The Best and Sustainable COVID-19 Policy in the World

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***Abstract*— This article will scientifically evaluate individual COVID-19 policies of countries around the world, U.S. states, and Japanese prefectures, respectively. The efficacy of the vaccines has been reported in many of the world's top medical journals, but even after more than a year of vaccination, the claims have yet to be met. Human emotions, behaviors, and individual policies can significantly influence the outcome against the pandemic. The evaluation in this article is based on a single determinant of the policy outcome. Scoring policies is based on dividing the number of deaths due to COVID-19 by the population in millions. The lower the score, the better the policy. Unfortunately, scores monotonically increase, so that policymakers can only suppress them but cannot improve or decrease them. Therefore, mistakes by policymakers cannot be corrected in the future and they are fatal forever. The result using three tools will reveal the best COVID-19 policy in the world. The revealed policy should have been or be adopted in individual countries for mitigating and ending the COVID-19 pandemic. This article also suggests what is needed in our society for reducing the unnecessary deaths due to COVID-19.**

***Index Terms*— COVID-19 policy evaluation, efficacy of vaccines, nonpharmacological approach, number of deaths, policymakers.**

I. Introduction

THIS article will evaluate individual COVID-19 policies of countries in the world, U.S. states, and Japan prefectures, respectively. The efficacy of vaccines has been reported in many of the world's top journals, such as NEJM, Lancet, Nature, and Science [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], but as of today, more than a year after the vaccination, their claims have not been fulfilled yet. Human emotions, behaviors, and individual policies can greatly influence the outcome to a pandemic.

To evaluate individual COVID-19 policies in the world requires determining a single indicator for scoring the policy. Ludvigsson et al. [13] reported their policy in Sweden about herd immunity in NEJM. The single indicator for evaluating their policy in Sweden was proposed and accepted where it is based on dividing the number of deaths due to COVID-19 by the population in millions [14]. Based on the results of the single indicator, the policy has failed because of the high number of deaths among the elderly in Sweden [14]. The single metric was validated by three refereed journals [14], [15], [16].

Based on the proposed calculation, scores monotonically increase, so that policymakers can only suppress them. In other words, policymakers cannot improve or decrease their scores, so that mistakes by policymakers cannot be corrected in the future and their mistakes are fatal forever. The lower the score, the better the policy.

Based on the single indicator, a new tool was developed for scoring individual COVID-19 policies in the world. The tool is called scorecovid and Python Package Index (PyPI) application [15], [16]. The advantage of PyPI allows scorecovid to run on Windows, MacOS, and Linux operating systems, without being aware of operating systems as long as Python is installed on the system for maximum software dissemination to the world. According to PePy: https://pepy.tech/project/, scorecovid has been downloaded by 15 109 users worldwide.

The goal of scorecovid is for poorly scored countries to learn good strategies from countries with excellent scores for mitigating the COVID-19 pandemic.

Scorecovid revealed that the robust test-isolation policy adopted by China, Taiwan, and New Zealand is very effective against the COVID-19 pandemic without vaccination [15], [16].

However, scorecovid can only show four determinants, such as the country name, the number of deaths, the population in millions, and score. In order to observe vaccination rates with scores, a scoring tool, PyPI scorev, was newly developed with the country name, the number of deaths, the population, score, rate at least one dose, fully vaccinated rate, and rate of booster given [17]. Scorev has been downloaded by 2579 users worldwide.

To run scorev, install it by the following pip command. Note that ($) sign indicates a prompt in the terminal from the system. Python can be easily installed by using miniconda on Windows, MacOS, and Linux operating systems, respectively.

$ pip install scorev

To run scorev, run the command shown in Table I. China, Taiwan, and United Arab Emirates (UAE) were added to oecd.csv file. Oecd.csv file contains a list of countries to be scored.

The result of scorev as of July 5, 2022, shows that vaccination rates do not significantly affect scores because UAE has the highest fully vaccination rates on among all countries and the UAE score is in the first place. This is because China, Taiwan, and New Zealand have adopted the robust

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TABLE I
$ scorev

country	deaths	population	score	1dose	full	booster
China Taiwan	862	23.86	36.13	82.74	78.12	58.93
New Zealand	702	5.13	136.84	83.65	79.82	51.87
United Arab Emirates	2302	9.99	230.43	98.99	96.72	51.39
Japan	29553	126.05	234.45	81.83	80.49	52.43
Australia	7236	25.79	280.57	86.39	83.48	52.05
Iceland	119	0.37	321.62	35	35	35
South Korea	22794	51.31	444.24	87.77	86.83	68.69
Norway	2932	5.47	536.01	79.31	73.78	53.59
Finland	3939	5.55	709.73	81.28	77.87	52.57
Canada	39278	38.07	1031.73	88.69	82.21	48.99
Denmark	6149	5.81	1058.35	83.21	82.55	62.39
Israel	10695	9.29	1151.24	72.19	66.04	56.93
Turkey	98760	85.04	1161.34	67.99	62.36	43.09
Netherlands	22350	17.17	1301.69	78.4	72.23	54.09
Ireland	7087	4.98	1423.09	81.86	80.74	59.99
Switzerland	13712	8.72	1572.48	69.77	68.78	42.68
Germany	135451	83.9	1614.43	76.87	76.77	63.52
Luxembourg	1064	0.63	1688.89	75.71	34	58.8
Sweden	18772	10.16	1847.64	77.04	75.11	52.06
Estonia	2538	1.33	1908.27	64.94	63.75	35.24
Austria	18138	9.04	2006.42	75.44	73.06	57.37
France	145938	67.42	2164.61	80.18	77.93	55.45
Portugal	22280	10.17	2190.76	19	19	19
Spain	104456	46.75	2234.35	88.14	86.46	52.98
Mexico	324294	130.26	2489.59	65.87	2	34.65
United Kingdom	175081	68.21	2566.79	77.98	72.91	57.54
Belgium	31439	11.63	2703.27	79.41	78.56	63.3
Italy	163377	60.37	2706.26	84.09	79.36	65.73
Greece	29114	10.37	2807.52	76.28	73.45	57.05
United States	993588	332.92	2984.46	77.6	66.17	30.3
Chile	57509	19.21	2993.7	93.25	90.87	93.24
Poland	116042	37.8	3069.89	59.94	59.35	31.54
Latvia	5760	1.87	3080.21	72.03	69.84	27.91
Slovenia	6592	2.08	3169.23	60.86	58.75	31.25
Lithuania	9090	2.69	3379.18	72.52	69.69	34.52
Slovakia	19879	5.45	3647.52	51.77	50.75	30.22
Hungary	46201	9.63	4797.61	66.5	64.28	43.08

TABLE II
$ scorecovid

country	deaths	population	score
United Arab Emirates	2348	9.89	237.4
Japan	46591	126.48	368.4
New Zealand	2095	4.82	434.6
China Taiwan	12563	23.82	527.4
South Korea	29100	51.27	567.6
Australia	15636	25.5	613.2
Iceland	213	0.34	626.5
Canada	46563	37.74	1233.8
Israel	11759	8.66	1357.9
Germany	153377	83.78	1830.7
Sweden	20659	10.1	2045.4
France	156840	65.27	2402.9
United Kingdom	209208	67.89	3081.6
United States	1070055	331	3232.8
Brazil	687962	212.56	3236.6
Hungary	47938	9.66	4962.5

test-isolation policy from the beginning of the COVID-19 pandemic [14], [15], [16]. The test-isolation policy is to test and identify the infected individuals at an early stage and to isolate them from uninfected individuals during the quarantine period. The term “robust” means that the test-isolation policy is regulated by law.

Usscore has been downloaded by 7170 users worldwide.

In this article, two new tools were developed for further investigation of scoring in U.S. and Japan, respectively.

In order to compare the latest scores by country, use scorecovid [15]. This is because many countries did not update vaccination rates any more and the scorev dataset is not updated. Table II shows the result of scores as of October 28, 2022.

II. USSCORE FOR SCORING POLICIES IN U.S

Usscore was newly developed for scoring state COVID-19 policies in U.S. [18]. Usscore is to calculate scores based on dividing the number of deaths due to COVID-19 by the population in millions. To install usscore, run the following command:

$ pip install usscore

Then, run usscore by command as shown in Table III.

The result as of October 28, 2022, shows that Vermont has the best score of 1150, while Arizona has the worst score of 4411. The score of Vermont is nearly 4× better than that of Arizona. We must carefully examine what makes the significant difference between Vermont and Arizona.

TABLE III
$ usscore

state	deaths	population	score
Vermont	740	0.643	1150
Hawaii	1701	1.455	1169
Utah	5056	3.272	1545
Alaska	1369	0.733	1867
Washington	14595	7.705	1894
Maine	2642	1.362	1939
New Hampshire	2737	1.378	1986
District of Columbia	1392	0.69	2017
Oregon	8680	4.237	2048
Nebraska	4559	1.962	2323
Colorado	13614	5.774	2357
Minnesota	13825	5.706	2422
California	96928	39.538	2451
Maryland	15539	6.177	2515
Virginia	22171	8.631	2568
North Carolina	26963	10.439	2582
Wisconsin	15434	5.894	2618
Idaho	5219	1.839	2837
Illinois	39968	12.813	3119
North Dakota	2434	0.779	3124
Massachusetts	22023	7.03	3132
Texas	91374	29.146	3135
Delaware	3136	0.99	3167
Connecticut	11462	3.606	3178
Iowa	10177	3.19	3190
Kansas	9628	2.938	3277
Montana	3569	1.084	3292
Wyoming	1908	0.577	3306
Rhode Island	3696	1.097	3369
Ohio	40178	11.799	3405
South Dakota	3059	0.887	3448
Missouri	21845	6.155	3549
New York	72424	20.201	3585
South Carolina	18578	5.118	3629
Georgia	39057	10.712	3646
Indiana	24864	6.786	3664
Pennsylvania	47705	13.003	3668
Nevada	11555	3.105	3721
New Jersey	34898	9.289	3756
Oklahoma	14961	3.959	3778
Florida	82176	21.538	3815
Kentucky	17261	4.506	3830
Michigan	39199	10.077	3889
Louisiana	18168	4.658	3900
Tennessee	27792	6.911	4021
New Mexico	8635	2.118	4076
Alabama	20558	5.024	4091
Arkansas	12462	3.012	4137
West Virginia	7513	1.794	4187
Mississippi	12968	2.961	4379
Arizona	31548	7.152	4411

Although Vermont has the best score in U.S., the UAE is nearly 5× better than Vermont in scores. This is because U.S. has never adopted the mandatory test-isolation policy from the beginning of the COVID-19 pandemic.

Scores of all states are generally poor because U.S. government and the states did not adopt the robust test-isolation policy adopted in China, Taiwan, New Zealand, and UAE. It took a year for vaccination in U.S. Prior to vaccination, U.S. should have had an effective policy against the COVID-19 pandemic without vaccination.

III. JPSCORE FOR SCORING POLICIES IN JAPAN

Jpscore was newly developed to investigate which prefectures in Japan are handling well against COVID-19 [19]. Jpscore is a PyPI application for scoring prefecture COVID-19 policies in Japan. To install jpscore, run the following command.

$ pip install jpscore

To run jpscore, type the command shown in Table IV.

The result as of October 28, 2022, shows that Niigata has the best score of 80.5, while Osaka has the worst score of 748.7 in Japan. Niigata's score is 9× better than that of Osaka. It should be noted that Niigata's score is 3× better than that of the UAE.

The significant harsh climate difference, such as snowfall, may nurture herding behavior for mitigating human mobility. The difference regarding the total number of snowfall days and total amount of snowfall from 2008 to 2017 is 501 days and 1470 cm for Niigata and 16 days and 17 cm for Osaka.

TABLE IV
$ jpscore

prefecture	deaths	population	score
Niigata	179	2.223	80.5
Fukui	104	0.768	135.4
Shimane	98	0.674	145.4
Tottori	85	0.556	152.9
Fukushima	299	1.846	162
Iwate	202	1.227	164.6
Toyama	181	1.044	173.4
Miyagi	408	2.306	176.9
Nagano	365	2.049	178.1
Yamagata	206	1.078	191.1
Yamanashi	168	0.811	207.2
Shizuoka	763	3.644	209.4
Ehime	289	1.339	215.8
Okayama	420	1.89	222.2
Tokushima	181	0.728	248.6
Ibaraki	718	2.86	251
Nagasaki	336	1.327	253.2
Shiga	363	1.414	256.7
Ishikawa	294	1.138	258.3
Aomori	324	1.246	260
Gunma	506	1.942	260.6
Akita	254	0.966	262.9
Tochigi	517	1.934	267.3
Hiroshima	781	2.804	278.5
Wakayama	261	0.925	282.2
Saga	237	0.815	290.8
Yamaguchi	396	1.358	291.6
Mie	548	1.781	307.7
Gifu	615	1.987	309.5
Kagawa	303	0.956	316.9
Kanagawa	3054	9.198	332
Saitama	2478	7.35	337.1
Kagoshima	549	1.602	342.7
Oita	393	1.135	346.3
Miyazaki	383	1.073	356.9
Kumamoto	656	1.748	375.3
Aichi	2959	7.552	391.8
Fukuoka	2018	5.104	395.4
Nara	552	1.33	415
Chiba	2639	6.259	421.6
Tokyo	5986	13.921	430
Kyoto	1119	2.583	433.2
Kochi	307	0.698	439.8
Hokkaido	2702	5.25	514.7
Hyogo	2910	5.466	532.4
Okinawa	784	1.453	539.6
Osaka	6595	8.809	748.7

A wide range of social factors, including socioeconomic status, racial and ethnic minority status, family and household composition, and environmental factors, can affect individual scores significantly associated with COVID-19 deaths [20].

Hungary has the worst score in the world in this article. Karim and Karim [21] and Kozlov [22] explained many reasons. However, this was due to Hungary's military dictatorship [23], which led the government to appoint more than 100 hospital directors with no medical experience, and the management lost the trust of the medical team.

The recent COVID-19 deaths in China, Taiwan, and New Zealand were due to lifting border controls and shortening the quarantine period [24]. The shorter the quarantine period, the more the COVID-19 spreads.

Jpscore has been downloaded by 6444 users worldwide.

IV. Conclusion

Watson clearly stated that vaccination with boosting is not sustainable [25], while the revealed best COVID-19 policy with the mandatory test-isolation strategy adopted in China, Taiwan, New Zealand, and UAE is sustainable.

Scoring policies are based on dividing the number of deaths due to COVID-19 by the population in millions. The goal of scoring policies is for poorly scored countries to learn good strategies from countries with excellent scores. The lower the score, the better the policy. Scores monotonically increase, so that policymakers can only suppress them. In other words, policymakers cannot improve them in the future and mistakes by policymakers are fatal forever.

scorev revealed that China Taiwan has the best score of 36.13 in July 5, 2022, while Hungary has the worst score of 4797.61. China Taiwan has adopted the robust test-isolation policy from the beginning of COVID-19, which is sustainable.

usscore revealed that Vermont has the best score of 1150 and Arizona has the worst score of 4411.

jpscore revealed that Niigata has the best score of 80.5 and Osaka has the worst score of 748.7. Niigata has the best score in the world.

The result of four tools, such as scorev, scorecovid, usscore, and jpscore, deduced that mortality outcomes are not only induced by government or municipal policies but also by actions of individuals and communities. We do not know the ratio of policy and human action. Poorly scored countries should adopt the best policy for mitigating and ending the COVID-19 pandemic.

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