ly/2QW5LAh>, but the most dynamic are worldometers <https://www.worldometers.info/coronavirus/>, Covid19 Tracker <https://www.bing.com/covid> developed by Microsoft and John Hopkins University & Medicine Coronavirus Resource Center <https://coronavirus.jhu.edu/map.html>.

To measure the size of the challenge facing humanity, at 18:32 (GMT) on March 29, 2020, the Worldometers pointed out 710,950 confirmed cases with 33,553 deaths and 150,734 recovered cases. At the same time, with the last update made at 2:37 pm, Covid Crawler19 pointed to 710,290 new confirmed cases, 33,550 deaths and 150,734 recovered cases (Figure 1). At the same time, but with the last update made at 1:30 pm, the John Hopkins University & Medicine Coronavirus Resource Center pointed to 704,095 confirmed cases with 33,509 deaths and 148,824 recovered (Figure 2).

The results in Figure 3 show the twenty-five most affected countries, of which the ten most critical registered at 18:32 (BMT) on March 29, 2020, are: 1st) the USA; 2nd) Italy; 3rd) China; 4th) Spain; 5th) Germany; 6th) France; 7th) Iran; 8th) the United Kingdom; 9th) Switzerland and 10th) the Netherlands.

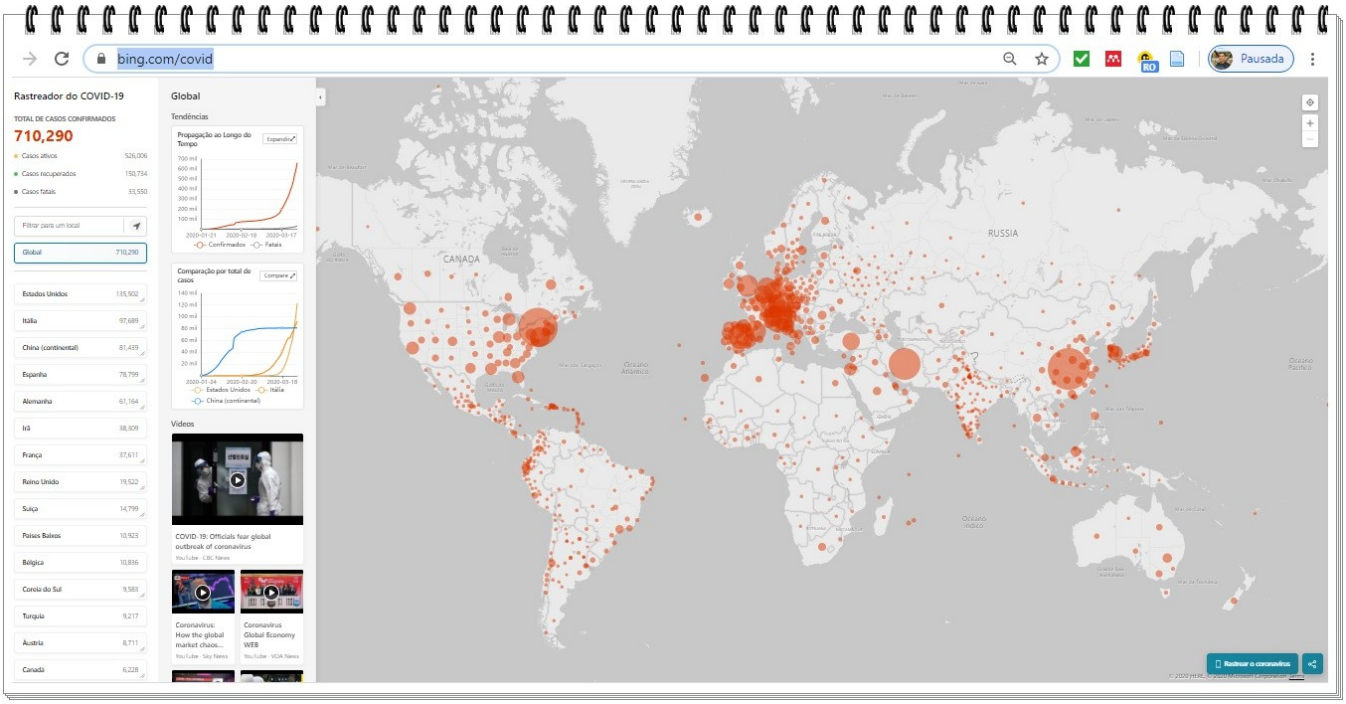


Figure 1: Statistics about COVID19 on 03/29/20

Source: COVID-19 Tracker <https://www.bing.com/covid>

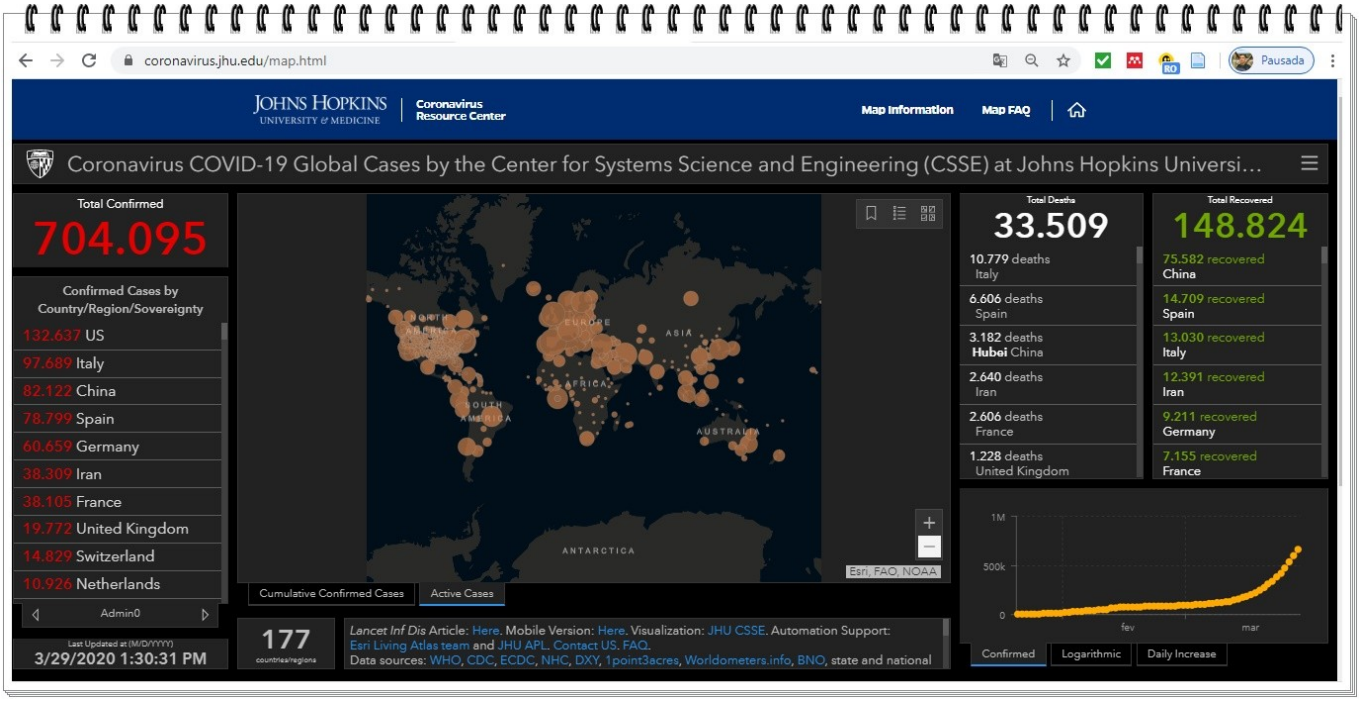
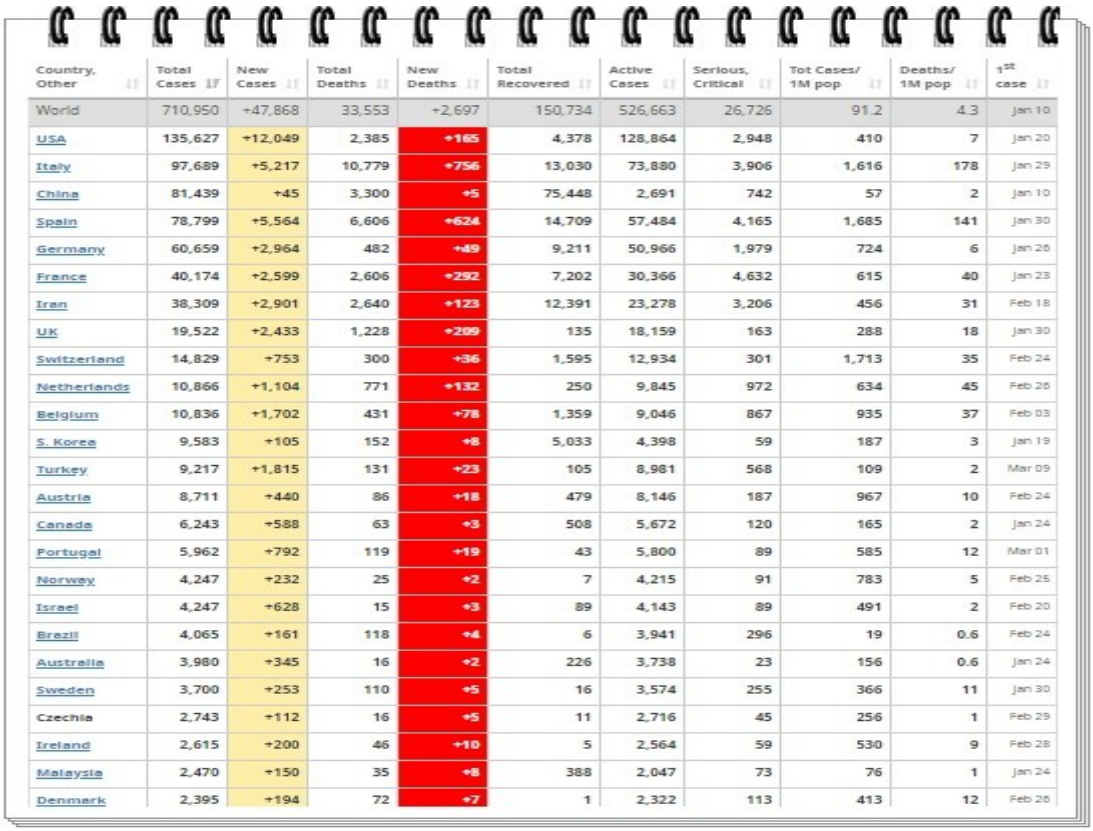


Figure 2: Statistics about COVID19 on 03/29/20

Source: John Hopkins Coronavirus Resource Center <https://coronavirus.jhu.edu/map.html>



Country, Other	Total Cases	New Cases	Total Deaths	New Deaths	Total Recovered	Active Cases	Serious, Critical	Tot Cases/ 1M pop	Deaths/ 1M pop	1st case
World	710,950	+47,868	33,553	+2,697	150,734	526,663	26,726	91.2	4.3	Jan 10
USA	135,627	+12,049	2,385	+165	4,378	128,864	2,948	410	7	Jan 20
Italy	97,689	+5,217	10,779	+756	13,030	73,880	3,906	1,616	178	Jan 29
China	81,439	+45	3,300	+5	75,448	2,691	742	57	2	Jan 10
Spain	78,799	+5,564	6,606	+624	14,709	57,484	4,165	1,685	141	Jan 30
Germany	60,659	+2,964	482	+49	9,211	50,966	1,979	724	6	Jan 26
France	40,174	+2,599	2,606	+292	7,202	30,366	4,632	615	40	Jan 23
Iran	38,309	+2,901	2,640	+123	12,391	23,278	3,206	456	31	Feb 18
UK	19,522	+2,433	1,228	+209	135	18,159	163	288	18	Jan 30
Switzerland	14,829	+753	300	+36	1,595	12,934	301	1,713	35	Feb 24
Netherlands	10,866	+1,104	771	+132	250	9,845	972	634	45	Feb 26
Belgium	10,836	+1,702	431	+78	1,359	9,046	867	935	37	Feb 03
S. Korea	9,583	+105	152	+8	5,033	4,398	59	187	3	Jan 19
Turkey	9,217	+1,815	131	+23	105	8,981	568	109	2	Mar 09
Austria	8,711	+440	86	+18	479	8,146	187	967	10	Feb 24
Canada	6,243	+588	63	+3	508	5,672	120	165	2	Jan 24
Portugal	5,962	+792	119	+19	43	5,800	89	585	12	Mar 01
Norway	4,247	+232	25	+2	7	4,215	91	783	5	Feb 25
Israel	4,247	+628	15	+3	89	4,143	89	491	2	Feb 20
Brazil	4,065	+161	118	+4	6	3,941	296	19	0.6	Feb 24
Australia	3,980	+345	16	+2	226	3,738	23	156	0.6	Jan 24
Sweden	3,700	+253	110	+5	16	3,574	255	366	11	Jan 30
Czechia	2,743	+112	16	+5	11	2,716	45	256	1	Feb 29
Ireland	2,615	+200	46	+10	5	2,564	59	530	9	Feb 28
Malaysia	2,470	+150	35	+8	388	2,047	73	76	1	Jan 24
Denmark	2,395	+194	72	+7	1	2,322	113	413	12	Feb 26

Figure 3: The twenty-five most critical countries affected by COVID199
Source: Worldometer <https://www.worldometers.info/coronavirus/ >

In this list of 25 most critical countries, Brazil was in 19th place, with 4,065 new cases and 118 deaths, but there is strong evidence that it may move the world in the coming months, due the 10 reasons bellow:

1) its continental dimension with an estimated population of approximately 212.4 million inhabitants (UNPFA, 2020a);

2) for not having an efficient national public health system, for many years not being considered an international reference in various rankings (WHO, 2000; ERIC et al, 2017; NUMBEO, 2019);

3) billion dollar freezes and/or cuts in the health budget, carried out by several governments in recent years;

4) number of hospital beds has decreased in recent years (IBGE, 2010; WORLD BANK, 2020; MONTANEZ, 2019), only 10% one Intensive Care Unit (ICU) for every 10000 inhabitants within Public Health System, while WHO recommends that countries must have 1 to 3 beds per 10000 inhabitants. If the private health hospitals are included, around 12,6% of cities attend WHO recommendation, and the most critical regions are North and Northeast (AMIB, 2020; BRIGHT CITIES, 2020; FOLHA, 2020a);

5) excessive bureaucracy in the public sphere;

6) delay in carrying out tests in laboratories;

7) constant lack of medicines and personal protective equipment of Brazilian cities have at least for health professionals in public hospitals;

8) excessive delay by the federal government in recognizing the seriousness of the pandemic, with the President not obeying WHO guidelines, not protecting himself or his team, to the point that 23 close

people who accompanied him on a trip to the United States last March were infected by COVID19, in addition there is no harmony between the President and the Minister of Health, Governors and Mayors;
9) managerial inability of the current federal government to prepare the country to face the pandemic;
10) inefficient transparency and communication between government officials and the population, especially about information from the WHO and the real state of COVID19 in the country.

Given the above, the main research problem is "From the history of the most critical countries, what scenarios can Brazil have in the short term about the evolution of COVID19?"

Thus, the main objective of the research is to analyze the evolution of new cases of COVID19 in 16 countries to present short-term scenarios and recommendations for Brazil to face the pandemic.

The specific objectives are: a) to collaborate in the process of disseminating useful WHO information to protect the population and prepare any country to face the pandemic; b) to analyze the evolution of the pandemic in 16 countries (including Brazil); c) identify the countries with the lowest rates of new cases and deaths, for future studies of the good management practices adopted; d) present possible short-term scenarios for Brazil by using metaphorical analysis of the Tablet, the Inverted Pyramid and Papyri.

The research is not intended to use complex mathematical or statistical models but hopes to be relevant to: a) the population has access to basic information from the WHO on COVID19; b) the academy because it can serve as a reflection and point out new research opportunities, especially on the good management practices adopted by countries with the best performance in coping with the disease; c) public and private managers understand the guidelines recommended by WHO to plan and prepare the health system to face the pandemic, in addition for the understanding of the pandemic evolution and for the creation of indicators to better monitor the disease; d) presidents, ministries, governors, secretaries responsible for Health Systems, since they will have to access a simple approach that permits to compares their countries against the 16 countries investigated, as well as to forecast new scenarios of covid19 in short-term.

2. Theoretical Referential

2.1 World Health Organization (WHO)

The WHO headquarters is located in Geneva, Switzerland, is part of the United Nations and was founded on the seventh day of April 1948.

Its history started from a meeting of diplomats held in San Francisco (USA) in 1945 to form the United Nations, at the time one of the points of discussion was the creation of a global health organization, is then officially created on the aforementioned date. At that time, the 53 delegates held the first Assembly in June 1948, placing the health of women and children, malaria, tuberculosis, venereal diseases, nutrition, and environmental sanitation as a priority (WHO, 2006 p. 4).

Currently, WHO is recognized as the Global Guardian of Public Health, has helped to eradicate or face diseases, as well as helping to face humanitarian crises, thanks to its 7000 professionals working in more than 150 countries: scientists, epidemiologists, aid specialists emergency, medical doctors, public health specialists, administrative managers, economists, financial specialists, information systems specialists, specialists in health statistics, etc.

In its seventeenth general program (WHO, 2018) covering the period from 2019 to 2023, WHO defined as its mission “Promoting health, keeping the world safe and serving the vulnerable”, also based on Article 1 of its constitution, defined as a vision "A world in which all people meet the maximum possible standard of well-being and health".

To this end, they developed three strategic goals to help improve public health in each member country, as can be seen in Figure 4. Strategies range from political dialogue, strategic support, technical assistance to service delivery during emergencies.

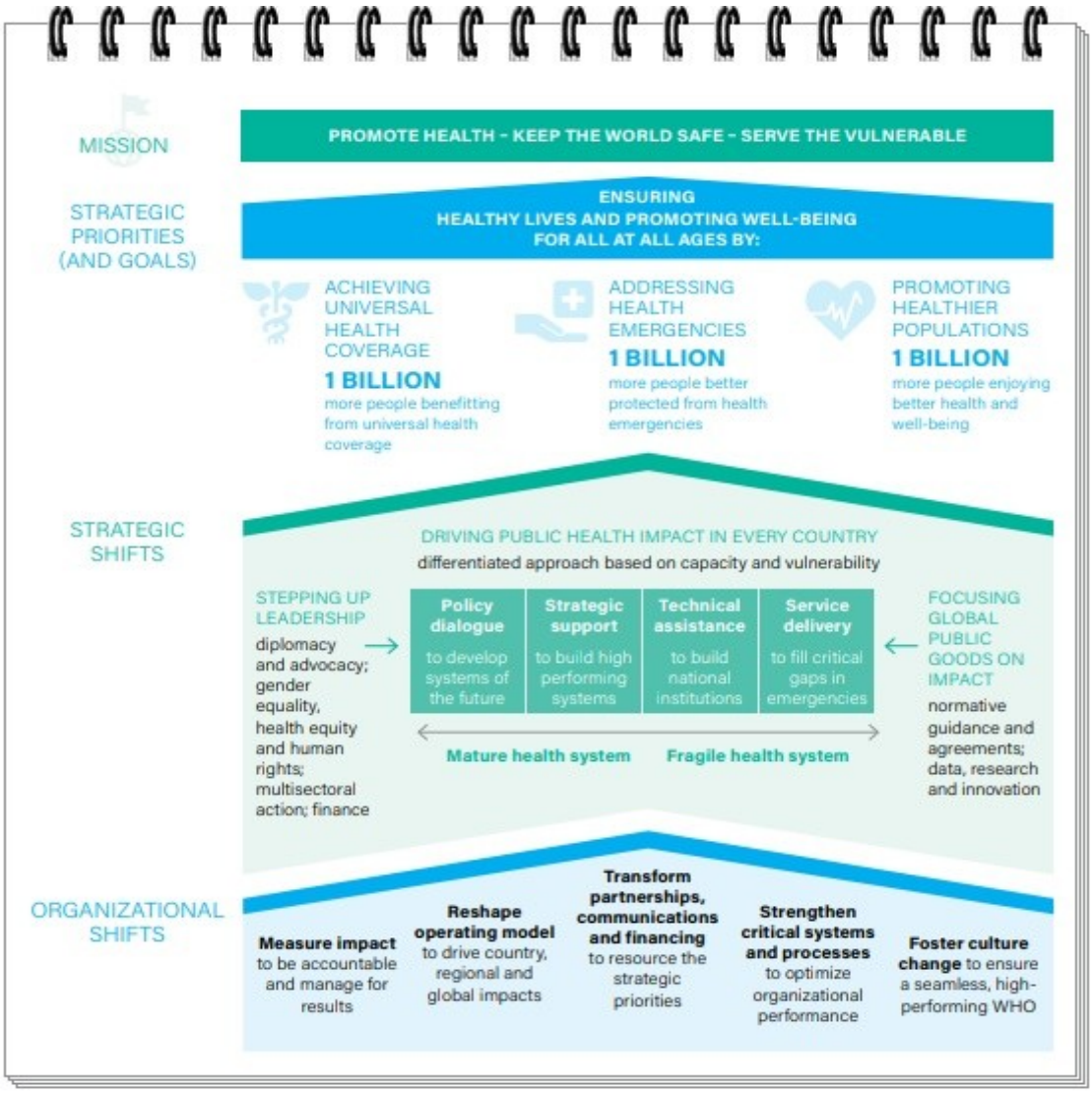


Figure 4: Overview of the 17th WHO Program for the period from 2019 to 2023.
Source: WHO (2018)

The WHO recognizes the importance of Research and Innovation, which is why it will use several approaches to find and disseminate innovative solutions on a global scale. Also, WHO is redesigning its key processes to adopt a new structure capable of accomplishing the program's mission, vision and goals. WHO is an internationally respected organization, especially by those who have been related to it over time (WHO, 2015), being recognized as an indispensable and essential leader to improve global health results, as a provider of reliable, accurate and useful information, etc.

There are several working groups at WHO, but for this research, it is worth highlighting the work of the Strategic and Technical Advisory Group for Infectious Hazard (STAG-IH) that was created on the recommendation of the review committee dealing with Ebola in 2005 This committee has between 10 and 15 temporary advisers with 5 functions, three of which are: assessing the global context of infectious diseases, providing analysis and advice on priorities for WHO to formulate their strategies and activities, providing analysis and advice on innovative collaborations and partnerships, etc. It is recommended in the current situation to follow the work developed by them through the link <https://bit.ly/3bCPI2c>.
Finally, there are just over 300 topics covered by WHO, ranging from abortion, air pollution, asthma, biological weapons, cancer, covid19, to zoonosis, but the most popular are Ebola, Nutrition, Hepatitis, the ten causes of death and COVID19, the latter will be dealt with in the next section.

2.2 COVID19

2.2.1 Thecnical name and zero pacient

In the last 3 months, a new disease challenges humanity again, it is COVID19 or coronavirus disease. It is caused by a virus whose technical name was released by WHO on 11/02/20 as “Severe acute respiratory syndrome coronavirus2 (SARS-CoV-2) because the virus is genetically related to the coronavirus that caused the outbreak of SARS (Severe Acute Respiratory Syndrome) occurred in 2003, although both are different.
It is still difficult to prove who the zero patient was. Although the WHO Office (WHO, 2019), located in China, reported on December 31, 2019, the occurrence of people suffering from unknown pneumonia in the city of Wuhan in China's Hubei Province, Huang et al (2020 p 500) argue that the first case was identified on 12/1/19, a man who worked at the Seeuan market in Huanan, in the Wuhan district.
In an article published by the South China Morning Post, on March 13, 2020, author Ma (2020) argues based on access to government data in China, that patient zero was registered much earlier, on November 17, 2019, a 55-year-old from Hubei province. Although the Chinese government did not release the facts until the end of December 2019, there were about 266 contagions, increasing the number of new cases to 381 on January 1, 2020.
Regardless of who was the zero patient, the fact is that then-unknown pneumonia crossed the borders of several cities in China, getting out of control and reaching not only nearby countries but other continents.
Besides, from a data series involving 72314 COVID19 cases in China, published on February 11, 2020, by the Chinese Center for Disease Control and Prevention (China CDC Weekly, 2020), it is possible to observe that of the 44672 (62%) confirmed cases: a) the majority (38680; 86.6%) were between 30 and 79 years old; b) there is no distinction between those infected concerning gender since 51.4% were men and 48.6% women; about the degree of severity, most (36160; 81%) had mild symptoms, 6168 cases (14%) had severe symptoms and 2087 cases (5%) were considered critical; c) the percentage of death was 2.3% (1023 deaths), no fatality occurred as people in the light or severe groups, but reached 49% of the critical cases. Another interesting point is that of the 1023 fatal cases, most are male (63.8%).
Wu and McGoogan (2020), analyzing the data series above to identify the lessons learned, pointed out that given that there were no drugs and vaccines available to tackle COVID19, China focused on

traditional public health tactics to tackle the disease, such as community restraint, quarantine, isolation and social detachment.

2.2.2 Symptoms and ways of preventing the public

According to WHO, COVID19 is a respiratory disease, the majority of infected people will develop symptoms between mild and moderate levels, and can recover without the need for special treatment. However, WHO warns that elderly people over 60 years old and those with medical problems (cardiovascular disease, diabetes, chronic respiratory diseases, and cancer) are the most vulnerable to having the situation aggravated by the new disease and dying. The common symptoms are fever, tiredness and dry cough. Other symptoms are shortness of breath, pain, sore throat, and few people have reported runny nose, nausea or diarrhea. Healthy people who experience mild symptoms should isolate themselves and communicate with the doctor and/or the local organization responsible for monitoring, testing, and results. For those who experience fever, cough or difficulty breathing, seek medical advice.

On this page <https://bit.ly/2JotvZk> WHO presents protective measures to the public to prevent infection and reduce the transmission of COVID19, the page is constantly updated according to new scientific findings. The recommendations are:

a) wash your hands frequently with soap and water or rub your hands with alcohol;

b) maintain a social distance of one meter (1m) between you and the person with a cough or sneeze;

c) avoid touching eyes, nose and mouth;

d) practice respiratory hygiene, covering your mouth and nose with your elbow or folded tissue when you cough or sneeze. Then dispose of the used fabric in the correct place immediately;

e) stay home if you don't feel well. If you have a fever, cough or difficulty breathing, see a doctor. Follow the guidelines of your local health authority;

f) avoid smoking or performing any other activity that weakens the lungs;

g) avoid unnecessary travel and stay away from groups of people;

h) stay informed and follow the advice of health authorities.

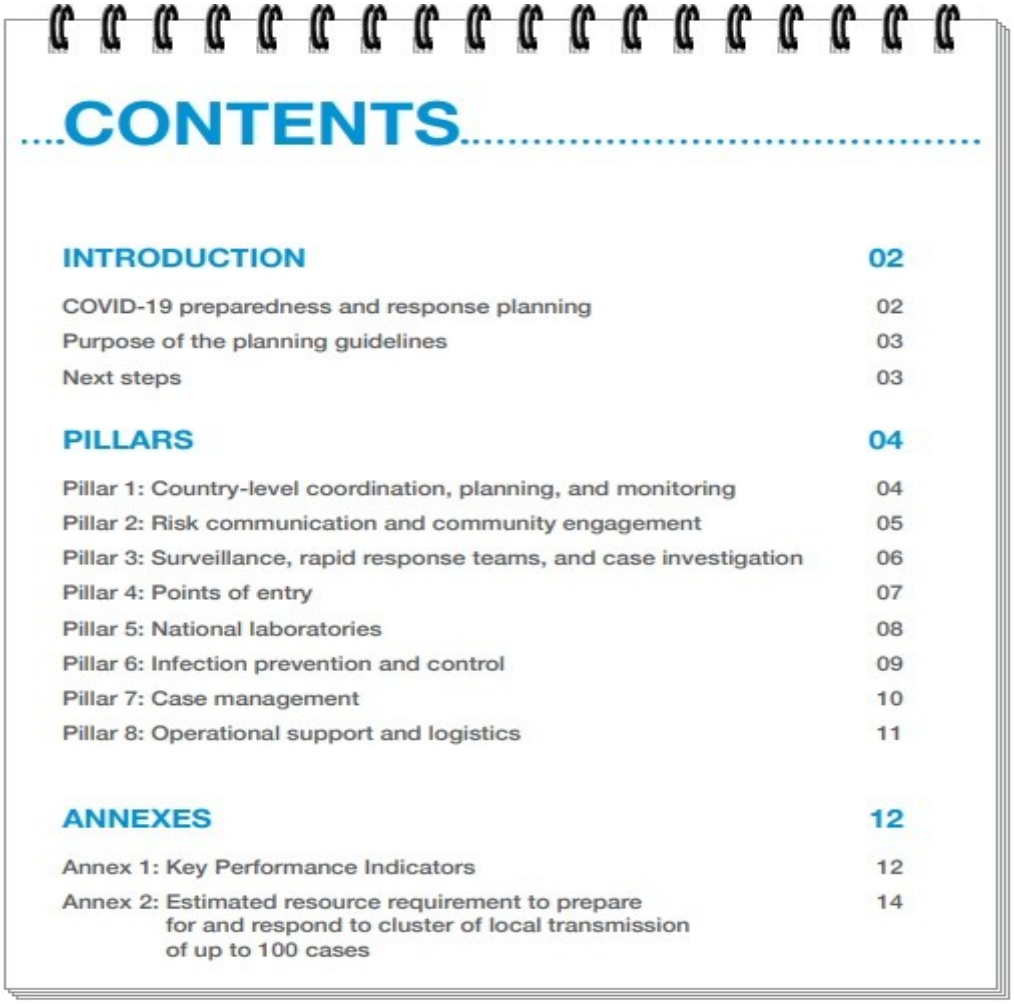
2.2.3 Preparedness and Response Plan to COVID19

On February 12, 2020, WHO launched a draft (Figure 5) called “COVID19 Strategic Preparedness and Response Plan” aimed at helping local United Nations teams and partners work to develop the Country Preparedness and Response Plan (CPRP) to immediately support the national government to prepare and respond to COVID10. The guidance was given so that the plan was for 3 months, between 2/1/20 and 4/30/20, which can be changed over time according to the evolution of the situation and needs.

The guide is available at <https://bit.ly/2xzOW7n>. In summary, it consists of 8 pillars (Figure 5) that represent the priority steps in the public health preparedness and response process:

P1 (Country-level coordination, planning, and monitoring) containing 3 steps and 12 actions; P2 (Risk communication and community engagement) containing 3 steps and 11 actions; P3 (Surveillance, rapid response teams, and case investigation) with 3 steps and 10 actions; P4 (Points of entry) with 3 steps and 5 actions; P 5 (National Laboratories) with 3 steps and 10 actions; P6 (Infection prevention and control)

with 3 steps and 13 actions; P7 (Case Management) with 3 steps and 11 actions; P8 (Operational support and logistics) with 3 steps and 6 actions to be performed.



CONTENTS

Figure 5: Contents of the Preparadness and Response Guide to COVID19
Source: WHO (2020b)

In addition to the pillars, there are two annexes; the first contains a list of several key indicators for each of the pillars. The second has the resources estimated in US $ for a cluster to prepare and respond to the transmission of covid19 for up to 100 cases.

This guide model was then complemented with another document <https://bit.ly/3awqORp> released on March 25, 2020 (WHO, 2020c), aimed at helping countries to reorganize and maintain the population's access to a good quality of service. Both documents are excellent guides for ministers, governors, health secretaries and hospital managers.

2.2.4 WHO updates about COVID19

This site is recommended <https://bit.ly/2QWpy2m> to follow the latest official WHO information on COVID19, to avoid being a victim of fake news on the subject.

As an example, on 03/27/20, WHO launched Health Alert, a messaging service in partnership with Whatsapp and Facebook to keep people safe from the coronavirus.

The service can be accessed through a link that initiates conversation via WhatsApp, simply by typing:

In Spanish “hola” to +41 22 501 76 90 on WhatsApp <wa.me/41225017690?text=hola>
In French “salut” to +41 22 501 72 98 on WhatsApp <wa.me/41225017298?text=salut>
In English “hi” to +41 79 893 18 92 on WhatsApp <wa.me/41798931892?text=hi>
In Arabic “مرحبا" to +41 22 501 70 23 on WhatsApp <wa.me/41225017023?text= مرحبا>
At this link <https://bit.ly/3avHGYK> WHO has technical material for public, private and other professionals interested in the subject. Finally, at this link <https://bit.ly/34h70zq> the WHO presents the “Draft landscape of COVID19 candidate vacine – 20 March 2020”, as well as some important notes written in the document footer.

2.3 Health system and national performance of countries

2.3.1 Health System from the perspective and assessment of WHO

A technical report with 215 pages was published 20 years ago by OMS about “Health Systems: Improving Performance”. In short, the report (OMS, 2000):

a) conceptualizes a Health System as being the composition of all organizations, institutions, and resources destined to produce health actions. A health action was defined as any effort, whether in personal health care, public health services or intersectoral initiatives to improve health;

b) the objectives of a Health System are: b1) to improve people's health; b2) meeting people's expectations; b3) protect them against the financial costs of the disease, treating them with dignity;

c) three elements are important when entering a Health System: Human Resources; Physical Capital and Consumables, the performance of the system ultimately depends on the knowledge, skills, and motivation of the people responsible for delivering the services;

d) without functional facilities, diagnostic equipment and medicines, it will not do to have qualified employees with a high level of knowledge and skills, service delivery will continue to below;

e) failures in the health system are because ministries are concentrated in the public sector, paying little attention to the private sector;

f) to evaluate a health system, 5 things are necessary: the general level of health (the overall level of health); the distribution of health in the population (the distribution of health in the population); the general level of responsiveness (the overall level of responsiveness); the distribution of responsiveness (the distribution of responsiveness); and the distribution of the financial contribution (distribution of financial contribution);

g) based on the methodology adopted, the ten member countries at the time with the best general health levels were: 1) France; 2) Italy; 3) San Marino; 4) Andorra; 5) Malta; 6) Singapore; 7) Spain; 8) Oman; 9) Austria; 10) Japan. Brazil ranked 125th among the 191 countries analyzed.

Due to the complexity of the theme, this was the first and last study carried out by WHO, and over time other new methodologies were developed to assess the performance of the National Health System, among them Eric et al. (2017), Numbeo (2019) and NTI, JHU and EIU (2019), the latter being an easily accessible report containing more complete information than the previous ones.

2.3.2 Health System Assessment by the GHS Index (NTI, JHU and EIU, 2019)

The Global Health Security Index (GHS) is a project of the Nuclear Threat Initiative (NTI) together with the Johns Hopkins Center for Health Security (JHU) in partnership with The Economist Intelligence Unit (EIU).

The GHS Index 2019 is a report that presents the global assessment of the health security capacity of 191 countries, based on a questionnaire with 140 questions divided into 6 categories, 34 indicators, and 85 sub-indicators.

The project started in 2017 with a meeting in London in April to develop its structure, with the pilot test in October 2017 with 4 countries, panels and other activities in 2018, being completed in July 2019 and the GHS Index launched on October 24, 2019.

Figure 6 shows the six categories:

1. Prevention (emergency prevention or pathogen release);
2. Detection and Reporting (detection and early notification of epidemics of international interest);
3. Rapid Response (rapid response and mitigation of the spread of an epidemic);
4. Health System (robust health system to treat patients and protect health professionals);
5. Compliance with international standards (commitment to improving national capacity, finance plans to fill gaps and adhere to international standards);
6. Environmental Risk (risk of the general environment and the country's vulnerability to biological threats)

Figure 6: GHS Index 2019 categories
Source: NTI, JHU and EIU (2019)

In summary, the results of the report:

a) point out that health security is fundamentally weak on the planet, no country is fully prepared to face epidemics and pandemics, and each country has gaps that need to be resolved;

b) the overall average of the GHS Index 2019 of 195 countries is 40.2 points, on a scale of points that goes up to 100;

c) points out 33 recommendations, among them, there is one related to the health security capacity of each country, needs to be transparent and regulated;

d) the average score for the indicator "Health System" is 26.4, being considered the category with the lowest score;

e) the ten countries (Figure 7) with the best overall scores were: 1) USA (83.5); 2) United Kingdom (77.9); 3) the Netherlands (75.6); 4) Australia (75.5); 5) Canada (75.3); 6) Thailand (73.2); 7) Sweden (72.1); 8) Denmark (70.4); 9) South Korea (70.2) and Finland (68.7);

f) The ten countries with the lowest scores were: 195) Equatorial Guinea (16.2); 194) Somalia (16.6); 193) North Korea (17.5); 192) São Tomé and Príncipe (17.7); 191) Marshall Islands (18.2); 190) Yemen (18.5); 189) Kiribati (19.2); 188) Syria (19.9); 187) Guinea Bissau (20); and 186) Gabon (20);

OVERALL SCORE			1. PREVENTION OF THE EMERGENCE OR RELEASE OF PATHOGENS			2. EARLY DETECTION & REPORTING FOR EPIDEMICS OF POTENTIAL INTERNATIONAL CONCERN			3. RAPID RESPONSE TO AND MITIGATION OF THE SPREAD OF AN EPIDEMIC		
Rank		Score	Rank		Score	Rank		Score	Rank		Score
1	United States	83.5	1	United States	83.1	1	United States	98.2	1	United Kingdom	91.9
2	United Kingdom	77.9	2	Sweden	81.1	2	Australia	97.3	2	United States	79.7
3	Netherlands	75.6	3	Thailand	75.7	2	Latvia	97.3	3	Switzerland	79.3
4	Australia	75.5	4	Netherlands	73.7	4	Canada	96.4	4	Netherlands	79.1
5	Canada	75.3	5	Denmark	72.9	5	South Korea	92.1	5	Thailand	78.6
6	Thailand	73.2	6	France	71.2	6	United Kingdom	87.3	6	South Korea	71.5
7	Sweden	72.1	7	Canada	70.0	7	Denmark	86.0	7	Finland	69.2
8	Denmark	70.4	8	Australia	68.9	7	Netherlands	86.0	8	Portugal	67.7
9	South Korea	70.2	9	Finland	68.5	7	Sweden	86.0	9	Brazil	67.1
10	Finland	68.7	10	United Kingdom	68.3	10	Germany	84.6	10	Australia	65.9
11	France	68.2	11	Norway	68.2	11	Spain	83.0	11	Singapore	64.6
12	Slovenia	67.2	12	Slovenia	67.0	12	Brazil	82.4	12	Slovenia	63.3
13	Switzerland	67.0	13	Germany	66.5	13	Lithuania	81.5	13	France	62.9
14	Germany	66.0	14	Ireland	63.9	13	South Africa	81.5	14	Sweden	62.8
15	Spain	65.9	15	Belgium	63.5	15	Thailand	81.0	15	Spain	61.9
16	Norway	64.6	16	Brazil	59.2	16	Italy	78.5	16	Malaysia	61.3
17	Latvia	62.9	17	Kazakhstan	58.8	17	Greece	78.4	17	Canada	60.7
18	Malaysia	62.2	18	Austria	57.4	18	Ireland	78.0	18	Chile	60.2
19	Belgium	61.0	19	South Korea	57.3	19	Estonia	77.6	19	Denmark	58.4
20	Portugal	60.3	20	Turkey	56.9	20	Mongolia	77.3	20	Norway	58.2
21	Japan	59.8	21	Armenia	56.7	21	France	75.3	21	New Zealand	58.1
22	Brazil	59.7	22	Hungary	56.4	22	Georgia	75.0	22	Madagascar	57.8

Figure 7: The ten best countries in the GHS Index 2019
Source: NTI, JHU and EIU (2019)

g) Brazil was in 22nd place with 59.7 points, receiving low scores in indicator 6 (General environmental risk and vulnerability of the country with biological threats) being in 94th position with 56.1 points, as well as in indicator 4 (System of Robust health to treat patients and protect healthcare professionals) ranking 33rd with 45 points. The strongest scores were the indicators: 3 (Rapid Response) ranked 9th

with 67.1 points; 2 (Detection and Reporting) ranked 12th with 82.4 points, and 1 (Prevention) ranked 16th with 59.2 points;
h) transparency and trust are vital elements in preparing for the pandemic.

2.4 The Most Transparent Countries in 2019

One of the recommendations of the GHS Index 2019 report for each country is that the health security capacity is transparent and regularly evaluated, and the results are published at least once every two years (NTI, JHU, and EIU, 2019 p. 13).

Also, one of the principles of the GHS Index 2019 is that transparency and trust are vital elements in preparing for the pandemic. Shared Transparency, data publicity is needed to draw a more comprehensive and reproducible picture of global gaps related to preparedness (NTI, JHU, and EIU, 2019 p. 34).

Given the above, each government must streamline its data collection and dissemination process involving COVID19. Governments must, therefore, act with integrity and transparency (E.V., T. I., 2020b).

The population needs to feel confident in the government and its public managers responsible for health and other essential areas, to act more correctly in the face of the pandemic.

One of the studies that assess the level of perception of a sample of the population with its leaders is carried out annually in 180 countries, called "Corruption Perceptions Index - CPI", published by Transparency International <https://www.transparency.org/>.

The last report was CPI 2019, it contains 34 pages and its methodology aggregates data from different sources that allow evaluating on a scale from 0 to 100, the perception of specialists and entrepreneurs with the level of corruption in the public sector, where 100 points mean that the country is very clean, while 0 points mean that the region is highly corrupt (EV, TI, 2020b p.4).

In summary, this report points out that:
a) The average score for all countries was 43 points;
b) Two-thirds of the countries had points below 50 points;
c) The region with the highest score was the European Union and Western Europe with an average of 66 points;
d) The region with the lowest score was sub-Saharan Africa with an average of 32 points;
e) The ten most transparent countries were:
Denmark (87 points), New Zealand (87 points), Finland (86 points), Singapore (85 points), Sweden (85 points), Switzerland (85 points), Norway (84 points), Germany (80 points) and Luxembourg (80 points);
f) The ten least transparent countries were:
Somalia (9 points), South Sudan (12 points), Syria (13 points), Yemen (15 points), Venezuela (16 points), Sudan (16 points), Equatorial Guinea (16 points), Afghanistan (16 points), North Korea (17 points) and Libya (18 points);
g) recommendations were made to manage conflicts of interest, control political funding, strengthen electoral integrity, regulate lobbying activities, address special treatment, empower citizens and strengthen controls and balance sheets;

Regarding Brazil, it is worth noting that the country in 2019 had the worst score (35 points) since 2012, the 2019 report highlights that after the 2018 elections, the country underwent a series of anti-corruption setbacks in its legal framework and institutional.

Among other things, it highlighted the growing political interference of President Bolsonaro in the so-called control bodies and the approval of legislation that threatens the independence of law enforcement officials and the accountability of political parties.

The use of this ranking is important to look more confidently at the data released by the countries considered most transparent, especially the top 20, on the other hand, it signals the need to maintain a more critical view regarding the reliability of the data released by the other countries, especially those considered less transparent, since the possibility of the data being underestimated is high.

3. Methodology

The research is applied, as its results and recommendations can be applied with adaptation by public managers and other people interested in the theme.

The research is descriptive, with a combined, qualitative and quantitative approach, based on bibliographic and documentary research, involving study articles, reports, manuals and other technical documents related to the subject.

Descriptive statistics were also applied to the number of new confirmed cases collected daily on the Worldometers and John Hopkins Coronavirus Research Center sites.

The research has the following steps:

Stage 1) Bibliographic review with documentary and article research

Step 2) Definition of the 16 countries:

In addition to Brazil, the 15 countries were divided into two groups. Group 1 composed of the 5 most critical countries, affected in terms of the number of new cases confirmed by COVID19 until the first half of March 2020, that is, China, Italy, Iran, Spain, and Germany.

Group 2 was composed of 10 countries considered by the GHS Index 2019 with the best overall scores: USA (83.5); 2) United Kingdom (77.9); 3) the Netherlands (75.6); 4) Australia (75.5); 5) Canada (75.3); 6) Thailand (73.2); 7) Sweden (72.1); 8) Denmark (70.4); 9) South Korea (70.2) and Finland (68.7).

It is worth mentioning that if by the end of the data collection (03/30/20) one of these countries evolves to the top of the 5 most critical on the planet, it will be transferred to Group 1 during the development of the scenarios.

Step 3) Data collection and analysis

Initially, it was sought to collect data from the ministries of health of each nation. However, in some countries, such as Brazil, it is difficult to collect updated data and in a more organized way, because of this, data released in real-time by the Worldometers <https://bit.ly/3dpMErI>, by COVID-19 tracker <https://www.bing.com/covid>, created by Microsoft, as well as data from the John Hopkins Coronavirus Resource Center <https://coronavirus.jhu.edu/>.

For each country, the number of new cases and confirmed deaths were entered in spreadsheets (Figure 8), with daily values since the day in each country officially announced its 1st case until 03/30/20.
Columns were also created to insert the percentage of daily and accumulated evolution, aiming at analyzing the data.

Day	Week	China	WD	81518		DG(%)	DAG(%)	Death	Ac Death	Italy	WD	101739		DG(%)	DAG(%)	Death	Ac Death
1	1	31/12/19	T(3a)	27	27	-	-	0	0	31/01/20	F(6a)	2	2	-	-	0	0
2	1	01/01/20	W(4a)	0	27	-100	0,00	0	0	01/02/20	Sa	0	2	-100,00	0,00	0	0
3	1	02/01/20	Th(5a)	0	27	0,00	0,00	0	0	02/02/20	Sun(D)	0	2	0,00	0,00	0	0
4	1	03/01/20	F(6a)	17	44	.	62,96	0	0	03/02/20	M(2a)	0	2	0,00	0,00	0	0
5	1	04/01/20	Sa	0	44	-100,00	0,00	0	0	04/02/20	T(3a)	0	2	0,00	0,00	0	0
6	1	05/01/20	Sun(D)	15	59	.	34,09	0	0	05/02/20	W(4a)	0	2	0	0,00	0	0
7	1	06/01/20	M(2a)	0	59	-100,00	0,00	0	0	06/02/20	Th(5a)	1	3	.	50,00	0	0
8	2	07/01/20	T(3a)	0	59	0,00	0,00	0	0	07/02/20	F(6a)	0	3	-100	0,00	0	0
9	2	08/01/20	W(4a)	0	59	0,00	0,00	0	0	08/02/20	Sa	0	3	0	0,00	0	0
10	2	09/01/20	Th(5a)	0	59	0,00	0,00	0	0	09/02/20	Sun(D)	0	3	0	0,00	0	0
11	2	10/01/20	F(6a)	0	59	0,00	0,00	0	0	10/02/20	M(2a)	0	3	0	0,00	0	0
12	2	11/01/20	Sa	0	59	0,00	0,00	0	0	11/02/20	T(3a)	0	3	0	0,00	0	0
13	2	12/01/20	Sun(D)	0	59	0,00	0,00	0	0	12/02/20	W(4a)	0	3	0	0,00	0	0
14	2	13/01/20	M(2a)	0	59	0,00	0,00	0	0	13/02/20	Th(5a)	0	3	0	0,00	0	0
15	3	14/01/20	T(3a)	0	59	0,00	0,00	0	0	14/02/20	F(6a)	0	3	0	0,00	0	0
16	3	15/01/20	W(4a)	0	59	0,00	0,00	0	0	15/02/20	Sa	0	3	0	0,00	0	0

Figure 8: Daily launch of the number of new confirmed cases and deaths from COVID19
Source: Author

The daily and weekly evolution was compared with the same period in each country, using accumulated values, averages, medians, standard deviation and coefficient of variation.
With the analysis of the data, it was possible to identify the countries that are performing better against the increase in the confirmed cases of COVID19, which will be recommended for future benchmark studies on the best management practices adopted.

Step 4) Creation of scenarios
Also, the evolution of the new confirmed cases of COVID19 from the most critical countries was studied to compare with Brazil and outline short-term scenarios, as well as to propose recommendations to the public, private and start-up managers.
To simplify understanding and facilitate future applications of scenarios, a strategic metaphorical approach with the number 7, the Board, the Pyramid, the Papyri and was used, together with variables that will be explained during the discussion of the results.
Finally, sites from Clipart Library, Bibme and software from Edraw Max, Libre Office, PhotoScape and CopySpyder were used to write and improve the article.

4. Results

4.1 Basic profile of the 16 countries

Table 1 presents the profile of the 16 countries investigated, organized in ascending order of the GHS Index 2019.

Regarding Group 1, the countries considered the most critical at the end of the first half of March 2020, it is observed that Italy, China, and Iran are respectively in the 31st., 51st and 97th positions of the GHS Index 2019.

Table 1: Information of the countries investigated (Global Health System, Transparency, Population)

RANK	GROUP	COUNTRIES	GHSI2019	CPI2019	* P (Mil)	** PD	* LEXP	* 0-14 (%)	* 10-24 (%)	*15-64 (%)	* >=65 (%)
1TH	2	USA	01 (83.5)	023 (69)	329.1	36	80	19	20	65	16
2TH	2	UK	02 (77.9)	012 (77)	67	279.1	82	18	17	63	19
3TH	2	NETHERLANDS	03 (75.6)	008 (82)	17.1	507	82	16	18	64	20
4TH	2	AUSTRALIA	04 (75.5)	012 (77)	25.1	3.3	83	19	19	65	16
5TH	2	CANADA	05 (75.3)	012 (77)	37.3	4.1	83	16	17	66	18
6TH	2	THAILAND	06 (73.2)	101(36)	69.3	136.3	76	17	19	71	12
7TH	2	SWEDEN	07 (72.1)	004 (85)	10.1	24.5	83	18	17	62	20
8TH	2	DENMARK	08 (70.4)	001 (87)	5.8	136	81	16	18	64	20
9TH	2	SOUTH KOREAN	09 (70.2)	039 (59)	51.3	526.8	83	13	16	72	15
10TH	2	FINLAND	10 (68.7)	003 (86)	5.6	18.2	82	17	17	62	22
11TH	1	GERMANY	14 (66.0)	009 (80)	82.4	239.6	82	13	14	65	22
12TH	1	SPAIN	15 (65.9)	030 (62)	46.4	93.7	84	14	15	66	20
13TH	NG	BRAZIL	22 (59.7)	106 (35)	212.4	25.3	76	21	23	70	9
14TH	1	ITALY	31 (56.2)	051 (53)	59.2	205.9	84	13	14	63	24
15TH	1	CHINA	51 (48.2)	080 (41)	1420.1	152.7	77	18	17	71	12
16TH	1	IRAN	97 (37.7)	146 (26)	82.8	50.9	77	24	21	70	6

Sources: NTI, JHU and EIU (2019); E.V., T. I. (2019); UNFPA (2019b); UNITED NATIONS (2019)

In terms of the perception of experts and entrepreneurs with the level of corruption in the countries in the year 2019 (EV, TI, 2019), the CPI2019 ranking (Corruption Perception Index) points out that the most transparent countries on the planet that were classified up to the 12th position are: 1st) Denmark (87 points); 3rd) Finland (86 points); 4th) Sweden (85 points); 8th) The Netherlands (82 points); 9th) Germany (80 points); 12th) United Kingdom, Australia, and Canada, all with 77 points.

The countries that were between the 20th and 40th global positions were: 23rd) USA (69 points); 30th) Spain (62 points) and South Korea (59 points).

The least transparent countries were: 146a) Iran (26 points); 106a) Brazil (106 points), worth noting that Brazil has been losing positions in recent years; 80a) China (41 points) and 51a) Italy (53 points). This information is relevant to analyze more carefully the data collected from countries whose perception of public transparency is considered low.

In terms of population, China, the USA, Brazil, Iran, and Germany are the five most populous countries, while Finland, Denmark, Sweden, the Netherlands, and Australia are the least populated regions respectively.

In terms of population density (number of people per Km^2) the five most dense countries are respectively: South Korea (526.8), Netherlands (507), United Kingdom (279.10), Germany (239.6) and Italy (205.90), while the five least dense countries are in this order: Australia (3.3), Canada (4.1), Finland (18.2), Sweden (24.5), Brazil (25.3) and the USA (36). This information can be useful for future research aimed

to analyze the increase in new cases due to the greater number of the population and its greater concentration in the affected region.

Finally, concerning the countries with the highest proportion of people aged 65 and over, the following decreasing order was observed: 1st) Italy (24%); 2nd) Germany and Finland (22%); 3rd) Netherlands, Denmark, Spain, Switzerland (20%); 4th) United Kingdom (19%); 5th) Canada (18%); 6th) USA and Australia (16%); 7th) South Korea (15%); 8th) China and Thailand (12%); 9th) Brazil (9th); 10th) Iran (6%).

4.2 Daily evolution of new confirmed cases from Covid19 in 16 countries

The first analysis was made observing the date of the first officially confirmed case (START), the Number of Days (ND) and Weeks (NWEEKS) in which the country faces the pandemic (ND) until the date of 03/30/20, Total new confirmed cases in this period (TOTNC), Average number of confirmed cases per day (TOTNC/ND), Total deaths in the period (TDEATHS) and Average number of confirmed deaths per day (TDEATHS/ND).

The results were organized in Table 2 in decreasing order of Total New Cases (TOTNC) confirmed in this period, which allows observing that:

a) The total of new confirmed cases among the 16 countries is approximately 612,043, with approximately 32,226 deaths recorded, representing about 5.3% of the total of new cases;

b) Among the five countries with the longest time to face COVID19, only China is in Group 1 with 91 days and 3 weeks, the other four are in Group 2: Thailand with 78 days and 11.14 weeks, South Korea with 71 days and 10.14 weeks, the USA with 70 days and 10 weeks, and Australia with 66 days and 9.43 weeks. On the other hand, the countries with the least time are Denmark and the Netherlands with 33 days and 4.71 weeks, Brazil with 35 days and 5 weeks, Iran with 41 days and 5.86 weeks, and Sweden with 45 days and 6.43 weeks. It is worth mentioning that among these five countries with less time to act against the pandemic, Iran registered an average of 67 deaths per day, ahead of the Netherlands (26), Brazil (5), Sweden (3) and Denmark (2);

Table 2: Classification of countries in decreasing order of new confirmed cases of COVID19

RANK	GROUP	COUNTRIES	GHSI2019	CPI2019	** PD	*15-64 (%)	* >=65 (%)	START	ND	NWEEKS	TOTNC	TOTNC/ND	TDEATHS	TDEATHS/ND
1TH	2	USA	01 (83.5)	023 (69)	36	65	16	21/01/20	70	10,00	162848	2326	3157	45.1
2TH	1	ITALY	31 (56.2)	051 (53)	205,90	63	24	31/01/20	60	8,57	101739	1696	11591	193
3TH	1	SPAIN	15 (65.9)	030 (62)	93,70	66	20	31/01/20	60	8,57	87956	1466	7716	129
4TH	1	CHINA	51 (48.2)	080 (41)	152,70	71	12	31/12/19	91	13,00	81518	896	3413	38
5TH	1	GERMANY	14 (66.0)	009 (80)	239,60	65	22	27/01/20	64	9,14	66885	1045	645	10
6TH	1	IRAN	97 (37.7)	146 (26)	50,90	70	6	19/02/20	41	5,86	41565	1014	2757	67
7TH	2	UK	02 (77.9)	012 (77)	279,10	63	19	31/01/20	60	8,57	22141	369	1408	23
8TH	2	NETHERLANDS	03 (75.6)	008 (82)	507	64	20	27/02/20	33	4,71	11750	356	864	26
9TH	2	SOUTH KOREAN	09 (70.2)	039 (59)	526,80	72	15	20/01/20	71	10,14	9661	136	158	2
10TH	2	CANADA	05 (75.3)	012 (77)	4,10	66	18	27/01/20	64	9,14	7448	116	89	1
11TH	NG	BRAZIL	22 (59.7)	106 (35)	25,30	70	9	25/02/20	35	5,00	4630	132	163	5
12TH	2	AUSTRALIA	04 (75.5)	012 (77)	3,30	65	16	25/01/20	66	9,43	4460	68	19	0
13TH	2	SWEDEN	07 (72.1)	004 (85)	24,50	62	20	15/02/20	45	6,43	4028	90	146	3
14TH	2	DENMARK	08 (70.4)	001 (87)	136	64	20	27/02/20	33	4,71	2577	78	77	2
15TH	2	THAILAND	06 (73.2)	101(36)	136,30	71	12	13/01/20	78	11,14	1524	20	10	0
16TH	2	FINLAND	10 (68.7)	003 (86)	18,20	62	22	29/01/20	62	8,86	1313	21	13	0

Sources: NTI, JHU and EIU (2019); E.V., T. I. (2019); UNFPA (2019b); Worldometers (2020)

c) Group 1 composed of Italy, Spain, China, Germany and Iran, the five countries with the most cases at the end of the first half of March/20, accounted for approximately 379,663 new cases with about 26,122 deaths, representing 6.9% new cases in this group. The total number of new cases in Group 1 represents about 62.03% of the total of the 16 countries, while the total number of deaths in Group 1 represents 81.06% of the total number of deaths in the 16 countries.

d) Most Group 1 countries, except for Germany, did not rank in 2019 among the 10 most transparent countries on the planet, which is why the data presented may have been or still be underestimated, especially in Iran (146th place with 26 points), China (80th place with 41 points), Italy (51st place with 53 points) and Spain (30th place with 62 points);

e) In Group 2 with the countries with the best global score in times of Health Security, about 227,750 people were infected and 5,941 fatal cases were registered, which represents about 26.08% of all cases registered in this group. The total number of new cases in Group II represents about 37.21% of the total of the 16 countries, while the total number of deaths in Group II represents 18.43% of the total number of deaths in the 16 countries;

f) The sum of the population of the 5 countries in Group 1 reaches 1,691 billion inhabitants, which is 2.74 times greater than the sum of the 10 countries in Group 2 (617.7 million). The number of new cases registered in Group 1 countries (379,663) is 1.67 times higher than Group II (227,750), while the number of deaths in Group 1 (26,122) is 4.4 times higher than in Group 2 (5,941). This last result draws attention because the countries considered to have the best health security systems are presenting a total amount of average deaths per day (59), which is much lower than the countries in Group 1 (437), with an emphasis on Finland, Thailand, Australia, Canada, Denmark, and South Korea. In Group 1 Germany is the only country with an average number of deaths per day (10) close to the majority of Group 1;

g) Among the Group 2 countries, the USA is the one that has presented the worst indicators, after 67 days it assumed the leadership in the world ranking on March 27, 2020, on March 30, 2020, accumulated 162,848 new cases, about 2,326 new cases per day. Altogether there are 3,157 deaths, representing an average of 45.1 deaths per day, behind only Italy (193 deaths/day), Spain (129 deaths/day) and Iran (67 deaths/day). Until the last day of data collection, only the UK (22141 new cases/day and 369 deaths), the Netherlands (11750 new cases/day and 356 deaths) and South Korea (9661 new cases per day and 136 deaths) had most worrying indicators;

h) Of the 16 countries, the majority (11; 68.75%) has several days equal to or greater than 60 (two months): China (91 days), Thailand (78), South Korea (71), USA (70 days), Australia (66 days), Canada and Germany (64 days), Finland (62 days), United Kingdom, Spain, and Italy with 60 days. Among these 11 countries with the longest pandemic time (Table 3), the five that had the lowest averages of new daily cases of COVID19 were Thailand (20), Finland (21), Australia (68), Canada (116) and South Korea (136), all with the best performances in terms of the average number of deaths per day overtime;

Besides, these five countries are in the top ten of the 2019 GHS Index, with Finland standing out for being the country with the best ranking in terms of transparency (3rd place in CPI 2019), as well as having a rate (22%) of people over 65 years old, considered to be the highest risk by WHO. Because of this, they are highly recommended for benchmark studies to identify the good practices adopted to face the virus, only highlighting the care with Thailand, even though it was considered the 6th country with

the best Health Security System (GHSI2019), the country was considered by the GPI2019 the 101st country in terms of transparency;

Table 3: Classification of 11 countries in increasing order of the average new cases/day of COVID19

RANK	GROUP	COUNTRIES	GHSI2019	CPI2019	** PD	*15-64 (%)	* >=65 (%)	START	ND	NWEEKS	TOTNC	TOTNC/ND	TDEATHS	TDEATHS/ND
1TH	2	THAILAND	06 (73.2)	101(36)	136,30	71	12	13/01/20	78	11,14	1524	20	10	0
2TH	2	FINLAND	10 (68.7)	003 (86)	18,20	62	22	29/01/20	62	8,86	1313	21	13	0
3TH	2	AUSTRALIA	04 (75.5)	012 (77)	3,30	65	16	25/01/20	66	9,43	4460	68	19	0
4TH	2	CANADA	05 (75.3)	012 (77)	4,10	66	18	27/01/20	64	9,14	7448	116	89	1
5TH	2	SOUTH KOREAN	09 (70.2)	039 (59)	526,80	72	15	20/01/20	71	10,14	9661	136	158	2
6TH	2	UK	02 (77.9)	012 (77)	279,10	63	19	31/01/20	60	8,57	22141	369	1408	23
7TH	1	CHINA	51 (48.2)	080 (41)	152,70	71	12	31/12/19	91	13,00	81518	896	3413	38
8TH	1	GERMANY	14 (66.0)	009 (80)	239,60	65	22	27/01/20	64	9,14	66885	1045	645	10
9TH	1	SPAIN	15 (65.9)	030 (62)	93,70	66	20	31/01/20	60	8,57	87956	1466	7716	129
10TH	1	ITALY	31 (56.2)	051 (53)	205,90	63	24	31/01/20	60	8,57	101739	1696	11591	193
11TH	2	USA	01 (83.5)	023 (69)	36	65	16	21/01/20	70	10,00	162848	2326	3157	45.1

Sources: NTI, JHU and EIU (2019); E.V., T. I. (2019); UNFPA (2019b); Worldometers (2020)

I) In the ranking of the 16 countries, Brazil was in 11th place with 4630 new cases registered in 35 days and 9th place with 163 deaths (Figure 9)

Day	Week	Brazil	WD	DV	DVAC	DG(%)	DAC(%)	DVTAC%	DEATH	DEATHAC
1	1	25/02/20	T(3a)	1	1	-	-	100	0	0
19	3	14/03/20	Sa	23	121	9,52	23,47	19,01	0	0
20	3	15/03/20	Sun(D)	79	200	243,48	65,29	39,50	0	0
21	3	16/03/20	M(2a)	34	234	-56,96	17,00	14,53	0	0
22	4	17/03/20	T(3a)	112	346	229,41	47,86	32,37	1	1
23	4	18/03/20	W(4a)	183	529	63,39	52,89	34,59	3	4
24	4	19/03/20	Th(5a)	111	640	-39,34	20,98	17,34	3	7
25	4	20/03/20	F(6a)	330	970	197,30	51,56	34,02	4	11
26	4	21/03/20	Sa	208	1178	-36,97	21,44	17,66	7	18
27	4	22/03/20	Sun(D)	368	1546	76,92	31,24	23,80	7	25
28	4	23/03/20	M(2a)	378	1924	2,72	24,45	19,65	9	34
29	5	24/03/20	T(3a)	323	2247	-14,55	16,79	14,37	12	46
30	5	25/03/20	W(4a)	307	2554	-4,95	13,66	12,02	13	59
31	5	26/03/20	Th(5a)	431	2985	40,39	16,88	14,44	18	77
32	5	27/03/20	F(6a)	432	3417	0,23	14,47	12,64	15	92
33	5	28/03/20	Sa	487	3904	12,73	14,25	12,47	22	114
34	5	29/03/20	Sun(D)	352	4256	-27,72	9,02	8,27	22	136
35	5	30/03/20	M(2a)	374	4630	6,25	8,79	8,08	27	163

Figure 9: Evolution of the numbers of new cases and deaths of COVID19 in Brazil
Source: Worldometers (02/25 to 03/30/20)

Brazil is a worrying case for the reasons already mentioned in the introduction and for being the second country among the 16 investigated to have the worst performance in transparency (106th place on the planet with 35 points), behind only Iran (146th place on the planet with 26 points) points).

Given the importance of speed and transparency advocated by WHO in combating pandemics, Brazil is a worrying case, since there is evidence of slowness in the process of daily registration of new cases and deaths throughout the country, with several records published in newspapers (CAMPBELL, 2020; CORREIO BRAZILIENSE, 2020; LEMOS, 2020; CRUZ, 2020; DINIZ et al, 2020; FOLHA, 2000b) involving new unrecorded cases or burials in a record time of suspected victims of COVID19 who were not registered locally and nationally.

Figure 9 shows the evolution of the number of new cases and deaths registered in Brazil. When analyzing the behavior of the numbers until 03/30/20, a series of numbers with very close values is perceived, sometimes showing reduction, sometimes slow growth, such values have characteristics of the low ability of Brazil to record efficiently the COVID19 cases and/or bias. Since the number of unregistered cases that are being disclosed in newspapers, as well as the experience of the most critical countries, especially Italy, Spain, and the USA, it will not be long before hundreds of cases appear around the country, and it is no longer possible to officially control the slow evolution of the numbers.

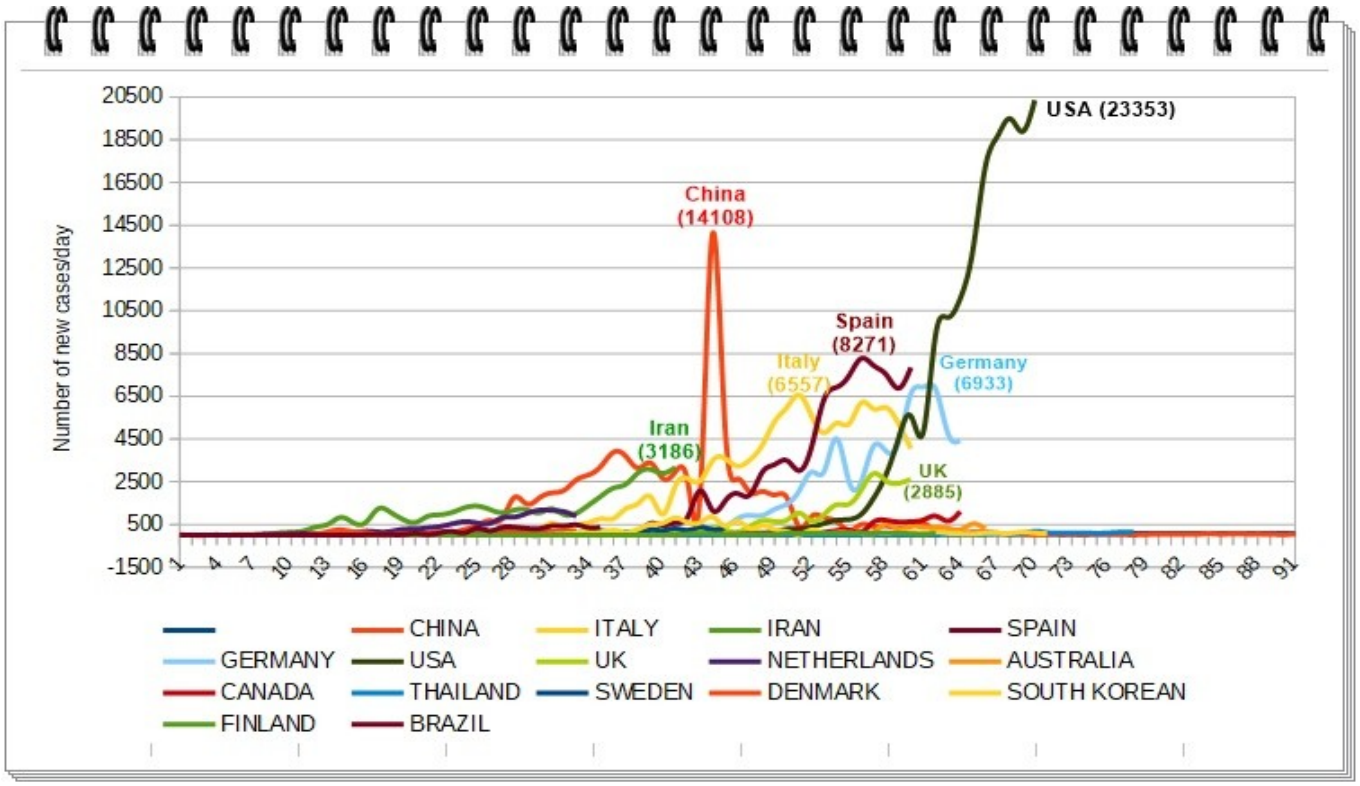


Figure 10: Number of new cases confirmed daily between 12/31/19 until 03/30/20
Source: Author (2020)

4.3 China's actions and critical periods of COVID19 in the first 91 days

This analysis took into account the daily (Figure 10) and weekly values of new confirmed cases in each of the 16 countries, focusing primarily on the countries that were considered most critical in March 2020.

Daily growth in percentage (DG%) was also analyzed to identify the most critical weeks and days in each of the countries. The results of Figure 10 show that until March 03/30/20, when 91 days have passed since the first case officially announced to WHO by China (December 31, 19), the most critical countries in terms of registering new cases are: USA, China, Italy, Spain, Germany, and Iran.

4.3.1 China

It seems that in November and December, China took a long time to communicate to the WHO about the new disease and the first people infected.

The first official report only took place on 12/31/20. By the end of the 3rd week, 291 new cases had been announced, as of the 4th week, the number of new cases evolved rapidly, reaching a maximum value of 14108 on the 44th day (02/12/20) of the 7th week, the date from which registered the reduction over time, apparently being the only country that managed to control the pandemic for the number of cases in the order of dozens daily, starting from the 67th day (03/06/20) of the 10th week.

Table 6: Daily Growth (DG%) of the Number of COVID19 cases in China (12/31/19 to 03/30/20)

WEEK – CHINA	T(3a)	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	M(2a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	.	-100,00	.	-100,00	-75,00	-100,00	50,00	-66,67
2	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
3	0,00	0,00	0,00	.	1350,00	32,76	20,78	233,92	10,39	546,93	233,81
4	60,22	-12,08	107,63	63,24	54,95	11,77	130,30	59,43	60,22	49,61	83,47
5	-17,62	19,05	14,05	5,96	23,39	9,07	14,51	9,77	14,05	13,40	137,11
6	20,06	-4,89	-14,92	7,70	-21,65	12,10	-17,02	-2,66	-4,89	16,14	-607,03
7	-18,32	600,15	-63,92	-48,11	-23,97	1,99	-7,81	62,86	-18,32	238,01	378,65
8	-7,36	-77,64	127,37	-7,42	-21,26	-66,98	137,38	12,01	-7,42	86,76	722,31
9	-20,08	6,65	-24,48	30,58	34,19	-64,75	-38,12	-10,86	-20,08	36,45	-335,70
10	-4,80	16,81	2,88	-30,77	-55,56	-9,09	-52,50	-19,00	-9,09	27,86	-146,61
11	26,32	-37,50	13,33	-23,53	53,85	-20,00	31,25	6,25	13,33	33,75	540,37
12	-38,10	161,54	14,71	5,13	12,20	-15,22	100,00	34,32	12,20	70,62	205,75
13	-39,74	42,55	-17,91	-1,82	-16,67	-31,11	54,84	-1,41	-16,67	36,41	-2585,29
X	-3,29	47,28	12,21	0,09	99,19	-11,62	21,05				
MED	-6,08	0,00	0,00	0,00	0,00	-4,55	14,51		X of all DG (%)	24,81	
S	28,20	177,32	51,39	29,88	378,29	30,43	70,28		Med of all DG (%)	0,00	
CV	-858,36	375,05	420,91	34747,67	381,38	-261,85	333,94				

Source: Author (2020)

Table 6 shows the daily growth (DG) as a percentage of new cases of COVID10 in China from 12/31/19 to 3/30/20, as well as the mean (X), the median (Med), the deviation standard (S), the coefficient of variation (CV), the general mean (X of all DV) and the general median (MED of all DG%) of all Daily Increases.

The results in Table 6 show that, in relative terms, weeks 3, 4, 7 and 12 were those with the highest daily growth percentages for Covid19 in China, while weeks 1, 8, 9 and 10 showed those that had the lowest growth rates. The most critical days of the week were Saturday (X = 99.19%), Wednesday (47.28%) and Monday (X = 21.5%) respectively, the least critical were Sunday (X = -11.62) and Tuesday (X = -3.29).

Because China has been the focus of the pandemic, it will receive greater emphasis in this section, especially on some of the actions taken over time.

According to a report (WHO, 2020d) of an international mission carried out in China (25 experts from China, Germany, Japan, South Korea, Nigeria, Russia, Singapore, USA, and WHO), between 16 and 24 February 2020:

a) implementation of control and prevention measures in the main areas of Hubei and Wuhan;

b) closing public markets to identify the zoonotic source;

c) formulation of the protocol to diagnose, treat, monitor, manage contacts of people close to patients, and perform tests in laboratories delivering the result on the same day;

d) implementation of strategies to reduce the intensity of the pandemic in the priority regions of Wuhan and Hubei: other markets for the sale of wild animals have also been closed; temperature checks, quarantine; isolation of people close to patients and with medical monitoring; changes to the Spring Festival holiday dates; cancellation of mass activities; traffic control; control of the capacity of the transport system to reduce the movement of people; construction of new hospitals; use of reserve beds; coordination of the allocation of medical supplies; guarantee price stability and product distribution;

e) reduce the clusters of cases: standardization of manuals; implementing measures to improve testing capacity, admission, and treatment of patients; adoption of technologies (big data, artificial intelligence, applications, bar codes, etc. to strengthen the tracking of people involved and the management of priority populations; promulgation of policies related to health insurance, involving payment and financial compensation; popularization of knowledge about disease prevention, control of the gradual return of social activities, etc.

At the end of the report, the mission presents various technical information and recommendations deemed useful not only for the Chinese but for other countries.

4.3.2 USA

Concerning the other countries considered critical in Group 1, none has yet managed to drastically reduce the number of new cases over time.

The USA, despite being in Group 2, is currently the leader of new cases, which is why this country will be compared within Group 1.

Politicians and public officials in the USA, Italy and Spain ignored the warnings of scientists, control bodies and WHO, when prioritizing the economy, it took a long time to recognize the seriousness of the pandemic and to react since the first confirmed cases in the second half January 2020 (PISANO, SADUN and ZANINI, 2020; GLOBO, 2020; HALTIWANG, 2020; KEELEY, 2020).

The US officially registered the first case on 1/21/20 and only 100 new cases by the end of the 6th week. In the 7th week, 604 new cases were registered (average of 86 new cases/day), six times the value of the first six weeks.

In the eighth week, more than 3959 new cases were recorded (average of 566 cases/day), with daily growth rising from 3 digits after the 9th week, with a peak of 20353 new cases recorded on the last day of data collection (03/30/20).

The average growth rate in the USA in the last ten days is 16.54%, one of the highest indexes when compared against other countries, reason by which it may register continuous growth of new cases and it seems that it may remain at the top of the world for the next month.

Table 7 points out that from the end of the 6th week onwards, the highest percentage of new cases of COVID19 increased in the USA, with Sunday (X = 42.90%) and Monday (17.83%) being the days most critical of the week.

Table 7: Daily Growth (DG%) of the New cases of COVID19 in USA (01/21-30/03/20)

WEEK – USA	T(3a)	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	M(2a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	.	0,00	100,00	-100,00	-20,00	0,00	83,67	-418,33
2	0,00	0,00		0,00	0,00	200,00	-100,00	16,67	0,00	98,32	589,92
3	0,00	.	-100,00	0,00	0,00	0,00	0,00	-16,67	0,00	40,82	-244,95
4	0,00	0,00	0,00	0,00	.	0,00	0,00	0,00	0,00	0,00	0,00
5	0,00	0,00	.	-100,00	0,00	0,00	.	-20,00	0,00	44,72	-223,61
6	-77,78	-25,00	-100,00	.	66,67	40,00	257,14	26,84	7,50	130,01	484,43
7	-4,00	41,67	85,29	55,56	18,37	-8,62	53,77	34,58	41,67	34,27	99,12
8	77,91	5,86	28,99	38,89	26,55	5,89	33,38	31,07	28,99	24,34	78,35
9	**77,82**	**62,93**	**59,06**	**23,13**	**-13,50**	**94,82**	**8,39**	**44,67**	**59,06**	**39,41**	**88,23**
10	8,94	20,14	29,16	8,46	4,34	-3,13	7,79	10,81	8,46	10,63	98,30
X	9,21	0,62	0,31	3,25	11,38	42,90	17,83				
MED	0,00	0,00	14,50	4,23	0,00	2,95	7,79		X of all DG (%)	13,05	
S	46,78	45,77	68,09	46,48	23,77	68,56	104,52		Med of all DG (%)	0,00	
CV	507,89	7364,82	21726,15	1427,96	208,92	159,84	586,18				

Source: Author

4.3.3 Italy

Italy has officially released only 3 new cases on the 21st (1/20/20) of the 3rd week since January 31, 2020, when the first case was confirmed. In the 4th week, 647 new cases were recorded (average of 92 new cases/day), hundreds of times the value of the first 3 weeks. In the 5th week more 3208 new cases registered (average of 458 cases/day), in the 6th week more 11255 new cases (average of 1608 new cases/ day) with daily growth with 4 digits, reaching the maximum value of 101739 new cases recorded on the last day of data collection (03/30/20). In the last ten days, the number of new cases has evolved more slowly with records of increases and decreases in cases, with an average rate of – 3.03%.

Table 8: Daily Growth (DG%) of the Number of COVID19 cases in Italy (01/31 - 03/26/20)

WEEK – CHINA	T(3a)	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	M(2a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	**-100,00**	0,00	.	**-100,00**	.	**-100,00**	-75,00	-100,00	50,00	-66,67
2	0,00	**0,00**	0,00	0,00	**0,00**	0,00	**0,00**	0,00	0,00	0,00	0,00
3	**0,00**	**0,00**	**0,00**	**.**	**1350,00**	**32,76**	**20,78**	**233,92**	**10,39**	**546,93**	**233,81**
4	**60,22**	**-12,08**	**107,63**	**63,24**	**54,95**	**11,77**	**130,30**	**59,43**	**60,22**	**49,61**	**83,47**
5	-17,62	**19,05**	14,05	5,96	**23,39**	9,07	**14,51**	9,77	14,05	13,40	137,11
6	20,06	**-4,89**	-14,92	7,70	**-21,65**	12,10	**-17,02**	-2,66	-4,89	16,14	-607,03
7	-18,32	**600,15**	-63,92	-48,11	**-23,97**	1,99	**-7,81**	62,86	-18,32	238,01	378,65
8	-7,36	**-77,64**	127,37	-7,42	**-21,26**	-66,98	**137,38**	12,01	-7,42	86,76	722,31
9	-20,08	**6,65**	-24,48	30,58	**34,19**	-64,75	**-38,12**	-10,86	-20,08	36,45	-335,70
10	-4,80	**16,81**	2,88	-30,77	**-55,56**	-9,09	**-52,50**	-19,00	-9,09	27,86	-146,61
11	26,32	**-37,50**	13,33	-23,53	**53,85**	-20,00	**31,25**	6,25	13,33	33,75	540,37
12	-38,10	**161,54**	14,71	5,13	**12,20**	-15,22	**100,00**	34,32	12,20	70,62	205,75
13	-39,74	**42,55**	-17,91	-1,82	**-16,67**	-31,11	**54,84**	-1,41	-16,67	36,41	-2585,29
X	-3,29	**47,28**	12,21	0,09	**99,19**	-11,62	**21,05**				
MED	-6,08	**0,00**	0,00	0,00	**0,00**	-4,55	**14,51**		X of all DG (%)	24,81	
S	28,20	**177,32**	51,39	29,88	**378,29**	30,43	**70,28**		Med of all DG (%)	0,00	
CV	-858,36	**375,05**	420,91	34747,67	**381,38**	-261,85	**333,94**				

Source: Author (2020)

Table 8 shows that from the end of the 4th week to the 6th week, the highest percentages of increase in new cases of COVID19 were recorded in Italy, with Thursday (X = 38.37%), Saturday (X = 26.93%) and Wednesday (17.83%) respectively the most critical days of the week.

4.3.4 Spain

Spain officially released a total of only 25 new cases until the 28th day (02/27/20) of the 4th week, since January 31, 2020, where the first case was confirmed.

In the 5th week, 257 new cases were recorded (average of 36.7 new cases/day), a value 10 times higher than that recorded in the first 4 weeks. In the 6th week more 2864 new cases were registered (average of 409 cases/day), in the 7th week, there were 14931 new cases (average of 2133 per week) with values of 4 digits.

The highest number of new cases was 8271 recorded on the last day of the 8th week (03/26/20). And because the average growth rate in the last ten days (10.7%/day) is higher than the average growth rate for the same period recorded in Italy (- 3.03%), Spain is likely to exceed Italy among the April 3 and 5, 2020.

Table 9 shows that from the end of the 4th week until the 7th week, the highest percentages of increase in new cases of COVID19 were registered in Spain, with Monday (X = 41.04%), Tuesday (X = 64.18%) and Thursday (X = 33.34%), respectively the most critical days of the week.

Table 9: Daily growth (DG%) of the number of cases of COVID19 in Spain (01/31 - 03/26/20)

WEEK – SPAIN	F(6a)	Sa	Sun(D)	M(2a)	T(3a)	W(4a)	Th(5a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	0,00	0,00	0,00	0,00	-16,67	0,00	40,82	-244,95
2	0,00	0,00	.	-100,00	0,00	0,00	.	-20,00	0,00	44,72	-223,61
3	-100,00	0,00	0,00	0,00	0,00	0,00	0,00	-14,29	0,00	37,80	-264,58
4	**0,00**	**0,00**	**0,00**	**.**	**500,00**	**-33,33**	**175,00**	**106,94**	**0,00**	**206,45**	**193,05**
5	-27,27	212,50	4,00	38,46	25,00	40,00	-14,29	39,77	25,00	80,37	202,07
6	120,37	4,20	20,16	273,83	-16,70	25,43	49,31	68,09	25,43	100,66	147,85
7	140,05	-44,44	37,79	22,35	-3,53	56,07	12,44	31,53	22,35	57,54	182,48
8	5,62	-13,42	37,92	52,64	8,70	7,73	10,92	15,73	8,70	22,15	140,81
X	**19,82**	**7,35**	**14,27**	**41,04**	**64,18**	**11,99**	**33,34**				
MED	**0,00**	**0,00**	**4,00**	**22,35**	**0,00**	**3,86**	**10,92**		**X of all DG (%)**	**27,45**	
S	83,79	90,16	17,62	113,97	176,49	27,81	65,52		**Med of all DG (%)**	**0,00**	
CV	422,68	1225,78	123,53	277,72	274,97	231,96	196,50				

Source: Author (2020)

4.3.5 Iran

Iran was the only country that surpassed more than 1000 new cases in a day before the end of the 3rd week (1234 cases on the 17th day and 1076 cases on the 18th day).

Initially, it released a total of only 95 new cases on the 7th day (2/27/20) of the 1st week, since February 19, 2020, when the first case was confirmed. In the 2nd week, 2241 new cases were registered (average of 320 new cases/day), 23.6 times the value of the first week. In the 3rd week, more than 5706 new cases

were registered (average of 815 cases/day), with daily growth twice exceeding the 3-digit number and returning to 3 digits.

In the 4th week more 8127 new cases (average of 1161 cases/day) with values exceeding 3 digits. The peak of 3186 new cases registered on the last day of data collection (03/30/20), and in the last ten days the growth rate was 11.21%. Table 10 shows in the first two weeks the highest percentages of increase in new cases of COVID19 were recorded in Iran, with Friday (X = 34.91%), Tuesday (X = 48.07%), Thursday (X = 12.21%) and Sunday (X = 6.42%), respectively the most critical days of the week.

Table 10: Daily growth (DG%) of the number of COVID19 cases in Iran (02/19 - 03/24/20)

WEEK – IRAN	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	M(2a)	T(3a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	**50,00**	**333,33**	**-23,08**	**50,00**	**20,00**	**88,89**	**86,52**	**50,00**	**126,51**	**146,22**
2	29,41	140,91	34,91	43,36	87,80	35,84	59,66	61,70	43,36	40,26	65,25
3	-29,82	0,85	108,80	-12,80	-30,95	-19,92	48,07	9,18	-12,80	51,59	562,22
4	8,74	12,21	19,91	5,90	-11,43	-12,90	11,87	4,90	8,74	12,43	253,65
5	1,19	-12,25	18,26	-21,91	6,42	37,26	29,84	8,40	6,42	21,57	256,71
X	2,38	38,35	103,04	-1,71	20,37	12,06	47,66				
MED	4,96	12,21	34,91	-12,80	6,42	20,00	48,07		X of all DG (%)	32,60	
S	24,56	61,85	133,99	27,73	48,13	26,97	29,34		Med of all DG (%)	19,08	
CV	1031,90	161,31	130,03	-1624,47	236,27	223,71	61,55				

Source: Author (2020)

Table 11: Daily growth (DG%) of the number of cases of COVID19 in Germany (01/27 - 03/29/20)

WEEK – GERMANY	M(2a)	T(3a)	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	200,00	-100,00	.	100,00	-50,00	0,00	30,00	0,00	120,42	401,39
2	100,00	-100,00	0,00	.	0,00	-100,00	0,00	-16,67	0,00	75,28	-451,66
3	0,00	.	-50,00	-100,00	0,00	0,00	0,00	-25,00	0,00	41,83	-167,33
4	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5	**0,00**	**.**	**300,00**	**175,00**	**18,18**	**-80,77**	**920,00**	**222,07**	**96,59**	**368,24**	**165,82**
6	-31,37	8,57	55,26	379,66	-55,83	4,00	84,62	63,56	8,57	147,35	231,83
7	-23,33	85,33	17,60	94,26	19,38	-0,65	31,39	32,00	19,38	43,23	135,12
8	20,18	43,59	41,29	1,11	51,29	-44,43	-0,28	16,11	20,18	33,67	209,04
9	66,72	-5,93	10,09	52,70	4,81	-1,57	-30,54	13,75	4,81	34,16	248,34
X	16,52	33,08	30,47	86,11	15,31	-30,38	111,69				
MED	0,00	8,57	10,09	52,70	4,81	-1,57	0,00		X of all DG (%)	36,38	
S	45,04	92,76	111,42	155,21	42,38	39,86	304,80		Med of all DG (%)	0,00	
CV	272,59	280,42	365,66	180,25	276,71	-131,20	272,90				

Source: Author (2020)

4.3.6 Germany

Germany registered the first case on January 27, 2020. Until the 5th week, it officially released a total of only 130 new cases, in the 6th week another 910 new cases were registered (average of 130 new cases/day), almost 9 times the value of the first 5 weeks.

In the 7th week more 4773 new cases registered (average of 682 cases/day), with daily growth exceeding 3 digits on the last day of this week (1214 cases on 03/15/20). By the end of the last day (03/29/20) which completed 9 weeks, the peak of 6933 new cases was registered on 27 March 2020.

Germany's average growth rate in the last ten days is 4.54 %, which is the second-lowest rate in this group, second after Italy.

Table 11 shows between the 5th and 8th weeks, the highest percentages of increase in new cases of COVID19 were recorded in Germany, with Thursday (X = 86.11%), Sunday (X = 111.69%), Tuesday (X = 33.08%), Wednesday (X = 30.47%) and Friday (X = 15.31%), respectively the most critical days of the week.

4.3.7 United Kingdom

The United Kingdom registered the first two cases on January 31, 2020. Until the 5th week, it officially released a total of only 116 new cases, in the 6th week another 480 new cases were registered (average of 68.3 new cases/day), 4 times the value of the first 5 weeks.

In the 7th week more 2673 new cases registered (average of 382 cases/day).

In the 8th week more 8389 new cases (1199 new cases/day), with a maximum value of 2129 new cases per day registered on 26 March 2020.

The average growth rate of new cases for Covid19 in the United Kingdom in the last ten days is 17.75%, one of the highest index among the countries, reason by which the daily growth may continue during the next month.

Table 12 shows that between the 5th and 8th weeks the highest percentages of increase in new cases of COVID19 were registered in the United Kingdom, with Tuesday (X = 57.15%), Wednesday (X = 42.24%), Sunday (X = 46.33%), respectively the most critical days of the week.

For reasons of space, Tables 13 to 20 containing the daily growth (DG%) of the other countries can be seen in the Appendix of this article.

Table 12: Daily growth (DG%) of the number of cases of COVID19 in the UK (01/31 03/26/20)

WEEK – UK	F(6a)	Sa	Sun(D)	M(2a)	T(3a)	W(4a)	Th(5a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	0,00	0,00	0,00	0,00	-16,67	0,00	40,82	-244,95
2	0,00	0,00	0,00	.	-100,00	.	-100,00	-40,00	0,00	54,77	-136,93
3	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
4	0,00	0,00	.	-100,00	0,00	0,00	.	-20,00	0,00	44,72	-223,61
5	**33,33**	**-25,00**	**333,33**	**-76,92**	**300,00**	**200,00**	**-19,44**	**106,47**	**33,33**	**168,22**	**158,00**
6	65,52	-6,25	53,33	-37,68	41,86	27,87	74,36	31,29	41,86	40,42	129,19
7	48,53	69,31	-26,61	-39,44	167,76	66,09	-4,88	40,11	48,53	71,53	178,34
8	11,04	44,96	-35,75	45,41	47,57	1,75	46,63	23,09	44,96	32,13	139,15
X	22,63	-2,12	46,33	-29,80	57,15	42,24	-0,48				
MED	11,04	0,00	0,00	-37,68	20,93	1,75	0,00		X of all DG (%)	19,74	
S	26,76	49,93	129,69	49,56	123,07	73,77	54,93		Med of all DG (%)	0,00	
CV	118,22	-2351,82	279,93	-166,28	215,36	174,63	-11506,03				

Source: Author (2020)

4.3.8 Brazil

Brazil registered the first case on February 25, 2020. Up to the 3rd week, a total of 234 new cases were officially released, in the 4th week another 1690 new cases were registered (average of 241 new

cases/day), 7 times the value of the first 3 weeks. In the 5th week more 2706 new cases registered (average of 387 cases/day).

During the 5 weeks, the highest value was 487 new cases, registered on March 28, 2020. The average growth rate in Brazil in the last ten days is 5.51%, considered lower than the USA, Iran, Spain, the UK and near to Germany.

Table 21 shows that between the 2nd and 4th weeks, the highest percentages of increase in new cases of COVID19 were recorded in Brazil, especially week 4. It is noteworthy that in the 5th week, the average daily growth decreased dramatically, falling from 70.49% to 1.77%, which is strange for a country with a continental dimension and with chronic problems in its health system.

In addition, Thursday (X = 87.99%) and Wednesday (X = 77.11%) are the days with the most significant increases in the percentage of new cases registered, followed by Tuesday respectively (X = 48.72%), Sunday (X = 38.54%) and Friday (X = 36.31%).

Table 21: Daily growth (DG%) of the number of cases of COVID19 in Brazil (02/25 - 03/30/20)

WEEK – BRAZIL	T(3a)	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	M(2a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	0,00	.	-100,00	0,00	-40,00	0,00	54,77	-136,93
2	0,00	.	400,00	0,00	20,00	0,00	-16,67	67,22	0,00	163,44	243,14
3	-20,00	350,00	38,89	-16,00	9,52	243,48	-56,96	78,42	9,52	155,05	197,72
4	**229,41**	**63,39**	**-39,34**	**197,30**	**-36,97**	**76,92**	**2,72**	**70,49**	**63,39**	**107,73**	**152,83**
5	-14,55	-4,95	40,39	0,23	12,73	-27,72	6,25	1,77	0,23	21,66	1224,84
X	48,72	**77,11**	**87,99**	36,31	1,32	38,54	-12,93				
MED	-7,28	**29,22**	**38,89**	0,00	11,13	0,00	0,00		X of all DG (%)	39,31	
S	120,76	**193,87**	**177,47**	90,27	25,90	130,90	26,14		Med of all DG (%)	0,00	
CV	247,89	**251,42**	**201,70**	248,63	1960,11	339,69	-202,11				

Source: Author

This information is useful to advance studies on which days are the ones that have the greatest growth of new cases, to identify the causes and to guide the population over time. For example, if you assume that:

a) the average incubation time is 5.2 days and the average time from the beginning to the hospital visit is 12.5 days (LI, GUAN, WU et al, 2020);

b) that in the two public hospitals in São Paulo (Brazil) that concentrate serious cases of patients with COVID19, it is taking an average of one week to obtain and confirm the test result (LEÃO and CARVALHO, 2020);

c) it takes a day for hospitals to inform the authorities to update the new case with the Ministry of Health, so it can be speculated that it would take about 20.5 days to confirm a case of Covid19 in the Brazilian health system, in this hypothesis, looking at Table 21, would it be possible to consider that the days of greatest contagion were Wednesday, Thursday and Friday, while Sunday, Monday and Tuesday would be the periods with the least contagion?

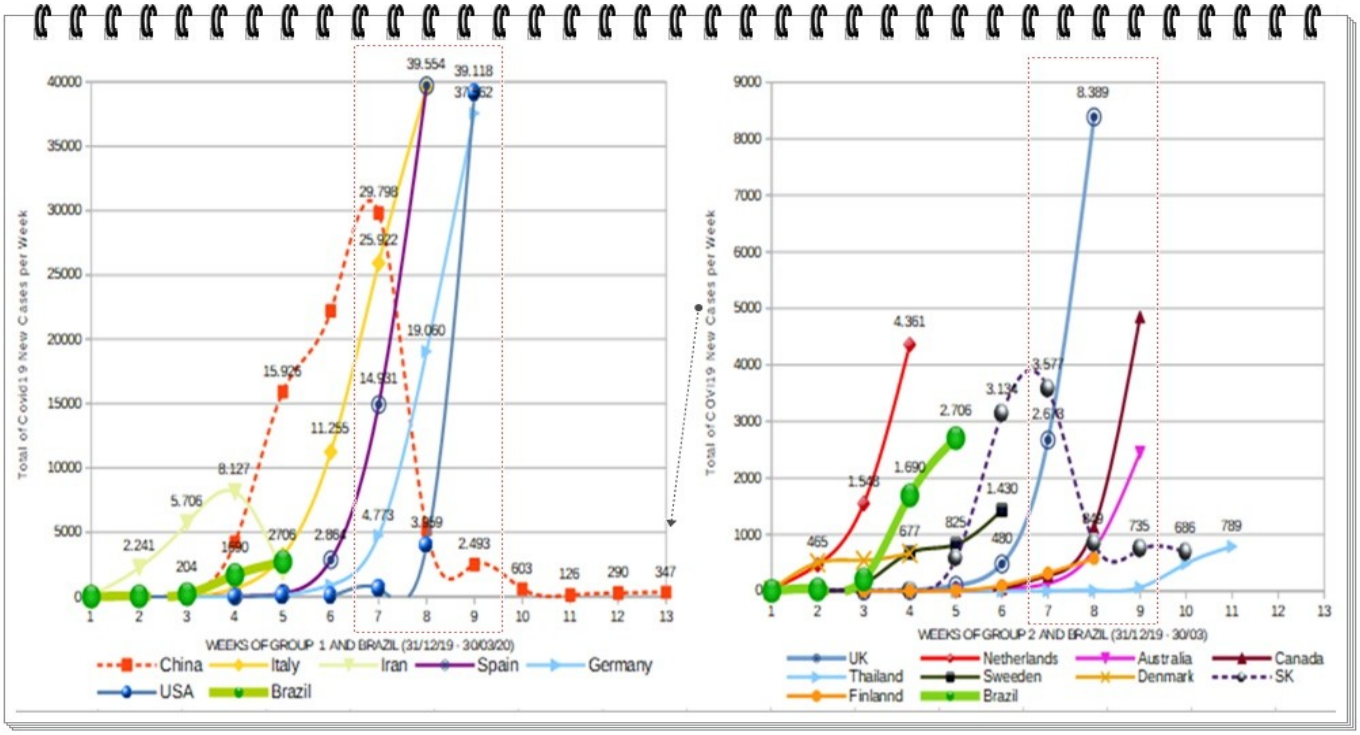
Because the weighting is based on initial Chinese statistics analyzed in early January/20, the answer is difficult, which is why further research is recommended to advance this topic.

4.3.9 Brazil and the 15 countries

Figures 11 and 12 summarize the total number of new cases per week between the two groups, inserting Brazil in each of them, just placing the total of new cases for the weeks that were completed between 12/31/19 and 03/30/20.

In short, the results from Figure 11 and 12 show that:

a) Each country has a different dynamic of evolution in the number of new cases per week overtime, because while Iran and China had rapid evolution from the third week, Italy, Spain, Germany, and the United States had rapid evolution a from the 6th, 7th, 8th and 9th weeks respectively;



Figures 11 and 12: Total new cases per week in Group 1 countries (left), Group 2 and Brazil

Source: Author (2020)

b) among the countries of Group 2 (except USA; 2326 cases/day), the UK in 60 days reached a total of 22141 new cases, an average of 369 new cases/day, with fast growth from the 7th week.

After, that is Netherland, in 33 days already reached a total of 11750 new cases, 356 new cases/day.

South Korea in 71 days reached a total of 9661 new cases (average of 136 new cases/day), with its fast growth from the 5th week, peaking in the 7th week, reducing the values over the time.

Next comes Canada, which in 64 days had a total of 7448 new cases, an average of 116 cases/day, with critical growth from the 8th week.

The other countries had daily average values lower than 90, standing out Thailand, Australia and Finland for having more than 2 months of combat against coronavirus, they were able to maintain the lowest vales when compared with others;

c) When comparing the result of the first 5 weeks of Brazil with the same period of the 15 countries (Figures 11, 12), it is clear that, except China, Iran, and the Netherlands, the growth of its curve is greater than the other countries, with the potential to increase significantly between the 7th (April 7 to 13, 20)

and 9th (April 21 to 27, 20) weeks, and maybe among the 5 most-affected countries before the end of May 2020.

For example, the two weeks (4 and 5), in absolute terms, Brazil had 4396 new cases (95% of the total), second only to China, Iran, and the Netherlands respectively (Table 22 - TNCW45) and surpassing Italy, Denmark, Sweden, South Korea, Spain, Germany, United Kingdom, USA, and other countries.

Tables 22 and 23: New Cases of Covid 19 in Brazil during weeks 4 and 5 compared to 15 countries

RANK	COUNTRIES	TNCW45	AVDG (%)	MEDDG (%)	SDG(%)	CVDG (%)
1TH	China	20150,0	34,6	16,8	43,4	125,4
2TH	Iran	16839,0	7,6	7,6	17,0	224,7
3TH	Netherlands	11563,0	9,4	10,0	18,4	195,1
4TH →	Brazil	4396,0	36,1	4,5	82,7	229,0
5TH	Italy	3855,0	52,8	20,3	90,2	170,8
6TH	Denmark	2050,0	12,1	6,0	32,9	270,9
7TH	Sweeden	1502,0	18,8	30,2	39,2	208,4
8TH	SK	575,0	223,8	0,0	751,6	335,8
9TH	Spain	279,0	70,8	4,0	149,0	210,5
10TH	Germany	114,0	102,5	0,0	264,2	257,7
11TH	UK	108,0	53,8	0,0	142,8	265,6
12TH	USA	41,0	-9,1	0,0	30,2	-331,7
13TH	Canada	16,0	20,9	0,0	137,1	655,9
14TH	Thailand	16,0	-20,0	0,0	42,2	-210,8
15TH	Finlannd	10,0	-10,0	0,0	87,6	-875,6
16TH	Australia	10,0	-22,7	0,0	41,0	-180,4

RANK	COUNTRIES	TNCW45	AVDG (%)	MEDDG (%)	SDG(%)	CVDG (%)
1TH	SK	575,0	223,8	0,0	751,6	335,8
2TH	Germany	114,0	102,5	0,0	264,2	257,7
3TH	Spain	279,0	70,8	4,0	149,0	210,5
4TH	UK	108,0	53,8	0,0	142,8	265,6
5TH	Italy	3855,0	52,8	20,3	90,2	170,8
6TH →	Brazil	4396,0	36,1	4,5	82,7	229,0
7TH	China	20150,0	34,6	16,8	43,4	125,4
8TH	Canada	16,0	20,9	0,0	137,1	655,9
9TH	Sweeden	1502,0	18,8	30,2	39,2	208,4
10TH	Denmark	2050,0	12,1	6,0	32,9	270,9
11TH	Netherlands	11563,0	9,4	10,0	18,4	195,1
12TH	Iran	16839,0	7,6	7,6	17,0	224,7
13TH	USA	41,0	-9,1	0,0	30,2	-331,7
14TH	Finlannd	10,0	-10,0	0,0	87,6	-875,6
15TH	Thailand	16,0	-20,0	0,0	42,2	-210,8
16TH	Australia	10,0	-22,7	0,0	41,0	-180,4

Note: TNCW25: Total of New Cases in Weeks 4 and 5; AVDG (%): Average of Daily Growth of New Cases in Weeks 4 and 5; MED: Median; S: Standard Deviation; CV: Coeficient of Variation

Source: Author (2020)

When analyzing indicators involving the average and median daily growth rate during this period, it is clear that it presented an average growth rate of 36.13% (Table 23 - AVDG%), ranking sixth, behind South Korea, Germany, Spain, the United Kingdom, and Italy.

Given the high variability of the % around the Average, when using the Median Daily Growth Rate of new cases (MDDG%), it is noticed that it represents 4.5%, that is, half the days varied up to 4.5%, while the other half was worth more than that. When ranking countries by this indicator, Brazil is ranked 7th, behind Sweden (30.2%), Italy (20.3%), China (16.8%), Netherlands (10%), Iran (7.6%) and Denmark (6.0%), while surpassing Spain (4%) and other countries.

In both cases, Brazil is worrying, because in absolute and relative terms it has grown more than some of the countries that are currently in the lead in new cases of COVID 19 on the planet, which justifies the concern of scenarios in which it may be at the top of the countries most affected before the end of May 2020.

4.4 The Leap and the Board of Covid19

The Covid19 is a pandemic that if it happened in ancient times it would be considered a plague, because of that and to facilitate the analysis of the evolution of new cases, as well as the construction of scenarios, it was decided to develop a simple metaphorical approach that could be used in any country, the strategy was to use numbers and symbols widely known on the planet: Number 7, the Board, the Papyri and the Pyramid, as explained below.

The Leap of COVID is defined as the first value of the number of new coronavirus cases chosen when it first exceeds a certain level. As over the period from 12/31/19 to 3/30/20, most of the critical countries (except Iran) came to register more than 6000 new cases per day, so it was decided to use the number of 7 levels (number considered sacred, of cyclical completion, renewal: the menorah, seven plagues of Egypt, seven days of creation, etc.):

The Leap of COVID level 1 (LD1): when the first value is recorded above 50 cases/day; Leap of COVID level 2 (LD2): when the first value is recorded above 250 cases/day; Leap of COVID level 3 (LD3): when the first value above 500 cases/day is recorded; Leap of COVID level 4 (LD4): when the first value is recorded above 1000 cases/day; Leap of COVID level 5 (LD5): when the first value is recorded above 2000 cases/day; Leap of COVID level 6 (LD6): when the first value is registered above 4000 cases/day; Leap of COVID level 7 (LD7): when the first value is registered above 6000 cases/day.

The Board of COVID19 (Figure 13) aims to condense in a spreadsheet all the main data for the effectiveness of calculations to more clearly identify the performance of each country, group, to find success cases over time, as well as allowing an initial comparison of any country with those analyzed.

The initial variables used to record the data for each country in the main spreadsheet were (Figure 9): DAY (Number of the day), WEEK (Number of the week), Date (Date), WD (weekday), DV (Number value) of new cases registered on the day), DVAC (Number of new cases accumulated on the day), DG (Daily Growth in% compared to the previous day), DAC (Accumulated Daily Growth in% compared to the previous day), DVTA (how much the value of the number of new cases registered in the day represents the accumulated total: DV * 100 / DAC), DEATH (Number of fatal cases in the day), DEATHAC (Number of fatal cases accumulated in the day).

In addition to these variables, the variable ND (Total number of days until the end of data collection) and LD (Leap Day) was also created, which counts when the leap with the ND happened, that is, the nth day on which each of the seven leaps was identified: LD1, LD2…. up to LD7.

To make the comparison between countries, the sequence of values was recorded respecting the values of the same period of contagion from Day 1. To illustrate, Figure 9 shows that in the case of Brazil, the first leap of COVID19 (LD1>=50) was on 03/20/20 (Date) of the third week, so:

LD1 = 19 means that COVID's first leap above 50 occurred on the 19th day;

Week = 3 means the third week;

WD = Sun occurred on Sunday;

DV = 79 days means that 79 new cases were registered;

DVAC = 200 means that from the 1st day to this date there have already been 200 new confirmed cases;

DG = 243.48% is the percentage of growth about the previous day;

DAC = 65.29 is the percentage of accumulated growth with the previous day;

DVTA = 39.5% represents the percentage of the number of new cases concerning the total number of cases;

DEATH = 0 means that there was no death on that day;

DEATHAC = 0 means that from the first day until the moment, the total number of deaths was zero.

After completing the registration, the COVID19 Board was created, condensing all the registered values, organized horizontally by:

Group 1 (China, Italy, Iran, Spain, Germany and the USA);
Group 2 (United Kingdom, Netherlands, Australia, Canada, Thailand, Sweden, Denmark, South Korea, and Finland);
Brazil with indicators to compare its performance with those of Group 1 and 2
The "CASE" below Brazil was a space created so that another country could be studied compared to those investigated.
In the vertical columns, for each COVID19 Leap (LD1 to LD7), was inserted the ND (Total number of days), LD (Leap Day), WD (Weekday), DV (Number of New cases), DVTA (percentage) number of new cases about the accumulated total). There is also the total number of new cases, the total number of fatal cases, as well as the percentage of fatal cases concerning the total recorded in the period.
Although it does not appear on the COVID19 Board, columns were also created to calculate the difference in days between each level created:

Example:
Δ L1 L0 means the number of days it took to register Covid1 9's first leap;
Δ L2 L1 it means the difference between LD2 and LD2, that is, how many days it took for the second leap from the first;
Δ L3 L1 means the number of days it took to register the 3rd leap in relation to the second
The logic goes until the **Δ L7 L1** which means the number of days it took to register Covid19's seventh leap compared to the first.
In addition, the variable SCL7L1 was created to calculate the Speed of coronavirus contagion between levels 7 and 1:

(1) SCL7L1 = Δ DV7DV1 / Δ **L7 L1**

Where: Δ DV7DV1 is the variation in the number of covid cases between levels 7 and 1
Δ **L7 L1** is the time variation between levels 7 and 1

The period between the seventh and first level was chosen as a priority because of the scenario analysis to focus on the critical countries that reached level 7. But the form can be adjusted to calculate other periods:

(2) SCLYLX = Δ DVYDVX / Δ **LY LX**

Finally, the mean, the median, the standard deviation, and the variation coefficient were used for the final construction of the COVID19 Board.

In summary, the Covid19 Board (Figure 13) revealed that:
1) the majority of Group 1 countries, except for Iran, reached the last level (LD7 red), with China registering at this level 14,108 new cases on the 44th day (Wednesday), the USA with 9400 new cases on the 62nd day (Sunday), Germany with 6615 new cases on the 60th day (Thursday), Italy with 6557 new cases on the 51st day (Saturday) and Spain with 6368 cases on the 53rd day (Monday). In general, the coefficient of variation (CV%) of the day of the COVID 19 leap has been decreasing since the first (47%) to the sixth (9%). All levels had similar average and median jumps: LD1 (X = 28; Med = 29; S = 13),

LD3 (X = 35; Med = 35; S = 14), LD4 (X = 38; Med = 37; S = 16), LD5 (X = 44; Med = 42; S = 10), LD6 (X = 53; Med = 53; S = 5) and LD7 (X = 54; Med = 53; S = 7);

	31/12/19-30/03/20	LEAP DAY 1>=50 NC/DAY				LD2 >= 250 NC/DAY				LD3 >= 500 NC/DAY				LD4 >=1K NC/DAY				LD5 >= 2K NC/DAY				LD 6 >= 4K NC/DAY				LD7 >= 6K NC/DAY			
	COUNTRY	ND	LD1	WD1	DV1	DV1TA%	LD2	WD2	DV2	DV2TA%	LD3	WD3	DV3	DV3TA%	LD4	WD4	DV4	↓4TA	LD5	WK5	DV5	DV5TA%	LD6	WK6	DV6	DV6TA%	LD7	WK7	VD7	DV7TA%
G1	China	91	19	Sa	58	47,93	24	Th	272	32,27	26	Sa	688	34,84	28	M	1771	39,22	32	F	2099	17,8	L>6K				44	W	14108	24,01
	Italy	60	23	Sa	59	74,68	28	Th	250	38,46	31	Sun	566	33,41	37	Sa	1247	21,20	41	W	2313	18,56	48	W	4207	11,78	51	Sa	6557	12,24
	Iran	41	9	Th	106	43,27	12	Sun	385	39,37	13	M	523	34,84	17	F	1234	26,00	36	W	2206	8,14								
	Spain	60	34	W	63	27,63	L>500				39	M	557	45,25	L>2K				43	F	2086	38,87	52	Sun	4172	14,5	53	M	6368	18,12
	Germany	64	35	Sun	51	39,23	39	Th	283	51,93	46	Th	779	28,28	49	Sun	1214	20,88	51	T	2095	22,81	54	F	4528	22,81	60	Th	6615	15,06
	USA	70	45	Th	63	28,51	50	T	290	29,18	53	F	550	24,48	57	T	1748	27,27	58	W	2848	30,76	59	Th	4530	32,85	62	Sun	9400	27,98
	X	64	28	Sun, W, Th2x	67	43,5	31	Sun, T, Th3x	296	38,2	35	SunM 2x,Th, F,Sa	611	33,5	38	Sun, M, T, F, Sa	1443	26,9	44	T, W3x F2x	2275	22,8	53	Sun, W, Th, F	4359	20,5	54	Sun, M, W Th	8610	19,5
	MEDIAN	62	29	and Sa 2x	61	41,3	28		283	38,5	35		562	34,1	37		1247	26,0	42		2153	20,7	53		4368	18,7	53		6615	18,1
	S	16	13		20	17,2	15		52	8,8	14		101	7,1	16		289	7,4	10		294	10,8	5		197	9,5	7		3319	6,5
	CVX(%)	25	47		30	40	47		18	23	42		16	21	43		20	28	22		13	47	9		5	46	13		39	33
G2	UK	60	38	Sun	69	24,8	44	Sa	342	30,0	48	W	676	25,7	51	Sa	1035	20,63	56,0	Th	2129	18,3	GOING TO BE AMONG 6 MOST AFFECTED COUNTRIES							
	Netherland	33	10	Sa	60	31,9	19	M	278	19,7	23	F	534	17,8	29	Th	1019	13,71	33 DAYS & 6,71% OF DG IN THE LAST 10 DAYS & 11750 NEW CASES & 356 NC/DAY											
	Australia	66	51	Sun	52	17,3	L>500				58	Sun	537	33,4	BENCHMARK 3 – 66 DAYS & 17,52% OF DAILY GROWTH IN THE LAST 10 DAYS & 4460 NC & 68 NC/DAY													
	Canada	64	47	F	56	19,0	L>500				57	M	621	29,7	64	M	1128	15,15	64 DAYS & 39,5% OF DG IN THE LAST 10 DAYS & 7448 NEW CASES 116 & NC/DAY											
	Thailand	78	67	Th	60	22,1	BENCHARK 1 – 78 DAYS & 17,8% OF DAILY GROWTH IN THE LAST 10 DAYS & 1524 NEW CASES & 20 NC/DAY																							
	Sweden	45	24	M	57	21,2	39	T	253	11,0	BENCHMARK 5 – 45 DAYS & 14,75% OF DAILY GROWTH IN THE LAST 10 DAYS & 4028 NEW CASES & 90 NC/DAY																			
	Denmark	33	12	M	55	61,1	14	W	252	49,0	BENCHMAR 4 – 33 DAYS & 9,89% OF DAILY GROWTH IN THE LAST 10 DAYS & 2577 NEW CASES & 78 NC/DAY																			
	SK	71	32	Th	53	47,8	38	W	284	22,5	39	Th	505	28,6	BENCHMAR 6 - 71 DAYS & GOOD CASE TO STUDY ON HOW TO REDUCE THE NEW CASES OF COVID19													
	Finland	62	42	T	54	50,0	BENCHMARK 2 – 62 DAYS & 5,29 % OF DAILY GROWTH IN THE LAST 10 DAYS & 1313 NEW CASES & 21 NC/DAY																							
	X	57	36	Sun2x, M2x,T,T h2x,F,S a	57	33	31	M, T, W2x, Sa	282	26	45	Sun, M, W, F	575	27	48	M, Th, Sa	1061	16												
	MEDIAN	62	38		56	25	38		278	23	48		537	29	51		1035	15												
	S	16	19		5	16	13		37	14	15		71	6	18		59	4												
	CVX(%)	28	52		9	49	43		13	54	32		12	22	37		6	22												
BRAZIL	Brazil	35	20	Sun	79	39,5	25	F	330	34,02									35 days & 4630 NC & is goind to be among top 5 countries the end of May											
	Brazil x G1	-29	-8	Germ	12	-4	-6	-	34	-4									Conclusion: Brazil has total days (ND) and LD1 lowers than most countries, and the results are much closer with group 1 than group 2											
	Brazil x G2	-22	-16	UK/Aust	22	7	-6	-	48	8																				
CASE	x G1																													
	x G2																													

Figure 13: COVID19 Board (12/31/19-30/03/20)
Source: Author

2) There were 37 jumps in Group 1, the most critical day of the week that registered the most jumps was Thursday (8 times; 21.2%), followed by Wednesday (6 times; 16.22%), Sunday (6 times; 16.22%), Friday and Saturday each repeating 5 times (13.5%). On the other hand, the two days on which fewer jumps occurred were Tuesday (3 times; 8.1%) and Monday (10.8%);

3) In Group 1, the means and medians of the speed of contagion between the level 7 and 1 of the countries were respectively XSCL7L1 = 388 new cases/day, MEDSCL7L1 = 332 new cases per day with S = 151 and CV = 41%. The speeds between countries were in ascending order: 1) China (SCL7L1 = 562 new cases per day); 2) the USA (SCL7L1 = 549 new cases per day; 3) Spain (SCL7L1 = 332 new cases per day); 4) Germany (SCL7L1 = 263 new cases per day) and 5) Italy (SCL7L1 = 232 new cases per day);

4) In Group 1, the rapid spread in China reached level 7 on the 44th day (Week 7) with 14108 new cases, a moment from which there was a slowdown with a drastic reduction until the end of the data collection when 48 new ones were registered cases on the 91st day (03/30/20). On the other hand, the second-fastest country, the USA, reached level 7 on the 62nd day (03/22/20) with 9400 new cases and by the end of the data collection, it had a daily growth rate (DG%) 19.88%, reaching 20353 new cases on 03/30/20, which is why if it continues at this pace, it will continue to lead with an increase in cases in the coming weeks;

5) In Group 2, no country reached the last level, the United Kingdom was the only one to reach the fifth leap and if it continues at the current pace, it could be among the 6 most-affected on the planet in the

coming weeks. The Netherlands and Canada reached the 4th level, South Korea reached the third level even with 71 days of fighting COVID19;

6) Thailand (Benchmark1) was the country with the best results, as in 78 days, it only registered a leap from COVID on the 67th day, Tuesday, 60 cases representing 22.1% of the total new accumulated cases. The other countries considered Benchmark were in this order: Finland (only one leap), Australia (3 leaps in 66 days); Denmark (2 leaps, but has little time, 33 days), Sweden (2 leaps) and South Korea (3 leaps in 71 days with a sharp reduction in new cases over time).

7) Brazil in 36 days (ND) advanced to the 2nd level with contagion speed (SCL2L1) of 50 new average cases per day when compared to the 1st level. When comparing the speed with the other countries, this speed is lower than the average (55) and median (45) of Group 1, but higher than the average (44) and median (39) of the Group 2 countries. Brazil was the country whose first leap started earlier (LD1 = 20), eight days before the average of Group 1 and 16 days before the average of Group 2. Overall, Brazil's results are closer to Group 1 than Group 2.

4.5 The COVID19's Inverted Pyramid

The board is useful to perform data accounting, however, it would not be recommended to present it to decision-makers, due to the difficulty of having a synthesized visualization of the events, so the next step was to develop an easy-to-understand conceptual model to synthesize Covid19's leaps over the levels, the main values (X, MED and S) of Group 1 and Group 2, as well as the difference of days in each level about its previous one.

The board is useful to perform data accounting, however, it would not be recommended to present it to decision-makers, due to the difficulty of having a synthesized visualization of the events, so the next step was to develop an easy-to-understand conceptual model to synthesize Covid19's Leaps over the levels, the main values (X, MED and S) of Group 1 and Group 2, as well as the difference of days in each level with the first one: **Δ L2 L1** ….**Δ L7 L1.**

The model used the figure of the Pyramid because it represents one of the most accurate monuments of humanity, especially those built by the Egyptians, who used astronomy to accurately align the pyramids in the North-South direction (SPENCE, 2000).

Since the number of COVI19 new cases tends to grow rapidly over the first 3 months, it was opted to use the COVID19´s Inverted Pyramid, which allows viewing coronavirus leaps both in a group of countries or individuals.

Figure 14 shows COVID's Inverted Pyramid with the two groups, for which it is possible for a country that is in the initial stage of the pandemic (3 months) to identify the main indicators of Group 1/Group 2 in order to compare and predict with some certainty when the next leap will happen (LD) and the number of new cases (DV) at each level (L).

For example, between February 25th (first day with new cases registered) and March 30th (last day of data collection), Brazil made two leaps, Covid's last leap has the following information:

L2 (Second Level)> = 250: Second Level with a value above or equal to 250

LD2 = 25: the second jump took place on the 25th day (03/20/20 Friday) since the start of the count

DV2 = 330: On the day of the second leap, 300 new cases of covid19 were registered in Brazil

As the indicators on the Covid19 Board pointed out that Brazil has results closer to Group1 (red) compared to Group 2, then one of two events may happen:

First) Brazil may leap to the Third Level (L3> = 500) in LD3 = 35 days, that is, on the 35th day after the beginning of the count, which would be on the date of 03/30/20 (last day of collection) with a tolerance of 14 days. The number of new cases to be registered can be on average 651 or 562 cases if we consider the median. Sunday, Monday (2x = more chance), Thursday or Saturday may be the most likely days. Taking into account that the second jump happened on the 25th day and that the tolerance would be 14 days, then this jump could occur until the 39th day (24 + 14), whose date would be 04/03/20;

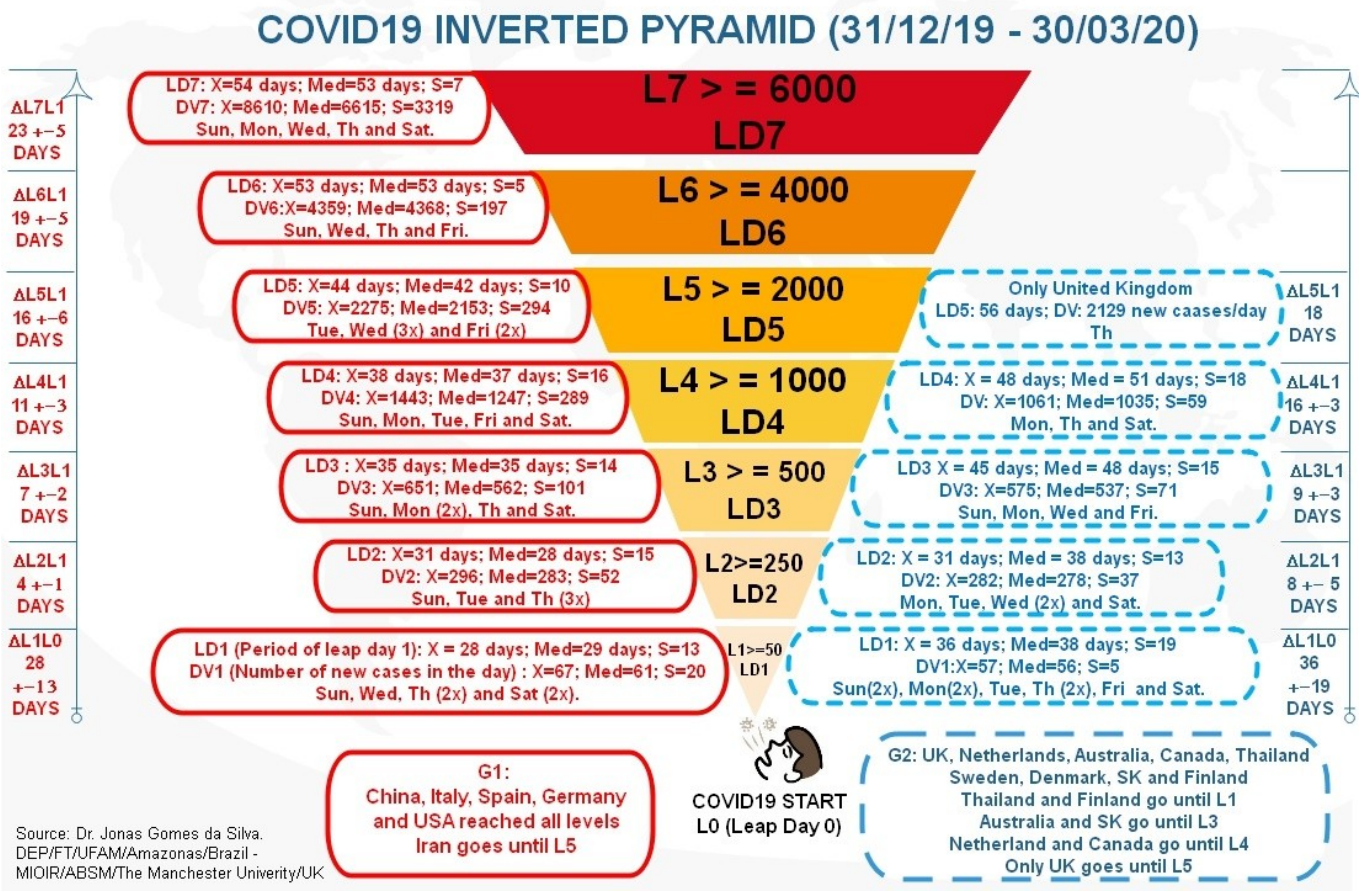


Figure 14: COVID's Inverted Pyramid involving 15 countries (except Brazil)
Source: Author (2020)

Second) With the difficulty in Brazil to carry out tests effectively to confirm the covid19, the leap may take time, but when it comes it will have a value much over than 500, quickly surpassing Level 1 to Level 4 (LD> = 1000), on the 38th day (04/04/20) with an average value of 1443 or median of 1247, with a range of ± 289 new cases.

After reach the next level, the logic remains the same for the following levels, it is important to record what has been learned to the results obtained.

Finally, on the extreme sides of the Pyramid there is a spear that indicates the variation of the average time that the Group took to leap from one level comparing with first level.

In the case of Brazil, looking at Δ L3 L1 = 7 ± 2, this means that in the Group 1 took an average of 5 to 9 days to jump from Level 1 to Level 3, so that would be between March 20 (because the first jump was on

the 25th day) and March 29, 20, the date on which 352 new cases were registered, a value well below the expected L3 (> = 500), so there is a strong possibility that Brazil will jump directly from level 1 to level 3 in a few days.

To use the Pyramid effectively, it is recommended to register the data using a spreadsheet with the model shown in Figure 9 together with the COVID19 Board.

Although the inverted Pyramid is useful to have a synthesized view of the evolution of COVID9 over time and help to estimate the next values, it is necessary to develop other board that allow decision-makers to analyze trends within a more detailed range of variation COVID19 values around the mean and median, which is why the COVID19 Papyri were created.

The Papyri is very symbolic due to the use of it by ancient peoples such as Egyptians and Greeks to describe and record facts involving medicinal wisdom and health at the time, and the papyrus well known are: Edwin Smith, Ebers, Kahun Gynecology, Hearst, Chester Beatty, Berlin, London Medical and Carlsberg (REGGIANI, 2019; EGYPT GUIDE, 2020; WRF, 2020).

So, in this research, they are also useful to develop the Inverted Pyramid of an individual country that wants to analyze scenarios.

4.6 The COVID19´s Papyri

The COVID19´s papyri is defined as a document containing statistics and/or facts involving COVID19, which can be a control chart of the mean and median of the main variables involved, or a combination of this chart with other decision-making variables such as the number of hospital beds in the country, costs, etc.

If the Papyri consists of a control chart, then it contains the mean, the median with the upper and lower limits of the three main variables used in the study of Coronavirus leaps at each of the seven levels adopted in the research. If combined with other variables, it is up to the researcher to arrange the information in the best way for the decision-maker to analyze.

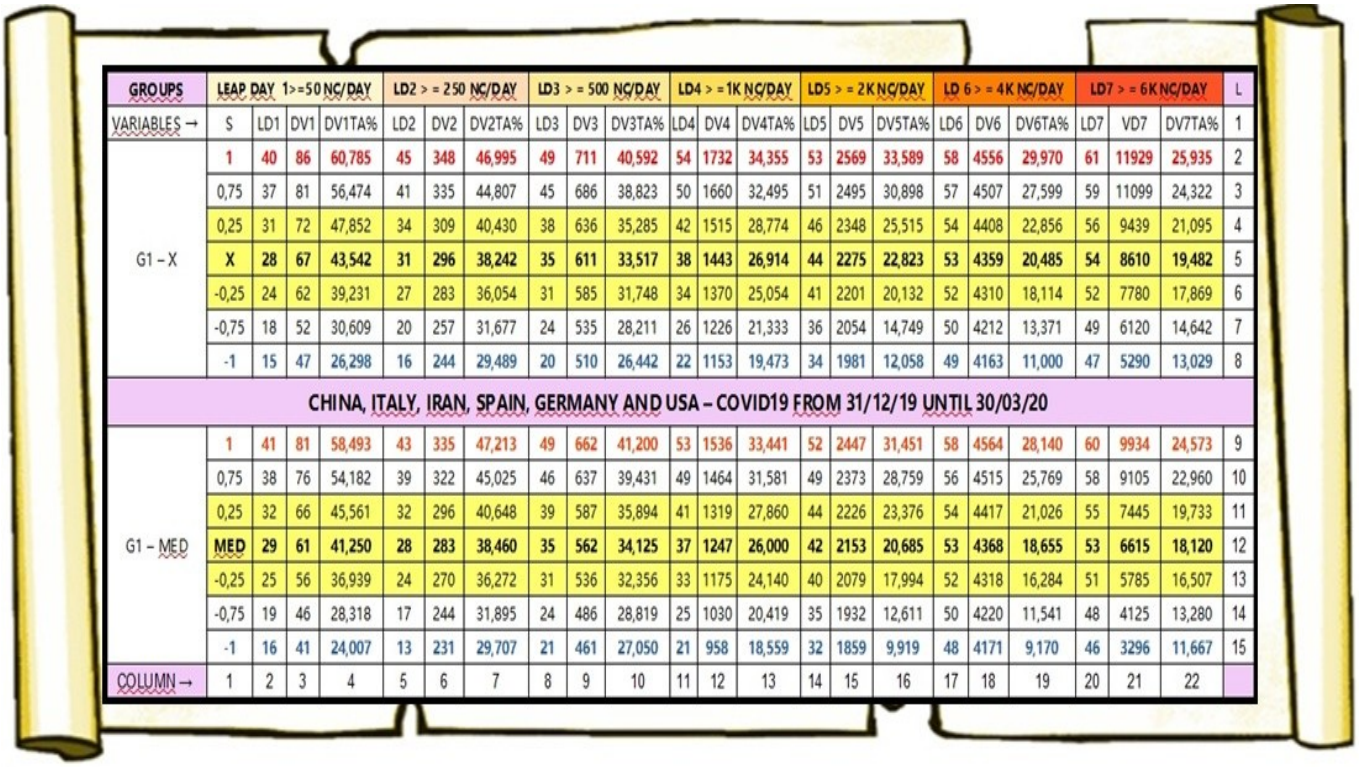
The COVID19`s papyri is built from the COVID19 Board, with the difference that there is a variation of three levels of values around the means: Standard Deviation (S) = 0 = X = Med; X or MED ± 0.25 S; X or MED ± 0.75S; X or M ± 1 S.

The Papyri's number one (Figure 14) objective is to allow any country to compare its moment of the Covid19 leap (LD), the Covid19 Leap Value (DV), the percentage of the accumulated total (DVTA), the total number of new cases accumulated (DVAC), etc with a Group of Countries or other country individually.

The second objective is to estimate future values at levels that the country has not yet reached, to create scenarios with priority actions over time, according to the example proposed in the following section.

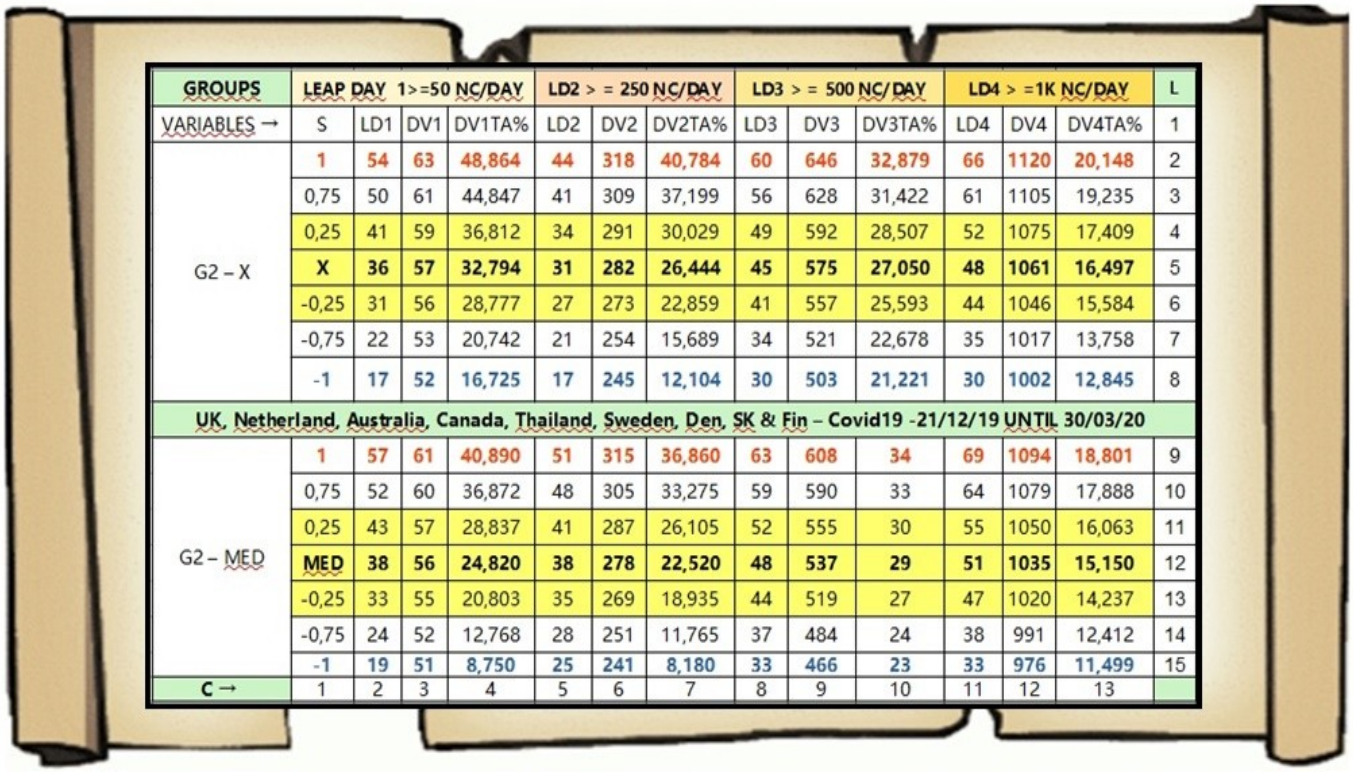
The third objective is to compare the control chart with other decision-making variables.

On each papyri, there are the groups investigated, the possible variations of the three variables at each level, as well as numbers at the end of the right side to indicate the lines, and numbers at the base of the papyri to indicate the columns, to easily make the crossing and identification of results. Figure 14 shows the variations of the mean and median at all levels of Group 1, while Figure 15 shows only the variations up to the Level 4 Leap of Group 2 since from level 5 only the United Kingdom passed for this step.



GROUPS	LEAP DAY 1>=50 NC/DAY				LD2 > = 250 NC/DAY			LD3 > = 500 NC/DAY			LD4 > =1K NC/DAY			LD5 > = 2K NC/DAY			LD 6 > = 4K NC/DAY			LD7 > = 6K NC/DAY			L
VARIABLES →	S	LD1	DV1	DV1TA%	LD2	DV2	DV2TA%	LD3	DV3	DV3TA%	LD4	DV4	DV4TA%	LD5	DV5	DV5TA%	LD6	DV6	DV6TA%	LD7	VD7	DV7TA%	1
G1 – X	1	40	86	60,785	45	348	46,995	49	711	40,592	54	1732	34,355	53	2569	33,589	58	4556	29,970	61	11929	25,935	2
	0,75	37	81	56,474	41	335	44,807	45	686	38,823	50	1660	32,495	51	2495	30,898	57	4507	27,599	59	11099	24,322	3
	0,25	31	72	47,852	34	309	40,430	38	636	35,285	42	1515	28,774	46	2348	25,515	54	4408	22,856	56	9439	21,095	4
	X	**28**	**67**	**43,542**	**31**	**296**	**38,242**	**35**	**611**	**33,517**	**38**	**1443**	**26,914**	**44**	**2275**	**22,823**	**53**	**4359**	**20,485**	**54**	**8610**	**19,482**	5
	-0,25	24	62	39,231	27	283	36,054	31	585	31,748	34	1370	25,054	41	2201	20,132	52	4310	18,114	52	7780	17,869	6
	-0,75	18	52	30,609	20	257	31,677	24	535	28,211	26	1226	21,333	36	2054	14,749	50	4212	13,371	49	6120	14,642	7
	-1	15	47	26,298	16	244	29,489	20	510	26,442	22	1153	19,473	34	1981	12,058	49	4163	11,000	47	5290	13,029	8
CHINA, ITALY, IRAN, SPAIN, GERMANY AND USA – COVID19 FROM 31/12/19 UNTIL 30/03/20																							
G1 – MED	1	41	81	58,493	43	335	47,213	49	662	41,200	53	1536	33,441	52	2447	31,451	58	4564	28,140	60	9934	24,573	9
	0,75	38	76	54,182	39	322	45,025	46	637	39,431	49	1464	31,581	49	2373	28,759	56	4515	25,769	58	9105	22,960	10
	0,25	32	66	45,561	32	296	40,648	39	587	35,894	41	1319	27,860	44	2226	23,376	54	4417	21,026	55	7445	19,733	11
	MED	**29**	**61**	**41,250**	**28**	**283**	**38,460**	**35**	**562**	**34,125**	**37**	**1247**	**26,000**	**42**	**2153**	**20,685**	**53**	**4368**	**18,655**	**53**	**6615**	**18,120**	12
	-0,25	25	56	36,939	24	270	36,272	31	536	32,356	33	1175	24,140	40	2079	17,994	52	4318	16,284	51	5785	16,507	13
	-0,75	19	46	28,318	17	244	31,895	24	486	28,819	25	1030	20,419	35	1932	12,611	50	4220	11,541	48	4125	13,280	14
	-1	16	41	24,007	13	231	29,707	21	461	27,050	21	958	18,559	32	1859	9,919	48	4171	9,170	46	3296	11,667	15
COLUMN →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

Figure 14: COVID19`s papyri with a control chart of the mean and median of countries of Group 1
Source: Author (2020)



GROUPS	LEAP DAY 1>=50 NC/DAY				LD2 > = 250 NC/DAY			LD3 > = 500 NC/DAY			LD4 > =1K NC/DAY			L
VARIABLES →	S	LD1	DV1	DV1TA%	LD2	DV2	DV2TA%	LD3	DV3	DV3TA%	LD4	DV4	DV4TA%	1
G2 – X	1	54	63	48,864	44	318	40,784	60	646	32,879	66	1120	20,148	2
	0,75	50	61	44,847	41	309	37,199	56	628	31,422	61	1105	19,235	3
	0,25	41	59	36,812	34	291	30,029	49	592	28,507	52	1075	17,409	4
	X	**36**	**57**	**32,794**	**31**	**282**	**26,444**	**45**	**575**	**27,050**	**48**	**1061**	**16,497**	5
	-0,25	31	56	28,777	27	273	22,859	41	557	25,593	44	1046	15,584	6
	-0,75	22	53	20,742	21	254	15,689	34	521	22,678	35	1017	13,758	7
	-1	17	52	16,725	17	245	12,104	30	503	21,221	30	1002	12,845	8
UK, Netherland, Australia, Canada, Thailand, Sweden, Den, SK & Fin – Covid19 -21/12/19 UNTIL 30/03/20														
G2 – MED	1	57	61	40,890	51	315	36,860	63	608	34	69	1094	18,801	9
	0,75	52	60	36,872	48	305	33,275	59	590	33	64	1079	17,888	10
	0,25	43	57	28,837	41	287	26,105	52	555	30	55	1050	16,063	11
	MED	**38**	**56**	**24,820**	**38**	**278**	**22,520**	**48**	**537**	**29**	**51**	**1035**	**15,150**	12
	-0,25	33	55	20,803	35	269	18,935	44	519	27	47	1020	14,237	13
	-0,75	24	52	12,768	28	251	11,765	37	484	24	38	991	12,412	14
	-1	19	51	8,750	25	241	8,180	33	466	23	33	976	11,499	15
C →	1	2	3	4	5	6	7	8	9	10	11	12	13	

Figure 15: COVID19`s papyri with a control chart of the mean and median of countries of Group 2
Source: Author (2020)

4.7 Short-term scenarios for Brazil: Papyri, Number of Beds in Brazil and Inverted Pyramid

To carry out the construction of short-term scenarios to the impact of the growth of new cases on public and private hospitals in Brazil, the following facts published by the Brazilian Association of Intensive Care Medicine (AMIB, 2020) will be taken into account:

First) About 20% of the total cases of covid19 will need hospitalization, of which 15% will need intensive care;

Second) In Brazil, there are approximately 47,000 ICU beds, of which 32,000 are intended for adult patients, the main victims of COVID19;

Third) Of the 32,000 beds, half are for patients in the Unified Health System (SUS) and the other half is for patients who have access to supplementary health;

Fourth) The average occupancy rate in public hospitals is over 95%;

Given this, it can be considered that there are about 5% of the public beds available to deal with severe cases of COVID.

The scenario analysis of the Brazilian case was based on the Papyri and Inverted Pyramids of the Average and Median of Group 1, as the country presented results closer to this group compared to Group 2.

In each Papyri, the information from Group 1 was placed at the top, while at the bottom the facts, the Scenarios, When, Number of estimated cases (DV), as well as the number of beds needed to attend the 15% of severe cases of Covid19 (15% DVA), this last value was calculated based on the number of new cases accumulated on the day of the Covid19's leap.

Two lines were placed at the base of the papyri, line 17 compares the number of estimated beds (15% DVA) with the total available beds (1600), generating a percentage of the system's capacity to absorb severe cases, with maximum and minimum values estimated.

Line 18 shows the number of new beds that will be needed in each leap of the COVID, considering the minimum, average and maximum estimated beds.

Finally, the scenario analysis was designed from the third leap of covid19 (LD3> = 500) until the last leap (LD7> = 6000 new cases), since the first and the second have already happened.

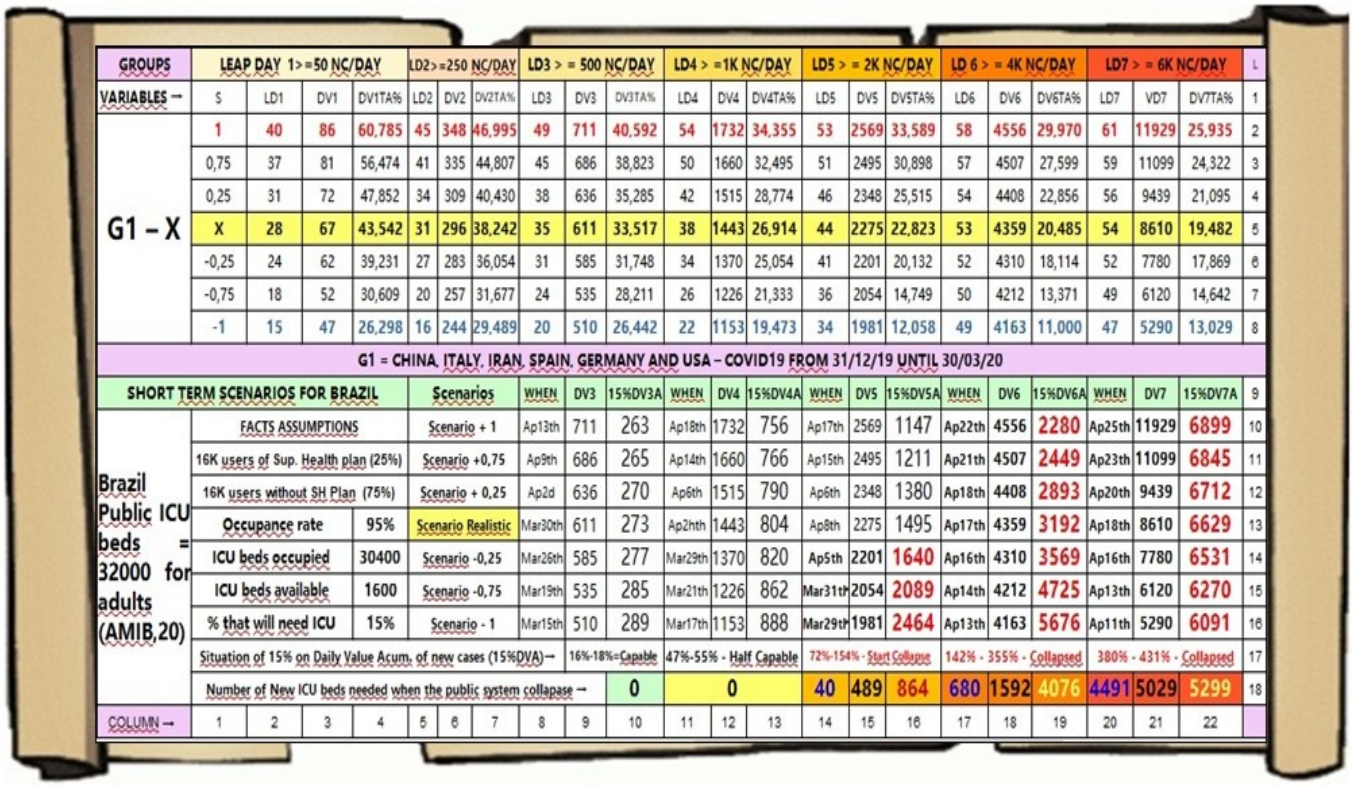
4.7.1 Papyri and Inverted Pyramid of Mean and Median

The Figure 16 shows that:

a) In the Realistic Scenario (X), the third leap could happen on the 35th day (Line L5 column C8), on March 30 (Wednesday - L13xC8) with an average value of 611 new cases (L13 - C9), in this day it is estimated that there would be 273 ICU beds (L13xC10) accumulated since the first day registered in Brazil. In the scenario (X + 1S), the maximum value (L16xC10) of beds is 289 accumulated beds (18% of 1600), and in the scenario (X - 1S) the minimum is 263 accumulated beds (16% of 1600), so the National Health System is managing to meet almost a fifth of the demand;

b) In the Realistic Scenario, the fourth leap could happen on the 38th day (Line L5 column C11), on April 02 (L13xC11) with an average value of 1443 new cases (L13xC12), on this day it is estimated that 804 beds would be needed accumulated ICU (L13xC13). In the scenario (X + 1S), the maximum value

(L16xC13) of accumulated beds is 888 (55% of 1600), and in the scenario (X - 1S) the minimum is 756 beds (47% of 1600), so the National Health System is managing to meet almost half of the demand.



GROUPS	LEAP DAY 1> =50 NC/DAY				LD2> =250 NC/DAY			LD3 > = 500 NC/DAY			LD4 > =1K NC/DAY			LD5 > = 2K NC/DAY			LD 6 > = 4K NC/DAY			LD7 > = 6K NC/DAY			L
VARIABLES →	S	LD1	DV1	DV1TA%	LD2	DV2	DV2TA%	LD3	DV3	DV3TA%	LD4	DV4	DV4TA%	LD5	DV5	DV5TA%	LD6	DV6	DV6TA%	LD7	VD7	DV7TA%	1
G1 – X	1	40	86	60,785	45	348	46,995	49	711	40,592	54	1732	34,355	53	2569	33,589	58	4556	29,970	61	11929	25,935	2
	0,75	37	81	56,474	41	335	44,807	45	686	38,823	50	1660	32,495	51	2495	30,898	57	4507	27,599	59	11099	24,322	3
	0,25	31	72	47,852	34	309	40,430	38	636	35,285	42	1515	28,774	46	2348	25,515	54	4408	22,856	56	9439	21,095	4
	X	28	67	43,542	31	296	38,242	35	611	33,517	38	1443	26,914	44	2275	22,823	53	4359	20,485	54	8610	19,482	5
	-0,25	24	62	39,231	27	283	36,054	31	585	31,748	34	1370	25,054	41	2201	20,132	52	4310	18,114	52	7780	17,869	6
	-0,75	18	52	30,609	20	257	31,677	24	535	28,211	26	1226	21,333	36	2054	14,749	50	4212	13,371	49	6120	14,642	7
	-1	15	47	26,298	16	244	29,489	20	510	26,442	22	1153	19,473	34	1981	12,058	49	4163	11,000	47	5290	13,029	8
G1 = CHINA, ITALY, IRAN, SPAIN, GERMANY AND USA – COVID19 FROM 31/12/19 UNTIL 30/03/20																							
SHORT TERM SCENARIOS FOR BRAZIL				Scenarios	WHEN	DV3	15%DV3A	WHEN	DV4	15%DV4A	WHEN	DV5	15%DV5A	WHEN	DV6	15%DV6A	WHEN	DV7	15%DV7A				9
Brazil Public ICU beds = 32000 for adults (AMIB,20)	FACTS ASSUMPTIONS			Scenario + 1	Ap13th	711	263	Ap18th	1732	756	Ap17th	2569	1147	Ap22th	4556	2280	Ap25th	11929	6899				10
	16K users of Sup. Health plan (25%)			Scenario +0,75	Ap9th	686	265	Ap14th	1660	766	Ap15th	2495	1211	Ap21th	4507	2449	Ap23th	11099	6845				11
	16K users without SH Plan (75%)			Scenario + 0,25	Ap2d	636	270	Ap6th	1515	790	Ap6th	2348	1380	Ap18th	4408	2893	Ap20th	9439	6712				12
	Occupance rate		95%	Scenario Realistic	Mar30th	611	273	Ap2hth	1443	804	Ap8th	2275	1495	Ap17th	4359	3192	Ap18th	8610	6629				13
	ICU beds occupied		30400	Scenario -0,25	Mar26th	585	277	Mar29th	1370	820	Ap5th	2201	1640	Ap16th	4310	3569	Ap16th	7780	6531				14
	ICU beds available		1600	Scenario -0,75	Mar19th	535	285	Mar21th	1226	862	Mar31th	2054	2089	Ap14th	4212	4725	Ap13th	6120	6270				15
	% that will need ICU		15%	Scenario - 1	Mar15th	510	289	Mar17th	1153	888	Mar29th	1981	2464	Ap13th	4163	5676	Ap11th	5290	6091				16
	Situation of 15% on Daily Value Acum. of new cases (15%DVA)→				16%-18%=Capable			47%-55% - Half Capable			72%-154% - Start Collapse			142% - 355% - Collapsed			380% - 431% - Collapsed						17
	Number of New ICU beds needed when the public system collapse →				0			0			40	489	864	680	1592	4076	4491	5029	5299				18
COLUMN →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

Figure 16: COVID19`s Papiri (Average) with scenarios of leaps and beds estimated in Brazil
Source: Author (2020)

c) In the Realistic Scenario, the fifth leap could happen on the 44th day (L5xC14), on the 8th of April (L13xC14) with an average value of 2275 new cases (L13xC15), on this day it is estimated that 1485 accumulated ICU beds would be needed (L13xC16), in this case, the system is reaching its limit. In the scenario (X + 1S), the number of accumulated beds would be 1147 (L10xC16) which would occupy 72% of the available beds, this value seems strange, but it is worth mentioning that this will occur on April 17 when an average of 2569 is recorded new cases, that is, this event happened later, 9 days after the estimated period of the central average. In the scenario (X - 1S) the system collapses since the minimum number of accumulated beds would be 2464, so another 864 new beds would be needed to meet the demand in this scenario;

d) In the sixth and seventh leaps of COVID19, the system collapsed completely, requiring between 680 (L18xC17) and 5299 (L18xC22) new beds to meet the possible demands, depending on the scenario that occurred. That would be between April 11th and 25th, 2020.

To facilitate visualization, Figure 17 shows Covid19's Inverted Pyramid in Brazil using the Papyri of average leaps as a base.

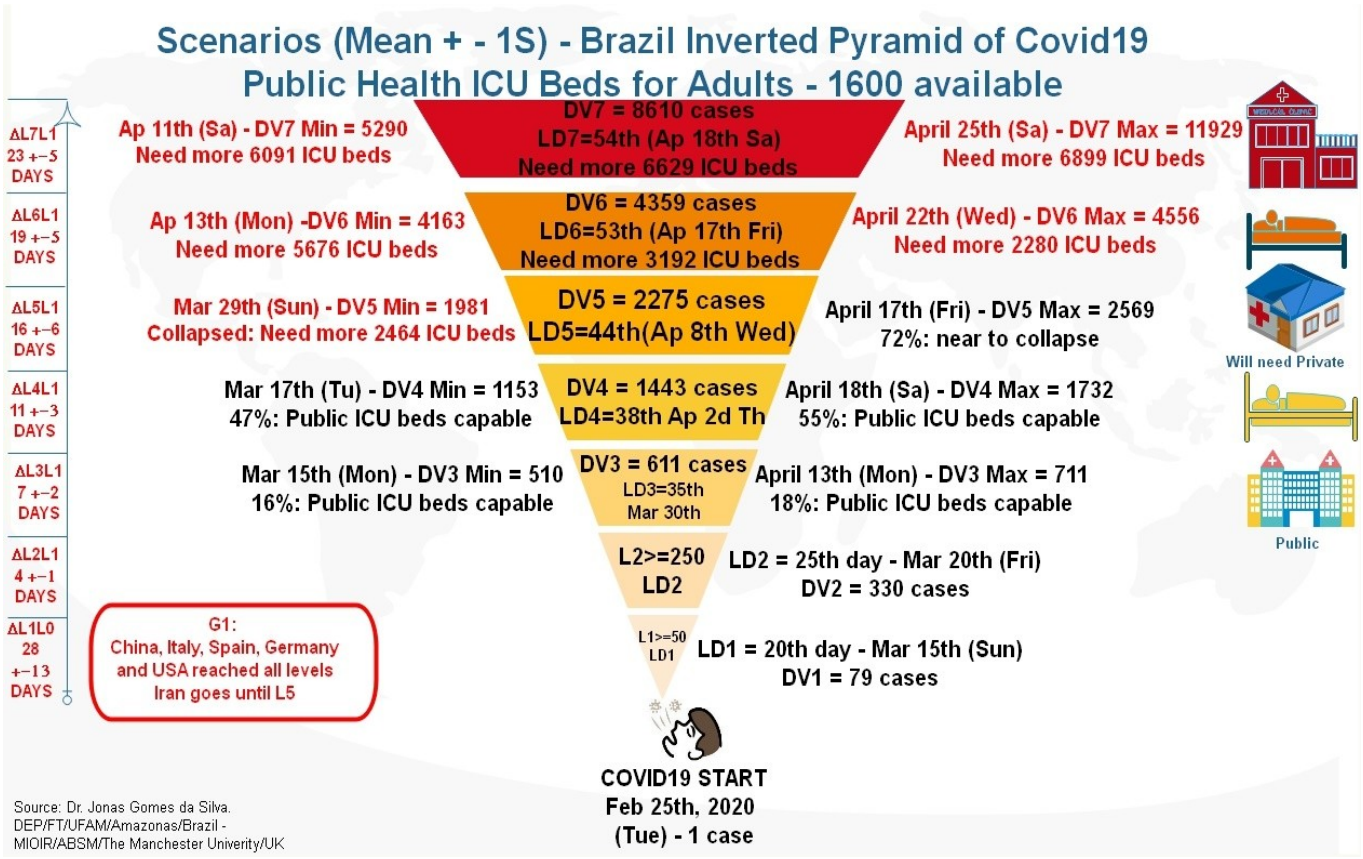
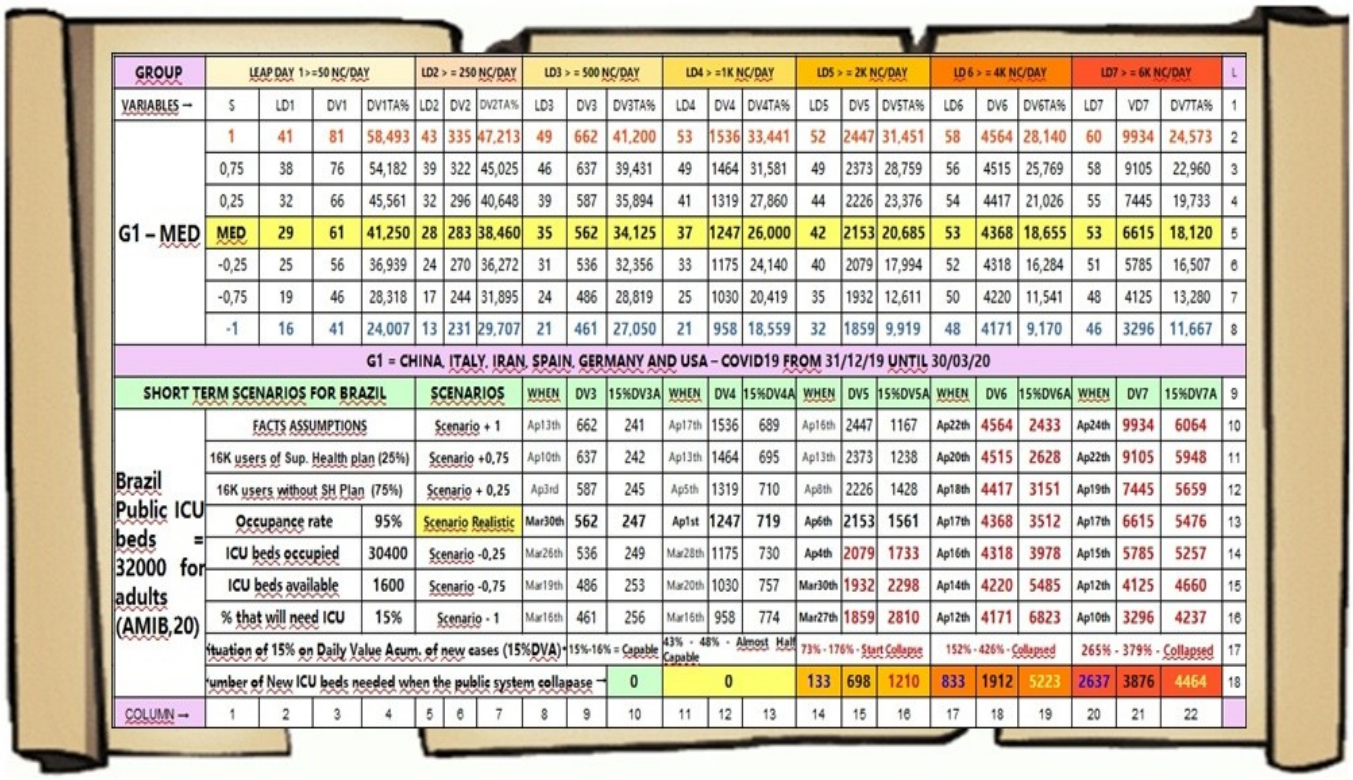


Figure 17: Covid19´s Inverted Pyramid (Average) with scenarios for Brazil including ICU Beds
Source: Author (2020)

Figure 17 shows inside the base of the Pyramid the beginning of the count with date, day and number of cases registered in Brazil, in the center of it there are the levels with their respective jumps, number of new cases (DV) when it occurred and in the case of needing more beds, your quantity.

On the left side of the pyramid, there is the spear containing the average difference in days between the levels registered and Level 1 of Group 1, also beside the pyramid it has information on its maximum and minimum values, as well as the estimated number of beds needed after the collapse in the public health system. Finally, on the extreme right side of the pyramid were placed images that represent the public hospital (base) and when it would need support from private hospital beds.

The same approach can be followed for a second scenario analysis using the Median and Figures 18 and 19 show the papyrus and the inverted pyramid containing the possible scenarios overtime.



GROUP	LEAP DAY 1>=50 NC/DAY				LD2 > = 250 NC/DAY			LD3 > = 500 NC/DAY			LD4 > =1K NC/DAY			LD5 > = 2K NC/DAY			LD 6 > = 4K NC/DAY			LD7 > = 6K NC/DAY			L
VARIABLES →	S	LD1	DV1	DV1TA%	LD2	DV2	DV2TA%	LD3	DV3	DV3TA%	LD4	DV4	DV4TA%	LD5	DV5	DV5TA%	LD6	DV6	DV6TA%	LD7	VD7	DV7TA%	1
G1 – MED	1	41	81	58,493	43	335	47,213	49	662	41,200	53	1536	33,441	52	2447	31,451	58	4564	28,140	60	9934	24,573	2
	0,75	38	76	54,182	39	322	45,025	46	637	39,431	49	1464	31,581	49	2373	28,759	56	4515	25,769	58	9105	22,960	3
	0,25	32	66	45,561	32	296	40,648	39	587	35,894	41	1319	27,860	44	2226	23,376	54	4417	21,026	55	7445	19,733	4
	MED	29	61	41,250	28	283	38,460	35	562	34,125	37	1247	26,000	42	2153	20,685	53	4368	18,655	53	6615	18,120	5
	-0,25	25	56	36,939	24	270	36,272	31	536	32,356	33	1175	24,140	40	2079	17,994	52	4318	16,284	51	5785	16,507	6
	-0,75	19	46	28,318	17	244	31,895	24	486	28,819	25	1030	20,419	35	1932	12,611	50	4220	11,541	48	4125	13,280	7
	-1	16	41	24,007	13	231	29,707	21	461	27,050	21	958	18,559	32	1859	9,919	48	4171	9,170	46	3296	11,667	8

G1 = CHINA, ITALY, IRAN, SPAIN, GERMANY AND USA – COVID19 FROM 31/12/19 UNTIL 30/03/20

SHORT TERM SCENARIOS FOR BRAZIL			SCENARIOS	WHEN	DV3	15%DV3A	WHEN	DV4	15%DV4A	WHEN	DV5	15%DV5A	WHEN	DV6	15%DV6A	WHEN	DV7	15%DV7A	9
Brazil Public ICU beds = 32000 for adults (AMIB,20)	FACTS ASSUMPTIONS		Scenario + 1	Ap13th	662	241	Ap17th	1536	689	Ap16th	2447	1167	Ap22th	4564	2433	Ap24th	9934	6064	10
	16K users of Sup. Health plan (25%)		Scenario +0,75	Ap10th	637	242	Ap13th	1464	695	Ap13th	2373	1238	Ap20th	4515	2628	Ap22th	9105	5948	11
	16K users without SH Plan (75%)		Scenario + 0,25	Ap3rd	587	245	Ap5th	1319	710	Ap8th	2226	1428	Ap18th	4417	3151	Ap19th	7445	5659	12
	Occupance rate	95%	Scenario Realistic	Mar30th	562	247	Ap1st	1247	719	Ap6th	2153	1561	Ap17th	4368	3512	Ap17th	6615	5476	13
	ICU beds occupied	30400	Scenario -0,25	Mar26th	536	249	Mar28th	1175	730	Ap4th	2079	1733	Ap16th	4318	3978	Ap15th	5785	5257	14
	ICU beds available	1600	Scenario -0,75	Mar19th	486	253	Mar20th	1030	757	Mar30th	1932	2298	Ap14th	4220	5485	Ap12th	4125	4660	15
	% that will need ICU	15%	Scenario - 1	Mar16th	461	256	Mar16th	958	774	Mar27th	1859	2810	Ap12th	4171	6823	Ap10th	3296	4237	16
	Situation of 15% on Daily Value Acum. of new cases (15%DVA) →			15%-16% = Capable			43% - 48% - Almost Half Capable			73% - 176% - Start Collapse			152% - 426% - Collapsed			265% - 379% - Collapsed			17
	Number of New ICU beds needed when the public system collapse →			0			0			133	698	1210	833	1912	5223	2637	3876	4464	18
COLUMN →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

Figure 18: Papyri of COVID19 (Median) with scenarios of leaps and ICU beds estimated in Brazil
Source: Author (2020)

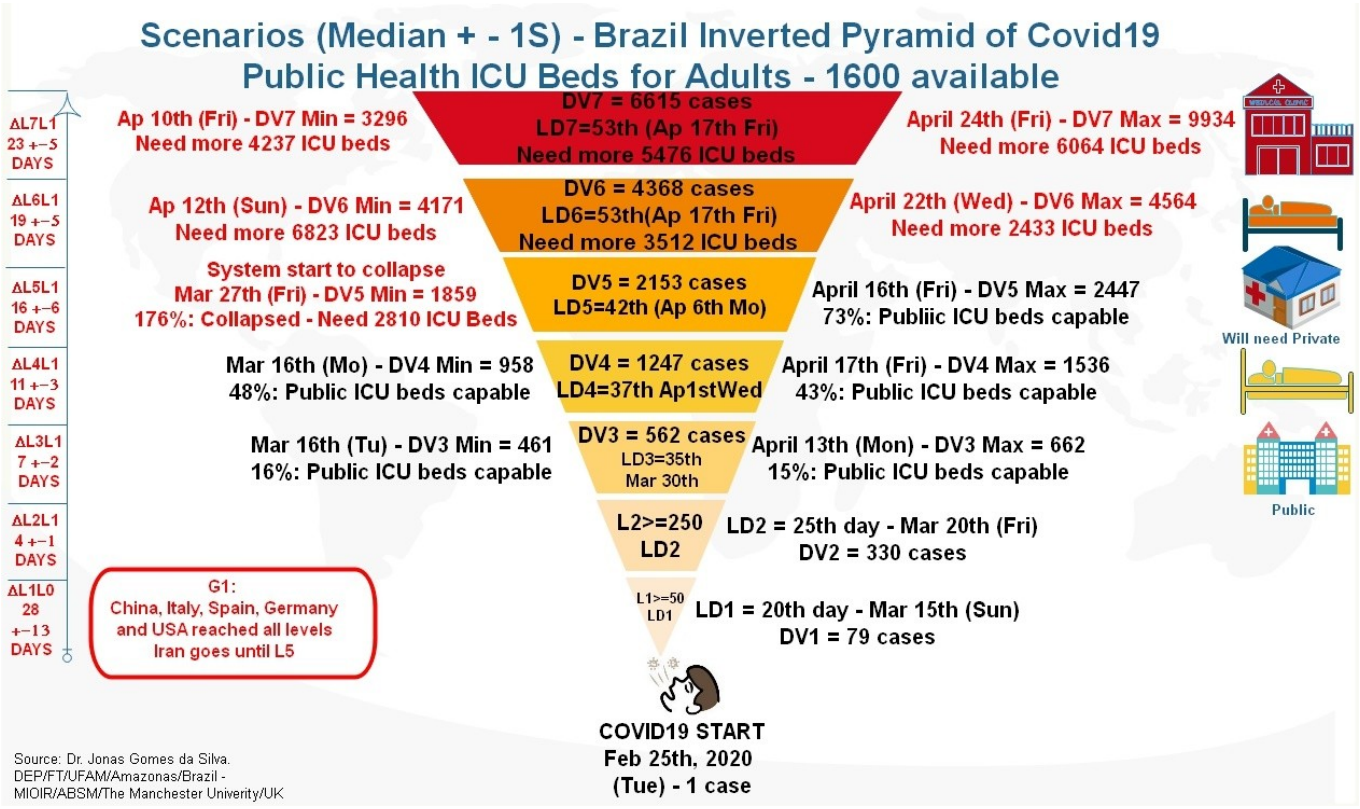


Figure 19: Covid 19 Inverted Pyramid (Median) with scenarios for Brazil (New cases and ICU Beds)
Source: Author (2020)

5. Conclusions and recommendations

The top ten conclusions and recommendations are:

First) Although no country is prepared to face epidemics and pandemics (NTI, JHU, and EIU, 2019), among the 16 countries investigated, Thailand, Finland, Australia, South Korea, Denmark, and Sweden are cases that Brazil could study so as not to repeat the scenarios of China, USA, Italy, and Spain. New research can be carried out to identify good government practices successfully adopted in partnership with the private sector, academia and organized civil society. However, certain care is recommended with Thailand, because even though it was considered the 6th with the best Health Security System (GHSI2019), the GPI2019 Report placed it in 101st place in terms of transparency;

Second) WHO needs to be more valued and known by the population, as it has a very rich collection of information, documents, and guidelines to help in the fight against global diseases. Also, since February 12, 2020, it has developed a model action plan with guidelines to be implemented in partnership with member countries, but in the name of the economy, the leaders of the most critical countries have taken a long time to recognize the pandemic and act in together with the managers of local WHO offices;

Third) Each country has a different dynamic of evolution in the number of new cases per week overtime, because while Iran and China had rapid evolution from the third week, Italy, Spain, Germany, and the United States had rapid evolution a from the 6th, 7th, 8th and 9th weeks respectively;

Fourth) 37 COVID19 leaps were recorded in Group 1, the most critical day of the week on which most leaps were recorded was Thursday (8 times; 21.2%), followed by Wednesday (6 times; 16.22 %), Sunday (6 times; 16.22%), Friday and Saturday each repeating 5 times (13.5%). On the other hand, the two days on which fewer leaps occurred were Tuesday (3 times; 8.1%) and Monday (10.8%). Further research may be carried out to try to identify the days of the greatest contagion throughout the week to orient the population. In this sense, the Appendix Tables can be useful in conjunction with the use of Information and Communication Technologies to develop innovative solutions that allow the citizen to know when a store, a supermarket or a pharmacy has less movement of people, as well as if there is the product you are looking for, optimizing time and reducing the risk of contagion;

Fifth) Among the 16 countries surveyed, 11 (69%) had at least 60 days of fighting the pandemic. Regarding the average number of new cases per day, the performance of the best to the worst followed this order: 1st) Thailand (20/day); 2nd) Finland (21/day); 3rd) Australia (68/day); 4th) Canada (116/day); 5th) South Korea (136/day); 6th) United Kingdom (369/day); 7th) China (896/day); 8th) Germany (1045/ day); 9th) Spain (1466/day); 10th) Italy (1696/day) and 11th) USA (2326/day). The top six are in group 2, of which the majority (83%) is among the 39 countries considered most transparent on the planet in 2019 (E.V., T. I., 2020), the only exception being Thailand. New research can be carried out to identify the performance of combating covid19 among the most transparent and least transparent countries;

Sixth) Shared transparency, publicity of data are needed to draw a more comprehensive and reproducible picture of global gaps related to preparedness (NTI, JHU, and EIU, 2019 p. 34). Given the above, each government must streamline the data collection process, ensuring easy access to the database with integrated, standardized and updated information about new cases, fatalities, location, the number of tests, technical documents, educational material, etc. (EV, TI, 2020b; NAKANO, 2020);

Seventh) Overall, Group 2 countries (except for the USA) performed better in tackling the pandemic. Then, the recommendations of the 2019 GHS Index report (NTI, JHU, and EIU, 2019) to strengthen the National Health System become more reinforced for each investigated nation;

Eighth) When comparing the results of the first 5 weeks in Brazil with the same period in the 15 countries, it is clear that, except China, Iran, and the Netherlands, the growth of its curve is greater than the others.

The analysis of the scenarios showed that the number of new cases has the potential to increase significantly on the 8th (April 14th to 20th/20) and 9th weeks (April 21st to 27th/20), with April/20 ending with an accumulated total of new cases between 46,000 and 50,000, and the country being among the 5 most-affected before the end of May 2020.

A good portion of public hospitals in Brazil will start showing signs of collapse at the beginning of the second week of April/20, so to help optimize the services of hospitals and their partners, it is urgently recommended: a) adopt an efficient bed management system; b) partner with private hospitals and laboratories to reduce the time taken to deliver test results; c) create field hospitals in strategic cities to serve patients with low or medium complexity, especially in cities with a certain hospital structure, but whose number of beds is insufficient to meet the strong demand; d) involve the Armed Forces to assist in security and also in the logistics of essential products for hospitals, supermarkets, etc; e) supermarkets create specific hours to serve health professionals, in the United Kingdom some of the supermarket chains use the hours from 8 am to 9 am to specifically serve these professionals; f) involve the private initiative and the universities to adapt their production lines and laboratories to produce equipment, gel, detergent, soap, alcohol and other useful materials for health professionals and other professionals involved in essential services for the population, etc; g) encourage start ups to develop innovative solutions to assist hospitals, supermarkets, pharmacies, in this sense, access to the Coronvirus Innovation Map <https://bit.ly/2XMIcy5> under the responsibility of StartUp Blink, etc;

Ninth) Follow strategies recommended by the Ministry of Health, Health Departments and other organizations of Health professionals or researchers (AMIB, 2020; BEDFORD et al, 2020);

Tenth) It is possible to create and present scenario analysis without having to use complex mathematical models, which are difficult for most of the population to understand. The proposal to use descriptive statistics in conjunction with metaphorical figures (Board, Papyri and Inverted Pyramid) can make knowledge more accessible to the population, as well as simpler for managers and researchers working in related fields. Far from being perfect, it is expected that the approaches can be improved over time with the development of software that allows treating this information more reliably and quickly. Besides, the research was limited to studying only the number of new cases per day, so a similar study is recommended, but involving the variable number of fatal cases.

6. Appendices - Covid19 daily growth charts in other countries

Table 13: Daily growth (DG%) of the Number of COVID19 case in the Netherlands

WEEK - NETHERLAND	Th(5a)	F(6a)	Sa	Sun(D)	M(2a)	T(3a)	W(4a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	0,00	300,00	-25,00	233,33	-50,00	180,00	106,39	90,00	149,70	140,71
2	214,29	4,55	30,43	26,67	-25,00	7,02	98,36	50,90	26,67	81,43	159,98
3	-8,26	71,17	-18,42	13,55	57,95	5,04	18,49	19,93	13,55	33,17	166,43
4	18,21	30,56	19,29	-10,05	-4,89	48,81	5,06	15,28	18,21	20,55	134,48
X	74,74	26,57	82,83	1,29	65,35	2,72	75,48				
MED	18,21	17,55	24,86	1,75	26,53	6,03	58,43		X of all DG (%)	45,97	
S	121,57	32,64	146,28	23,19	117,43	40,53	80,94		Med of all DG (%)	18,21	
CV	162,65	122,85	176,62	1795,24	179,69	1492,58	107,24				

Table 14: Daily growth (DG%) of the Number of COVID19 case in Australia

WEEK – AUSTRALIA	Sa	Sun(D)	M(2a)	T(3a)	W(4a)	Th(5a)	F(6a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	.	-100,00		0,00	-100,00	-75,00	-100,00	50,00	-66,67
2	.	100,00	-100,00	0,00	0,00	0,00	0,00	0,00	0,00	63,25	0,00
3	.	-100,00	0,00	0,00	0,00	0,00	0,00	-16,67	0,00	40,82	-244,95
4	0,00	0,00	0,00	0,00	0,00	.	0,00	0,00	0,00	0,00	0,00
5	0,00	-50,00	-100,00	0,00	.	-100,00	.	-50,00	-50,00	50,00	-100,00
6	-100,00	.	0,00	50,00	133,33	-50,00	-57,14	-3,97	-25,00	84,79	-2136,76
7	**266,67**	**-18,18**	**11,11**	**130,00**	**-47,83**	**133,33**	**53,57**	**75,52**	**53,57**	**109,14**	**144,51**
8	13,95	6,12	94,23	-46,53	161,11	13,48	7,50	35,69	13,48	68,98	193,27
9	-16,28	272,92	-48,23	54,68	-16,51	4,18	-12,30	34,06	-12,30	109,84	322,44
X	27,39	13,86	-17,86	9,79	32,87	0,12	-13,55				
MED	0,00	0,00	0,00	0,00	0,00	0,00	0,00		X of all DG (%)	6,36	
S	124,15	122,95	64,12	64,90	80,34	65,98	46,10		Med of all DG (%)	0,00	
CV	453,27	887,26	-358,98	662,64	244,41	53493,74	-340,29				

Table 15: Daily growth (DG%) of the Number of COVID19 case in Canada

WEEK – CANADA	M(2a)	T(3a)	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	0,00	0,00	0,00	0,00	-16,67	0,00	40,82	-244,95
2	0,00	.	-66,67	-100,00	.	-100,00	0,00	-53,33	-66,67	50,55	-94,79
3	0,00	0,00	0,00	0,00	0,00	.	-100,00	-16,67	0,00	40,82	-244,95
4	0,00	0,00	0,00	0,00	.	-100,00	.	-20,00	0,00	44,72	-223,61
5	0,00	-100,00	.	100,00	-50,00	400,00	-20,00	55,00	-10,00	181,52	330,04
6	-25,00	0,00	33,33	225,00	-46,15	-14,29	0,00	24,70	0,00	91,67	371,16
7	**83,33**	**63,64**	**-16,67**	**113,33**	**75,00**	**-3,57**	**64,81**	**54,27**	**64,81**	**47,15**	**86,89**
8	12,36	57,00	-17,83	13,18	46,58	12,62	-41,08	11,83	12,62	33,98	287,25
9	337,32	12,88	-11,98	2,76	12,62	25,77	-25,95	50,49	12,62	127,64	252,82
X	51,00	-8,31	-9,98	39,36	5,43	27,57	-15,28				
MED	0,00	0,00	-5,99	2,76	0,00	-1,79	-10,00		X of all DG (%)	13,43	
S	119,94	62,00	28,03	93,34	45,42	158,10	46,44		Med of all DG (%)	0,00	
CV	235,17	-746,13	-280,91	237,14	835,78	573,51	-303,98				

Table 16: Daily growth (DG%) of the Number of COVID19 case in the Thailand

WEEK – THAILAND	M(2a)	T(3a)	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	0,00	.	-100,00	0,00	-40,00	0,00	54,77	-136,93
2	0,00	0,00	.	-50,00	0,00	100,00	-100,00	-8,33	0,00	66,46	-797,50
3	.	-100,00	0,00	0,00	.	-100,00	0,00	-40,00	0,00	54,77	-136,93
4	0,00	0,00	.	0,00	0,00	0,00	.	0,00	0,00	0,00	0,00
5	-100,00	.	0,00	0,00	.	0,00	-100,00	-40,00	0,00	54,77	-136,93
6	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
7	0,00	0,00	.	50,00	-100,00	0,00	0,00	-8,33	0,00	49,16	-589,92
8	.	0,00	0,00	0,00	.	-75,00	100,00	5,00	0,00	62,25	1244,99
9	**-100,00**	**.**	**100,00**	**83,33**	**-54,55**	**40,00**	**357,14**	**70,99**	**61,67**	**160,52**	**226,12**
10	3,13	-9,09	16,67	71,43	-16,67	78,00	111,24	36,39	16,67	49,90	137,14
11	-35,11	-13,11	0,94	3,74	-18,02	19,78	31,19	-1,51	0,94	22,70	-1501,36
X	-29,00	-24,69	14,70	14,41	-27,03	-3,38	39,96				
MED	0,00	0,00	0,00	0,00	-16,67	0,00	0,00		X of all DG (%)	-15,34	
S	45,54	42,97	34,95	38,44	37,55	66,01	131,20		Med of all DG (%)	0,00	
CV	-157,04	-174,02	237,72	266,78	-138,92	-1950,90	328,36				

Table 17: Daily growth (DG%) of the Number of COVID19 case in Sweeden

WEEK – SWEEDEN	Sa	Sun(D)	M(2a)	T(3a)	W(4a)	Th(5a)	F(6a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	0,00	0,00	0,00	0,00	-16,67	0,00	40,82	-244,95
2	0,00	0,00	0,00	0,00	.	400,00	-20,00	63,33	0,00	165,13	260,73
3	**-50,00**	**-50,00**	**0,00**	**1400,00**	**46,67**	**90,91**	**2,38**	**205,71**	**2,38**	**529,03**	**257,18**
4	-44,19	75,00	35,71	66,67	52,63	28,97	-32,09	26,10	35,71	46,85	179,48
5	15,75	-46,26	2,53	-7,41	40,00	31,43	44,93	11,57	15,75	31,93	276,08
6	-34,50	25,19	-31,71	125,89	-10,28	38,33	-27,07	12,27	-10,28	57,64	469,94
X	-22,59	-16,01	1,09	264,19	25,80	98,27	-5,31				
MED	-34,50	-23,13	0,00	33,33	40,00	34,88	-10,00		X of all DG (%)	51,74	
S	28,89	62,23	21,35	558,85	28,83	150,74	28,35		Med of all DG (%)	0,00	
CV	-127,92	-388,65	1959,58	211,53	111,72	153,39	-534,03				

Table 18: Daily growth (DG%) of the Number of COVID19 case in Denmark

WEEK – DENMARK	Th(5a)	F(6a)	Sa	Sun(D)	M(2a)	T(3a)	W(4a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	0,00	0,00	0,00	-100,00	.	-33,33	-26,67	0,00	43,46	-162,98
2	**25,00**	**-60,00**	**200,00**	**33,33**	**587,50**	**212,73**	**46,51**	**149,30**	**46,51**	**216,75**	**145,18**
3	-36,51	-18,75	-75,38	-12,50	78,57	26,00	26,98	-1,66	-12,50	50,14	-3028,86
4	17,50	10,64	-31,73	-2,82	-5,80	101,54	1,53	12,98	1,53	42,03	323,84
X	2,00	-17,03	23,22	4,50	140,07	113,42	10,42				
MED	17,50	-9,38	-15,87	-1,41	36,39	101,54	14,26		X of all DG (%)	38,12	
S	33,56	31,12	121,84	19,95	307,08	93,93	34,50		Med of all DG (%)	0,76	
CV	1680,06	-182,75	524,68	442,96	219,23	82,81	331,01				

Table 19: Daily growth (DG%) of the Number of COVID19 case in South Korea

WEEK – SK	M(2a)	T(3a)	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	0,00	.	-100,00	.	-50,00	-50,00	57,74	-115,47
2	0,00	-100,00	0,00	.	150,00	-80,00	200,00	28,33	0,00	121,72	429,61
3	-100,00	.	200,00	33,33	-75,00	-100,00	.	-8,33	-75,00	128,83	-1545,96
4	-100,00	.	-100,00	0,00	0,00	0,00	.	-40,00	0,00	54,77	-136,93
5	**0,00**	**0,00**	**2600,00**	**96,30**	**84,91**	**131,63**	**-26,87**	**412,28**	**84,91**	**966,50**	**234,43**
6	39,16	-37,66	97,22	77,82	13,07	42,38	-27,92	29,15	39,16	50,43	172,98
7	2,22	42,07	-48,88	52,41	-53,39	44,98	-39,29	0,02	2,22	47,13	267993,38
8	-39,34	-78,79	591,43	-52,89	-3,51	-2,73	-28,97	55,03	-28,97	238,05	432,59
9	-2,63	13,51	10,71	63,44	-42,76	68,97	-33,33	11,13	10,71	43,12	387,48
10	-24,49	-10,81	51,52	4,00	-12,50	60,44	-28,08	5,72	-10,81	35,95	628,01
X	-25,01	-33,96	340,20	30,49	6,76	6,57	2,22				
MED	-2,63	-24,24	31,11	33,33	-3,51	21,19	-28,08		X of all DG (%)	53,58	
S	47,52	54,08	817,66	46,98	70,66	78,55	87,32		Med of all DG (%)	0,00	
CV	-190,00	-159,24	240,35	154,09	1045,78	1196,04	3935,08				

Table 20: Daily growth (DG%) of the Number of COVID19 case in Finland

WEEK – FINLAND	W(4a)	Th(5a)	F(6a)	Sa	Sun(D)	M(2a)	T(3a)	X - DG(%)	Med - DG(%)	S - DG(%)	CV - DG(%)
1	Start	-100,00	0,00	0,00	0,00	0,00	0,00	-16,67	0,00	40,82	-244,95
2	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
3	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
4	0,00	0,00	0,00	0,00	0,00	0,00	.	0,00	0,00	0,00	0,00
5	-100,00	.	200,00	-100,00	.	-100,00	.	-25,00	-100,00	150,00	-600,00
6	**25,00**	**-80,00**	**400,00**	**40,00**	**28,57**	**77,78**	**237,50**	**104,12**	**40,00**	**161,25**	**154,87**
7	35,19	-21,92	-50,88	-7,14	80,77	-4,26	-11,11	2,95	-7,14	42,74	1448,93
8	112,50	0,00	-11,76	4,00	-2,56	7,89	15,85	17,99	4,00	42,56	236,57
X	10,38	-28,85	67,17	-7,89	15,25	-2,32	40,37				
MED	0,00	0,00	0,00	0,00	0,00	0,00	0,00		X of all DG (%)	13,24	
S	62,93	42,93	154,29	39,94	30,87	47,94	96,95		Med of all DG (%)	0,00	
CV	606,10	-148,81	229,70	-506,08	202,38	-2063,78	240,14				

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