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Original Research Article

Global, regional, and national COVID-19 vaccination rate in 237 countries and territories, March 2022: a systematic analysis for World Health Organization COVID-19 Dashboard, Release 2

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Abstract

Objective: We aimed to better understand the impact of the COVID-19 pandemic through analysis of disruptions in a global, regional, and national status of COVID-19 vaccination coverage compared by a global scale, World Health Organization regions, World Bank income groups, and each country.

Methods: Global datasets of 237 countries and territories from the World Health Organization Dashboard until March 5, 2022 were used and paired with estimates of COVID-19 vaccination coverage of individual levels which were derived from country level models form World Health Organization Dashboard, Release 1. The numbers of persons vaccinated with at least one dose, persons vaccinated with at least one dose per 100 population, and persons fully vaccinated per 100 population were then calculated and estimated. The data were described by a global scale and stratified by World Health Organization regions (Eastern Mediterranean, Americas, Europe, Southeast Asia, the Western Pacific, and Africa), World Bank income groups (high, upper-middle, lower-middle, and low income), and each country.

Results: A total of 4,964,626,775 persons worldwide were vaccinated with at least one dose, which is 63.69 per 100 population administered of COVID-19 vaccines at least one dose, and 56.16 per 100 population were fully vaccinated. The number of persons vaccinated with at least one dose was highest in the Eastern Mediterranean (84.18 per 100 population), followed by the Americas (75.82 per 100 population), South-East Asia (68.97 per 100 population), Europe (66.28 per 100 population), Western Pacific (47.18 per 100 population), and Africa (15.87 per 100 population). Persons fully vaccinated had similar patterns of those vaccinated with at least one dose; Eastern Mediterranean (84.25 per 100 population), the Americas (65.08 per 100 population), Europe (61.59 per 100 population), South-East Asia (55.67 per 100 population), Western Pacific (39.04 per 100 population), and Africa (11.62 per 100 population). The proportion of persons who were vaccinated at least one dose or fully vaccinated was greatest in the high income countries, followed by upper-middle, lower-middle, and low income.

Conclusion: The rate of COVID-19 vaccination with at least one dose and those who were fully vaccinated was estimated to be 63.69 per 100 population and 56.16 per 100 population, respectively. Although the COVID-19 vaccine coverage trajectories points towards global increasement in vaccination, persistent inequality in preventing the COVID-19 pandemic occurred in vulnerable groups such as under-developed and low income countries.

Keyword: COVID-19; SARS-CoV-2; vaccination; coverage; global; regional; national; World Health Organization

1. Introduction

Vaccines to cope with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have been developed since 2020.[1] The rapid development and clinical trials of the

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coronavirus disease 2019 (COVID-19) vaccines lead to the initiation of COVID-19 vaccination in 2021.[2, 3] Almost all COVID-19 vaccines (including NVX-CoV2373 [Novavax], Ad26.COV2.S [Johnson & Johnson–Janssen], ChAdOx1-S [AstraZeneca], BNT162b2 [Pfizer/BioNTech], and mRNA-1273 [Moderna]) targeted the spike protein of SARS-CoV-2, which have been acknowledged as a crucial determinant of invasion and tropism.[4, 5] The main types of vaccines were mRNA (BNT162b2 [Pfizer/BioNTech] andmRNA-1273 [Moderna]), engineered recombinant SARS-CoV-2 nanoparticle (NVX-CoV2373 [Novavax]), and viral vector-based vaccines (Ad26.COV2.S [Johnson & Johnson–Janssen] and ChAdOx1-S [AstraZeneca]).[6-8] Clinical trials on COVID-19 vaccines were reported to have above 95% effectiveness in preventing COVID-19 without serious adverse effects.[9-11] Moreover, more clinical data regarding the effectiveness of COVID-19 vaccination is being discovered.[12, 13]

Although dedicated efforts in reducing the number of COVID-19 cases lead to the introduction of COVID-19 vaccination, there is an inconclusive status of global, regional, and national COVID-19 vaccine coverage. To better understand the impact of the COVID-19 pandemic, we aimed to estimate disruptions in the global, regional, and national status of COVID-19 vaccination coverage on a global scale and by World Health Organization region and World Bank income group, and each country. We then calculated and estimated numbers of persons vaccinated with at least one dose, persons vaccinated with at least one dose per 100 population, and persons fully vaccinated per 100 population, using the World Health Organization dataset.[14] The current data on COVID-19 vaccination trends can be an indicator for making efficient public policies regarding COVID-19 vaccination.

2. Method

Our main analysis involved three main steps: (1) synthesizing data available on the World Health Organization Dashboard of 237 countries and territories updated until March 5, 2022[14]; (2) calculating and estimating number of persons vaccinated with at least one dose, persons vaccinated with at least one dose per 100 population, and persons fully vaccinated per 100 population by pairing estimates of COVID-19 vaccination coverage by individual level, which were originally country level models form the World Health Organization Dashboard, Release 1,; and (3) analyzing and describing the data by a global scale and stratifying it according to World Health Organization regions (Eastern Mediterranean, Americas, Europe, Southeast Asia, the Western Pacific, and Africa), World Bank income groups (high, upper-middle, lower-middle, and low income), and each country (total n=237).

The numbers on referred from the World Health Organization Dashboard were generated from December 2019 to March 2020 and were estimated numbers of persons vaccinated with at least one dose, persons vaccinated with at least one dose per 100 population, and persons fully vaccinated per 100 population by the official ministries of health in each country collected. The World Health Organization Dashboard aimed to provide weekly updates on COVID-19 vaccine coverage of 237 countries and territories, which was last updated on March 5, 2022. The index date described is equivalent to the date of the first vaccine administrated. Suspension of COVID-19 vaccination were not taken into account in this study. Also, the specific vaccine

types were excluded from our analysis (NVX-CoV2373 [Novavax], Ad26.COV2.S [Johnson & Johnson–Janssen], ChAdOx1-S [AstraZeneca], BNT162b2 [Pfizer/BioNTech], and mRNA-1273 [Moderna]). [15]

2.1 Statistical Analysis

We evaluated country level model forms drawn from the World Health Organization Dashboard, Release 1 and estimated COVID-19 vaccination coverage in individual levels calculated by estimated numbers of persons vaccinated with at least one dose, persons vaccinated with at least one dose per 100 population, and persons fully vaccinated per 100 population. We then aggregated the estimated numbers to global scales, World Bank income groups (high, upper-middle, lower-middle, and low income), World Health Organization regions (Americas, Eastern Mediterranean, Europe, South-East Asia, Western Pacific, and Africa), and each country (n=237). Systematic analysis was performed[16, 17] and all generated findings were calculated using R software (version 3.1.3; R Foundation, Vienna, Austria).

2.2 Patient and Public Involvement

No patients were directly involved in designing the research question or conducting the research. No patients were asked to interpret or write up the results. However, we plan on disseminating the results of this study to any of the study participants or wider relevant communities on request.[18]

3. Results

A total of 4,964,626,775 persons worldwide were vaccinated with at least one dose, which is 63.69 per 100 population administered COVID-19 vaccines at least one dose, and 56.16 per 100 population were fully vaccinated (Table 1 and Fig. 1).

In Fig. 2, the proportion of persons fully vaccinated was highest in the Eastern Mediterranean (81.25 per 100 population), followed by the Americas (65.08 per 100 population), Europe (61.59 per 100 population), South-East Asia (55.67 per 100 population), the Western Pacific (39.04 per 100 population), and Africa (11.62 per 100 population). The proportion of persons vaccinated with at least one dose have similar patterns of those fully vaccinated (Fig. 3); Eastern Mediterranean (84.18 per 100 population), the Americas (75.82 per 100 population), South-East Asia (68.97 per 100 population), Europe (66.28 per 100 population), Western Pacific (47.18 per 100 population), and Africa (15.87 per 100 population).

According to income groups classified by the World Bank, the proportion of persons fully vaccinated were highest in the high income group (72.25 per 100 population), followed by the upper-middle income group (70.73 per 100 population), lower-middle income (45.77 per 100 population), and low income (10.36 per 100 population).

According to country levels, the proportion of persons fully vaccinated were highest in Gibraltar (121.45 per 100 population), followed by United Arab Emirates (97.25 per 100 population), Cayman Islands (90.88 per 100 population), Puerto Rico (90.75 per 100 population),

Table 1. COVID-19 vaccination coverage globally and by World Health Organization regions and World Bank income groups.

Name	Number of persons vaccinated with at least one dose	Persons vaccinated with at least one dose per 100 population	Persons fully vaccinated per 100 population
Global	4,964,626,775	63.69	56.16
By World Health Organization Region			
Europe	618,443,276	66.28	61.59
Americas	775,517,630	75.82	65.08
South-East Asia	1,394,145,011	68.97	55.67
Eastern Mediterranean	1,653,678,036	84.18	81.25
Western Pacific	344,775,883	47.18	39.04
Africa	178,040,232	15.87	11.62
By World Bank Income Group			
High income	943,938,853	78.28	72.25
Upper-middle income	2,266,250,095	77.00	70.73
Lower-middle income	1,658,402,430	56.14	45.77
Low income	94,415,216	13.76	10.36

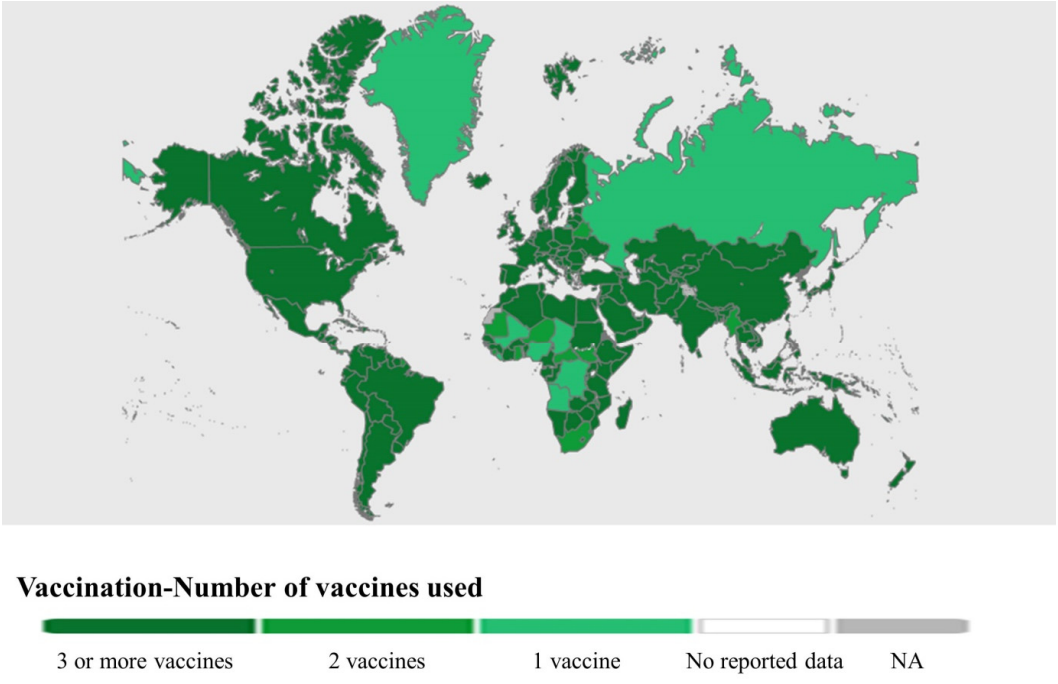

Fig. 1. Global COVID-19 vaccination coverage (number of vaccine used)

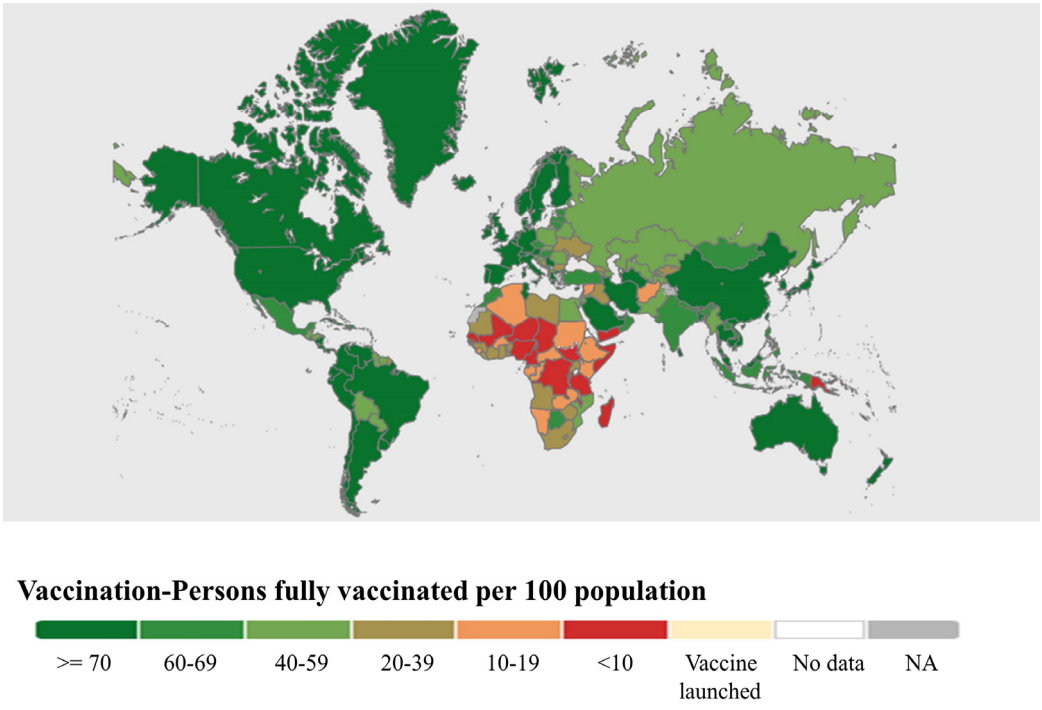

Fig. 2. Global COVID-19 vaccination coverage (persons fully vaccinated per 100 population)

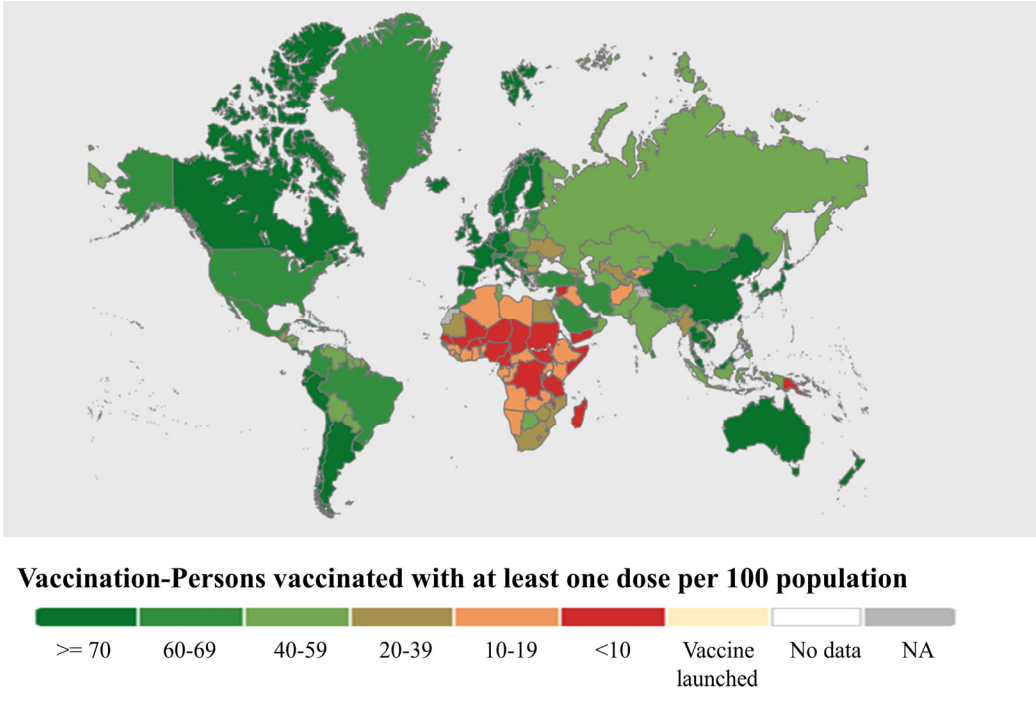

Fig. 3. Global COVID-19 vaccination coverage (persons vaccinated with at least one dose per 100 population)

Chile (89.89 per 100 population), Qatar (89.41 per 100 population), Cuba (87.19 per 100 population), Republic of Korea (86.38 per 100 population), Malta (85.68 per 100 population), Portugal (84.12 per 100 population), and China (83.98 per 100 population).

In Table 2, the proportion of persons fully vaccinated were lowest in Burundi (0.08 per 100 population), followed by Democratic Republic of the Congo (0.50 per 100 population), Chad (0.87 per 100 population), Haiti (0.89 per 100 population), Yemen (1.29 per 100 population), Papua New Guinea (2.80 per 100 population), Cameroon (3.06 per 100 population), Madagascar (3.57 per 100 population), South Sudan (3.81 per 100 population), Nigeria (4.11 per 100 population), United Republic of Tanzania (4.18 per 100 population), Malawi (4.24 per 100 population), Niger (4.34 per 100 population), Mali (4.35 per 100 population), Sudan (5.32 per 100 population), Burkina Faso (5.51 per 100 population), Somalia (5.90 per 100 population), Syrian Arab Republic (7.25 per 100 population), Djibouti (10.15 per 100 population), Zambia (10.25 per 100 population), and Afghanistan (11.00 per 100 population).

4. Discussion

In this analysis, we provide a quantitative assessment of global, regional, and national disruptions to COVID-19 vaccination coverage up to March 2022. A total of 4,964,626,775 persons were vaccinated worldwide with at least one dose, which is 63.69 per 100 of the population being administered COVID-19 vaccines at least one dose, and 56.16 per 100 population fully vaccinated. Persons vaccinated with at least one dose or fully were highest in the Eastern Mediterranean, followed by the Americas, South-East Asia, Europe, Western Pacific, and Africa. In addition, the proportion of persons who were vaccinated at least one dose or fully was also greatest in the high income countries, followed by upper-middle, lower-middle, and low income. Our results suggested that COVID-19 vaccination strategies must be separately established according to region, especially in underdeveloped countries, and global efforts are needed for support in low income countries in order to improve COVID-19 vaccination programs.

Previous studies have described regional differences in the progress of COVID-19 vaccination.[19-21] Due to limited evidence because of the lack of long-term clinical outcomes, the acceptance of COVID-19 vaccination can vary according to cultural or regional differences. A meta-analysis demonstrated that the COVID-19 vaccine acceptance rate was approximately 62.79% (95% confidence intervals [CI], 58.98 to 66.60).[19] According to regions, South-East Asia showed a vaccine acceptance rate as high as 70.18% (95% CI, 58.12 to 82.25), while Africa showed a vaccine acceptance rate as low as 39.51% (95% CI, 23.42 to 55.59).[19] In addition, national guidelines or policies of individual nations for COVID-19 vaccination can influence the rate of COVID-19 vaccination.[1] For instance, COVID-19 vaccination in the pediatric population initiated from the USA.[1] The population's age range may have an impact on the rate of COVID-19 vaccination.

4.1 Strengths and Limitations

Our study has several limitations. Firstly, accuracy of the dataset used in this study was not

Table 2. COVID-19 vaccination coverage by each country

Name	Number of persons vaccinated with at least one dose	Persons vaccinated with at least one dose per 100 population	Persons fully vaccinated per 100 population
Afghanistan	4,952,744	12.72	11.00
Albania	1,284,034	45.12	41.89
Algeria	7,456,361	17.00	13.86
American Samoa	42,212	76.48	68.49
Andorra	57,797	75.87	69.90
Angola	10,780,927	32.80	17.07
Anguilla	10,370	69.12	63.53
Antigua and Barbuda	63,582	64.93	62.44
Argentina	40,572,052	89.77	80.18
Armenia	1,080,404	36.46	29.44
Aruba	87,350	81.81	75.31
Australia	22,047,151	86.46	80.30
Austria	6,791,963	76.31	73.55
Azerbaijan	5,309,691	52.37	47.14
Bahamas	163,061	41.47	39.13
Bahrain	1,231,321	72.36	71.28
Bangladesh	124,691,912	75.71	51.38
Barbados	159,958	55.66	51.91
Belarus	5,528,298	58.51	49.03
Belgium	9,199,837	79.84	78.44
Belize	234,370	58.94	51.95
Benin	2,591,583	21.38	16.61
Bermuda	46,961	75.41	74.06
Bhutan	596,568	77.32	74.49
Bolivia (Plurinational State of)	6,944,412	59.49	48.10
Bonaire	17,366	83.03	74.82
Bonaire, Sint Eustatius and Saba	5,726	22.03	11.41
Bosnia and Herzegovina	943,394	28.76	25.79
Botswana	1,438,728	61.18	52.23

Table 2. Continued

Name	Number of persons vaccinated with at least one dose	Persons vaccinated with at least one dose per 100 population	Persons fully vaccinated per 100 population
Brazil	172,334,091	81.08	69.99
British Virgin Islands	18,923	62.58	57.30
Brunei Darussalam	407,674	93.19	92.46
Bulgaria	2,073,249	29.83	29.23
Burkina Faso	2,117,997	10.13	5.51
Burundi	9,738	0.08	0.08
Cabo Verde	352,929	63.48	53.98
Cambodia	14,524,943	86.88	82.79
Cameroon	1,073,258	4.04	3.06
Canada	32,365,984	85.76	81.33
Cayman Islands	61,502	93.58	90.88
Central African Republic	819,313	16.96	16.15
Chad	271,031	1.65	0.87
Chile	17,759,193	92.90	89.89
China	1,276,556,393	86.77	83.98
Colombia	41,253,498	81.08	65.59
Comoros	341,102	39.23	34.64
Congo	675,865	12.25	11.51
Cook Islands	14,571	82.96	72.72
Costa Rica	4,152,664	81.52	74.36
Côte d'Ivoire	6,874,956	26.06	15.19
Croatia	2,303,242	56.79	54.75
Cuba	10,604,386	93.62	87.19
Curaçao	106,676	65.01	59.80
Cyprus	655,735	73.84	73.51
Czechia	6,935,621	64.86	63.87
Democratic Republic of the Congo	754,459	0.84	0.50
Denmark	4,842,238	83.16	81.52
Djibouti	140,287	14.20	10.15
Dominica	32,113	44.61	41.03

Table 2. Continued

Name	Number of persons vaccinated with at least one dose	Persons vaccinated with at least one dose per 100 population	Persons fully vaccinated per 100 population
Dominican Republic	7,110,411	65.55	53.97
Ecuador	14,761,254	83.67	76.72
Egypt	41,192,990	40.25	29.49
El Salvador	4,540,530	70.00	65.72
Equatorial Guinea	251,474	17.92	14.55
Estonia	835,907	62.90	62.46
Eswatini	380,363	32.79	28.97
Ethiopia	21,524,528	18.72	15.71
Falkland Islands (Malvinas)	2,632	75.57	50.96
Faroe Islands	41,715	85.37	83.69
Fiji	667,948	74.51	69.21
Finland	4,468,653	80.88	76.35
France	54,700,591	81.25	79.75
French Guiana	95,896	32.11	28.88
French Polynesia	183,676	65.39	64.21
Gabon	299,993	13.48	11.04
Gambia	330,027	13.66	13.11
Georgia	1,255,300	31.47	28.37
Germany	63,380,508	76.21	75.15
Ghana	7,721,716	24.85	15.42
Gibraltar	41,968	124.57	121.45
Greece	7,828,777	73.04	70.38
Greenland	41,229	72.62	67.77
Grenada	42,971	38.19	33.29
Guadeloupe	146,572	36.63	34.99
Guam	147,421	87.35	79.02
Guatemala	7,184,896	40.10	31.30
Guernsey			
Guinea	3,067,446	23.36	15.93
Guinea-Bissau	515,764	26.21	17.23

Table 2. Continued

Name	Number of persons vaccinated with at least one dose	Persons vaccinated with at least one dose per 100 population	Persons fully vaccinated per 100 population
Guyana	464,288	59.03	44.47
Haiti	151,962	1.33	0.89
Honduras	5,414,940	54.67	46.07
Hungary	6,326,391	64.76	62.46
Iceland	305,549	83.91	80.92
India	964,234,491	69.87	57.42
Indonesia	190,976,834	69.82	52.83
Iran (Islamic Republic of)	63,110,540	75.14	66.34
Iraq	9,992,944	24.84	17.14
Ireland	4,018,239	80.94	79.10
Isle of Man	69,417	81.64	78.41
Israel	7,046,983	81.42	73.55
Italy	50,198,378	84.17	78.46
Jamaica	764,769	25.83	21.90
Japan	101,672,246	80.39	79.21
Jersey	82,645	76.67	73.23
Jordan	4,694,106	46.01	42.98
Kazakhstan	10,110,959	53.85	43.46
Kenya	7,858,965	14.62	14.25
Kiribati	76,491	64.04	42.22
Kosovo	899,560	50.10	45.29
Kuwait	3,393,521	79.46	76.74
Kyrgyzstan	1,320,378	20.24	17.02
Lao People's Democratic Republic	4,830,440	66.39	58.50
Latvia	1,295,877	67.93	65.98
Lebanon	2,641,501	38.70	33.49
Lesotho	782,175	36.51	33.96
Liberia	1,116,709	22.08	21.44
Libya	2,168,808	31.56	16.02
Liechtenstein	26,707	68.93	68.02

Table 2. Continued

Name	Number of persons vaccinated with at least one dose	Persons vaccinated with at least one dose per 100 population	Persons fully vaccinated per 100 population
Lithuania	1,944,941	69.76	67.66
Luxembourg	467,216	74.62	72.84
Madagascar	1,038,325	3.75	3.57
Malawi	1,536,112	8.03	4.24
Malaysia	26,873,297	83.03	79.55
Maldives	398,214	73.67	68.65
Mali	1,227,110	6.06	4.35
Malta	448,134	87.09	85.68
Marshall Islands	27,833	47.02	39.94
Martinique	146,841	39.13	37.58
Mauritania	1,539,645	33.11	22.44
Mauritius	993,298	78.10	74.50
Mexico	85,083,649	65.99	61.08
Micronesia (Federated States of)	57,174	49.71	39.87
Monaco	28,875	73.58	65.40
Mongolia	2,271,500	69.29	66.28
Montenegro	275,260	44.26	40.46
Montserrat	1,869	37.39	34.99
Morocco	24,854,067	67.34	63.15
Mozambique	12,963,020	41.47	36.72
Myanmar	23,586,822	43.35	38.45
Namibia	440,661	17.34	14.71
Nauru	7,764	71.66	67.97
Nepal	18,491,302	63.46	60.03
Netherlands	13,447,203	77.25	70.96
New Caledonia	187,718	65.75	62.79
New Zealand	4,255,126	88.24	82.14
Nicaragua	5,423,137	81.86	59.54
Niger	1,474,560	6.09	4.34
Nigeria	18,404,584	8.93	4.11

Table 2. Continued

Name	Number of persons vaccinated with at least one dose	Persons vaccinated with at least one dose per 100 population	Persons fully vaccinated per 100 population
Niue	1,340	82.82	79.60
North Macedonia	851,356	41.00	40.10
Northern Mariana Islands (Commonwealth of the)	44,211	76.81	74.50
Norway	4,324,308	80.56	74.83
occupied Palestinian territory	1,979,151	38.80	33.64
Oman	3,220,696	63.07	58.84
Pakistan	124,309,711	56.28	45.32
Palau	19,923	110.12	96.34
Panama	3,331,140	77.20	67.76
Papua New Guinea	310,659	3.47	2.80
Paraguay	3,786,974	53.09	44.66
Peru	27,499,335	83.40	73.13
Philippines	68,661,595	62.66	57.51
Pitcairn Islands	37	74.00	74.00
Poland	22,587,330	59.51	58.30
Portugal	9,651,664	93.81	84.12
Puerto Rico	3,098,101	108.29	90.75
Qatar	2,575,934	89.41	89.41
Republic of Korea	44,776,711	87.34	86.38
Republic of Moldova	1,074,332	26.63	25.54
Romania	8,147,081	42.15	41.68
Russian Federation	78,284,278	53.64	49.06
Rwanda	8,811,796	68.03	60.29
Saba	1,582	81.84	81.01
Saint Helena	4,361	71.83	58.16
Saint Kitts and Nevis	31,162	58.58	49.43
Saint Lucia	57,622	31.38	28.27
Saint Vincent and the Grenadines	35,207	31.74	26.25
Samoa	145,989	73.58	65.67

Table 2. Continued

Name	Number of persons vaccinated with at least one dose	Persons vaccinated with at least one dose per 100 population	Persons fully vaccinated per 100 population
San Marino	24,583	71.35	63.39
Sao Tome and Principe	111,775	51.00	35.58
Saudi Arabia	26,026,203	74.76	69.76
Senegal	1,448,125	8.65	6.16
Serbia	3,356,512	48.46	47.00
Seychelles	84,141	85.56	81.26
Sierra Leone	1,516,460	19.01	12.10
Singapore	4,977,864	85.09	83.73
Sint Eustatius	1,588	50.59	48.49
Sint Maarten	27,857	64.96	60.28
Slovakia	2,816,259	51.60	50.47
Slovenia	1,252,953	59.78	58.10
Solomon Islands	214,939	31.29	14.61
Somalia	1,479,158	9.31	5.90
South Africa	21,107,042	35.59	30.36
South Sudan	469,694	4.20	3.81
Spain	40,929,909	86.47	76.05
Sri Lanka	16,903,964	78.94	66.21
Sudan	5,126,250	11.69	5.32
Suriname	265,860	45.32	40.04
Sweden	7,526,952	72.88	71.02
Switzerland	6,076,088	70.60	67.43
Syrian Arab Republic	2,239,981	12.80	7.25
Tajikistan	4,916,961	51.55	43.07
Thailand	53,584,958	76.77	71.17
The United Kingdom	52,573,589	77.25	71.83
Timor-Leste	679,946	51.57	43.50
Togo	1,549,440	18.72	13.84
Tokelau	968	71.70	71.70
Tonga	75,868	71.78	65.37
Trinidad and Tobago	740,765	52.93	50.15

Table 2. Continued

Name	Number of persons vaccinated with at least one dose	Persons vaccinated with at least one dose per 100 population	Persons fully vaccinated per 100 population
Tunisia	8,830,044	74.71	53.56
Turkey	57,623,451	69.30	63.39
Turkmenistan	4,374,694	72.54	53.16
Turks and Caicos Islands	31,165	80.49	75.31
Tuvalu	6,230	52.83	49.90
Uganda	13,809,794	30.19	16.79
Ukraine	15,718,610	35.94	34.44
United Arab Emirates	9,991,089	101.02	97.25
United Republic of Tanzania	3,223,953	5.40	4.18
United States of America	253,157,102	76.48	63.50
Uruguay	2,964,083	85.33	78.55
Uzbekistan	18,446,210	55.11	39.32
Vanuatu	114,284	37.21	27.73
Venezuela (Bolivarian Republic of)	22,157,232	77.92	50.24
Viet Nam	79,469,390	81.64	77.38
Wallis and Futuna	6,450	57.35	56.90
Yemen	624,837	2.10	1.29
Zambia	2,510,296	13.66	10.25
Zimbabwe	4,368,633	29.39	22.90

able to be evaluated through individual-level data and vaccine types.[22] Secondly, as our findings depend on the dataset of each 234 countries, these may vary depending on the reporting strategy of each country, which may lead to inaccuracy or bias.[23, 24] The World Health Organization is trying to control and reduce these errors and underestimation. Despite of these limitations, our interpretations can contribute on solving public health problems on emerging issues and health inequality on the COVID-19 pandemic.[25, 26]

5. Conclusion

A total of 4,964,626,775 persons worldwide were vaccinated with at least one dose, which is 63.69 per 100 population administered COVID-19 vaccines at least one dose, and 56.16 per 100 population were fully vaccinated. Although the COVID-19 vaccine coverage trajectories points towards global increasement in vaccination, persistent inequality in preventing the

COVID-19 pandemic occurred in vulnerable groups such as under-developed and low income countries. These findings suggest that better understanding and international attention is needed in solving public health problems on emerging issues and health inequality on the COVID-19 pandemic.

Capsule Summary

A total of 4,964,626,775 persons worldwide were vaccinated with at least one dose, which is 63.69 per 100 population administered of COVID-19 vaccines at least one dose, and 56.16 per 100 population were fully vaccinated.

Ethics Statements

The study's protocol has been approved by the research ethics board at the University of Washington. This dataset shall be conducted in full compliance with University of Washington policies and procedures, as well as applicable federal, state, and local laws.

Patient and Public Involvement

No patients were directly involved in designing the research question or conducting the research. No patients were asked to interpret or write up the results. However, we plan on disseminating the results of this study to any of the study participants or wider relevant communities on request.

Data Availability Statement

Data of the study are publicly available.

Transparency Statement

The leading authors (Dr. RK and MR) are an honest, accurate, and transparent account of the study being reported.

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None

Author Contribution

Drs RK and MR had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. All authors approved the final version before submission. Study concept and design: RK and MR; Acquisition, analysis, or interpretation of data: RK and MR; Drafting of the manuscript: RK and MR; Critical revision of the manuscript for important intellectual content: RK and MR; Statistical analysis: RK and MR; Study supervision: RK and MR. MR is guarantor. The corresponding authors attest that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Conflicts of Interest

The authors have no conflicts of interest to declare for this study.

Provenance and Peer Review

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