A Utilitarian Ethical Framework for the Analysis of Public Policies Towards Vaccine Distribution

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Anthony Ouertani

Spring 2022

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

Kent Wayland, Assistant Professor, Department of Engineering and Society

Introduction

Coronavirus infections are a major issue for many countries around the world. Since the start of the pandemic, there have been over 400 million cases and nearly 6 million deaths worldwide. Thankfully, there are over 25 authorized vaccines worldwide (Zimmer et. al, 2020). These vaccines have proved to be an effective tool in preventing hospitalization and death from SARS-CoV-2. To date, over 60% of the world has received a dose of a coronavirus vaccine (Ritchie et. al, 2020). However, there is a wide disparity between countries in vaccination rates as only 10% of people in low-income countries have received at least one dose of a vaccine (Ritchie et. al, 2020). This is an issue for a variety of reasons. The World Health Organization (WHO) recommends that 20% of low-income countries' populations should be vaccinated. By reaching a 20% threshold, a country can vaccinate its health care workers and its high-risk citizens. COVAX, an organization co-led by Coalition for Epidemic Preparedness Innovations (CEPI), Global Alliance for Vaccines and Immunization (GAVI), and the WHO, aims to donate enough vaccine doses to low-income countries so that they can reach this goal. However, a low supply of vaccines has prevented COVAX from reaching their initial goal. One main consequence of a low overall vaccination rate is the possibility for more variants to emerge. As more people become infected, a strain of coronavirus replicates and mutates. A possibility for a mutation that leads to more transmissible exists. This is an issue for everyone worldwide. As diseases do not respect borders, it is possible for a mutation in another country to wreak havoc in a country with a high vaccination rate. A great way to reduce this possibility is to vaccinate as many people as possible to reduce the chances of a more transmissible variant (like Omicron) (CDC, 2019). Russia, China, and the United States have each had unique approaches to providing vaccinations abroad. I will be investigating and analyzing each of these policies to

determine which of these policies led to the greatest number of vaccines donated. The question I will be investigating is "Which of these three countries' policies maximized human well-being?"

Background Information

The idea of a "syndemic" instead of a pandemic has been coined in recent decades. A syndemic is defined as the combination of social, economic, and political factors that all contribute to a health crisis (Jecker et. al, 2021c). Diseases do not exist by themselves in a vacuum. Social conditions such as poverty, overcrowded living situations, and access to treatment can all contribute to the prevalence of the disease. A previous example of a syndemic was the AIDS crisis in inner cities in the 1980s and 1990s (Tsai et al., 2015). Recently, the idea of a syndemic has been applied towards the SARS-CoV-2 pandemic. Facets to this syndemic include the socioeconomic inequality between nations and current nation's policies towards vaccine use and distribution. However, vaccine nationalism has reduced the number of doses these low-income countries have received. In September of 2020, 13% of the world's population (mainly residing in wealthy nations) had secured 51% of the promised doses (Jecker et al., 2021b). As of May in 2021, only 1% of total vaccine doses produced went to Africa (Jecker et al., 2021a). Many low- and middle-income countries are still lagging in vaccination rates as mentioned previously. These outcomes are evidence for how political situations and vaccine nationalism can contribute to this pandemic in other nations. Each nation can be thought of a social group, each with their own vested interests that lead to their policy and decision-making regarding vaccines. Furthermore, many countries have continued to advocate for the distribution of booster shots to fight the effects and spread of the Omicron variant such as the United States.

Other nations, such as China, have made decisions to export over 1 billion vaccine doses (Song, 2021). Russia has taken steps to set up manufacturing plants to produce the Sputnik vaccine (Sullivan, 2021). Even the United States has donated nearly 200 million doses considering their decision to proceed booster shots (Reuters, 2021). My goal is to apply a utilitarian ethical framework towards the United States, Russia, and China's public policy on the distribution of the vaccines they produce. The purpose of this is to explore the research question of "Which of these three countries' policies maximized human well-being?" while using a Utilitarian perspective.

Research Question and Previous Work

I will be using a Utilitarian ethics framework. Utilitarianism is focused on actions and outcomes. What will be the most utilitarian outcome is what produces the greatest good for the greatest amount of people or the actions that promote the least amount of suffering and maximizes well-beings of humans. Previous work completed with a utilitarian framework uses longevity as a criterion when dealing with healthcare policies. In essence, this is a measure of how many years of lost life has been adverted by the implementation of a policy. Other previous work completed by Ferranna et. al uses Utilitarian, Prioritarian, and BCA (benefit cost analysis) frameworks towards the several differing vaccine allocation ideas. In these cases, the results are compared between each of the different frameworks. In summary, applying a utilitarian framework towards who to give vaccines to first resulted in prioritization for older people who are more at risk of disease and lower-income individuals who are more disproportionately affected by the disease (Ferranna et. al, 2021). One big take away from this body of work was its focus on vaccine allocation to different demographic groups withing a singular country. My work will differ in its focus on vaccine allocation internationally by examining the policies of

China, the United States, and Russia. In this scenario, like the previous work, I believe the most utilitarian outcome will be the policy that averts the greatest number of years of lives lost and thus leads to the most amount of wellbeing. By accomplishing this, the resolution would be a suggestion for a public policy that an upper-income country should adopt in the hope of achieving the most utilitarian outcome.

Methods

In essence, this will be a policy analysis and case comparison between the policies of China, the United States, and Russia. Detailed accounts of each of these countries' actions since the beginning of the pandemic will be needed. A utilitarian perspective will be applied to each of these policies. There are several measures of well-being when it comes to utilitarianism. A measure of well-being that I use includes the idea that lower-income countries have less robust healthcare systems. An upper income country will be more able to deal with an increase in cases in treating patients and thus there would be less suffering and death from the same level of disease. Evidence includes the United States', China's, and Russia's public health policies regarding booster shots (which can come from state department announcements or speeches), vaccine donations to other countries and COVAX, and domestic vaccinations. Vaccine donations were tracked through state department announcements and through UNICEF, which tracks which countries have donated vaccines and who they have donated them to. The UNICEF COVID-19 Vaccine Market Dashboard was used to track donations as they can be verified with the sources included in the dashboard (UNICEF, 2022). Based on these actions, I determined all the ways that each of these three countries have generated vaccine doses since vaccinations began. This can be broken down into actual donation of doses, promised doses to other nations, technology transfer necessary to make doses, money donated to groups such as COVAX to produce

vaccines. I can further break these numbers down into who these doses have gone to (low, low-middle, and upper-income countries). Other sources of evidence will include news articles and tertiary sources that can provide a detailed account on each nation's policy to date regarding vaccine donations. After I have all this information gathered, I can use the criteria I have defined to analyze these different policies. The ultimate criteria I used was how many doses a country donated to low and lower-middle income countries along with other policies relating to their donations such as the period. In previous work with using utilitarianism to guide vaccine allocation policies domestically, a value known as the social value of mortality risk reduction (SVRR) was used (Ferranna et. al, 2021). This value is used to numerically demonstrate which group benefitted the most (by avoiding a decrease in well-being) from vaccination. This value can take into account if a group is more susceptible to severe covid disease such as a more elderly population or a lower-income population. I will be focusing on the income of a country and will not be using this value of mortality risk reduction. This value requires a lot of statistical knowledge that I do not possess. However, in future research, I recommend using this value as a metric.

Results and Analysis

China's Policy

China has two companies, Sinopharm and Sinovac, that produce most of their vaccines. The Sinovac is an inactivated vaccine that is approved in 54 countries and has WHO emergency use authorization (Viper, 2022). The Sinopharm vaccine is also an inactivated vaccine that is approved in 90 countries and has WHO emergency use authorization (Viper, 2022). To date, China has promised over 125 million vaccine doses to countries around the world and has delivered on

over 103 million of those doses. From the beginning of the pandemic, China has placed big emphasis on donating vaccines and aiding developing countries to gather vaccine doses. In early 2021, China made an announcement of aiding nearly 20 African countries with vaccines. In late 2020, Sinopharm invited 50 diplomats from African countries to tour its vaccine manufacturing facility (Yang et al., 2020). Statements from Sinopharm chairman such as "Sinopharm stands ready to work with the African people to deepen cooperation in the fight against and pandemic, consolidate China-Africa friendship and make an important contribution to the joint development of the China-Africa health community" heavily indicate the goal of a close relationship and collaboration with African nations. One such example is that the company Sinovac reached a deal with Egypt to produce vaccines within the country so that it can be a source of vaccines for the whole African (Mourad et. al, 2021). Out of the 125 million promised doses, over 35 million were promised to African nations and over 22 million doses have been delivered. Out of a possible 54 countries in Africa, China has delivered doses to 41 of them and out of those 41 countries, 36 of them are low-income and lower-middle income nations (World Bank Data Help Desk, 2022). China also placed a large emphasis on helping other countries in Asia. Examples of this include a Chinese foreign minister touring every country within southeast Asia with promises of aiding deal with the pandemic (Poling et. al, 2022). Out of a possible 48 countries within the Asian continent, China provided vaccines to 29 of those countries. Out of these 29 countries, 18 of them are classified as low and lower-middle income countries. Over 77 million doses were promised and over 68 million doses have been delivered to those countries so far. China has donated vaccines to 13 countries within Latin America and the Caribbean out of a possible 42 countries. Over 7 million doses have been promised and over 7 million doses have been donated. Five of these countries are classified as lower-middle income countries. One important note is that all of China's vaccine

doses that have been donated and delivered have been through bilateral agreements (Nakkazi et. al, 2021). None of the donations were made through COVAX. The World Health Organization is against these bilateral deals and strongly suggests that countries receive vaccines through COVAX. However, COVAX has not reached its initial vaccination goals worldwide, making it easier for other countries in Asia, Africa, and South America to accept donations through these bilateral agreements (Lee, 2021). All the data gathered is shown in Figure 1.

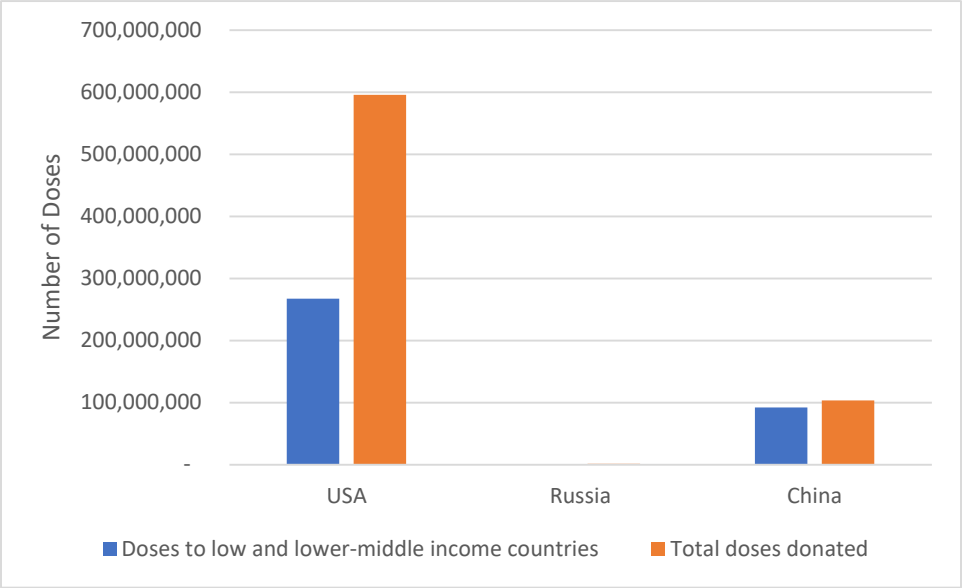

Figure 1. Total Doses Donated by the United States, Russia, and China

Russia's Policy

Russia has developed their own coronavirus vaccine, Sputnik V, under the Gamaleya Research Institute. This vaccine is an adenovirus-based vaccine and was one of the first registered Covid-19 vaccines (Gamaleya National Center, 2022). Sputnik V is about 91% effective (Hill et. al, 2021). Sputnik V does not have emergency use authorization and is not approved by the WHO. Some countries such as the United States only accept visitors who have

been vaccinated by FDA or WHO approved vaccines. The approval process of the vaccine has been delayed by the WHO due to concerns with the manufacturing process and lingering concerns with insufficient data. However, Sputnik V is approved in 74 countries. Publicly, Russia greatly emphasized that their vaccine was the first to be approved and quickly secured deals with several countries to produce and distribute the vaccine. Examples of this include Argentina and Serbia who began producing Sputnik V doses in mid-2021 (Person, 2021). However, Russia has had issues with scaling up production processes and technology transfers to other countries (Hill et. al, 2021). Russia seemed to take advantage where western countries faltered early in the pandemic in selling vaccines with decisions by the United States to ban exports on materials necessary to produce vaccines overseas (Abayawardena, 2021). As of May 2021, Russia had promised to sell about 800 million doses of their Sputnik V vaccine to countries. However, they delivered on only 33 million of their doses (Kier et. al, 2021). Some of these countries include many African countries which were only left with a few thousand doses each. Worldwide, Russia has not participated with COVAX. To date, Russia has promised 2,545,000 doses as donations and has delivered 1,427,500 doses to 21 countries. Out of their 1,427,500 delivered doses, only 141,000 have been donated to African countries. Only 5 African countries received donations. Out of a possible 48 countries in the Asian continent, Russia has delivered 723,500 doses to 10 of those countries. In total, Russia has donated 937,000 doses to 13 low and lower-middle income countries. As with China, all of Russia's vaccine donations have been accomplished through bilateral deals.

United States' Policy

The United States has three approved vaccines from Pfizer, Johnson and Johnson and Moderna. Each of the vaccines are authorized by the WHO. The United States' early global

response was marred with nationalistic decisions. When the Defense Production Act was enacted in early 2021, there was an embargo on exporting raw materials necessary to produce vaccines so that there could be a focus on domestic production (Sirur et. al, 2021). As of March 8th, 2021, the United States had enough doses stockpiled to vaccinate more than double its population (Shah, 2021). Another controversy occurred in March of 2021 when tens of millions of doses of AstraZeneca's vaccine were produced in the United States. Despite the vaccine not being approved in the United States, they refused to release them to other countries that desperately needed them. To date, AstraZeneca's vaccine is not approved in the United States (Weiland et. al, 2021). As of July 2021, the United States had a surplus of over a billion doses (Graziosi, 2021). Decisions to provide booster shots to their citizens instead of emphasizing the donations of vaccines have also been greatly criticized by the WHO. Despite these controversies and the stockpiling of doses, the United States has taken steps to increase vaccine equity around the world. In September of 2021, the United States announced plans of donating over 1 billion doses by September of 2022 (Mason et. al, 2021). These extra announced doses are to be donated to low and lower-middle income countries. To date the United States has facilitated 596,409,410 doses and has delivered 526,731,930 doses to 120 countries. Out of the 526 million delivered doses, 178,186,110 million doses have gone to 48 African countries. Out of the 526 million delivered doses, 279, 732,890 million doses have gone to 38 countries in Asia and the Pacific region. The United States have donated 267,381,120 million doses to 24 low and low-middle income countries. Over 340 million doses have been facilitated to these countries through COVAX. It is important to note that not all the United States' donations were bilateral as some of them were done through COVAX. In fact, most of their donated doses (435 million) were accomplished through COVAX.

In summary, China took an early step in donating doses to low and lower-middle income countries in Africa and Asia when other developed countries were not. Russia touted their 1st to the market vaccine and secured hundreds of millions of doses but failed to execute on delivering them. The extent of Russia's vaccine donations were miniscule in comparison to that of China and the United States. The United States faltered in their early vaccine donations. However, they later stepped up and have now donated over 4 times as many vaccines as China has with a great emphasis on vaccines donated to African and Asian countries. When considering the most Utilitarian approach, both China's and the United States' policies have utilitarian attributes. The United States ultimately donated more doses to low and low-middle income countries. However, their initial focus in responding to the pandemic was not focused on donating vaccines to these countries that had no way of obtaining vaccines to combat the pandemic. Previous mathematical modeling demonstrated that more deaths could be prevented worldwide if stockpiled doses were distributed more equally. This model placed a focus on distributing vaccines based on population sizes (GAVI, 2020). Neither China nor the United States did that. However, during the beginning of vaccinations, one could say that China had a vaccine distribution policy that was based more on Utilitarianism since more deaths were prevented by focusing on vaccinating countries that were not receiving vaccines at all. One could also say that the United States currently has a policy based on Utilitarianism as they have now surpassed China on donations to these low and low-middle income countries. When it comes to maximizing the general well-being and health of individuals around the world, these initial vaccines provided by China helped greatly with many of these countries abilities to vaccinate their own health workers to deal with the pandemic. A recent report stated that the death toll from Covid-19 was four times greater in lower- income countries than in higher income ones (Rusu, 2021). Therefore, the policies that would place more

emphasis on donating vaccines to lower-income countries would also be considered the most utilitarian.

Conclusion

In conclusion, both China and the United States implemented Utilitarian policies. However, when it comes to the United States, they faltered in the beginning of the pandemic and were not focused on donating vaccines abroad. Previous models and reports have demonstrated that lower income countries had higher death tolls than higher income countries when it comes to covid-19. Thus, when devising a Utilitarian policy, it is important to place focus on distributing vaccines to lower income countries if one wants to maximize well being and prevent deaths. This is important for not only the current pandemic but also for any future endemics and pandemics. For further research, I would recommend using the social value of mortality risk reduction as another metric of policy success.

References

Abayawardena, S. C. (2021, April 30). *India is burning, and the West keeps hoarding vaccines*. POLITICO. Retrieved April 15, 2022, from https://www.politico.eu/article/india-west-eu-us-coronavirus-vaccines/

Centers for Disease Control and Prevention. (n.d.). *What you need to know about variants*. Centers for Disease Control and Prevention. Retrieved February 18, 2022, from https://www.cdc.gov/coronavirus/2019-ncov/variants/about-variants.html

Ferranna, M., Sevilla, J. P., & Bloom, D. (2021). Addressing the COVID-19 pandemic: Comparing alternative value frameworks. https://doi.org/10.3386/w28601

Gamaleya National Center. (2022). *FAQ*. Sputnik V - the first registered vaccine against COVID-19. Official website vaccine against coronavirus Sputnik V. Retrieved April 15, 2022, from https://sputnikvaccine.com/faq/

GAVI. (2020, November 14). *Equitable covid-19 vaccine distribution will lead to the biggest reduction in deaths*. Gavi, the Vaccine Alliance. Retrieved April 15, 2022, from https://www.gavi.org/vaccineswork/equitable-covid-19-vaccine-distribution-will-lead-biggest-reduction-deaths

Graziosi, G. (2021, July 20). *Millions of Covid vaccines could go to waste as states stockpile them*. The Independent. Retrieved April 15, 2022, from https://www.independent.co.uk/news/world/americas/millions-covid-vaccine-waste-states-b1887542.html

Hill, I., Jackson, L., Zimmermann, F. B., & Mac'Ouma, E. (2021, September 14). *Russia and China's vaccine diplomacy: Not quite the geopolitical slam dunk*. Australian Institute of International Affairs. Retrieved April 15, 2022, from https://www.internationalaffairs.org.au/australianoutlook/russia-and-chinas-vaccine-diplomacy-not-quite-the-geopolitical-slam-dunk/

Jecker, N. S., & Lederman, Z. (2021a). Three for me and none for you? an ethical argument for delaying COVID-19 boosters. *Journal of Medical Ethics*. https://doi.org/10.1136/medethics-2021-107824

Jecker, N. S., Wightman, A. G., & Diekema, D. S. (2021b). Vaccine ethics: An ethical framework for global distribution of COVID-19 vaccines. *Journal of Medical Ethics*. https://doi.org/10.1136/medethics-2020-107036

Jecker, N., & Atuire, C. (2021c). Out of Africa: A Solidarity-based approach to vaccine allocation. Hastings Center Report. https://doi.org/10.1002/hast.1250

Kier, G., & Stronski, P. (2021, August 3). *Russia's vaccine diplomacy is mostly smoke and mirrors*. Carnegie Endowment for International Peace. Retrieved April 15, 2022, from https://carnegieendowment.org/2021/08/03/russia-s-vaccine-diplomacy-is-mostly-smoke-and-mirrors-pub-85074

Lee, S. T. (2021, July 6). *Vaccine diplomacy: Nation branding and China's COVID-19 soft power play*. Place Branding and Public Diplomacy. Retrieved April 15, 2022, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8259554/

Mourad, M., & Abolfadl, A. (2021, June 7). *Egypt to start local production of Sinovac vaccine mid-june- minister*. Reuters. Retrieved March 25, 2022, from https://www.reuters.com/world/middle-east/egypt-start-local-production-sinovac-vaccine-mid-june-minister-2021-06-07/

Nakkazi, K. C. & E., Cullinan, K., & Nakkazi, E. (2021, March 4). *Russian and chinese bilateral vaccine deals & donations outmaneuver europe & united states*. Health Policy Watch. Retrieved April 15, 2022, from https://healthpolicy-watch.news/russia-and-chinas-bilateral-vaccine/

Person. (2021, June 4). *Serbia and Argentina start producing Russia's sputnik v vaccine*. Reuters. Retrieved April 15, 2022, from https://www.reuters.com/business/healthcare-pharmaceuticals/serbia-argentina-start-producing-russias-sputnik-v-vaccine-2021-06-04/

Person, & Jeff Mason, C. O. (2021, September 22). *Under pressure, U.S. donates half billion more COVID-19 vaccine doses to world*. Reuters. Retrieved April 15, 2022, from https://www.reuters.com/world/us/biden-pledges-new-vaccine-donations-bid-rally-global-pandemic-fight-2021-09-22/

Poling, G., & Hudes, S. (2022, April 20). *Vaccine diplomacy is Biden's first test in Southeast Asia*. Vaccine Diplomacy Is Biden's First Test in Southeast Asia | Center for Strategic and International Studies. Retrieved April 15, 2022, from https://www.csis.org/analysis/vaccine-diplomacy-bidens-first-test-southeast-asia

Reuters. (2021, October 21). *U.S. coronavirus vaccine donations reach 200 million doses ...* Retrieved December 1, 2021, from https://www.usnews.com/news/top-news/articles/2021-10-21/us-coronavirus-vaccine-donations-reach-200-million-doses.

Ritchie, H., Mathieu, E., Rodés-Guirao, L., Appel, C., Giattino, C., Ortiz-Ospina, E., Hasell, J., Macdonald, B., Beltekian, D., & Roser, M. (2020, March 5). *Coronavirus (COVID-19) vaccinations*. Our World in Data. Retrieved February 18, 2022, from https://ourworldindata.org/covid-vaccinations

Rusu, L. (2022, March 3). *Covid-19 death toll four times higher in lower-income countries than Rich Ones*. Oxfam International. Retrieved April 15, 2022, from https://www.oxfam.org/en/press-releases/covid-19-death-toll-four-times-higher-lower-income-countries-rich-ones

Shah, S. (2021, August 13). *Column: Why the U.S. must lead in COVID-19 vaccine diplomacy - HS Today*. Hstoday. Retrieved April 15, 2022, from https://www.hstoday.us/subject-matter-areas/coronavirus/column-why-u-s-must-lead-in-covid-19-vaccine-diplomacy/

Sirur, S., Rampal, N., Gupta, M., & Chitnis, P. C. (2021, April 21). *US embargo on exporting Covid vaccine raw materials and how it could impact India*. ThePrint. Retrieved April 15, 2022, from https://theprint.in/theprint-essential/us-embargo-on-exporting-covid-vaccine-raw-materials-and-how-it-could-impact-india/643374/

Song, W. (2021, October 9). *Covid-19 vaccines: Has China made more than other countries combined?* BBC News. Retrieved December 1, 2021, from https://www.bbc.com/news/58808889.

Sullivn, J. (2021, September 9). *Covid-19 manufacturing roundup: Russia will produce sputnik V in Peru - report; CEPI calls for established vaccine use in trials*. Endpoints News. Retrieved December 1, 2021, from https://endpts.com/covid-19-manufacturing-roundup-russia-will-produce-sputnik-v-in-peru-report-cepi-calls-for-established-vaccine-use-in-trials/.

Tsai, A. C., & Venkataramani, A. S. (2015). Syndemics and Health Disparities: A methodological note. AIDS and Behavior, 20(2), 423–430. https://doi.org/10.1007/s10461-015-1260-2

UNICEF. (2022, March 22). *Covid-19 vaccine market dashboard*. UNICEF Supply Division. Retrieved April 15, 2022, from https://www.unicef.org/supply/covid-19-vaccine-market-dashboard

Viper. (2022). *Sinovac: Coronavac*. COVID. Retrieved March 25, 2022, from https://covid19.trackvaccines.org/vaccines/7/

Weiland, N., & Robbins, R. (2021, March 11). *The U.S. is sitting on tens of millions of vaccine doses the world needs*. The New York Times. Retrieved April 15, 2022, from https://www.nytimes.com/2021/03/11/us/politics/coronavirus-astrazeneca-united-states.html

World Bank Data Help Desk. (2022). *World Bank Country and lending groups*. World Bank Country and Lending Groups – World Bank Data Help Desk. Retrieved April 15, 2022, from https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

Yang, L., & Jing, Z. (2020, October). *50 African diplomats visit Chinese coronavirus vaccine maker*. CTGN. Retrieved March 25, 2022, from https://news.cgtn.com/news/2020-10-16/50-African-diplomats-visit-Chinese-coronavirus-vaccine-maker-UDKAcH773O/index.html

Zimmer, C., Corum, J., Wee, S.-lee, & Kristoffersen, M. (2020, June 10). *Coronavirus vaccine tracker*. The New York Times. Retrieved February 18, 2022, from https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html

Appendix

Table 1. United States Vaccine Donations

Recipient Country	Amount Delivered	Doses Facilitated	Type of Country
Afghanistan	4,320,050	-	L
Algeria	604,800	-	LM
Angola	7,901,220	10,726,560	LM
Angtigua/Barbuda	73,350	-	H
Argentina	3,500,000	-	UM
Bahamas	295,850	-	H
Bangladesh	14,600,000	-	LM
Bangladesh	61,221,290	118,425,060	LM
Barbados	140,400	-	H
Belize	228,150	-	LM
Benin	710,190	1,306,890	LM
Bhutan	590,090	90,090	LM
Bolivia	4,506,300	8,082,360	LM
Bosnia/Herzegovina	96,000	-	UM
Botswana	182,520	201,240	UM
Brazil	5,187,300	-	UM
Burkina Faso	2,254,650	3,439,800	L

Cabo Verde	400,790	352,170	LM
Cambodia	1,060,100	7,516,080	LM
Cameroon	791,150	432,900	LM
Canada	1,000,000	-	H
Central African Republic	907,320	430,560	L
Chad	552,890	726,570	L
Colombia	6,000,000	-	UM
Comoros	160,290	250,380	LM
Congo (DRC)	1,499,880	6,446,700	L
Costa Rica	1,500,800	-	UM
Cote d'Ivoire	6,605,410	7,599,150	LM
Djibouti	180,450	230,490	LM
Dominica	11,700	-	UM
Dominica	63,180	94,770	UM
Ecuador	2,000,000	-	UM
Egypt	24,999,030	44,272,800	LM
El Salvador	684,450	3,188,570	LM
Eswatini	503,640	201,240	LM
Ethiopia	9,087,170	9,962,550	L
Fiji	150,080	-	UM

Gabon	472,200	758,160	UM
Gambia	403,020	160,290	L
Georgia	500,000	-	UM
Ghana	9,605,110	9,831,510	LM
Grenada	29,250	-	UM
Grenada	69,030	69,030	UM
Guatemala	8,500,000	-	UM
Guinea	2,302,290	3,593,070	L
Guinea-Bissau	302,400	-	L
Guyana	146,250	-	UM
Guyana	142,740	142,740	UM
Haiti	836,800	696,150	LM
Honduras	3,976,710	1,573,650	LM
Indonesia	35,781,970	54,281,710	LM
Iraq	503,100	-	UM
Jamaica	617,760	-	UM
Jordan	500,000	-	UM
Kenya	990,990	-	LM
Kenya	16,000,920	10,591,100	LM
Kiribati	-	53,820	LM

Kosovo	1,054,170	1,054,170	UM
Kyrgyzstan	458,640	458,640	LM
Lao	2,706,840	2,699,190	LM
Lebanon	336,000	-	UM
Lesotho	770,970	696,150	LM
Liberia	1,098,210	814,320	L
Libya	1,408,680	2,809,170	UM
Madagascar	1,384,250	2,010,060	L
Malawi	1,399,200	4,577,040	L
Malayasia	1,000,000	-	UM
Maldives	439,920	512,460	UM
Mali	587,820	1,082,250	L
Mauritania	1,411,020	444,600	LM
Mauritius	387,270	387,270	UM
Mexico	10,410,900	-	UM
Mongolia	1,088,100	1,088,100	LM
Morocco	2,752,380	2,449,980	LM
Mozambique	3,494,600	10,635,300	L
Myanmar	-	4,048,200	LM
Nambia	-	-	UM

Nambia	267,930	484,380	UM
Nepal	3,798,800	9,990,630	LM
Nicaragua	962,910	305,370	LM
Niger	1,205,370	1,559,610	L
Nigeria	25,789,770	30,576,780	LM
Pakistan	4,700,000	-	LM
Pakistan	56,000,080	61,003,800	LM
Palau	6,200	-	H
Panama	503,100	-	UM
Papau New Guinea	302,400	-	LM
Paraguay	2,000,000	-	UM
Peru	2,000,000	-	UM
Philippines	33,307,210	41,254,200	LM
South Korea	1,413,000	-	H
Moldova	403,020	480,870	UM
Rwanda	999,180	-	L
Rwanda	5,295,630	4,658,940	L
Saint Kitts and Nevis	18,000	-	H
Saint Lucia	52,650	-	UM
Saint Lucia	115,830	115,830	UM

Saint Vincent and the Grenadines	35,100	-	UM
Saint Vincent and the Grenadines	70,200	70,200	UM
Samoa	-	45,630	LM
Senegal	1,840,530	3,999,060	LM
Seychelles	79,560	74,880	H
Sierra Leone	562,080	961,740	L
Solomon Islands	153,270	188,370	LM
Somalia	889,280	1,045,980	L
South Africa	7,877,610	2,217,150	UM
South Sudan	656,950	-	L
Sri Lanka	187,200	-	LM
Sri Lanka	3,408,370	1,908,270	LM
Sudan	2,386,430	4,496,310	L
Suriname	267,200	-	UM
Taiwan	4,000,000	-	H
Tajikistan	2,822,200	3,400,020	LM
Thailand	3,503,470	-	UM
the Republic of the Congo	1,129,110	1,519,830	L
Timor-Leste	201,240	201,240	LM
Togo	1,446,330	1,638,000	L

Tonga	-	7,020	UM
Trinidad and Tobago	-	685,050	H
Tunisia	2,803,890	2,955,420	LM
Uganda	14,850,230	19,390,410	L
Ukraine	3,187,590	8,181,810	LM
Tanzania	4,952,460	3,724,110	LM
Uruguay	500,000	-	H
Uzbekistan	7,626,240	10,169,640	LM
Viet Nam	39,650,490	33,650,370	LM
West Bank/Gaza	703,580	999,180	L
Yemen	319,200	-	L
Zambia	3,041,040	2,954,250	LM
Total	**526,731,930**	**596,409,410**	

Table 2. China Vaccine Donations

Recipient Country	**Amount Promised**	**Amount Delivered**	**Type of Country**
Afghanistan	3,700,000	2,700,000	L
Algeria	200,000	200,000	LM
Angola	200,000	200,000	LM
Bangladesh	7,600,000	7,600,000	LM
Benin	100,000	100,000	LM
Bhutan	50,000	50,000	LM
Bolivia	3,500,000	3,500,000	LM
Burkina Faso	400,000	400,000	L
Burundi	500,000	500,000	L
Cabo Verde	50,000	50,000	LM
Cambodia	10,233,000	8,403,000	LM
Cameroon	200,000	200,000	LM
Central African Republic	150,000	150,000	L
Chad	200,000	200,000	L
Comoros	100,000	100,000	LM
Congo (DRC)	800,000	800,000	L
Cote d Iviore	100,000	100,000	LM
Djibouti	200,000	200,000	LM

Egypt	2,600,000	2,600,000	LM
El Salvador	1,100,000	1,100,000	LM
El Salvador	750,000	750,000	LM
Ethiopia	3,900,000	3,900,000	L
Guinea	400,000	400,000	L
Guinea-Bissau	300,000	300,000	L
Indonesia	1,200,000	1,200,000	LM
Iran	1,350,000	1,350,000	LM
kenya	200,000	200,000	LM
Kiribati	90,000	90,000	LM
Kyrgyzstan	1,800,000	1,800,000	LM
Lao	7,302,000	7,302,000	LM
Lesotho	203,340	203,340	LM
Madagascar	300,000	300,000	L
Mauritania	50,000	50,000	LM
Mongolia	300,000	300,000	LM
Mozambique	1,260,000	1,260,000	L
Myanmar	11,500,000	11,500,000	LM
Nepal	3,400,000	3,400,000	LM
Nicaragua	200,000	200,000	LM

Niger	400,000	400,000	L
Pakistan	6,220,000	6,220,000	LM
Papau New Guinea	200,000	200,000	LM
Philippines	4,000,000	4,000,000	LM
Rwanda	500,000	500,000	L
Senegal	300,000	300,000	LM
Sierra Leone	400,000	400,000	L
Solomon Islands	50,000	50,000	LM
Somolia	700,000	700,000	L
South Sudan	100,000	-	L
Sri Lanka	3,000,000	3,000,000	LM
Sudan	250,000	250,000	L
Syria	1,800,000	1,800,000	L
Tajikstan	1,800,000	300,000	LM
The republic of the Congo	400,000	400,000	L
Timor-Leste	100,000	1,000,000	LM
Togo	400,000	400,000	L
Tunisia	1,100,000	1,100,000	LM
Uganda	1,000,000	1,000,000	L
Tanzania	1,500,000	1,500,000	LM

Vanuatu	180,000	180,000	LM
Viet Nam	7,300,000	1,800,000	LM
West Bank/Gaza	600,000	600,000	L
Zambia	1,100,000	500,000	LM
Zimbabwe	11,900,000	1,900,000	LM
Total	**111,788,340**	**92,158,340**	

Table 3. Russia Vaccine Donations

Recipient Country	**Amount Promised**	**Amount Delivered**	**Type of Country**
Antigua/Barbados	2,000	1,000	H
Belarus	250,000	250,000	UM
Benin	100,000	100,000	LM
Bosnia/Herzegovina	5,000	-	UM
Gabon	20,000	20,000	UM
Georgia	20,000	6,500	UM
Guinea	10,000	10,000	L
Kyrgyzstan	700,000	240,000	LM
Lao	60,000	60,000	LM
Mongolia	300,000	-	LM
Montengro	40,000	40,000	UM
Nicaragua	100,000	100,000	LM
Philipinnes	5,000	5,000	LM
Moldova	210,000	172,000	UM
Seychelles	1,000	1,000	H
Sierra Leone	10,000	10,000	L
Sri Lanka	300,000	-	LM
Syria	250,000	250,000	L

Tajikstan	50,000	50,000	LM
Vietnam	102,000	102,000	LM
West Bank/Gaza	10,000	10,000	L
Total	2,545,000	1,427,500	