Global, regional, and national disruptions to COVID-19 vaccine coverage in 237 countries and territories, March 2022: a systematic analysis for World Health Organization COVID-19 Dashboard, Release 1

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Abstract

Objective: Measuring coronavirus disease 2019 (COVID-19) vaccination is crucial in improving global public health system during the pandemic. However, there is limited supporting data needed in order to identify the global, regional, and national status of the COVID-19 vaccination coverage. Given to such limitations, this study aimed at investigating the status of COVID-19 vaccination coverage in a global, regional, and national perspective.

Methods: For this study, we analyzed the COVID-19 vaccination data by the World Health Organization Dashboard of 237 countries and territories up to March 5, 2022. We then calculated the total vaccine doses administered and total vaccine doses administered per 100 population. There were some cases when the total doses administered per 100 population exceeded 100 while some populations received heterologous vaccine regime. The COVID-19 vaccination data were categorized according to World Health Organization regions, the World Bank income groups, and each country.

Results: A total of 10,704,043,684 doses of COVID-19 vaccines and 137.33 doses per 100 population were administered globally. The COVID-19 vaccine coverage was highest in the Eastern Mediterranean (204 per 100 population), followed by the Americas (163.43 per 100 population), Europe (161.52 per 100 population), South-East Asia (127.82 per 100 population), Western Pacific (90.58 per 100 population), and Africa (24.17 per 100 population). High COVID-19 vaccine coverage was associated with the World Bank according to income groups (per 100 population; high income, 187.50; upper-middle income, 176.95; lower-middle income, 104.81; and low income, 19.65).

Conclusion: After the introduction of worldwide COVID-19 vaccine coverage, a total of 10,704,043,684 doses of COVID-19 vaccines were administered globally. However, international attention is needed on vaccination strategies for underdeveloped countries, which have low COVID-19 vaccine coverage.

Keywords: COVID-19; SARS-CoV-2; vaccination; coverage; global

1. Introduction

The Coronavirus disease 2019 (COVID-19) has been prevalent worldwide since December 2019.[1, 2] The impact of COVID-19 had on human health was unprecedented.[3] Due to the highly contagious features and variant types that impeded the introduction of effective treatment options, a considerable portion of the global population have contracted COVID-19.[4] Although many patients with COVID-19 had mild to moderate respiratory symptoms, a large number of patients suffered from severe illness and COVID-19-related deaths.[5, 6] Because the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a novel virus that
does not have a curative medicine or vaccination, a number of strategies, including quarantine maneuvers, have been conducted.[7, 8] To prevent or attenuate the COVID-19, multiple doses of vaccines have been administered worldwide.

The present study described the global, regional, and national statistics and trends of COVID-19 vaccine coverage. Total vaccine doses administered and total vaccine doses administered per 100 population have been investigated worldwide through the World Health Organization dataset. In addition, we calculated and stratified the COVID-19 vaccination data according to World Health Organization regions, World Bank income groups, and each country.

2. Method

This study used data derived from the World Health Organization Dashboard in 237 countries and territories up to March 5, 2022.[1] From December 2019 to March 2020, the World Health Organization collected the numbers of confirmed COVID-19 cases and deaths, total vaccine doses administered, and total vaccine doses administered per 100 population through official communications and by monitoring the official ministries of health in each country. These data were aimed to provide weekly updates on vaccine coverage by countries and territories. The COVID-19 vaccination data used in this study were collected and updated until March 5, 2022.

The total vaccine doses administered and total vaccine doses administered per 100 population were calculated. In some cases, the total doses administered per 100 population exceeded 100, while some population received a heterologous vaccine regime.[9] However, such specific vaccine types are not considered for the purpose of this study (ChAdOx1-S [AstraZeneca], BNT162b2 [Pfizer/BioNTech], mRNA-1273 [Moderna], Ad26.COV2.S [Johnson & Johnson–Janssen], and NVX-CoV2373 [Novavax]).[10]

2.1 Statistical Analysis

All dedicated efforts from government, international, national, and regional authorities have been made to improve the accuracy, reliability, and reproducibility of the World Health Organization Dashboard and present or potential errors in the data have been frequently corrected by the World Health Organization. The COVID-19 vaccination data were categorized according to World Health Organization regions (Americas, Eastern Mediterranean, Europe, South-East Asia, Western Pacific, and Africa), World Bank income groups (high income, upper-middle income, lower-middle income, and low income), and by countries (n=237). We systematically investigated all the data [11, 12] and all figures and tables were generated through the R software (version 3.1.4; 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 any results. However, we plan on disseminating the results of this study to any of the study participants or any relevant communities upon request.[13]
3. Results

A total of 10,704,043,684 doses of COVID-19 vaccines were administered globally (Table 1) with an average of total vaccine dose administered per 100 population was estimated to be 137.33.

According to regional groups classified by the World Health Organization (Fig. 1), COVID-19 vaccine coverage (total vaccine doses administered per 100 population) was the highest in Eastern Mediterranean (204 per 100 population), followed by Americas (163.43 per 100 population), Europe (161.52 per 100 population), South-East Asia (127.82 per 100 population), Western Pacific (90.58 per 100 population), and Africa (24.17 per 100 population).

According to income groups classified by the World Bank, total vaccine doses administered per 100 population were highest in the higher income group (187.50 per 100 population), followed by the upper middle income group (176.95 per 100 population), low middle income (104.81 per 100 population), and low income group (19.65 per 100 population).

According to countries, the highest COVID-19 vaccination doses were administered in China (3,138,003,103 doses and 213.28 per 100 population), followed by India (1,776,718,549 doses and 128.75 per 100 population), USA (537,567,013 doses and 162.41 per 100 population), Brazil (369,527,744 doses and 173.85), Indonesia (345,697,245 doses and 126.39 per 100 population), Japan (223,820,819 doses and 176.97 per 100 population), Pakistan (213,532,343 doses and 96.67 per 100 population), Bangladesh (213,176,935 doses and 129.44 per 100 population), Vietnam (192,865,986 doses and 198.14 per 100 population), Mexico (179,274,307 doses and 139.05 per 100 population), and Germany (169,071,638 doses and 162.41 per 100 population).

| Name                        | Total vaccine doses administered | Total vaccine doses administered per 100 population |
|-----------------------------|---------------------------------|---------------------------------------------------|
| Global                      | 10,704,043,684                  | 137.33                                            |
| By World Health Organization Region |                                 |                                                   |
| Europe                      | 1,507,085,453                   | 161.52                                            |
| Americas                    | 1,671,470,141                   | 163.43                                            |
| South-East Asia             | 2,583,697,206                   | 127.82                                            |
| Eastern Mediterranean       | 4,008,571,856                   | 204.04                                            |
| Western Pacific             | 661,956,824                     | 90.58                                             |
| Africa                      | 271,191,976                     | 24.17                                             |
| By World Bank Income Group  |                                 |                                                   |
| High income                 | 2,260,912,674                   | 187.50                                            |
| Upper-middle income         | 5,208,240,832                   | 176.95                                            |
| Lower-middle income         | 3,096,350,779                   | 104.81                                            |
| Low income                  | 134,792,949                     | 19.65                                             |

Table 1. Global COVID-19 vaccination status categorized by region and income groups
Total vaccine doses administered per 100 population were lowest in Burundi (11,502 doses and 0.10 per 100 population), followed by Democratic Republic of the Congo (850,731 doses and 0.95 per 100 population), Haiti (234,119 doses and 2.05 per 100 population), Chad (403,992 doses and 2.46 per 100 population), Yemen (784,792 doses and 2.63 per 100 population), Madagascar (1,228,391 doses and 4.44 per 100 population), Papua New Guinea (412,501 doses and 4.61 per 100 population), South Sudan (518,428 doses and 4.63 per 100 population), Cameroon (1,272,574 doses and 4.79 per 100 population), United Republic of Tanzania (4,440,797 doses and 7.43 per 100 population), Niger (1,840,055 doses and 7.60 per 100 population), Mali (1,735,358 doses and 8.57 per 100 population), Malawi (1,934,835 doses and 10.11 per 100 population), Burkina Faso (2,330,052 doses and 10.15 per 100 population), Somalia (1,838,348 doses and 11.57 per 100 population), Sudan (5,711,034 doses and 13.02 per 100 population), Nigeria (27,583,270 doses and 13.38 per 100 population), Afghanistan (5,597,130 doses and 14.38 per 100 population), and Congo (812,761 doses and 14.73 per 100 population).

4. Discussion

After the worldwide introduction of COVID-19 vaccine coverage, a total of 10,704,043,684 doses of COVID-19 vaccines were administered globally. The total COVID-19 vaccine doses administered exceeded 100% (137.33 per 100 population). When classified by regions, the Eastern
| Name                                      | Total vaccine doses administered | Total vaccine doses administered per 100 population |
|-------------------------------------------|---------------------------------|--------------------------------------------------|
| Afghanistan                               | 5,597,130                       | 14.38                                            |
| Albania                                   | 2,707,658                       | 94.10                                            |
| Algeria                                   | 13,631,683                      | 31.09                                            |
| American Samoa                            | 85,050                          | 154.08                                           |
| Andorra                                   | 142,420                         | 184.30                                           |
| Angola                                    | 16,633,167                      | 50.61                                            |
| Anguilla                                  | 22,165                          | 147.75                                           |
| Antigua and Barbuda                       | 124,726                         | 127.36                                           |
| Argentina                                 | 93,008,081                      | 205.79                                           |
| Armenia                                   | 1,971,565                       | 66.50                                            |
| Aruba                                     | 167,759                         | 157.13                                           |
| Australia                                 | 54,043,583                      | 211.94                                           |
| Austria                                   | 17,855,030                      | 200.60                                           |
| Azerbaijan                                | 12,659,541                      | 124.90                                           |
| Bahamas                                   | 327,515                         | 83.29                                            |
| Bahrain                                   | 3,410,306                       | 200.42                                           |
| Bangladesh                                | 213,176,935                     | 129.44                                           |
| Barbados                                  | 309,125                         | 107.57                                           |
| Belarus                                   | 10,649,534                      | 112.70                                           |
| Belgium                                   | 24,601,511                      | 213.50                                           |
| Belize                                    | 458,351                         | 115.27                                           |
| Benin                                     | 2,788,620                       | 23.00                                            |
| Bermuda                                   | 124,342                         | 199.67                                           |
| Bhutan                                    | 1,592,652                       | 206.41                                           |
| Bolivia (Plurinational State of)          | 12,606,278                      | 108.00                                           |
| Bonaire                                    | 33,014                          | 157.85                                           |
| Bonaire, Sint Eustatius and Saba          | 7,391                           | 28.44                                            |
| Bosnia and Herzegovina                    | 1,924,950                       | 58.70                                            |
| Botswana                                  | 1,438,728                       | 61.18                                            |
| Brazil                                    | 369,527,744                     | 173.85                                           |
| British Virgin Islands                    | 36,610                          | 121.08                                           |
| Brunei Darussalam                         | 1,041,610                       | 238.09                                           |
| Bulgaria                                  | 4,275,051                       | 61.50                                            |
| Burkina Faso                              | 2,330,052                       | 11.15                                            |
| Name                              | Total vaccine doses administered | Total vaccine doses administered per 100 population |
|----------------------------------|---------------------------------|-----------------------------------------------------|
| Burundi                          | 11,502                          | 0.10                                                |
| Cabo Verde                       | 711,323                         | 127.94                                              |
| Cambodia                         | 35,067,827                      | 209.75                                              |
| Cameroon                         | 1,272,574                       | 4.79                                                |
| Canada                           | 80,233,844                      | 212.58                                              |
| Cayman Islands                   | 143,257                         | 217.98                                              |
| Central African Republic         | 900,298                         | 18.64                                               |
| Chad                             | 403,992                         | 2.46                                                |
| Chile                            | 48,356,547                      | 252.96                                              |
| China                            | 3,138,003,103                   | 213.28                                              |
| Colombia                         | 76,733,198                      | 150.80                                              |
| Comoros                          | 637,961                         | 73.36                                               |
| Congo                            | 812,761                         | 14.73                                               |
| Cook Islands                     | 36,399                          | 207.24                                              |
| Costa Rica                       | 8,970,610                       | 176.10                                              |
| Côte d’Ivoire                    | 9,970,869                       | 37.80                                               |
| Croatia                          | 5,179,921                       | 127.60                                              |
| Cuba                             | 34,926,539                      | 308.36                                              |
| Curaçao                          | 244,091                         | 148.75                                              |
| Cyprus                           | 1,706,147                       | 192.10                                              |
| Czechia                          | 17,288,966                      | 161.70                                              |
| Democratic Republic of the Congo | 850,731                         | 0.95                                                |
| Denmark                          | 13,160,370                      | 226.00                                              |
| Djibouti                         | 160,742                         | 16.27                                               |
| Dominica                         | 61,649                          | 85.63                                               |
| Dominican Republic               | 15,173,404                      | 139.87                                              |
| Ecuador                          | 31,772,830                      | 180.09                                              |
| Egypt                            | 71,361,630                      | 69.73                                               |
| El Salvador                      | 10,174,711                      | 156.87                                              |
| Equatorial Guinea                | 455,655                         | 32.48                                               |
| Estonia                          | 2,010,403                       | 151.30                                              |
| Eswatini                         | 490,899                         | 42.31                                               |
| Ethiopia                         | 26,178,996                      | 22.77                                               |
| Falkland Islands (Malvinas)      | 4,407                           | 126.53                                              |

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| Name                     | Total vaccine doses administered | Total vaccine doses administered per 100 population |
|-------------------------|---------------------------------|---------------------------------------------------|
| Faroe Islands           | 103,894                         | 212.61                                            |
| Fiji                    | 1,288,363                       | 143.72                                            |
| Finland                 | 11,420,891                      | 206.70                                            |
| France                  | 153,013,512                     | 227.30                                            |
| French Guiana           | 219,105                         | 73.36                                             |
| French Polynesia        | 414,137                         | 147.43                                            |
| Gabon                   | 545,642                         | 24.52                                             |
| Gambia                  | 362,079                         | 14.98                                             |
| Georgia                 | 2,567,028                       | 64.30                                             |
| Germany                 | 169,071,638                     | 203.30                                            |
| Ghana                   | 12,511,697                      | 40.27                                             |
| Gibraltar               | 113,138                         | 335.81                                            |
| Greece                  | 19,946,219                      | 186.10                                            |
| Greenland               | 79,703                          | 140.39                                            |
| Grenada                 | 85,891                          | 76.33                                             |
| Guadeloupe              | 362,639                         | 90.63                                             |
| Guam                    | 317,874                         | 188.34                                            |
| Guatemala               | 14,535,479                      | 81.13                                             |
| Guernsey                | 148,014                         | 229.59                                            |
| Guinea                  | 5,159,979                       | 39.29                                             |
| Guinea-Bissau           | 558,351                         | 28.37                                             |
| Guyana                  | 863,110                         | 109.73                                            |
| Haiti                   | 234,119                         | 2.05                                              |
| Honduras                | 11,561,083                      | 116.72                                            |
| Hungary                 | 15,916,521                      | 162.90                                            |
| Iceland                 | 785,791                         | 215.80                                            |
| India                   | 1,776,718,549                   | 128.75                                            |
| Indonesia               | 345,697,245                     | 126.39                                            |
| Iran (Islamic Republic of) | 142,195,819            | 169.30                                            |
| Iraq                    | 17,014,009                      | 42.30                                             |
| Ireland                 | 10,418,205                      | 209.90                                            |
| Isle of Man             | 187,694                         | 220.73                                            |
| Israel                  | 13,765,678                      | 159.00                                            |
| Italy                   | 131,126,289                     | 219.90                                            |
| Name                                           | Total vaccine doses administered | Total vaccine doses administered per 100 population |
|------------------------------------------------|---------------------------------|---------------------------------------------------|
| Jamaica                                       | 1,353,947                       | 45.72                                             |
| Japan                                         | 223,820,819                     | 176.97                                            |
| Jersey                                        | 222,371                         | 206.29                                            |
| Jordan                                        | 9,649,298                       | 94.57                                             |
| Kazakhstan                                    | 24,149,547                      | 128.60                                            |
| Kenya                                         | 16,786,825                      | 31.22                                             |
| Kiribati                                      | 127,916                         | 107.09                                            |
| Kosovo                                        | 1,808,756                       | 100.70                                            |
| Kuwait                                        | 7,592,265                       | 177.78                                            |
| Kyrgyzstan                                    | 2,492,189                       | 38.20                                             |
| Lao People's Democratic Republic              | 8,791,236                       | 120.83                                            |
| Latvia                                        | 2,766,743                       | 145.00                                            |
| Lebanon                                       | 5,452,304                       | 79.88                                             |
| Lesotho                                       | 926,760                         | 43.26                                             |
| Liberia                                       | 1,200,630                       | 23.74                                             |
| Libya                                         | 3,347,763                       | 48.72                                             |
| Liechtenstein                                 | 70,228                          | 181.25                                            |
| Lithuania                                     | 4,432,081                       | 158.60                                            |
| Luxembourg                                    | 1,214,622                       | 194.00                                            |
| Madagascar                                    | 1,228,391                       | 4.44                                              |
| Malawi                                        | 1,934,835                       | 10.11                                             |
| Malaysia                                      | 66,872,362                      | 206.61                                            |
| Maldives                                      | 902,028                         | 166.87                                            |
| Mali                                          | 1,735,358                       | 8.57                                              |
| Malta                                         | 1,192,097                       | 231.70                                            |
| Marshall Islands                              | 51,939                          | 87.74                                             |
| Martinique                                    | 368,725                         | 98.26                                             |
| Mauritania                                    | 2,617,442                       | 56.29                                             |
| Mauritius                                     | 2,353,567                       | 185.06                                            |
| Mexico                                        | 179,274,307                     | 139.05                                            |
| Micronesia (Federated States of)              | 97,185                          | 84.49                                             |
| Monaco                                        | 65,140                          | 166.00                                            |
| Mongolia                                      | 5,568,712                       | 169.87                                            |
| Montenegro                                    | 526,852                         | 83.90                                             |
| Name                                      | Total vaccine doses administered | Total vaccine doses administered per 100 population |
|-------------------------------------------|---------------------------------|-----------------------------------------------------|
| Montserrat                                | 4,089                           | 81.80                                               |
| Morocco                                   | 53,894,957                      | 146.02                                              |
| Mozambique                                | 23,563,858                      | 75.39                                               |
| Myanmar                                   | 45,202,278                      | 83.08                                               |
| Namibia                                   | 814,463                         | 32.05                                               |
| Nauru                                     | 15,128                          | 139.63                                              |
| Nepal                                     | 37,129,004                      | 127.43                                              |
| Netherlands                               | 33,860,098                      | 194.50                                              |
| New Caledonia                             | 366,995                         | 128.55                                              |
| New Zealand                               | 10,554,287                      | 218.87                                              |
| Nicaragua                                 | 9,367,505                       | 141.41                                              |
| Niger                                     | 1,840,055                       | 7.60                                                |
| Nigeria                                   | 27,583,270                      | 13.38                                               |
| Niue                                      | 2,628                           | 162.42                                              |
| North Macedonia                           | 1,823,012                       | 87.50                                               |
| Northern Mariana Islands                  | 105,295                         | 182.94                                              |
| Norway                                    | 1,823,012                       | 87.50                                               |
| occupied Palestinian territory            | 3,609,984                       | 70.76                                               |
| Oman                                      | 6,878,593                       | 134.70                                              |
| Pakistan                                  | 213,532,343                     | 96.67                                               |
| Palau                                     | 45,692                          | 252.55                                              |
| Panama                                    | 7,544,898                       | 174.86                                              |
| Papua New Guinea                          | 412,501                         | 4.61                                                |
| Paraguay                                  | 8,070,750                       | 113.15                                              |
| Peru                                      | 61,695,372                      | 187.12                                              |
| Philippines                               | 135,251,295                     | 123.43                                              |
| Pitcairn Islands                          | 74                              | 148.00                                              |
| Poland                                    | 53,029,684                      | 139.70                                              |
| Portugal                                  | 23,288,435                      | 226.20                                              |
| Puerto Rico                               | 6,895,098                       | 241.02                                              |
| Qatar                                     | 6,398,889                       | 222.10                                              |
| Republic of Korea                         | 118,895,241                     | 231.90                                              |
| Republic of Moldova                       | 2,059,291                       | 51.00                                                |
| Romania                                   | 15,831,189                      | 81.90                                                |
| Name                                      | Total vaccine doses administered | Total vaccine doses administered per 100 population |
|-------------------------------------------|----------------------------------|---------------------------------------------------|
| Russian Federation                         | 160,816,996                      | 110.20                                            |
| Rwanda                                    | 18,038,703                       | 139.27                                            |
| Saba                                      | 3,148                            | 162.86                                            |
| Saint Helena                              | 7,892                            | 130.00                                            |
| Saint Kitts and Nevis                      | 60,467                           | 113.68                                            |
| Saint Lucia                               | 116,213                          | 63.29                                             |
| Saint Vincent and the Grenadines           | 67,378                           | 60.73                                             |
| Samoa                                     | 276,278                          | 139.24                                            |
| San Marino                                | 64,480                           | 190.00                                            |
| Sao Tome and Principe                      | 193,775                          | 88.42                                             |
| Saudi Arabia                              | 61,384,936                       | 176.32                                            |
| Senegal                                   | 2,493,984                        | 14.90                                             |
| Serbia                                    | 6,612,050                        | 95.50                                             |
| Seychelles                                | 198,120                          | 201.45                                            |
| Sierra Leone                              | 1,859,571                        | 23.31                                             |
| Singapore                                 | 13,452,417                       | 229.94                                            |
| Sint Eustatius                            | 3,110                            | 99.08                                             |
| Sint Maarten                              | 61,545                           | 143.52                                            |
| Slovakia                                  | 7,008,272                        | 128.40                                            |
| Slovenia                                  | 2,957,432                        | 141.10                                            |
| Solomon Islands                           | 315,423                          | 45.92                                             |
| Somalia                                   | 1,838,348                        | 11.57                                             |
| South Africa                              | 32,027,146                       | 54.00                                             |
| South Sudan                               | 518,428                          | 4.63                                              |
| Spain                                     | 98,615,715                       | 208.30                                            |
| Sri Lanka                                 | 38,275,280                       | 178.75                                            |
| Sudan                                     | 5,711,034                        | 13.02                                             |
| Suriname                                  | 545,058                          | 92.91                                             |
| Sweden                                    | 19,694,254                       | 190.70                                            |
| Switzerland                               | 11,821,090                       | 136.60                                            |
| Syrian Arab Republic                      | 3,264,756                        | 18.66                                             |
| Tajikistan                                | 9,279,471                        | 97.30                                             |
| Thailand                                  | 123,738,218                      | 177.28                                            |
| The United Kingdom                        | 139,482,283                      | 205.50                                            |
Mediterranean demonstrated the highest COVID-19 vaccination coverage, and Africa showed the lowest COVID-19 vaccination rates. By income level, the highest income group indicated the greatest COVID-19 vaccination coverage, while the lowest-income group described the lowest COVID-19 vaccination coverage. As such results represent the economic inequality in COVID-19 vaccination status, international attention is needed on vaccination strategies for underdeveloped countries which have low COVID-19 vaccination coverage.

Populations with higher economic levels or larger incomes demonstrated a higher rate of COVID-19 vaccination. A previous study also reported economic inequality in COVID-19 vaccination coverage.[14, 15] In addition, updated findings from other studies supported the fact that the proportion of the fully vaccinated population was inversely related to the poverty rate in many countries.[14, 16] Considering the low COVID-19 vaccination coverage among...
low-income populations, the incidence and mortality of COVID-19 were also related to economic inequality.[17] Although countries across the sociodemographic spectrum have reported serious concerning trends, improvements of COVID-19 vaccination suggest that the morbidity and mortality inequality worldwide can be decreased.[18-20] Thus, the key message is that by increasing the rate of the fully vaccinated population for COVID-19, economic inequality related to COVID-19 can be reduced.[21] Future studies will needed to monitor and further improve the healthcare system to cope with the COVID-19 era.

4.1 Strengths and Limitations

Our study is subject to several limitations. Firstly, the dataset used in this study did not account for all potential covariates (individual-level data) and vaccine types (ChAdOx1-S [AstraZeneca], BNT162b2 [Pfizer/BioNTech], mRNA-1273 [Moderna], Ad26.COV2.S [Johnson & Johnson–Janssen], and NVX-CoV2373 [Novavax]).[22] Secondly, the limitation of data on COVID-19 vaccines administered through private markets and certain countries impacted the representativeness of the results and lead to underestimation of our findings. Despite of these limitations, our global interpretations have met our objective by supporting international and rapid evidence to solve global emerging issues and economic inequality related to the COVID-19.[23, 24]

5. Conclusion

After introduction of worldwide COVID-19 vaccine coverage, a total of 10,704,043,684 doses of COVID-19 vaccines were administered globally. The total COVID-19 vaccine doses administered exceeded 100% (137.33 per 100 population) worldwide. However, underdeveloped nations and countries with low income have lower vaccination coverage compared to developed and countries with higher income. Thus, international attention is needed on vaccination strategies for underdeveloped countries which have low COVID-19 vaccine coverage.

**Capsule Summary**

After the introduction of worldwide COVID-19 vaccine coverage, a total of 10,704,043,684 doses of COVID-19 vaccines were administered globally.

**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 any results. However, we plan on disseminating the results of this study to any of the study participants or any relevant
communities upon request.

**Data availability statement**

Data of the study are publicly available.

**Transparency statement**

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

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None

**Author Contribution**

Drs SYK and SA 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: SYK and SA; Acquisition, analysis, or interpretation of data: SYK and SA; Drafting of the manuscript: SYK and SA; Critical revision of the manuscript for important intellectual content: SYK and SA; Statistical analysis: SYK; Study supervision: SYK and SA. SYK is guarantor. The corresponding author attests 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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