Thailand Performance and Best Management Practices that saved lives against Covid-19: a comparison against ten critical countries

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Abstract

1,002,137 lives were officially lost by Covid-19 until 27th September 2020 (WORLDOMETERS, 2020), with countries eager to learn from successful nations against the virus. An international survey, published in April/20, by Silva (2020a, p. 600), concluded that although no country is prepared to face epidemics and pandemics, among the 16 countries investigated, Thailand, Finland, Australia, SK, Denmark, and Sweden are cases that Brazil could study so as not to repeat the scenarios of China, USA, Italy, and Spain. Thus, this study investigates the performance and the best management practices (BMP) adopted in Thailand to save lives against Covid-19, during the first 180 days facing the pandemic. The research is useful for the academy, government policymakers, and authorities. It is descriptive, with the application of an online questionnaire, bibliographic and documentary research, involving the study of official sites, articles, reports, manuals, and other technical documents. The Fatality Total Index (FTI) developed by Silva (2020b p. 563) was used to evaluate 21 countries. The main conclusions are: 1) the ten most critical are Mexico, Peru, Italy, Ecuador, Iran, Chile, UK, Belgium, Colombia, and Brazil; 2) Thailand`s FTI180 is very low, indicating that this country has learned from the lessons of the past, reason by which is the best at saving lives against the Covid-19; 3) for 86 respondents living in Thailand, wear a mask, not shake hands, not hug in public, wash hands, and not wearing shoes in the house, were the five most decisive cultural practices that saved lives; 4) for 96 respondents living in Thailand, the ten main policy measures adopted by the Thailand Government that saved lives against the Covid-19 are international travel control, public event cancellations, schools closures, restriction on internal movement, workplaces closures, public information campaigns, effective public-private collaboration, increase the medical and personal equipment capacity, support the expansion of the testing system, and wage subsidies for workers; 5) to save lives against Covid-19, 28 innovative products or services were identified in Thailand, with the majority led by Corporations, Universities, followed by Public Sector, Start-Ups, and Others.

Keywords: BMP; Covid-19; Culture; FTI; Leadership by example; Innovation; Policy.

1. Introduction

Since the last day of 2019, we are facing a new challenge, when a virus spread across the world from China, called by the World Health Organization (WHO, 2020) as Coronavirus disease, well known as Covid-19, from Severe acute respiratory syndrome coronavirus2 (SARS-CoV-2).

Until now, there is no effective vaccine or treatment against the Covid-19, reason by which, every nation is trying to adopt several measures to reduce the pandemic impact on its population and economy. Considering the number of total cases, three months since the last day of 2019, on March 31, 2020, the 10 most critical countries were the USA, Italy, China, Spain, Germany, France, Iran, UK, Switzerland, and Netherlands (SILVA, 2020a).

In that time (March/20), Silva (2020a): a) developed an international survey with 16 countries related to the evolution of new cases of Covid-19; b) showed 10 reasons by which Brazil (it was in the 19th place) could move the world; c) provided ten conclusions and recommendations, and some of them were: c1) Brazil could be among the most-affected country before the end of May 2020; c2) although no nation is prepared to face epidemics and pandemics (NTI, JHU, and EIU, 2019), among the sixteen 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; c3) the research focused only the number of new cases per day, so it was recommended a study involving the fatal cases.

To complement Silva (2020a) survey, this research main goal is to investigate the performance and the best management practices (BMP) adopted in Thailand to save lives against Covid-19, during the first six months facing the pandemic. The specific objectives are a) define the ten most critical countries; b) compare the performance of Thailand with the ten most critical countries; c) identify the best management practices adopted in Thailand, taking into consideration cultural practices, main policy measures, and innovative solutions; d) present the ten best behaviors that a leader of a nation should adopt to inspire and get people support against the pandemic.

The research is relevant:

1) for government leaders, policymakers, or managers of health systems since they will know the best practices developed by Thailand against the Covid-19 during the first semester;

2) for academy it can be useful to develop strategies for preventing or controlling similar pandemic episodes in the future. In addition, for the behavior theory the study proposes ten attitudes considered crucial for a leader of a nation to get people support against the virus, opening new opportunities to grasp the impact of each behavior on the nation ability to save lives over the time;

3) although several authors have published relevant information about Covid-19 (BASHIR et al., 2020; CHAKRABORTY, AND MAITY, 2020; COWLING et al., 2020; CUI et al (2003); FLAXMAN et al., 2020; HA et al., 2020; LA et al., 2020; KAN et al. (2005); MAHATO, PAL, AND GHOST, 2020; SILVA, 2020; PANG (2003); PRATA, RODRIGUES, AND BERMEJO, 2020; ZAMBRANO-MONSERRATE, RUANO, AND SANCHEZ-ALCALDE, 2020; SAADAT, RAWTANI, AND RUSSAIN (2020); SVOBODA et al. (2004); YUNUS, MASAGO, AND HIJIOKA, 2020; WANG, NG, AND BROOK, 2020), there is a need to compare the performance of a benchmark country against critical nations, taking into consideration the real estimated number of Covid-19 fatal cases by one million

population during the first 6 months facing the pandemic, as well as to identify the benchmark country`s cultural aspects, policy measures, and innovative solutions adopted over the time.

2. WHO, SARS, and 20 leading countries with total fatal cases

The WHO is the global guardian of public health, with more than 7000 professionals in more than 150 countries working with over 300 topics, the most popular are Ebola, Nutrition, Hepatitis, and now Covid-19. In addition, according to WHO (2012), an epidemic of Severe Acute Respiratory Syndrome (SARS-CoV) appeared in Nov/2002 in southern China. According to WHO (2003), until August 7, 2003, it affected 8422 people from 32 countries with a total of 916 fatal cases (10,9%), most located in China (5327 cases; 349 deaths), HK (1755 cases; 300 deaths), Taiwan (665 cases; 180 deaths), Canada (251 cases; 41 deaths), Singapore (238 cases; 33 deaths), Vietnam (63 cases; 5 deaths), USA (33 cases; 0 death), Thailand (9 cases; 2 deaths), and Malaysia (5 cases; 2 deaths).

Since then, several authors (HOLMES, 2003; PANG, 2003; WATTS, 2003; BELL, 2004; INSTITUTE OF MEDICINE, 2004) provided information about the virus and also called the attention of the leaders about measures necessary to prevent, control, and respond to future global outbreaks.

After seventeen years, the WHO Office, in China, informed on December 31, 2019, the occurrence of people suffering from unknown pneumonia in Wuhan. On February 11, 2020, WHO announced as a new virus of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) with a popular disease name as Covid-19, and almost one month later, it was announced as a pandemic.

#	Country, Other	Total Cases	New Cases	Total Deaths	New Deaths	Total Recovered	Active Cases	Serious, Critical	Tot Cases/ 1M pop	Deaths/ 1M pop	Total Tests	Tests/ 1M pop
	World	33,297,501	+250,460	1,002,137	+3,852	24,621,170	7,674,194	65,337	4,272	128.6		
1	USA	7,320,669	+33,108	209,453	+276	4,551,321	2,559,895	14,100	22,085	632	104,322,093	314,722
2	Brazil	4,732,309	+14,194	141,776	+335	4,060,088	530,445	8,318	22,225	666	17,900,000	84,067
3	India	6,073,348	+82,767	95,574	+1,040	5,013,367	964,407	8,944	4,391	69	71,257,836	51,514
4	Mexico	726,431	+5,573	76,243	+399	521,241	128,947	2,631	5,620	590	1,665,057	12,882
5	UK	434,969	+5,693	41,988	+17	N/A	N/A	262	6,399	618	23,188,836	341,150
6	Italy	309,870	+1,766	35,835	+17	224,417	49,618	254	5,127	593	11,087,064	183,439
7	Peru	805,302	+5,160	32,262	+120	664,490	108,550	1,370	24,343	975	3,850,122	116,383
8	France	538,569	+11,123	31,727	+27	94,891	411,951	1,098	8,247	486	10,556,474	161,639
9	Spain	735,198		31,232		N/A	N/A	1,465	15,723	668	11,820,505	252,795
10	Iran	446,448	+3,362	25,589	+195	374,170	46,689	4,059	5,299	304	3,932,571	46,677
11	Colombia	813,056	+7,018	25,488	+192	711,472	76,096	2,220	15,938	500	3,636,868	71,293
12	Russia	1,151,438	+7,867	20,324	+99	943,218	187,896	2,300	7,889	139	45,100,000	309,010
13	South Africa	670,766	+1,268	16,398	+22	603,721	50,647	539	11,276	276	4,143,466	69,652
14	Argentina	711,325	+8,841	15,749	+206	565,935	129,641	3,604	15,704	348	1,905,361	42,065
15	Chile	457,901	+1,922	12,641	+50	431,704	13,556	888	23,904	660	3,228,414	168,535
16	Ecuador	134,747	+766	11,279	+6	112,296	11,172	355	7,610	637	418,785	23,651
17	Indonesia	275,213	+3,874	10,386	+78	203,014	61,813		1,004	38	3,207,055	11,695
18	Belgium	112,803	+1,827	9,974	+5	19,246	83,583	120	9,723	860	3,108,977	267,972
19	Germany	286,338	+1,313	9,534	+2	250,800	26,004	325	3,415	114	15,642,654	186,557
20	Canada	153,125	+1,454	9,268	+6	131,098	12,759	97	4,049	245	7,117,709	188,190

Fig. 1: The 20 most critical countries in terms of total deaths cases of Covid-19 on September 27, 2020
Source: Worldometers (2020)

Due to its fast transmission, after 271 days (Figure 1), since the first official case, at 23:59 (GMT) on September 27, 2020, the world officially exceed one million fatal cases, with 1st) USA (209,453), 2nd) Brazil (141,776), 3rd) India (95,574), 4th) Mexico (76,243), 5th) UK (41,988), 6th) Italy (35,835), 7th) Peru (32,262), 8th) France (31,727), 9th) Spain (31,232), 10th) Iran (25,589), 11th) Colombia (25,488), 12th) Russia (20,4324), 13th) South Africa (16,398), 14th) Argentina (15,749), 15th) Chile (12,641), 16th) Ecuador (11,279), 17th) Indonesia (10,386), 18th) Belgium (9,974), 19th) Germany (9,534), and 20th) Canada (9,268) among the 20 top countries leading the total number of fatal cases (WORLDOMETERS, 2020).

On the other hand, benchmark countries suggested by Silva (2020a) have the following position in terms of total fatal cases: 27th) Sweden (5888 deaths), 54th) Australia (872 deaths), 67th) Denmark (649 deaths), 78th) South Korea (401 deaths), 82th) Finland (343 deaths), and 133rd) Thailand (only 59 deaths), reason by which Thailand was selected to be firstly investigated.

3. Fatal cases indicators and Fatality Total Index (FTI)

According to Silva (2020b p.560), three authors (BALSARI, BUCKEE, AND KHANNA, 2020) stressed the importance of data, alerting that bad data could produce serious missteps, especially when models are produced and presented without appropriate expertise.

Nowadays, many organizations are developing indicators and collecting data related to the amount of fatal (or death) cases, such as a) tests per confirmed deaths; b) deaths per capita; c) total number of fatal cases by a total number of cases; d) case fatality rate (CFR); e) total number of fatal cases by 100 confirmed cases; f) the total number of fatal cases by a total number of recovered cases; g) the total number of fatal cases by 100,000 population; h) a total number of death cases by age, etc.

However, one of the limitation of these indicators is that they don't take into consideration the percentage of symptomatic cases reported (PSCR), and the % of symptomatic cases have been missed by the surveillance system over the time, reason by which Silva (2020b p. 563) proposed a new Indicator called Fatality Total Index (FTI), as shown in formula (1):

$$(1)\ FTI = [\ (TFC / XMPSCRnd) / 1MP / ND)\ ]$$

TFC = Total Fatal Cases

XMPSCRnd = The Average of the Median of PSCR related to the ND

1MP = one million of the population

ND = Nth day facing the Covid-19 since the first official case reported by the government

For Silva (2020b) and this research, the TFC is collected from the worldometer site <https://bit.ly/3dpMErI> since it is one of the most dynamic and updated sites about COVID-19.

The population of each country was collected from the United Nations Population Fund (2019), which shows the population of each country and other indicators for 2020.

The XMPSCRnd (Table 1) was calculated from the data provided by Golding, N. et al. (2020). Since each country was evaluated for six months (ND=180), it was used the median of PSCR related to the nth

day identified for each country, taking into consideration the delay of 13 days, by using the under-reporting estimates available in .csv file on the CMMI site <https://bit.ly/30N6qtj>.

For each country listed in Figure 1 plus Thailand, it was collected the MPSCRnd for 60, 70, 80, 90, 100, 120, 150, and 180 days, taking the average (XMPSCRnd).

And the results from Table 1 show that in terms of the Percentage of Symptomatic Cases Reported:

a) the best countries are: 1st) Thailand (74.04%), 2nd) Chile (71.31%), and 3rd) Russia (61.98%) with XMPSCRnd over 60%;

b) while other countries have the XMPSCRnd lower than 50%, especially Mexico (21th; 10.13%), France (20th; 14.35%), Italy (19th; 15.34%), UK (18th; 17.68%), and the USA (17th; 24.26%) with the lowest average.

Table 1: Twenty-one countries XMPSCRnd performance from 60 to 180 days

RANK	COUNTRIES	XMPSCRnd	MPSCR60	MPSCR70	MPSCR80	MPSCR90	MPSCR100	MPSCR120	MPSCR150	MPSCR180
1	THAILAND	77,04%	.	65,61%	66,44%	71,52%	76,90%	83,87%	87,20%	87,71%
2	CHILE	71,31%	73,88%	73,99%	75,47%	73,29%	61,08%	80,49%	72,27%	60,03%
3	RUSSIA	61,98%	43,40%	39,52%	53,31%	80,73%	89,14%	67,83%	62,62%	59,31%
4	SOUTH AFRICA	46,67%	40,78%	41,52%	37,34%	34,63%	41,06%	73,19%	55,81%	49,03%
5	ARGENTINA	42,68%	19,77%	24,92%	32,71%	42,65%	52,48%	62,95%	55,04%	50,93%
6	INDIA	39,51%	19,57%	23,21%	27,53%	29,27%	33,73%	47,77%	50,58%	84,44%
7	GERMANY	34,57%	37,13%	23,71%	17,55%	16,09%	17,21%	22,20%	46,60%	96,03%
8	PERU	32,81%	30,10%	34,55%	39,11%	41,23%	40,11%	26,60%	16,12%	34,64%
9	COLOMBIA	32,39%	25,04%	32,29%	34,81%	31,84%	27,88%	26,81%	34,40%	46,01%
10	IRAN	30,70%	27,51%	26,76%	31,35%	41,43%	46,45%	33,40%	17,08%	21,61%
11	BRAZIL	28,98%	10,41%	11,13%	13,29%	17,71%	24,54%	39,06%	51,05%	64,62%
12	SPAIN	28,09%	3,97%	5,59%	8,20%	7,43%	5,62%	26,00%	76,60%	91,34%
13	CANADA	27,34%	33,96%	23,02%	14,84%	12,14%	13,68%	15,89%	28,63%	76,55%
14	BELGIUM	26,39%	5,14%	6,07%	9,02%	12,43%	14,64%	19,66%	47,83%	96,35%
15	INDONESIA	25,86%	21,27%	23,67%	22,00%	21,24%	24,08%	28,66%	31,11%	34,82%
16	ECUADOR	24,87%	17,15%	17,75%	13,92%	17,48%	20,65%	19,19%	44,68%	48,11%
17	USA	24,26%	16,08%	13,24%	11,92%	12,03%	15,19%	22,34%	35,66%	67,59%
18	UK	17,68%	4,75%	4,48%	6,11%	9,21%	12,31%	15,43%	26,19%	62,99%
19	ITALY	15,34%	7,42%	9,87%	11,33%	12,06%	13,13%	13,53%	20,16%	35,22%
20	FRANCE	14,35%	5,24%	3,62%	3,86%	5,28%	6,70%	8,73%	24,11%	57,27%
21	MEXICO	10.13%	7,52%	7,89%	8,21%	8,35%	8,29%	9,53%	14,18%	17,06%

Source: Author (2020)

4. Best Management Practices (BMP)

According to the Cambridge Dictionary, management is the activity of overseeing a company, organization, department, or team of employees. Also, it defines as a group of people who control a company or organization.

To Drucker (1954), considered as the father of administration, management is a multipurpose organ that manages a business and manages managers and manages workers and work. The author gave importance to three jobs of management: (a) manage the business; (b) manage the manager; (c) manage the workers and work.

Management practice is considered by some authors as an entity of analytical instruments used to support the managers at work during the implementation of the selected management concept (DESSLER, 2004; SUTHERLAND and CANWELL, 2004; VAN ASSEN et al., 2009). Others consider the term as tools that are defined as a set of concepts, processes, and exercises (RIGBY, 2001).

According to Encyclopedia.com, Best Management Practices (BMP) are methods that have been determined to be the most effective and practical means of preventing or reducing the non-profit source of pollution to help achieve water goals.

For this research, Best Management Practices (BMP) is defined as those acceptable and effective management instruments able to achieve the goal(s) creatively and sustainably (adapted from GOMES DA SILVA, AND ASSUNÇÃO DE SOUZA, 2019 p. 702).

The instruments could be classified into 3 levels: International, National, and Regional/Local, as shown in Figure 2.

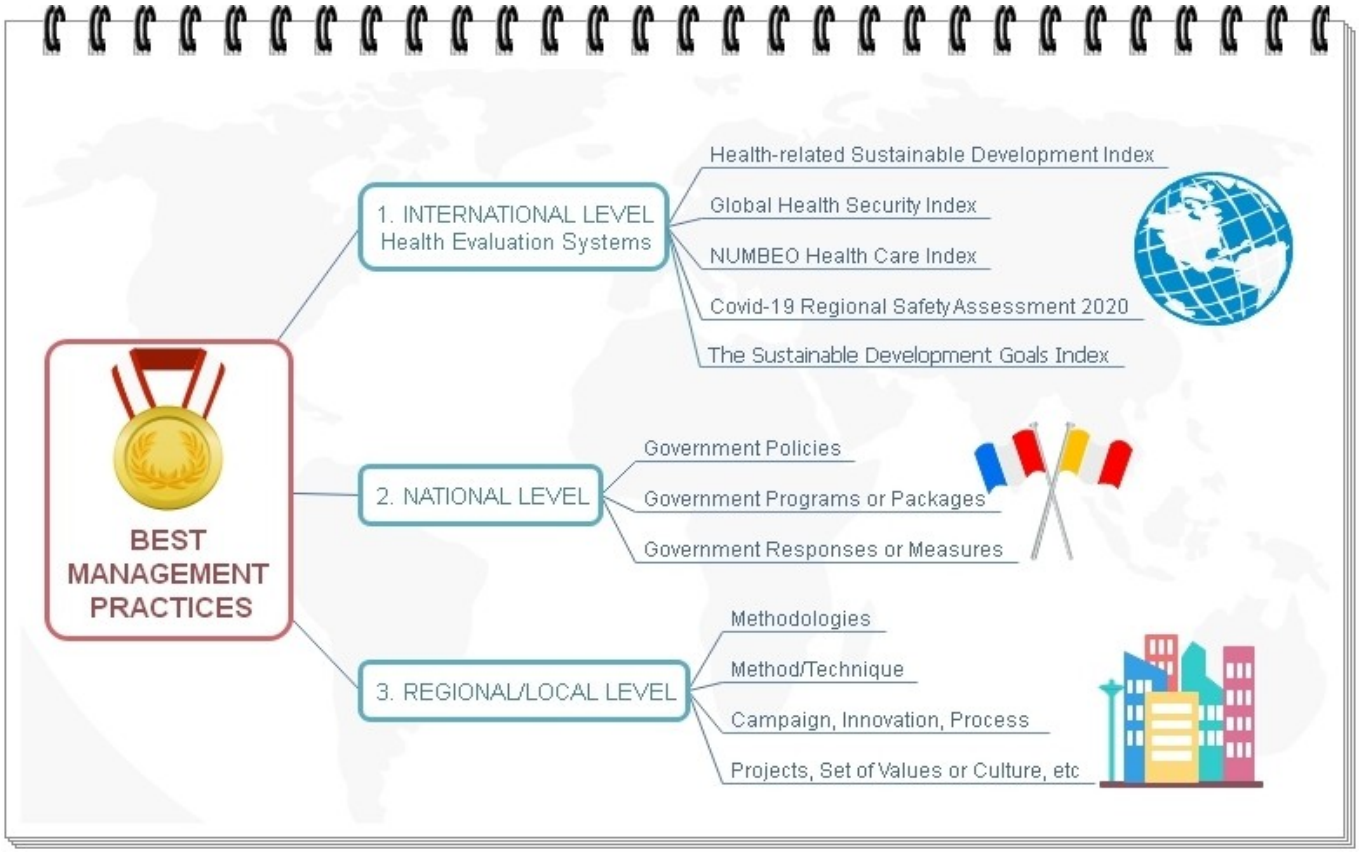


Figure 2: BMP instruments classification related to Health and/or Covid-19
Source: Author (2020)

At the International level, there are international evaluation systems;

At the National level, there are Government policies, package, responses or measures;

At the Regional/Local level, there are methodology, method/technique, innovation, process, campaign, project, a set of values, or culture (which also can be national) developed by many actors such as Universities, Startups, Companies, Governments, etc.

Examples of BMP to the International evaluation system focused on Health and/or Covid-19 are:

a) Health-related Sustainable Development Index (HSDG17) that evaluated 40 indicators of 195 countries from 1990 to 2017 (GBD 2017 SDG COLLABORATORS, 2018);

b) Global Health Security Index (GHSI19), a global assessment of the health security capacity of 195 countries, based on a questionnaire with 140 questions divided into 6 categories, 34 indicators, and 85 sub-indicators (NTI, JHU, and EIU, 2019).

c) NUMBEO Health Care Index (NUMBEO20) that estimates the overall quality of the health care system, health care professionals, doctors, cost, equipment, staff, with a total of 93 countries evaluated (NUMBEO, 2020);

d) Covid-19 Regional Safety Assessment 2020 (RSCOV20), one of several reports published by Deep Knowledge Group (2020) about the Covid-19 situation around the globe. It is designed to classify, analyze and rank economic, social, and health stability achieved in 200 regions, countries, and territories, by dividing them into 4 different Tiers: Tier 1 with 20 countries and 130 parameters, ranked highest in terms of regional safety and stability; Tier 2 has 20 regions with 60 parameters; Tier 3with 60 regions with 60 parameters; and Tier 4 with 100 regions that scored least favorably during a first-phase analysis, which suffer from a high level of data unavailability, reason by which is used only 40 parameters.

The framework has six top-level categories (each receives score from 0 to 100, which is multiplied by the weight) called: 1) Quarantine Efficiency (Weight=2.2); 2) Government Efficiency of Risk Management (Weight=2.2); 3) Monitoring and Detection (Weight=1.5); 4) Health Readiness (Weight=1.3); 5) Regional Resilience (Weight=1.3); and 6) Emergency Preparedness (Weight=1.5). The overall score is the sum of all categories scores reaching the maximum value of 1000.

e) The Sustainable Development Goals Index (SDGI20) and Covid-19, is the first global survey to evaluate each country concerning achieving the SDGs. It is also well known as SDG Index Report and Dashboards, and the version of last June 2020, is useful because also brings much information about Covid-19. According to Sachs et al. (2020, p. 24-25), the SDGI tracks 166 country performance on the 17 SDGs, as agreed by the international community in 2015 with equal weight to all 17 goals. The score signifies a country's position between the worst (0) and the best or target (100) outcomes, and the methodology has been peer-reviewed (SCHMIDT-TRAUB et al., 2017) and was audited by the European Commission Joint Research Centre (PAPADIMITRIOU, NEVES, and BECKER, 2019).

Examples of BMP related to National level government policies to combat the pandemic are: combat fake news, effective public-private collaboration, integration with mass media, international travel control, increase the medical and personal equipment capacity, improve intensive care unit structures, low-interest loans, schools closures, online training programs, public event cancellations, public information campaigns, public transport reduction, restriction on internal movement, reduction of bureaucracy, support the expansion of the testing system, tax relief, wage subsidies for workers, workplaces closures (PANG, 2003; SVOBODA et al, 2004; BALAJEE et al, 2017; HA et al, 2020; IMF, 2020; JONES, 2020; ROSER et al, 2020; OUR WORLD IN DATA, 2020a; WHO, 2020b).

Finally, examples of BMP related to Regional/Local levels to face Covid-19 are Hackathons, Donations Campaign, Development of Apps (Example: Tracking, On-Line Health Declaration), Robots, Sites, Maps, Products (Shields, Mask or Bio Masks), Temperature measurement (screen individual or crowds), Autonomous Vehicles, Distance Learning, Relief Funds, QR-Code Systems, Sterilizer, Chatbot, eCards, Ventilators, Video Conferences, Awards or Prizes, Booths, Center For Disease Control, BioChip, etc.

Some of Regional/Local BMP also can be done at National Level with the strong support of technologies such as Artificial Intelligence, Big Data, Blockchain, Blue Tooth, Cloud Computing, 3D printing, Deep-learning Algorithms, Internet, IoT, Infrared Technology, GPS, Nanotechnology, Open Source, Plasma air filtration, mRNA, Ultraviolet Rays, Sensors, Virtual Technology, Voice Recording, etc.

5. Methodology

The research is applied, useful for the academy, government policymakers, and authorities.

It is descriptive, with a qualitative and quantitative approach, based on bibliographic and documentary research, involving the study of articles, manuals, official sites, reports, and other technical documents.

To reach the specific objectives, the collection and data analysis were made in three phases:

Phase 1) to define the ten most critical countries

The 20 countries listed in Figure 1 are the sample to be investigated. Also, Thailand is included for further comparison.

The data were collected daily from the worldometers site from December 31, 2019, until September 27th, 2020. For each country, it was identified the official date where occurred the first case of Covid-19, and also the date when completed 180 days facing the pandemic (DTFC180). After that, the Formula (1) was applied for each country, and they are ranked in descending order by using the FTI180 Indicator.

The Table 2 (see section 6. Results) was created containing the following fields: Rank, Countries, Continent, SARS2003_TFC (Total Fatal Case of SARS in 2003)/TC (Total Case), START (Data of the first Covid-19 case reported), P2020 (Population per Million), PD20 (Population Density 2020), AGE>65 (Percentage of people over 65 years old in 2020), HBED/1K (Number of Hospital Beds per 1000 people), TFC180 (Total of Fatal Cases in 180 days), TFC1801M (TOTAL of Fatal Cases in 180 days per 1M people), FTI180 (Fatality Total Index in the 180th day taking into consideration the delay of 13 days).

Phase 2) to compare the performance of Thailand with the ten most critical countries

The comparative performance was made in two ways:

The first one compared the performance of each country by taking into consideration the Score of the five international evaluation system shown in Figure 2, focused on Health and/or Covid-19. All the scores are from 0 to 100 points, except the Score of Covid-19 Regional Safety Assessment 2020, that ranges from 0 to 1000, reason by which it was divided by ten, to normalize all scores for the same range.

The second one, focused on the Covid-19 Regional Safety Assessment 2020 (DEEP KNOWLEDGE GROUP, 2020) six top-level categories (Quarantine Efficiency; Government Efficiency of Risk Management; Monitoring and Detection; Health Readiness; Regional Resilience; and Emergency Preparedness), with each country Score. This international evaluation system was selected because is strongly related to Covid-19 with updated information.

Phase 3) identify the best management practices adopted in Thailand.

To this end, in June 2020, it was developed an electronic Survey <https://ufam.typeform.com/to/UL7R8M> containing an introductory video with 9 questions related to:

Q1) the country of the respondent, with 16 benchmark countries listed, selected by the author taking into consideration the FTI100. One of the countries is Thailand, the focus of this article, while other benchmark countries will be investigated in future articles.

Q2) eleven cultural practices that the respondent believes were decisive for the low rate of death in the selected country. Also, there is one option for those that don´t believe culture practice were decisive, and one option called "Other".

Q3) how much the respondent trust in official statistics released by the National Government about the number of deaths cases by Covid-19. A Likert Scale from 0 (Low trust) to 10 (High Trust) was provided.

Q4) what are the main policy measures adopted by the Country Government that saved lives against the Covid-19. Around 18 measures were provided for the respondent to select (multiple choice) and also one option called "Other" was included.

Q5) an opened question was created for the respondent inform (in case if know), the name of the most innovative product or service (test kit, telehealth equipment, robot, app, etc) that are protecting people in the Country against Covid-19. This question main aim is to identify some tips of possible products or services for the researcher intensify the search on the internet;

Q6) the age of the respondent;

Q7) a question to identify if the respondent is native or not of the country;

Q8) an open question to identify how long the respondent is living in the country;

Q9) an open question was created for suggestions or to inform e-mail, just in case the respondent is interested to receive the scientific article of this survey.

It was used the Typeform <https://www.typeform.com/> platform to create and manage the questionnaire, the author is a customer of the company, but due to the Covid-19, the use of the platform was free. Also, other software platforms were used such as Libre Office package, Edraw Max editor, Videorobot, Viddyoze, Piktochart, and Photoscape.

The main aim of this survey is to identify the perceptions of common people living in Thailand and to participate, the respondent must have 18 or more years old and living in the country for at least four months.

The pilot test was made from June 21st to July 21th, to improve the questionnaire (it was reduced one question) to make it more simple and easy to answer. After some improvement, the survey continues from the beginning of August until the 27th of September, 2020.

To invite people, it was used the Facebook paid service, called "Bost a post", an invitation message with the link of the questionnaire was written in English and send to the audience of Thailand.

Due to Covid-19 and cost limitations, it was tried to carry out sampling for convenience, where the researcher depends on the availability of the respondent to contribute in a volunteer way for the survey. As a result, a confidence interval or margin of error was not adopted, but it was hoped to get near 100 correct answers.

Finally, parallel to the online questionnaire survey, several searches on articles, sites of government, universities, journals, startups, and companies of Thailand were realized to identify the innovative products and services adopted in this country to protect and save lives against the Covid-19.

6. Results

6.1 The ten most critical countries

Table 2 shows the basic profile and the ranking of the most critical countries. For the comparative process, Thailand also was included. In short, the result of Table 2 shows that:

a) among the sample of 21 countries, Thailand was the first country to report the Covid-19, it has reported two fatal cases from nine of the first coronavirus SARS2003 pandemic. The order of countries that reported (Column START) the first cases of Covid-19 over the time in 2020 is: 1st) Thailand (13th/Jan); 2nd) USA (21th/Jan); 3rd) France (24th/Jan); 4th) Canada (27th/Jan); 5th) Germany (27th/Jan); 6th) India (30th/Jan); 7th) Italy (31th/Jan); 8th) UK (31th/Jan); 9th) Spain (31th/Jan); 10th) Russia (31th/Jan); 11th) Belgium (4th/Feb); 12th) Iran (12th/Feb); 13th) Brazil (25th/Feb); 14th) Mexico (28th/Feb); 15th) Ecuador (29th/Feb); 16th) Indonesia (2nd/Mar); 17th) Chile (3rd/Mar); 18th) Argentina (3rd/Mar); 19th) South Africa (5th/Mar); 20th) Peru (6th/Mar); and 21th) Colombia (6th/Mar);

Table 2: The most critical countries in descending order of FTI180

RANK	COUNTRIES	CONTINENT	SARS2003_TFC/TC	START	P2020 (Mil)	PD20	AGE>65(20)	HBED/1K	XMPSCRnd	TFC180	TFC1801M	FTI180
1	MEXICO	North America	NO CASE	28/02/20	128,9	66,44	6,86	1,38	10,13%	60800	471,68	15,3603
2	PERU	South America	NO CASE	06/03/20	33,00	25,13	8,70	1,60	32,81%	29068	880,85	14,1270
3	ITALY	Europe	0 / 4	31/01/20	60,50	205,86	23,30	3,18	15,34%	35277	583,09	9,1976
4	ECUADOR	South America	NO CASE	29/02/20	17,60	66,94	7,60	1,50	24,87%	10015	569,03	6,5710
5	IRAN	Asia	NO CASE	19/02/20	84,00	49,83	6,60	1,50	30,70%	19639	233,80	6,0105
6	CHILE	South America	NO CASE	03/03/20	19,10	24,28	12,20	2,11	71,31%	11181	585,39	5,4176
7	UK	Europe	0 / 4	31/01/20	67,90	272,90	18,70	2,54	17,68%	41135	605,82	5,3432
8	BELGIUM	Europe	NO CASE	04/02/20	11,60	315,56	19,30	5,64	26,39%	9718	837,76	4,8305
9	COLOMBIA	South America	0 / 1	06/03/20	50,90	44,22	9,10	1,71	32,39%	20052	393,95	4,7568
10	BRAZIL	South America	0 / 1	25/02/20	212,60	25,04	9,60	2,20	28,98%	114277	537,52	4,6212
11	FRANCE	Europe	1 / 7	24/01/20	65,30	122,58	20,80	5,98	14,35%	30165	461,94	4,4812
12	SPAIN	Europe	0 / 33	31/01/20	46,80	93,10	20,00	2,97	28,09%	28436	607,61	3,6956
13	USA	North America	0 / 33	21/01/20	331,00	35,61	16,60	2,77	24,26%	143366	433,13	3,5601
14	SOUTH AFRICA	Africa	1 / 1	05/03/20	59,30	46,75	5,50	2,32	46,67%	14149	238,60	2,7036
15	ARGENTINA	South America	NO CASE	03/03/20	45,20	16,18	11,20	5,00	42,68%	8353	184,80	2,0158
16	CANADA	North America	41 / 251	27/01/20	37,71	4,04	18,10	2,50	27,34%	8881	235,51	1,7092
17	RUSSIA	Europe	0 / 1	31/01/20	145,93	8,82	15,50	8,05	61,98%	13504	92,54	0,8668
18	GERMANY	Europe	0 / 9	27/01/20	83,80	237,01	21,70	8,00	34,57%	9201	109,80	0,6352
19	INDONESIA	Asia	0 / 2	02/03/20	273,50	145,72	6,30	1,04	25,86%	7169	26,21	0,4182
20	INDIA	Asia	3 / 0	30/01/20	1380,00	450,42	6,60	0,53	39,51%	33448	24,24	0,1595
21	THAILAND	Asia	2 / 9	13/01/20	69,80	135,13	13,00	2,10	77,04%	58	0,83	0,0053

Source: Author (2020)

b) among the 20 countries listed in Figure 1 with the highest number of fatal cases on 27th September 2020, most are located in Europe (7; 35%), followed by six countries (30%) of South America, three countries of Asia (15%), two countries from North America (10%), and only one country from Africa (5%);

c) for the first 180 days of facing Covid-19, the ten most critical countries are: 1st) Mexico (FTI180=15.3603); 2nd) Peru (FTI180=14.1270); 3rd) Italy (FTI180=9.1976); 4th) Ecuador (FTI180=6.5710); 5th) Iran (FTI180=6.0105); 6th) Chile (FTI180=5.4176); 7th) UK (FTI180=5.3432); 8th) Belgium (FTI180=4.8305); 9th) Colombia (FTI180=4.7568); and 10th) Brazil (FTI180=4.6212);

d) most (50%) of the ten critical countries is from South America, followed by Europe (30%), North America (10%), and Asia (10%);

e) no one of the ten top critical countries reported fatal cases of SARS2003, 60% of the nations without any case of that virus, which may indicate that since the first coronavirus pandemic in 2002/2003, these countries did not make a serious investment and preparations for the future return of the virus;

f) The ten most critical countries average of FTI180 is 7.62 (S=3.99; CV=69.87%), and the median equals 5.71, with Mexico, Peru, and Italy FTI180s values much higher than the average.

6.2 The Thailand performance against the ten most critical countries performance

Figure 3 shows the 7-day average of confirmed Covid-19 deaths per million people, not considering unreported cases. The performance of Thailand is much better than the ten most critical countries.

Besides, when the analysis considers the unreported cases, by taking into account the estimated number of total fatal cases, per million population during the first 180 days facing the pandemic, Thailand`s FTI180 value (Table 2) is only 0.0053, the lowest, indicating that this country is the best at saving lives against the Covid-19 when compared with the nations investigated.

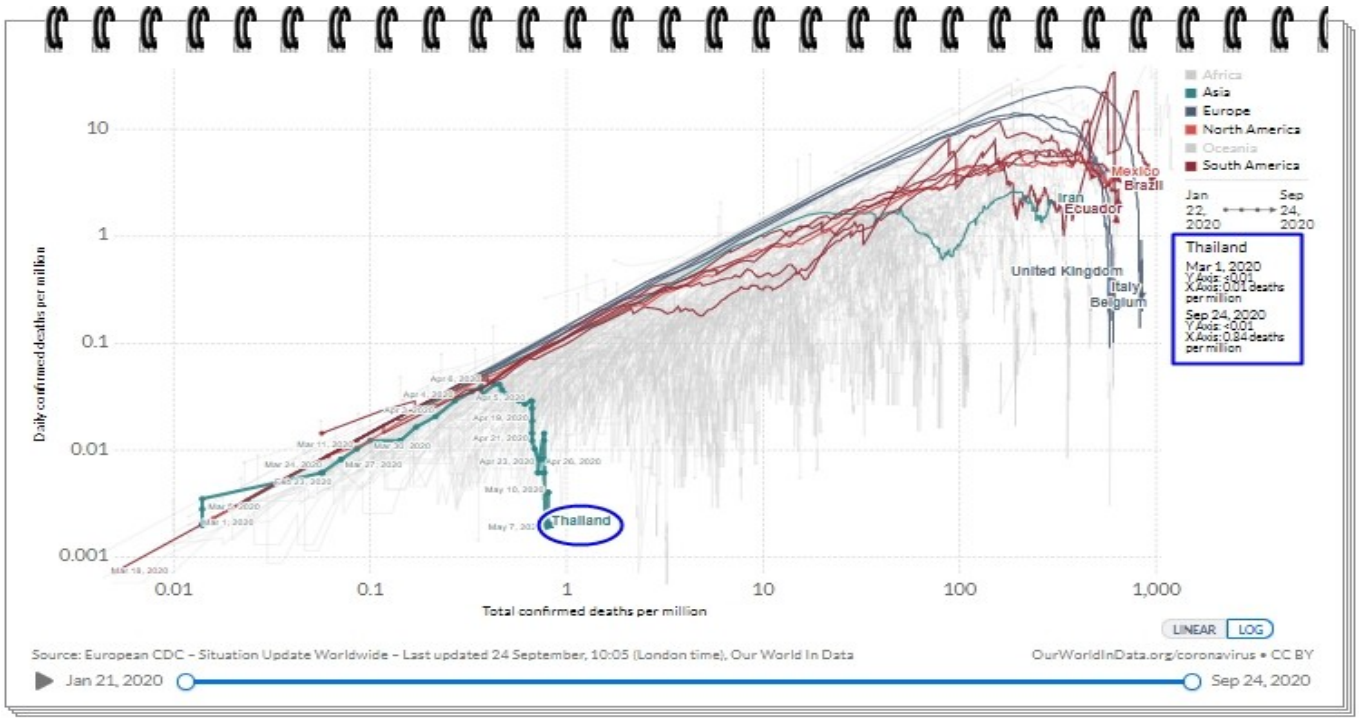


Figure 3: Thailand and ten most critical countries Daily vs. Total Confirmed Covid-19 deaths per million
Source: Our Data in World (2020b)

When the performance is related to the BMP`s International evaluation system, focused on Health and/or Covid-19, the five best performers (Table 3) are: 1st) UK (Average= 72.7), 2nd) Belgium (68.4), 3rd) Thailand (67.8), 4th) Italy (64.6), and Chile (64.2). On the other hand, 11th) Iran (54.7) and four countries from South America (Peru=56.9; Colombia=57; Brazil=60.7, and Ecuador=61.9) reached the lowest average score.

Table 3: Thailand and the ten most critical BMP´s International evaluation performance ranked by X

R	COUNTRY	CONTINENT	HSDG17	GHSI19	NUMBEO20	RSCOV20	SDGI20	X	S	CV %	MED
1	UK	Europe	80	77,9	74,46	51,3	79,8	72,7	12,2	16,7	77,9
2	Belgium	Europe	77	61	74,34	49,8	80	68,4	12,7	18,6	74,3
3	Thailand	Asia	59	73,2	77,95	54,1	74,5	67,8	10,5	15,5	73,2
4	Italy	Europe	70	56,2	66,59	53,3	77	64,6	9,8	15,2	66,6
5	Chile	South America	65	58,3	65,44	54,9	77,4	64,2	8,6	13,4	65,0
6	Mexico	North America	64	57,6	70,12	53,7	70,4	63,2	7,4	11,8	64,0
7	Ecuador	South America	64	50,1	70,59	50,5	74,3	61,9	11,2	18,1	64,0
8	Brazil	South America	68	59,7	56,29	47	72,7	60,7	10,1	16,6	59,7
9	Colombia	South America	66	44,2	67,24	36,7	70,9	57,0	15,5	27,1	66,0
10	Peru	South America	62	49,2	56,15	45,3	71,8	56,9	10,5	18,5	56,2
11	Iran	Asia	62	37,7	51,7	50,5	71,8	54,7	12,9	23,5	51,7

Source: Author (2020)

When the Performance of Thailand and ten critical countries are analyzed by each International evaluation system, Thailand performed best in NUMBEO Health Care Index 2020 (NUMBEO20 = First place – Table 4), the second place (Tables 5 and 6) in the Global Health Security Index (GHSI19) and the Covid-19 Regional Safety Assessment 2020 (RSCOV20).

Table 4: Thailand best BMP´s International evaluation performance

R	COUNTRY	CONTINENT	HSDG17	GHSI19	NUMBEO20	RSCOV20	SDGI20	X	S	CV %	MED
1	Thailand	Asia	59	73,2	77,95	54,1	74,5	67,8	10,5	15,5	73,2
2	UK	Europe	80	77,9	74,46	51,3	79,8	72,7	12,2	16,7	77,9
3	Belgium	Europe	77	61	74,34	49,8	80	68,4	12,7	18,6	74,3
4	Ecuador	South America	64	50,1	70,59	50,5	74,3	61,9	11,2	18,1	64,0
5	Mexico	North America	64	57,6	70,12	53,7	70,4	63,2	7,4	11,8	64,0
6	Colombia	South America	66	44,2	67,24	36,7	70,9	57,0	15,5	27,1	66,0
7	Italy	Europe	70	56,2	66,59	53,3	77	64,6	9,8	15,2	66,6
8	Chile	South America	65	58,3	65,44	54,9	77,4	64,2	8,6	13,4	65,0
9	Brazil	South America	68	59,7	56,29	47	72,7	60,7	10,1	16,6	59,7
10	Peru	South America	62	49,2	56,15	45,3	71,8	56,9	10,5	18,5	56,2
11	Iran	Asia	62	37,7	51,7	50,5	71,8	54,7	12,9	23,5	51,7

Source: Author (2020)

Table 5: Thailand second best BMP´s International evaluation performance (GHSI19)

R	COUNTRY	CONTINENT	HSDG17	GHSI19	NUMBEO20	RSCOV20	SDGI20	X	S	CV %	MED
1	UK	Europe	80	77,9	74,46	51,3	79,8	72,7	12,2	16,7	77,9
2	Thailand	Asia	59	73,2	77,95	54,1	74,5	67,8	10,5	15,5	73,2
3	Belgium	Europe	77	61	74,34	49,8	80	68,4	12,7	18,6	74,3
4	Brazil	South America	68	59,7	56,29	47	72,7	60,7	10,1	16,6	59,7
5	Chile	South America	65	58,3	65,44	54,9	77,4	64,2	8,6	13,4	65,0
6	Mexico	North America	64	57,6	70,12	53,7	70,4	63,2	7,4	11,8	64,0
7	Italy	Europe	70	56,2	66,59	53,3	77	64,6	9,8	15,2	66,6
8	Ecuador	South America	64	50,1	70,59	50,5	74,3	61,9	11,2	18,1	64,0
9	Peru	South America	62	49,2	56,15	45,3	71,8	56,9	10,5	18,5	56,2
10	Colombia	South America	66	44,2	67,24	36,7	70,9	57,0	15,5	27,1	66,0
11	Iran	Asia	62	37,7	51,7	50,5	71,8	54,7	12,9	23,5	51,7

Source: Author (2020)

For the Global Health Security Index 2019 Report (NTI, JHU, and EIU, 2019 p. 22-25), Thailand:

1) showed the sixth-best overall score among 195 nations investigated;

2) strongest categories are Sufficient and Robust Health System to treat the sick and protect health workers (2nd place with 70.5), Prevention of the Emergence or release of pathogens (third place with 75.7), Rapid response to and mitigation of the spread of an epidemic (the fifth place with 78.6), Commitments to improving national capacity, financing and adherence to norms (12th place with 70.9), and Early detection and report for the epidemic of potential international concern (15th place with 81).

Thailand has a strong field epidemiology training program and national laboratory system, scoring in the top tier for indicators of these capacities and demonstrating a robust electronic reporting surveillance system that functions at both national and sub national levels, rapidly collecting laboratory and epidemiological information. It demonstrates strength on prevention and response capability, scoring 75.7 and 78.8, respectively, in each of these categories and conducting regular event-based surveillance through a dedicated Situation Awareness Team embedded in the Ministry of Public Health's Emergency Operations Center (NTI, JHU, and EIU, 2019 p. 55). However, this report also calls attention to the category that Thailand needs improvements: overall risk environment and country vulnerability to biological threats (93rd place with 56.4).

For the Deep Knowledge Group (2020), responsible for the Covid-19 Regional Safety Assessment 2020 (RSCOV20), among the 11 countries investigated, Chile has the best performance, followed by Thailand, Mexico, Italy, and UK (Tables 6 and 7), while Colombia, Peru, Brazil, Belgium, and Iran showed the lowest performance respectively.

Table 6: Thailand second best BMP´s International evaluation performance (RSCOV20)

R	COUNTRY	CONTINENT	HSDG17	GHSI19	NUMBEO20	RSCOV20	SDGI20	X	S	CV %	MED
1	Chile	South America	65	58,3	65,44	54,9	77,4	64,2	8,6	13,4	65,0
2	Thailand	Asia	59	73,2	77,95	54,1	74,5	67,8	10,5	15,5	73,2
3	Mexico	North America	64	57,6	70,12	53,7	70,4	63,2	7,4	11,8	64,0
4	Italy	Europe	70	56,2	66,59	53,3	77	64,6	9,8	15,2	66,6
5	UK	Europe	80	77,9	74,46	51,3	79,8	72,7	12,2	16,7	77,9
6	Ecuador	South America	64	50,1	70,59	50,5	74,3	61,9	11,2	18,1	64,0
7	Iran	Asia	62	37,7	51,7	50,5	71,8	54,7	12,9	23,5	51,7
8	Belgium	Europe	77	61	74,34	49,8	80	68,4	12,7	18,6	74,3
9	Brazil	South America	68	59,7	56,29	47	72,7	60,7	10,1	16,6	59,7
10	Peru	South America	62	49,2	56,15	45,3	71,8	56,9	10,5	18,5	56,2
11	Colombia	South America	66	44,2	67,24	36,7	70,9	57,0	15,5	27,1	66,0

Source: Author (2020)

Table 7: The eleven countries performance according to Covid-19 Regional Safety Assessment2020

R	COUNTRY	CONTINENT	Quarentine Efficiency	Government Efficiency	Monitoring and Detection	Health Care Readiness	Regional Resiliency	Emmergency Prepareness	Final Score	Final Score Normalized
1	Chile	South America	99	**151**	92	63	80	63	549	54,9
2	Thailand	Asia	90	**144**	95	67	85	60	541	54,1
3	Mexico	North America	106	129	101	53	87	62	537	53,7
4	Italy	Europe	103	118	93	71	80	69	533	53,3
5	UK	Europe	103	102	81	70	78	79	513	51,3
6	Ecuador	South America	104	110	94	60	80	56	505	50,5
7	Iran	Asia	91	109	79	52	78	96	505	50,5
8	Belgium	Europe	98	107	85	75	83	49	498	49,8
9	Brazil	South America	96	99	82	67	77	49	470	47,0
10	Peru	South America	93	104	80	53	71	51	453	45,3
11	Colombia	South America	?	?	?	?	?	?	367	36,7

Source: Deep Knowledge Group (2020)

For the Deep Knowledge Group (2020), Thailand:

1) was the 47th best country (Figure 4) among the 200 countries, and territories analyzed;

2) is the 11th best country among 36 Asia and Pacific Region´s nations, and territories;

3) strongest category is Government Efficiency of Risk Management (Table 7; Score = 144), considered the 25th best country among the top 100 leaders in this category, followed by the category Regional Resiliency (Score = 85; 28th best among top 100), and the category Monitoring and Detection (Score = 95; 38th position among the top 100 countries), the category Health Care Readiness (Score = 67; 54th among the top 100 countries).

4) on the other hand, Emergency Preparedness (Score = 60; 68th place among the top 100 countries), and Quarantine Efficiency (Score = 90; 85th place among 100 best countries) are the categories that need further improvements.

Figure 4: Thailand performance categories in the Covid-19 Regional Safety Assessment 2020
Source: Deep Knowledge Group (2020, p. 183)

Table 8: Thailand lowest BMP´s International evaluation performance (HSDG17)

R	COUNTRY	CONTINENT	HSDG17	GHSI19	NUMBEO20	RSCOV20	SDGI20	X	S	CV %	MED
1	UK	Europe	80	77,9	74,46	51,3	79,8	72,7	12,2	16,7	77,9
2	Belgium	Europe	77	61	74,34	49,8	80	68,4	12,7	18,6	74,3
3	Italy	Europe	70	56,2	66,59	53,3	77	64,6	9,8	15,2	66,6
4	Brazil	South America	68	59,7	56,29	47	72,7	60,7	10,1	16,6	59,7
5	Colombia	South America	66	44,2	67,24	36,7	70,9	57,0	15,5	27,1	66,0
6	Chile	South America	65	58,3	65,44	54,9	77,4	64,2	8,6	13,4	65,0
7	Ecuador	South America	64	50,1	70,59	50,5	74,3	61,9	11,2	18,1	64,0
8	Mexico	North America	64	57,6	70,12	53,7	70,4	63,2	7,4	11,8	64,0
9	Peru	South America	62	49,2	56,15	45,3	71,8	56,9	10,5	18,5	56,2
10	Iran	Asia	62	37,7	51,7	50,5	71,8	54,7	12,9	23,5	51,7
11	Thailand	Asia	59	73,2	77,95	54,1	74,5	67,8	10,5	15,5	73,2

Source: Author (2020)

Concerning the two last international evaluation system, Thailand was in the last Position (Table 8) in the Health-related Sustainable Development Index (HSDG17) and the fifth position (Table 9) concerning The Sustainable Development Goals Index (SDGI20).

Among the 40 indicators of the Health-related Sustainable Development Index (HSDG17), evaluated from 1990 to 2017 (GBD 2017 SDG COLLABORATORS, 2018), Thailand:

a) fifteen best indicators were: FP needs to be met, mod (Score=99), Skilled birth attendance (98), Sanitation (98), Combat child sex abuse (92), Household air pollution (88), NTD prevalence (82), Non-intimate partner sexual violence (80), NCD Mortality (79), Child stunning (78), Poisoning mortality (76), Hygiene (74), Physical violence (74), UHC service coverage index (73), Heath worker intensity (71), and Under-5 mortality (71);

b) ten weakest indicators were: Hepatitis B incidence (Score = 24), Road Injury mortality (30), HIV incidence (39), Water (39), Occupation risk burden (41), Adolescent Birth Rare (45), Suicide mortality (46), WaSH mortality (46), Homicide (46), and Mean PM (47).

Table 9: Thailand fifth place in The Sustainable Development Goals Index (SDGI20)

R	COUNTRY	CONTINENT	HSDG17	GHSI19	NUMBEO20	RSCOV20	SDGI20	X	S	CV %	MED
1	Belgium	Europe	77	61	74,34	49,8	80	68,4	12,7	18,6	74,3
2	UK	Europe	80	77,9	74,46	51,3	79,8	72,7	12,2	16,7	77,9
3	Chile	South America	65	58,3	65,44	54,9	77,4	64,2	8,6	13,4	65,0
4	Italy	Europe	70	56,2	66,59	53,3	77	64,6	9,8	15,2	66,6
5	Thailand	Asia	59	73,2	77,95	54,1	74,5	67,8	10,5	15,5	73,2
6	Ecuador	South America	64	50,1	70,59	50,5	74,3	61,9	11,2	18,1	64,0
7	Brazil	South America	68	59,7	56,29	47	72,7	60,7	10,1	16,6	59,7
8	Peru	South America	62	49,2	56,15	45,3	71,8	56,9	10,5	18,5	56,2
9	Iran	Asia	62	37,7	51,7	50,5	71,8	54,7	12,9	23,5	51,7
10	Colombia	South America	66	44,2	67,24	36,7	70,9	57,0	15,5	27,1	66,0
11	Mexico	North America	64	57,6	70,12	53,7	70,4	63,2	7,4	11,8	64,0

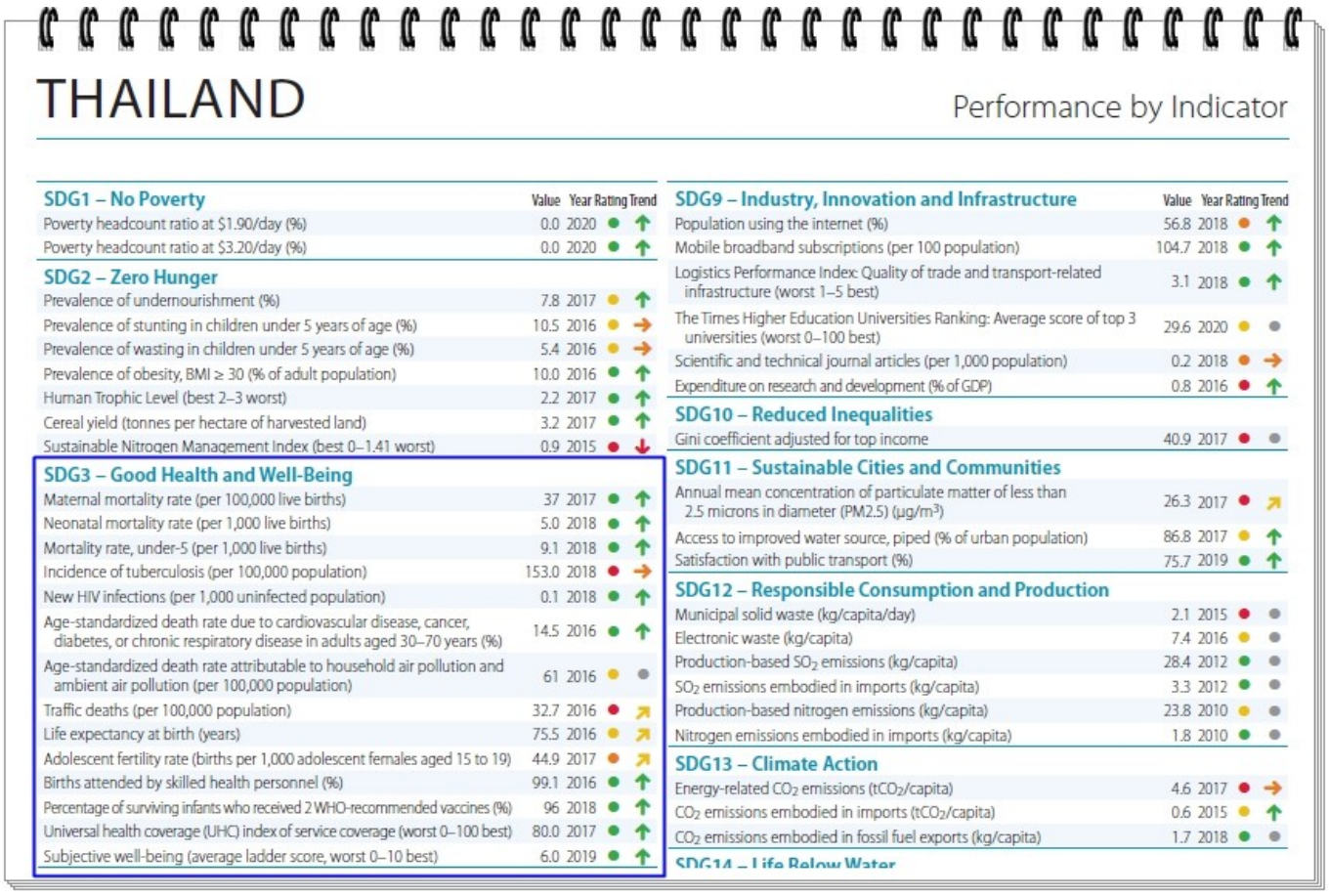
Source: Author (2020)

Finally, according to Sachs et al. (2020, p. 444-445), responsible for The Sustainable Development Goals Index (SDGI20) and Covid-19, among the 166 countries, Thailand:

a) was the 41st place (Score = 74.5), with the best results in SDG1 (No Poverty), SDG13 (Climate Action), SDG4 (Quality Education, but with trends showing decreasing), SDG11 (Sustainable Cities and Communities), SDG7 (Affordable and Clean Energy), SDG8 (Decent Work and Economic Growth), and SDG3 (Good Health and Well Being). On the other hand, the weakest results were in SDG9 (Industry, Innovation, and Infrastructure), SDG17 (Partnerships for the Goals, with trends showing decreasing), SDG2 (Zero Hunger), SDG10 (Reduced Inequalities), SDG14 (Life Bellow Water), SDG15 (Life on Land), and SDG16 (Peace, Justice and Strong Institutions);

b) has the trends of moderately improve the SDG3 related to Good Health and Well-Being and Figure 5 shows the nine indicators on track or maintaining SDG achievement (see the green arrow pointing up): Maternal mortality rate, Neonatal mortality rate, Mortality rate, under-5 (per 1,000 live births), New HIV infections (per 1,000 uninfected population), Age-standardized death rate due to

cardiovascular disease, cancer, diabetes, or chronic respiratory disease in adults aged 30–70 years (%), Births attended by skilled health personnel (%), Percentage of surviving infants who received 2 WHO-recommended vaccines (%), Universal health coverage (UHC) index of service coverage (worst 0–100 best), Subjective well-being (average ladder score, worst 0–10 best).



THAILAND

Performance by Indicator

SDG1 – No Poverty	Value	Year	Rating	Trend
Poverty headcount ratio at $1.90/day (%)	0.0	2020	●	↑
Poverty headcount ratio at $3.20/day (%)	0.0	2020	●	↑
SDG2 – Zero Hunger				
Prevalence of undernourishment (%)	7.8	2017	●	↑
Prevalence of stunting in children under 5 years of age (%)	10.5	2016	●	→
Prevalence of wasting in children under 5 years of age (%)	5.4	2016	●	→
Prevalence of obesity, BMI ≥ 30 (% of adult population)	10.0	2016	●	↑
Human Trophic Level (best 2–3 worst)	2.2	2017	●	↑
Cereal yield (tonnes per hectare of harvested land)	3.2	2017	●	↑
Sustainable Nitrogen Management Index (best 0–1.41 worst)	0.9	2015	●	↓
SDG3 – Good Health and Well-Being				
Maternal mortality rate (per 100,000 live births)	37	2017	●	↑
Neonatal mortality rate (per 1,000 live births)	5.0	2018	●	↑
Mortality rate, under-5 (per 1,000 live births)	9.1	2018	●	↑
Incidence of tuberculosis (per 100,000 population)	153.0	2018	●	→
New HIV infections (per 1,000 uninfected population)	0.1	2018	●	↑
Age-standardized death rate due to cardiovascular disease, cancer, diabetes, or chronic respiratory disease in adults aged 30–70 years (%)	14.5	2016	●	↑
Age-standardized death rate attributable to household air pollution and ambient air pollution (per 100,000 population)	61	2016	●	●
Traffic deaths (per 100,000 population)	32.7	2016	●	↗
Life expectancy at birth (years)	75.5	2016	●	↗
Adolescent fertility rate (births per 1,000 adolescent females aged 15 to 19)	44.9	2017	●	↗
Births attended by skilled health personnel (%)	99.1	2016	●	↑
Percentage of surviving infants who received 2 WHO-recommended vaccines (%)	96	2018	●	↑
Universal health coverage (UHC) index of service coverage (worst 0–100 best)	80.0	2017	●	↑
Subjective well-being (average ladder score, worst 0–10 best)	6.0	2019	●	↑

SDG9 – Industry, Innovation and Infrastructure	Value	Year	Rating	Trend
Population using the internet (%)	56.8	2018	●	↑
Mobile broadband subscriptions (per 100 population)	104.7	2018	●	↑
Logistics Performance Index: Quality of trade and transport-related infrastructure (worst 1–5 best)	3.1	2018	●	↑
The Times Higher Education Universities Ranking: Average score of top 3 universities (worst 0–100 best)	29.6	2020	●	●
Scientific and technical journal articles (per 1,000 population)	0.2	2018	●	→
Expenditure on research and development (% of GDP)	0.8	2016	●	↑
SDG10 – Reduced Inequalities				
Gini coefficient adjusted for top income	40.9	2017	●	●
SDG11 – Sustainable Cities and Communities				
Annual mean concentration of particulate matter of less than 2.5 microns in diameter (PM2.5) (µg/m³)	26.3	2017	●	↗
Access to improved water source, piped (% of urban population)	86.8	2017	●	↑
Satisfaction with public transport (%)	75.7	2019	●	↑
SDG12 – Responsible Consumption and Production				
Municipal solid waste (kg/capita/day)	2.1	2015	●	●
Electronic waste (kg/capita)	7.4	2016	●	●
Production-based SO_2 emissions (kg/capita)	28.4	2012	●	●
SO_2 emissions embodied in imports (kg/capita)	3.3	2012	●	●
Production-based nitrogen emissions (kg/capita)	23.8	2010	●	●
Nitrogen emissions embodied in imports (kg/capita)	1.8	2010	●	●
SDG13 – Climate Action				
Energy-related CO_2 emissions (tCO_2/capita)	4.6	2017	●	→
CO_2 emissions embodied in imports (tCO_2/capita)	0.6	2015	●	↑
CO_2 emissions embodied in fossil fuel exports (kg/capita)	1.7	2018	●	●
SDG14 – Life Below Water				

Figure 5: Part of Performance Indicators of Sustainable Development Goals Index 2020
Source: Sachs et al. (2020, p. 445)

6.3 The BMP adopted in Thailand to save people´s live against the Covid-19

From 21st June until 27th September 2020, two Boost Post with the invitation and link of the questionnaire reached 13.831 people living in Thailand, from which 96 (0.69%) respondents accepted voluntarily to participate in the survey.

6.3.1 Basic profile of the respondent

a) the respondents spent an average of 5min32s to watch the introductory video and answer all the nine questions;

b) most (94=98%) revealed the age, which average is 64 years old, the youngest respondent has 28 years old, and the oldest has 84 years old. This result may indicate that adult and old people are more motivated to participate in the survey;

c) one interesting result is that most respondent is not native (92=95.83%) of Thailand. Around 88 foreigners accepted to inform the time living in Thailand, with the average time being 11.53 years, and

the median 8 years. Only 12 foreigners are living in Thailand for less than one year, with the lowest time living there being four months. Maybe the reason for the low participation of native respondent could be the English barrier and/or the political situation of the country;

6.3.2 Cultural practices

Only eight respondents (8.33%) don´t believe that cultural practices were decisive to the low rate of Covid-19 in Thailand, while most (86=91.67%) believe in that.

From the group that believe (Figure 6), the most decisive cultural practices were:

First) wear a mask (97.67%);

2nd) not shake hands (86.05);

3rd) not hug in public (69.77%);

4th) wash hands (68.60%);

5th) not wearing shoes in the house (34.88).

On the other hand, the less decisive were:

12th) avoiding speak during public transport (19.77%);

11th) few foods eaten with bare hands (13; 95%);

10th) cleanliness of restaurants (19.77%).

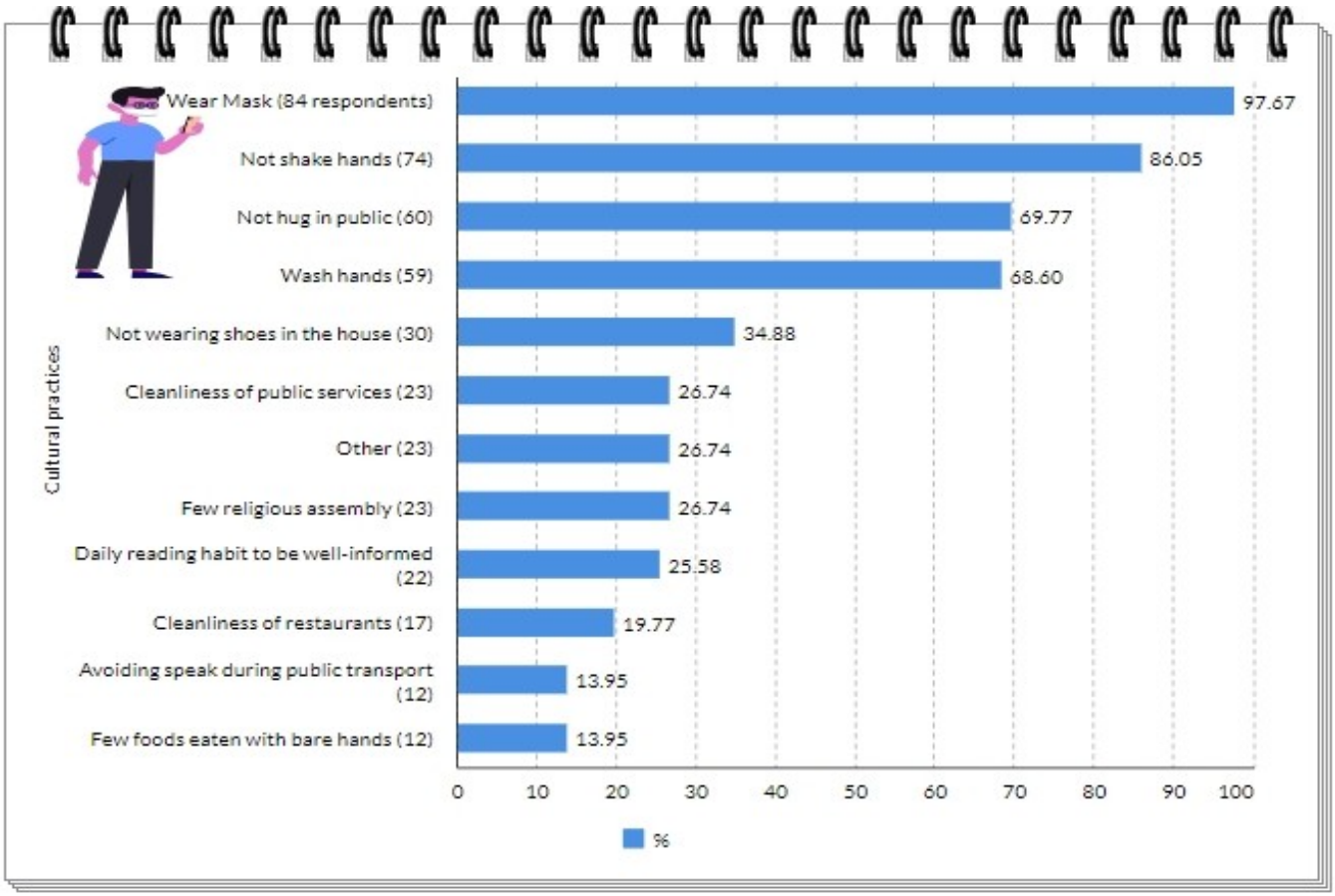


Figure 6: Cultural practices considered decisive to reduce the rate of Covid-19 deaths in Thailand
Source: Author (2020)

6.3.3 Ten golden behaviors that a leader of a nation should adopt to inspire and get people support

For effective national and regional efforts against any pandemic, cultural practices play an important role to get public cooperation or support, reason by which authorities and government managers should adopt the leadership by example, with intensive public information campaigns, especially in countries where wear masks, not shake hands, not hug in public, wash hands, not wearing shoes in the house are not cultural practices among most people.

For Kerissey and Edmondson (2020) to pass in the test during pandemic time, leaders are required to act with urgency, communicate with transparency, respond productively to missteps, engage in constant updating.

However, for leaders of a nation, the situation is much complex and demand leadership by example with the following behaviors to help people change and support government policies measures, programs, projects and actions:

1) hear carefully the scientists, WHO and intelligent services;

2) act fast for the national unity by integrating all ministries, media, companies, universities, army forces and main actors to fight the pandemic;

3) support the scientists and WHO;

4) follow the Covid-19 Safety Protocols;

5) encourage correct measures;

6) adopt clear communication and combat fake news;

7) avoid to spread medicines, drugs or treatments that are not proven effective against the virus;

8) praise and develop measures to protect the health workers, researchers and other professionals that are facing the Covid-19;

9) show empathy for sick people and for the families that lost parents over the time;

10) use diplomacy to create global cooperation against the virus;

For instance, in terms of total fatal cases, until 27th September, 2020, the USA and Brazil were the two main critical countries, with 351,229 total deaths, which represented 35.04% of all fatal cases reported by 215 countries (Figure 1).

After one month, in terms of total fatal cases, the USA and Brazil were still the two main critical countries, with 395,975 total deaths, which represented 33% of all fatal cases reported by 215 countries, calling the attention the two records of daily new cases of Covid-19 in USA reported on 29th (91.834) and 30th (101461) October, 2020.

In these two countries, wearing masks, not shake hands, not hug in public, and not wearing shoes in the house are not cultural practices among most people, reason by which presidents Trump and Bolsonaro should act in an exemplary way, instead of using the antithesis of the ten golden behaviours, as shown in Chart 1.

TEN BAD BEHAVIORS	SOURCES
1) Ignored early alerts and advises from scientists, WHO, and the intelligence services;	Duffy (2020), Poznansky (2020), Romano (2020), Graham (2020), CNN (2020), CNN, S.D. and I.K. (2020), Vargas (2020a), Vargas (2020b).
2) No initiative and leadership to act early to unite and organize the country against the virus;	Armstrong (2020), Barberia and Gómez (2020), Hamilton (2020), Haltiwanger (2020), Tisdall (2020a; 2020b), The Lancet (2020), and Ward (2020)
3) Attack scientists and WHO; 4) Don´t follow the Covid-19 Safety Protocols; 5) Sowing confusion and discouraging correct measures	The Lancet (2020), Horton (2020a), Tollefson (2020), Bernheim et al (2020), BBC News (2020a), Duffy (2020), Glick (2020), McDonald et al. (2020), NY Times (2020), Agência Brasil (2020), Human Right Watch (2020).
6) Spread more than 670 Fake News or distorted statement on Covid-19 (From Jan-Aug/20)	Ball and Maxmen (2020), Nature (2020b), Paz (2020) Statista (2020), CNN, D.D. and T.S. (2020), Collinson (2020), Paz (2020), Ricard and Medeiros (2020)
7) Discloses and forces the use of medicines (hydroxychloroquine and chloroquine) without proven efficacy against Covid-19; 8) Little ability to praise local authorities, health professionals and researchers for their hard work against the virus; 9) Lack of empathy to families that lost parents for Covid-19	Antonio Fernandes (2020), Bastos (2020), Bostock (2020), McCarthy (2020), Formoso (2020), Paz (2020), News, A.B.C (2020), Segundo, iG Ú. (2020), Euronews (2020), McDonald and Rieder (2020b), Samuels and Kelly (2020, Wessel (2020), Gragnari (2020), Tisdall (2020b)
10) Lack of diplomatic ability to create global cooperation. Ex: attack China without providing evidences, shooting down plans to buy vaccines from China, after health minister said it would be included in the Brazil's immunization program.	Nature (2020a), Horton (2020b), Agence France-Presse (2020), BBC News (2020b), Gonsalves and Yamey(2020), Reuters (2020), Paz (2020), The Independent (2020), McDonald et al (2020), Tisdall (2020a)

Chart 1: Ten bad behaviors adopted by President Trump and Bolsonaro during the pandemic Covid-19
Source: updated from Silva (2020b p. 544)

6.3.4 Trust in the National Government

All the 96 respondents rated from 0 to 10 the level of trust in official statistics released by the Thailand National Government about the number of deaths cases by Covid-19.

Figure 7 shows that the Average of trust is 7.2 (S=2.4; CV=32.6%) and the mean is 8, with most (68.75%) of them giving a rate equal or over 7 points, and 11.46% giving a rate lower or equal to 4.

Eleven (11.46%) respondents that rated 4 or lower this value are foreigners with an average of 7.55

years living in the country. On the other hand, concerning to the 66 (68.75 %) respondent that rated 7 or higher, they are living in Thailand 12.45 years as average, most (62) is foreigner, while four are native.

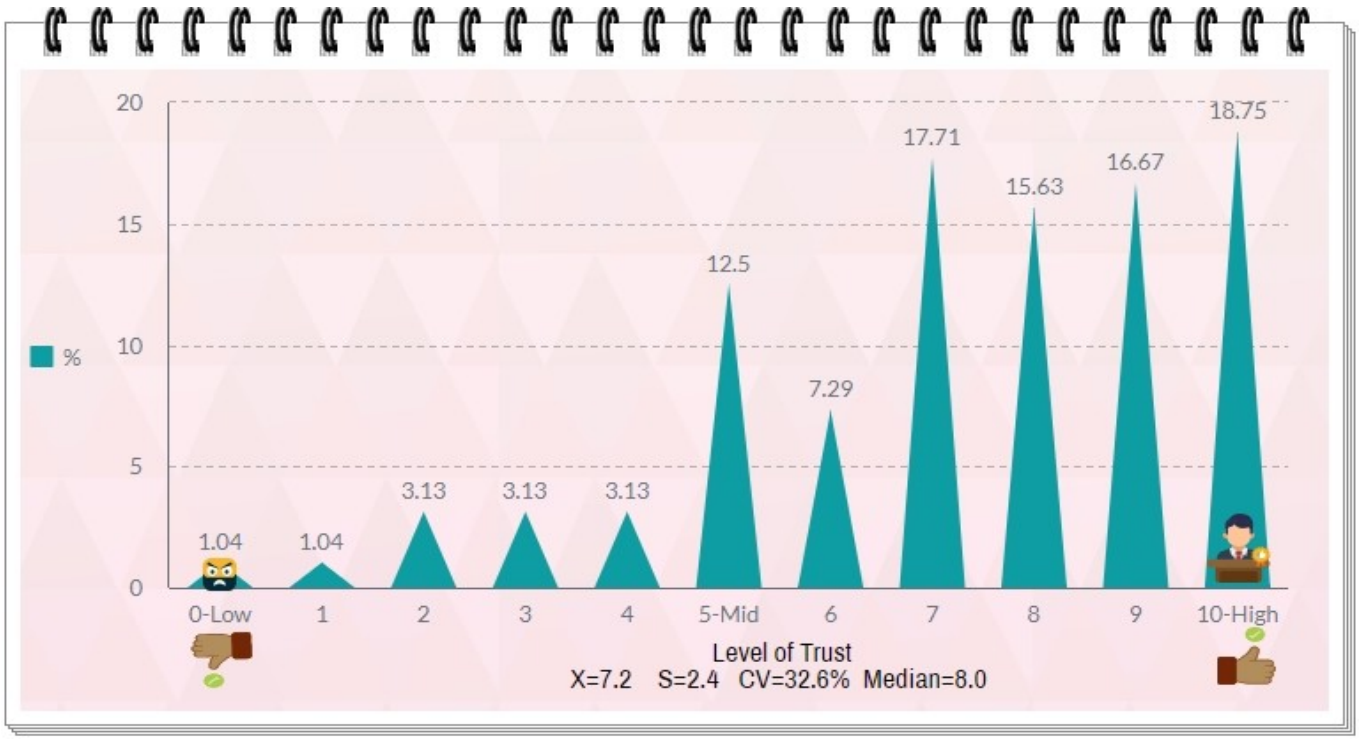


Figure 7: Level of trust in Thailand National Government about the number of deaths cases by Covid-19
Source: Author (2020)

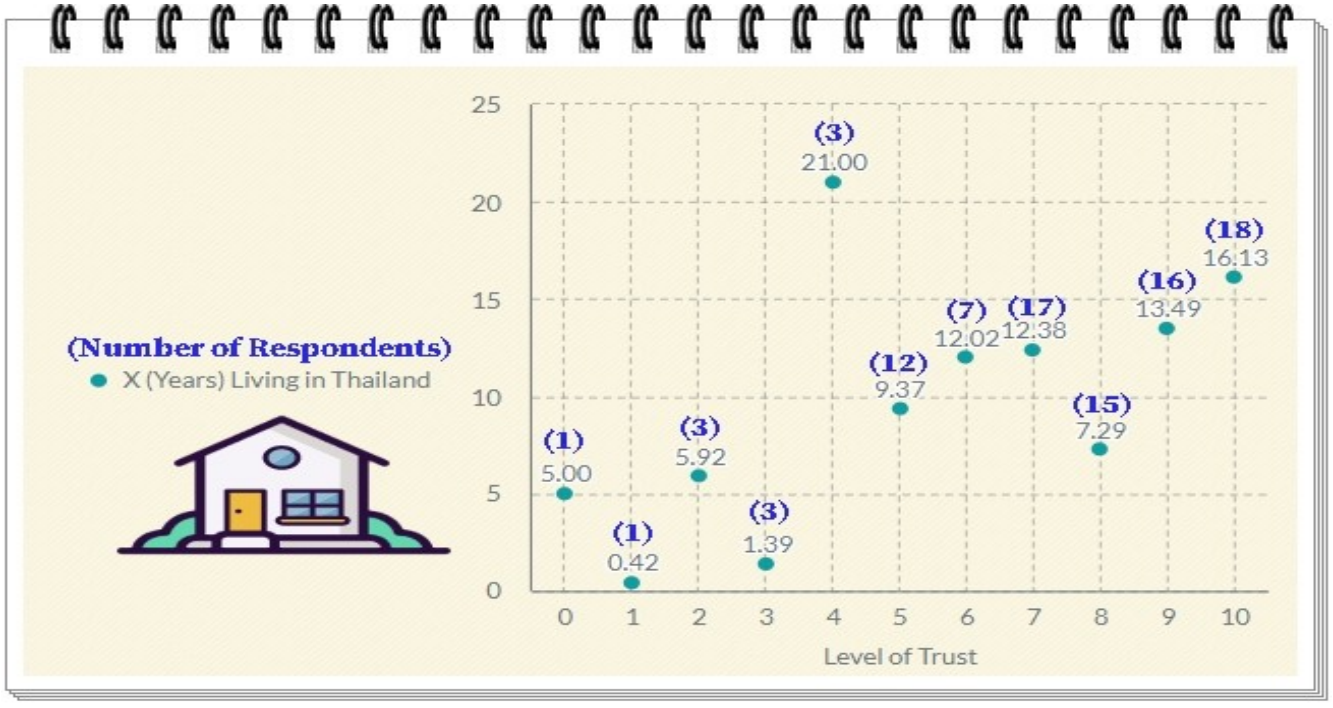


Figure 8: Correlation between the average (X in Year) of living in Thailand and level of trust
Source: Author (2020)

In short, most respondent trust in the official numbers (Figure 8) released by the Thailand National Government about the number of deaths cases, with most respondent living more than 7 years tending to consider the level of trust equal or higher than 5 points (except 3 respondent with the average of 21 years living in the country that rated 4).

This result is reasonable since the XMPSCRnd of Thailand (74.04%) is considered high (Tables 1), meaning that during the period analyzed, the official numbers released by this government represent on average 74.04% of total cases of real cases in the country.

6.3.5 The perception of the respondents on the main policies measures adopted that saved lives

Several authors and organizations focus on policies, responses, or measures against the Coronavirus (PANG, 2003; SVOBODA et al, 2004; BALAJEE et al, 2017; HA et al, 2020; IMF, 2020; JONES, 2020; ROSER et al, 2020; OCDE, 2020; OUR WORLD IN DATA, 2020a; WHO, 2020b).

However, in this research, it was aimed to identify the respondent perceptions about the subject, and all respondents selected at least one (multiple choice) of 18 measures provided.

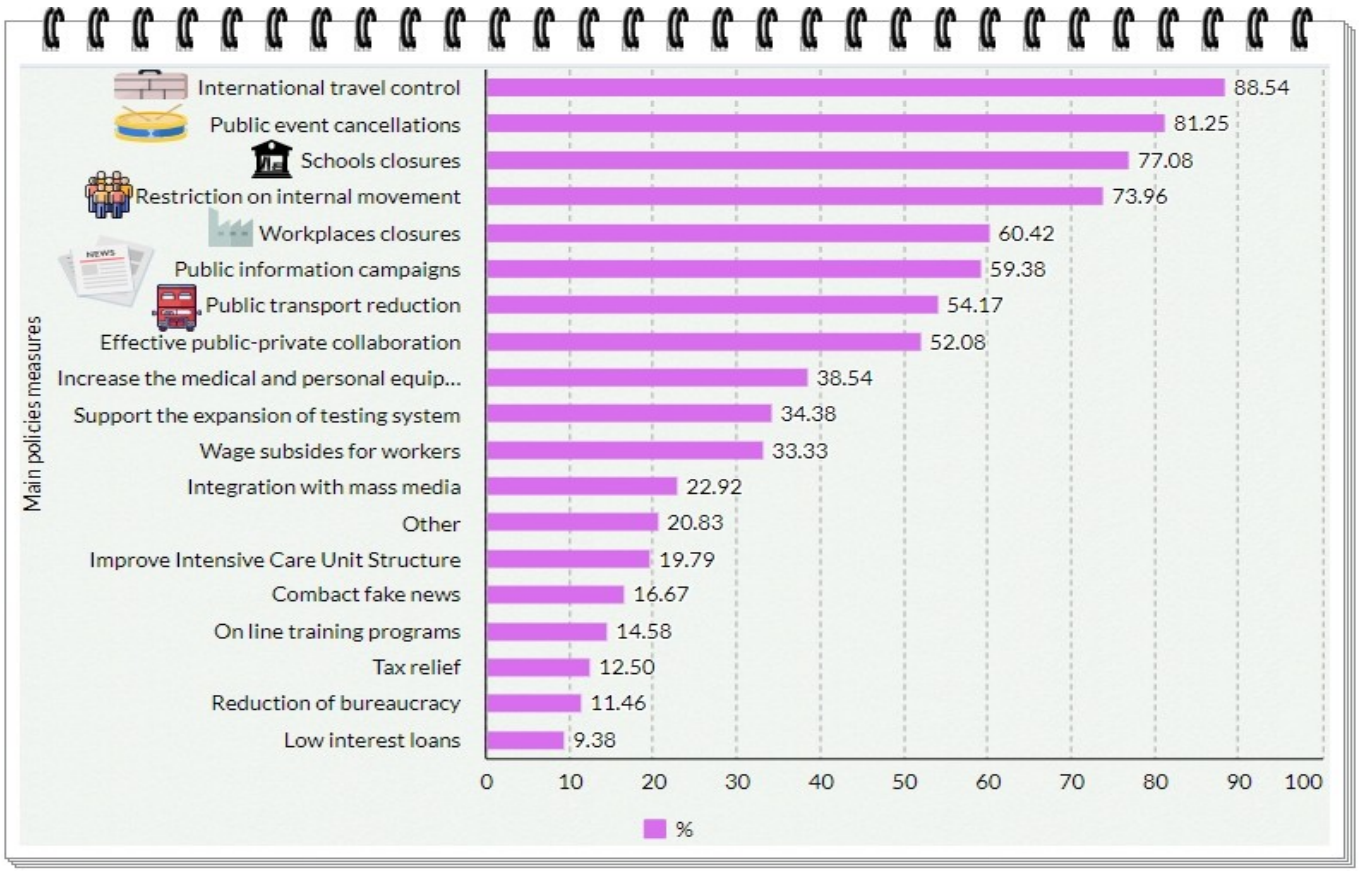


Figure 9: Perceptions of the 96 respondents on the main policies that saved lives in Thailand
Source: Author (2020)

Figure 9 shows that the ten main policy measures adopted by the Thailand Government that saved lives against the Covid-19 are: first) international travel control (88.54%); 2dn) public event cancellations (81.25%); 3rd) schools closures (77.08%); 4th) restriction on internal movement (73.96%); 5th) workplaces closures (60.42%); 6th) public information campaigns (59.38%); 7th) effective public-private

collaboration (52.08%); 8th) increase the medical and personal equipment capacity (38.54%); 9th) support the expansion of the testing system (34.38%), and 10th) wage subsidies for workers (33.33%).

Although they are considered important for the education and business activities, the five policies measures considered less powerful by the respondents to save lives are: 18th) low-interest loans (9.38%), 17th) reduction of bureaucracy (11.46%), 16th) tax relief (12.5%), 15th) online training programs (14.58%), and combat fake news (16.67%).

6.3.6 The most innovative products or services protecting people in Thailand against Covid-19

For question 5 of the questionnaire, it was asked to the respondent, if know, to write the name of the most innovative products or services that are protecting people in Thailand against the Covid-19.

Analyzing the answers, it was noted that: most (47=47%) respondent tried to inform what they believed as innovative products or services, while 31 (32%) respondents did not answer the question, ten (10%) informed that there was no innovative products or services, and 8 (8%) respondents informed that they did not know.

In technical terms, from the 47 respondents that tried to describe the innovative solutions, only ten (21%) informed the name of the products or services (Thai Channa app, and Village Health Volunteer System).

However, the main aim of this question was not to evaluate their ability in innovation issues, but to identify tips of products or services that respondents perceived as new during the pandemic, and from these tips, to search on the internet the organization, solution name, goal, technologies adopted, etc.

From the 47 respondents, the most innovative products and services are: Face Masks (8=17%), Apps (7=15%), Temperature (Thermometers) check at nearly all shop (7=15%), Hand sanitizer in all shops (6=13%), Public cooperation (6=13%), Thai Channa App (6=13%), Social distance (5=11%), Everybody wear mask (5=11%), Test Kit (4=9%), Village Health Volunteer System (4=9%), Early shutdown/lockdown (3=6%), Close borders (3=6%), General and strict control (2=4%), and Robots (2=4%), Citizen manufacturing masks (1), Clorox (1), Contactless transactions (1), Curfew masks (1), Fact-based communication (1), Food support (1), Mask distribution (1), Government measures to reopen (1), Personal protection equipment (1), Quarantine (1), Reduce seats on public transports (1), Check-in and Check-out (1), TV News (1), and Web News(1).

From the tips received, additional research was made to identify the innovative solutions, and a spreadsheet was developed with the following fields:

a) organization and solution, which describes the name of the organization and the solution developed; b) type, divided into Corporation (companies), Public Sector, Start-Up, University, and Other; c) contact, informing the e-mail or link for contact; d) site with the internet link; e) location, the name of the city where it was developed or applied; f) stage, divided into In Preparation, Pilot/Demo/Trial, or Ready; g) category, that classifies the solution as Prevention, Diagnostic, Treatment, Grants & Support Initiatives, Information, and Life & Business Application, by using the criteria of the Start-Up Blink (2020) that developed the Coronavirus Innovation Map; h) subcategory with subtopics for each category, by using the criteria of the Start-Up Blink (2020) that developed the Coronavirus Innovation Map; i) technology, which describes the main type of technology used; j) resume, which describes the main

information of the solution.

As a result, it was found 28 solutions in Thailand, with the majority led by Corporations (9=32.14%), Universities (8 from Chulalongkorn University =28.57%), followed by Public Sector (5=17.86%), Start-Ups (10.71%), and Others (10.71%).

Concerning the location, the most solution comes from the capital of Thailand, Bangkok (24=85.7%), followed by the other four cities. In terms of stage, most (26=92.86%) solution is Ready, and only two are in Pilot/Demo/Trial (Vaccines).

The main products, services, or technologies used by the solutions are Apps, Internet, QR Code, Websites, Chatbot, Face shields, Protecting Spray, Vaccine, Video Conference, UV Rays, Mobiles, Donations (Campaigns), 3D Printing, E-bike, Hepa Filter, Internet of Things (IoT), Nanotechnology, Online Map, Robot, Smart Indoor Air Quality, Social Channels, Stimulus Package Micro Loan, Test Kit, Call Center, Volunteers, Livestream Technology, E-commerce, E-Pharmacy, Data Storage, Masks, etc.

In terms of Category, most (12=42.85) is Prevention, while 7 (25%) for Diagnostic, 3 (10.71%) are Grants & Support Initiatives, 3 are for Information (10.71%), and 3 are for Life & Business Adaptation.

Chat 2 shows the organization name, the solution, the type organization, and the resume.

Organization → Solution	**Type**	**Resume and site**
1) Clicknic Co., Ltd. → CLICKNIC app	Corporation	An app that connects the patient to a doctor via video for a consultation. Site: https://www.clicknic.co/index.php/
2) BDMS → Samitivej Virtual Hospital	Corporation	It offers real-time consultations with doctors via video calling, available 24 hours a day, as well as home visits to take blood samples and deliver medication. Site: https://bit.ly/36c359V
3) Line Company Thailand → COVID-19 Info Hub	Corporation	A mini-app launched in Thailand that provides a daily health assessment. Sites: https://bit.ly/2Humit7; https://www.ryt9.com/en/prg/239007
4) Lazada Thailand → LazadaForGood	Corporation	To facilitate online donations to hospitals and medical foundations. Site: https://bit.ly/331ffjS
5) Lazada Thailand → A SME Stimulus Package	Corporation	To help more than 50,000 Thai SMEs with fast track access to microloan schemes with our bank partners and a 20% discount for Lazada's live-streaming channel. Site: https://bit.ly/331ffjS
6) Lazada Thailand → An O2O Promoter & Affiliate Programme	Corporation	To allow offline brand promoters or sales personnel to sell products through their social channels, and still earn commissions from brands and Lazada even though their offline livelihoods have been affected by the closure of shops in malls. Site: https://bit.ly/331ffjS

Continuation of Chart 2

Organization → Solution	Type	Resume and site
7) Line Company Thailand → "Work on LINE" promotion	Corporation	LINE tips and tricks for those working at home in Thailand, including on the use of LINE Call and LINE Video Call, which supports up to 200 people, and a live feature in LINE Group Chat, which supports up to 500. Site: https://bit.ly/2Humit7
8) Siam Cement Group → Modular Swab Unit	Corporation	Designed to separate patients in a pressurized room to prevent the virus from spreading while using concentrated UV radiation to kill the virus (UV Germicide) after each use. Site: https://bit.ly/3ilYNiG or https://bit.ly/2HJUdOK
9) BIOTEC & GPO → Inactivated Flu-based SARS-CoV2 vaccine + Adjuvant	Corporation	Non-replicating viral vector vaccine is in the Pre-clinical stage. Site: http://www.biotec.or.th/en/index.php
10) Cofact Thailand → Cofact Chatbot	Others	Users can verify the messages they receive via messaging services. They simply forward the message to the chatbot, which then accesses a database and tells users whether the message is correct or not. Site: https://cofact.org/
11) Maysa Talerd → Super Hero decorated face shields for children	Others	Face shields developed in Thailand with characters from cartoons, games, and sci-fi movies, hoping to cash in and promote safety for children. Site: https://reut.rs/3j525Ip
12) Chula VRC & GPO →Protein subunit vaccine	Others	RBD protein fused with Fc of IgG + Adjuvant vaccine in the Pre-clinical phase. Site: http://www.chulavrc.org/
13) NECTEC → µTherm FaceSense	Public Sector	A Smart Temperature Measurement System that identifies temperatures of up to 9 persons within only 0.1 seconds (within 1.5-meter range). Additionally, it supports IoT computing and data storage. Site: https://bit.ly/2S1H6tX
14) Thailand Government MoPH→ DoDC Covid-19	Public Sector	Thailand Government MoPH Department of Disease Control website to spread information (statistics, reports, articles, guidance, etc) about Covid-19. Site: https://bit.ly/33TbP1O
15) Thailand Government → Thaichana app	Public Sector	An app for use when people enter and leave stores and shopping centers in Thailand as some businesses were given the green light to reopen on May 17, 2002. Site: https://www.thaichana.com/

Continuation of Chart 2

Organization → Solution	Type	Resume and site
16) MoHESRI & Partners → WIN-Masks: Washable Innovative Nano-Masks	Public Sector	A mask with 3 layers. First, the water-resistant coated with nanotechnology and dust mite protection cloth, microfibre mixed with Zinc Oxide which can protect the user from bacteria and viruses. Third, the cotton cloth which can protect the user from the droplet from cough and sneezing. Site: https://bit.ly/33UEPq8
17) Government of Thailand MoPH→ Village Health Volunteer (VHV)	Public Sector	The VHVs scheme has been in place for over 43 years in Thailand. The Dep. of Health Service Support manages 1,040,000 VHVs across the country and an additional 15,000 public health volunteers in Bangkok. VHVs conduct home visits, provide health education, deliver medicines, and make reports to public health authorities. VHVs have been provided with surgical and cloth masks, face shields, biohazard bags, and alcohol gel. Between the 2nd and 26th March, VHVs visited 3.3 million households. Between 27th March and 11th April, VHVs visited 8 million additional households to support case (test and trace) efforts. Site: https://bit.ly/2S1OwgO
18) Doctor Raksa Co., Ltd → Raksa app	Start Up	App for online medical consultation and delivery of medicine. Site: https://www.doctorraksa.com/
19) 5LAB → CovidTracker	Start Up	An interactive map of Thailand that displays the location of the reported cases and a link to their sources to ensure that it is credible. It also lists the number of reported cases and shows any fake news that is being spread around. Site: https://covidtracker.5lab.co/en
20) CYFAI → E-bike Rental System	Start Up	An electric motorbike rental system in Bangkok that is reducing CO2 and protecting people from the crowded transport system. Also is donating part of the profit to BIG TREES PROJECT. Sites: https://m.socialgiver.com/shop/cyfai/ and www.cy-fai.com
21) Chulalongkorn University → Lung Care Application	University	The Lung Care application tests the lungs' performance. By blowing into the microphone of a smartphone, results will show how well the lungs are working. Site: https://www.chula.ac.th/news/29369/

Continuation of Chart 2

Organization → Solution	Type	Resume and site
22) Chulalongkorn University → Chula COVID-19 Strip Test Service	University	A quick screening test kit that provides results in 10 minutes. The 4.0 technology integration helps assess the risks and monitors the patient's symptoms to screen patients for risks before ordering for a CPR test. Site: https://www.chula.ac.th/news/28888/
23) Chulalongkorn Univ. → Willing Application	University	A platform that matches a donor to a recipient. Site: https://www.chula.ac.th/news/29521/
24) Chulalongkorn University → Face Shields	University	Face shields designed with 3D printing technology, made of lightweight PP+TPE material for ultra-comfort and can be cleaned with soapy water. The transparent sheet is made of anti-fog-coated PET sheets to reduce fogging during use. Site: https://www.chula.ac.th/news/29535/
25) Chulalongkorn University → Negative Pressure Cabinets for Specimen Collection	University	Made from transparent acrylic and designed to safely collect respiratory secretions from patients. The cabinet has an air cleaner installed with a HEPA filter, which can trap 99.96% of small particles. The UV-C light disinfection also hinders the virus from thriving. Site: https://www.chula.ac.th/news/29219/
26) Chulalongkorn University → Protecting Spray for Fabric Masks	University	The Covid-19 and PM 2.5 protecting spray from the Faculty of Pharmaceutical Sciences can be used on fabric masks to filter small particles of up to 0.3 microns, increasing the protection efficiency to 83%. Site: https://www.chula.ac.th/news/29506/
27) Chulalongkorn University → CU-RoboCOVID	University	A robot that provides medical support, decreases the workload of medical staff and replaces tasks prone to risks of exposure to infection. Site: https://www.chula.ac.th/en/news/30492/
28) Chulalongkorn University → VQ20 Spray Dispenser and VQ20+HP35 Device	University	The device makes sterilization of rooms and medical equipment more efficient. Site: https://www.chula.ac.th/en/news/30492/

Chat 2: List of 28 innovative products or services that are being implemented in Thailand to save lives against Covid-19.

Source: Author (2020)

7. Conclusions and recommendations

The main goal is to investigate the performance and the best management practices adopted in Thailand to save lives against Covid-19, during the first six months facing the pandemic. After the collection and analysis of data, it was possible to reach the ten conclusions and recommendations:

First) on 27th September 2020, without considering the unreported cases, population, and the same period of facing the pandemic, the 20 top countries leading the total number of fatal cases were: 1st) USA, 2nd) Brazil, 3rd) India, 4th) Mexico, 5th) UK, 6th) Italy, 7th) Peru, 8th) France, 9th) Spain, 10th) Iran, 11th) Colombia, 12th) Russia, 13th) South Africa, 14th) Argentina, 15th) Chile, 16th) Ecuador, 17th) Belgium, 18th) Indonesia, 19th) Germany, and 20th) Canada;

Second) when considering the indicator Fatality Total Index, which estimates the number of total real cases (including unreported), by one million (population) during the first 180 days facing the Covid-19, the ten most critical countries were: 1st) Mexico; 2nd) Peru; 3rd) Italy; 4th) Ecuador; 5th) Iran; 6th) Chile; 7th) the UK; 8th) Belgium; 9th) Colombia, and 10th) Brazil. Half of the ten critical countries comes from South America, followed by Europe (30%), North America (10%), and Asia (10%). No one of the ten top critical countries reported fatal cases of SARS2003, 60% of the nations without any case of that virus, which may indicate that since the first coronavirus in 2002/2003, these countries did not make enough investment and preparations for the future return of the virus;

Third) Thailand reported two fatal cases of SARS2003 and was the one first country to register new cases of Covid-19 after China. However, the value of Thailand's FTI180 is very low, indicating that this country has learned from the lessons of the past, reason by which is the best at saving lives against the Covid-19, when compared with all the 20 nations investigated. Further research could be done to investigate the main investments made over time. Also, a new study could compare the Thailand FTI180 performance with more countries, since this research was limited only to twenty nations with the highest number of total cases reported on 27th September 2020;

Fourth) in 2019, Thailand was globally recognized as strong in the following categories: Sufficient and Robust Health System to treat the sick and protect health workers; Prevention of the Emergence or release of pathogens; Rapid response to and mitigation of the spread of an epidemic; Commitments to improving national capacity, financing and adherence to norms; and Early detection and report for the epidemic of potential international concern (NTI, JHU, and EIU, 2019 p. 22 – 25). Besides, it has a strong field epidemiology training program and national laboratory system, demonstrating a robust electronic reporting surveillance system that functions at both national and sub national levels, rapidly collecting laboratory and epidemiological information. Thailand also demonstrates strength in prevention and response capability, conducting regular event-based surveillance through a dedicated Situation Awareness Team embedded in the Ministry of Public Health's Emergency Operations Center (NTI, JHU, and EIU, 2019 p. 55). However, this report also calls attention to the category that Thailand needs improvements: Overall risk environment and country vulnerability to biological threats;

Fifth) for the Deep Knowledge Group (2020), Thailand: 1) was the 47th best country among the 200 countries, and territories analyzed; 2) strongest category is Government Efficiency of Risk Management, Regional Resiliency, Monitoring and Detection, and Health Care Readiness. On the other hand,

Emergency Preparedness, and Quarantine Efficiency are the categories that need furthers improvements, reason by which new research could be done to identify solutions to improve the indicators of these categories;

Sixth) for 86 respondents living in Thailand, wear a mask, not shake hands, not hug in public, wash hands, and not wearing shoes in the house, were the five most decisive cultural practices that saved lives. On the other hand, the less decisive were: avoiding speak during public transport, few foods eaten with bare hands, and cleanliness of restaurants. As a result, for effective national and regional efforts against any pandemic, cultural practices play an important role to get public cooperation or support, reason by which government leaders and managers should adopt the leadership by example, with intensive public information campaigns, especially in countries where wear masks, not shake hands, not hug in public, wash hands, not wearing shoes in the house are not cultural practices among most people;

Seventh) for leaders of a nation, the situation is much complex and demand leadership by example with the following behaviors to help people change and support government policies measures, programs, projects and actions: 1) hear carefully the scientists, WHO and intelligent services; 2) act fast for the national unity by integrating all ministries, media, companies, universities, army forces and main actors to fight the pandemic; 3) support the scientists and WHO; 4) follow the Covid-19 Safety Protocols; 5) encourage correct measures; 6) adopt clear communication and combat fake news; 7) avoid to spread medicines, drugs or treatments that are not proven effective against the virus; 8) praise and develop measures to protect the health workers, researchers and other professionals that are facing the Covid-19; 9) show empathy for sick people and for the families that lost parents over the time; 10) use diplomacy to create global cooperation against the virus. Further research concerning behavior field should be done to advance the understanding of how leadership by example are playing crucial role in successful countries during the pandemic;

Eighth) for 96 respondents living in Thailand, the ten main policy measures adopted by the Thailand Government that saved lives against the Covid-19 are: first) international travel control; 2dn) public event cancellations; 3rd) schools closures; 4th) restriction on internal movement; 5th) workplaces closures; 6th) public information campaigns; 7th) effective public-private collaboration; 8th) increase the medical and personal equipment capacity; 9th) support the expansion of the testing system, and 10th) wage subsidies for workers. The result show the importance of such measures for policymakers and public managers, and further research could be done to: 1) identify how those practices were implemented; 2) identify and disseminate the successful programs, methodologies, methods, techniques, plans, partnerships, and projects developed;

Ninth) to save lives against Covid-19, twenty-eight products and services are being implemented in Thailand, with the majority led by Corporations, Universities, followed by Public Sector, Start-Ups, and Others. In terms of stage, most (93%) solution is Ready, and only two are in Pilot/Demo/Trial (Vaccines). The main products, services, or technologies used by the solutions are Apps, Internet, QR Code, Websites, Chatbot, Face shields, Protecting Spray, Vaccine, Video Conference, UV Rays, Mobiles, Donations (Campaigns), 3D Printing, E-bike, Hepa Filter, Internet of Things (IoT), Nanotechnology, Online Map, Robot, Smart Indoor Air Quality, Social Channels, Stimulus Package Micro Loan, Test Kit,

Call Center, Volunteers, Live stream Technology, E-commerce, E-Pharmacy, Data Storage, Masks, etc. Further research should be done to investigate the efficacy level of each solution.

Tenth) probably due political instability in Thailand and the use of English in the questionnaire, part of research result came from a small sample of 96 respondents, most foreigners living in Thailand that volunteering answered the survey, reason by which, is strongly recommended to translate the questionnaire into the official Thai language, to realize new research with a better representative size.

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