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Boao Forum for Asia

Report on the Global Use of Covid-19 Vaccines

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Covid-19 Vaccines**

Boao Forum for Asia Academy
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Abstract

Since the beginning of 2020, the outbreak and worldwide spread of the coronavirus disease (COVID-19) has caused the most serious global public health crisis in a century. By mid-2021, the pandemic is still raging around the world.

At the same time, through fast research and development, first generation COVID-19 vaccines are showing promising resistance against the virus and have become the main means of controlling the spread of the pandemic.

However, vaccinations are faced with serious global imbalances. This report seeks to present an depth picture of how the COVID-19 vaccines are currently being used globally. This includes critical discussions around its research and development, production, applications, effects, and future prospects.

This report points out that COVID-19 vaccines are among the most fastest-developed vaccines for infectious diseases in all of human history. Although the development of vaccines was urgent, the

safety of the vaccines has been effectively guaranteed too. It's also a remarkable change that emerging countries like China have once again joined in emergency vaccine development.

Although the effectiveness of vaccines have been challenged by virus mutations, this report suggests that vaccines are still highly effective in resisting the virus.

The ultimate length to which the pandemic will now last is largely dependent on whether the development and distribution of vaccines can keep up with the speed and spread of variant mutations.

At present, the total production capacity of the COVID-19 vaccines worldwide is expected to meet the needs of global herd immunity by the end of 2021. However, the question is whether or not vaccine production capacity can be put in place as scheduled. Questions loom if it can be distributed fairly and reasonably across the world.

Improving the availability and affordability of vaccines in developing countries is the most prominent problem faced by the international community in the fight against the pandemic. As long as there is an "immunization gap" between underdeveloped countries and developed countries, the world will face increase public health risks. The same holds true if countries have not reached the herd immunity threshold—the virus can menace.

According to the facts and data, the United States stockpiled a huge

amount of vaccines domestically. But there is a relatively huge gap between the amount they offered to the rest of the world and the quantities they're capable of providing. For the European Union, the vaccine distribution policy focuses on ensuring inoculation rates for only EU member states. In fact, they mainly export the vaccines to middle-income and high-income countries. The G7 Summit promised to donate 1 billion doses of the COVID-19 vaccine to poor countries by the end of 2022. However, this is still far from the actual global demand for vaccines. On the other hand, China's vaccine aid and exports have exceeded the total of other countries; export destinations are mainly sent to developing countries. The existing international COVAX vaccine distribution program is not mandatory for governments. It's urgent for the international community to establish a fair and efficient international vaccine distribution mechanism in order to ensure the universal supply of vaccines on a global scale. This is of paramount importance.

International discussions on vaccine allocation have highlighted different views on the private and public attributes of vaccines. The "vaccine diplomacy" argument is the latest manifestation of the politicization of the fight against the pandemic. This sad state of affairs also reflects growing ideological friction tainting international relations. Indeed, "vaccine nationalism" has continuously widened the inequality in vaccine distribution among countries, significantly delaying the progress of the international fight against the pandemic.

This report proposes that the international community should establish an effective coordination mechanism to solve the

problem of vaccine availability in underdeveloped countries. The world's major vaccine producing countries and major international cooperation mechanisms, such as the Group of Twenty (G20), should hold special intergovernmental meetings on vaccine supply. They should come together to summarize and sort out the vaccine demands around the world, especially in the developing countries. This entails making a global vaccine distribution plan combining bilateral and multilateral cooperation on a fair and reasonable basis. In order to end the inconveniences caused by international travel restrictions as soon as possible, the international community should also strengthen coordination on the issue of "vaccine passports" This will allow the world to reach a fair and effective travel plan among countries.

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I. An Overview on the Global Vaccine Development

Since the beginning of 2020, the outbreak and worldwide spread of the coronavirus disease (COVID-19) has caused the most serious global public health crisis in a century, resulting a heavy loss of life and property to the world. According to statistics from the World Health Organization, as of July 20, 2021, there were 190,671,330 confirmed COVID-19 cases worldwide, with a total of 4,098,758 deaths¹.

In view of the severity of the pandemic, countries that have R&D capabilities soon began vaccine research and development at the beginning of the disease outbreak in early 2020. To

combat COVID-19, the world has seen widespread research and development in many countries, plus quick global marketing of COVID-19 vaccines. As of July 16, 2021, there were a total of 135 vaccine candidates worldwide, with a total of 391 vaccines in trials, including 36 in Phase I clinical trials, 54 in Phase II clinical trials, and 40 in Phase III clinical trials. There are presently 20 vaccines being approved for use². Compared with the development of other infectious disease vaccines, the development of COVID-19 vaccines has several distinctive features.

The COVID-19 vaccine is one of the most fastest-developed

1 World Health Organization, "WHO Coronavirus (COVID-19) Dashboard," <https://covid19.who.int/>, access time: July 20, 2021.

2 COVID-19 Vaccine Tracker, <https://covid19.trackvaccines.org/vaccines/>, access time: July 21, 2021.

vaccines to battle infectious diseases in human history

The development of traditional vaccine usually undergo five stages. In the first stage, the vaccine design, concept verification, and pre-clinical testing research are conducted to test the safety and effectiveness of the sample vaccine on animals. The second to the fourth stages are clinical trials in which data about vaccine's safety and effectiveness on populations with different physical signs can be obtained by gradually enlarging the test scope. The fifth stage is the post-market surveillance stage.

After the vaccine is approved, real-world studies can be used to observe and study the side effects of vaccines after taking shots and understanding the long-term impact of the vaccine on the human body.

The traditional model of vaccine development usually follows these steps. However, in the development of the COVID-19 vaccines, joint efforts were made at each stage¹ to maximize the research and development efficiency.

According to research data from Johns Hopkins University, it usually takes 5-10 years to develop a vaccine. Sometimes the process is even longer, as time spent evaluating whether the vaccine is safe and effective in clinical trials. There is also time invested completing regulatory approval procedures and manufacturing sufficient vaccine doses for distribution.

Before the COVID-19 vaccine, the fastest-developed vaccine in history was the one for mumps launched in 1967, which took four years².

1 World Health Organization: "Update on COVID-19 vaccine development.", *The Latest On The Covid-19 Global Situation & Vaccine Development*, Last Update December 21, 2020, pp. 11-15.

2 Will Brothers, "A Timeline of COVID-19 Vaccine Development," *BioSpace*, Dec 03, 2020.

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By stark contrast, the COVID-19 vaccine broke the historical record of conventional vaccine research development. Some took only a few months, making it one of the fastest vaccines from development to approval in history.

With the accelerated development of the COVID-19 vaccines, the strong regulatory requirements of every government have provided effective guarantees of vaccine safety

Compared with the previous vaccine development process, the regulatory process and requirements in the COVID-19 vaccine development have no substantial changes. Regulators at the national level have not neglected product safety in vaccine development in spite of the accelerated development process. In terms of the supervision of adverse reactions, the monitoring of safety data, and the follow-up

of long-term vaccine performance, governments of the world haven't lowered their safety requirements on the COVID-19 vaccines due to emergency use. Research and development institutions are also required to strengthen their management framework while reporting vaccine testing and R&D results to national drug management authorities of their respective countries in a timely manner.

China and other emerging economies have once again joined in the emergency vaccine development

Cutting edge technology and organizational capability are required for a country to successfully develop a new vaccine in a very short time. Only a few developed countries could do this in the past.

However, in this global race for the development of COVID-19

vaccines, China and Russia are among the top players. They basically keeping pace with developed countries in Europe and the US. India, as a major country for developing generic drugs, has played an important role in the processing and production of vaccines from the EU and US.

This is a remarkable change in vaccine development. China's Sinopharm and Sinovac's inactivated vaccines, the British viral vector vaccine processed by the Serum Institute of India, as well as mRNA vaccines and viral vector vaccines developed in the EU, have all been certified by the WHO. These are all being provided in various ways to dozens of countries across the world.

It is not accidental that China has been able to rank among the forefront in the development of the COVID-19 vaccines. For many years, China has attached great importance to improve its

healthcare system and vaccine development jobs. Under the leadership of President Xi Jinping, China has formulated a "Healthy China" strategy and action plan. This has enabled China to build a strong technological foundation and basis in human resources by significantly increasing investment in healthcare. It has also allowed for huge investments and technical expertise in the fields of science and technology.

In the fight against the pandemic, the Chinese government puts "people-oriented" and "life first" in the first place. This is also been reflected in the development and application of vaccines.

Enterprises in different countries have demonstrated amazingly high efficiency in vaccine manufacturing

AstraZeneca Pharmaceuticals will have a production capacity

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of 3 billion doses in 2021¹. Pfizer will have a production capacity of 3 billion doses in 2021 and is expected to increase the capacity to 4 billion doses in 2022². The vaccine production capacity of China's Sinopharm will reach 3 billion doses in 2021, and the production capacity of another major Chinese vaccine, Sinovac, will also reach 2 billion doses per year.³ Significant growth in the global production capacity can be expected due to the huge global demands for vaccines.

Effective use of multiple technology routes in the development of COVID-19 vaccines has diversified vaccine choices for the world

Different vaccines are based on different principles and resist the virus in different ways. The features of the five main technology routes are shown below: Inactivated vaccines, mRNA vaccines, and Viral vector vaccines are currently the three most widely used and most productive vaccines. Protein subunit vaccines are the vaccine with the most clinical trials, accounting for more than 30% of the total global clinical trials.






Inactivated vaccines are based on the traditional vaccine technology, with mature technology, stable quality, with a prominent feature on high safety, good accessibility, and clear effectiveness

1 AstraZeneca, "AZD1222 vaccine met primary efficacy endpoint in preventing COVID-19," <https://www.astrazeneca.com/media-centre/press-releases/2020/azd1222hr.html>, access time: June 25, 2021.

2 Jared S. Hopkins, "Pfizer Lifts Covid-19 Vaccine Production Targets for 2021, 2022," Wall Street Journalist, May 7th, 2021.

3 Roxanne Liu and Ryan Woo, "Sinopharm's Wuhan affiliate boosts COVID-19 shot annual capacity to 1 bln doses," Reuters, June 1, 2021.

Fig 1: Main features of the five vaccine technology routes

Technology Routes		Main Features
Inactivated vaccine		Reliable technology platform, fast development, high protection safety and easy to use
Viral vector vaccine (compound, non-replicating)		Gene technology, fast development, easy manufacturing Intranasal vaccination, Inducing cellular immunity
Protein subunit vaccine (recombinant protein, VLP)		Artificial design, gene synthesis, easy to purify, low cost
mRNA, DNA		Fast development, short manufacturing cycle, easy mass production, low cost
Live-attenuated vaccine		Good immunogenicity and long immunity

Source: The 2nd Conference of Global Health Forum of Boao Forum for Asia

Inactivated vaccines are made through the cultivation of pathogens and then having them inactivated with heating or chemical agents. The vaccines produced by both Sinopharm and Sinovac, China's two vaccine manufacturers, are inactivated vaccines. China's large-scale vaccination work¹ has fully shown the good safety of the relevant vaccines. In fact, the incidence of general reactions

and abnormal reactions are lower than the average reported levels of various vaccines routinely inoculated in China in 2019. In addition to good safety, inactivated vaccines have the advantage of easy storage and transportation; they can be transported in the cold chain at 2-8 degrees Celsius.

Viral Vector vaccines are

¹ The Central Government of the PRC: At least 70% of target groups vaccinated by end of year, as more than 1 billion doses of Covid-19 vaccines administered, http://www.gov.cn/xinwen/2021-06/21/content_5619729.htm

characterized by inducing good cellular immunity in addition to humoral immunity, and by its low production cost

Representatives of this type of vaccine include CanSino (China), Russian Sputnik V, AstraZeneca (Oxford, UK), Janssen by Johnson & Johnson jointly developed by the United States and Belgium, and so on. However, Viral Vector vaccines have a potential "pre-existing immunity" problem; when some people have been infected by the vector virus and there are antibodies to the virus in the body, the body will attack the vector and reduce the vaccine effect¹.

The mRNA vaccine is characterized by a short development cycle and strong effectiveness

The mRNA vaccine works by injecting the gene of a certain antigen protein into the human body. The antigen protein produced by the body's normal immune response can induce the body to continuously produce immune responses². The mRNA vaccine is a relatively new technology, and the efficacy of vaccines produced in a very short R&D cycle is as high as 95%.³. However, it's the first time that this type of vaccine has been used in the human body on a such large scale, and its mid-to long-term safety require further evaluations.

Protein subunit vaccines are characterized by good immunogenicity and low production costs

The principle of its action is to

1 Mark Terry, "UPDATED Comparing COVID-19 Vaccines: Timelines, Types and Prices," BioSpace, May 26, 2021.

2 Kathy Katella, "Comparing the COVID-19 Vaccines: How Are They Different," Yale Medicine, May 21, 2021.

3 Helen Branswell, "Comparing the Covid-19 vaccines developed by Pfizer, Moderna, and Johnson & Johnson," February 2, 2021.

mass-produce the coronavirus antigen protein through genetic engineering. After the protein is injected into the human body, it may induce an immune response against the coronavirus, thereby producing a protective effect. This type of vaccine is identified with mature production technology, low production cost, and easy mass production. It also combines the advantages of both inactivated vaccines and mRNA vaccines. The main representatives of such vaccines are Novavax and Anhui ZhifeiLongcom.

At the same time, side effects have also been reported of some vaccines. The news released by the European Medicines Agency (EMA) respectively on April 7 and April 20, 2021, said that AstraZeneca and Janssen vaccines may cause unusual blood clots in people who get vaccinated¹. The US Centers for Disease Control and Prevention (CDC) announced that mRNA vaccines may cause myocarditis in adolescents.²

1 European Medicines Agency, AstraZeneca's COVID-19 vaccine: EMA finds possible link to very rare cases of unusual blood clots with low blood platelets,07/04/2021; European Medicines Agency, COVID-19 Vaccine Janssen: EMA finds possible link to very rare cases of unusual blood clots with low blood platelets,20/04/2021.

2 Centers for Disease Control and Prevention, Clinical Considerations: Myocarditis and Pericarditis after Receipt of mRNA COVID-19 Vaccines Among Adolescents and Young Adults , <https://www.cdc.gov/vaccines/covid-19/clinical-considerations/myocarditis.html>, access time: July 22, 2021

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Fig 2: Basic information on 20 vaccines approved at least one country in the world

Type of Vaccine	Country of Production	Manufacturer	Name of Vaccine	Approving Country	Trial
Protein Subunit	China	Anhui ZhifeiLongcom	RBD-Dimer	2	7 trials in 5 countries
Inactivated	India	Bharat Biotech	Covaxin	9	7 trials in 1 country
Non Replicating Viral Vector	China	CanSino	Ad5-nCoV	8	8 trials in 6 countries
Protein Subunit	Cuba	Center for Genetic Engineering and Biotechnology (CIGB)	CIGB-66	1	5 trials in 1 country
Inactivated	Russia	Chumakov Center	KoviVac	1	2 trials in 1 country
Protein Subunit	Russia	FBRI	EpiVacCorona	2	3 trials in 1 country
Non Replicating Viral Vector	Russia	Gamaleya	Sputnik Light	10	3 trials in 1 country
Non Replicating Viral Vector	Russia	Gamaleya	Sputnik V	70	19 trials in 7 countries
Non Replicating Viral Vector	USA/Belgium	Janssen (Johnson & Johnson)	Ad26.COVS.2.S	55	11 trials in 17 countries
Inactivated	Kazakhstan	Kazakhstan RIBSP	QazVac	1	3 trials in 1 country
Inactivated	China	Minhai Biotechnology Co.	SARS-CoV-2 Vaccine (Vero Cells)	1	3 trials in 1 country
RNA vaccine	USA	Moderna	mRNA-1273	63	22 trials in 4 countries
Non Replicating Viral Vector	UK/Sweden	Oxford/AstraZeneca	AZD1222	119	33 trials in 19 countries
RNA vaccine	USA/Germany	Pfizer/BioNTech	BNT162b2	96	28 trials in 15 countries

Non Replicating Viral Vector	India	Serum Institute of India	Covishield	44	2 trials in 1 country
Inactivated	Iran	Shifa Pharmed Industrial Co	COVID-19 Inactivated Vaccine	1	4 trials in 1 country
Inactivated	China	Sinopharm (Beijing)	BBIBP-CorV	56	8 trials in 7 countries
Inactivated	China	Sinopharm (Wuhan)	Inactivated (Vero Cells)	1	8 trials in 7 countries
Inactivated	China	Sinovac	CoronaVac	37	16 trials in 7 countries
RNA vaccine	Japan	Takeda	TAK-919	1	2 trials in 1 country

Source: Vaccine Tracker website¹

See Appendix 1 for the detailed description of the basic characteristics of the world's main vaccines.

¹ COVID-19 Vaccine Tracker <https://covid19.trackvaccines.org/vaccines/approved/>, access time: July 21, 2021.

II. Vaccinations in different countries

With the successful development and marketing of vaccines, countries around the world have rapidly carried out vaccination work

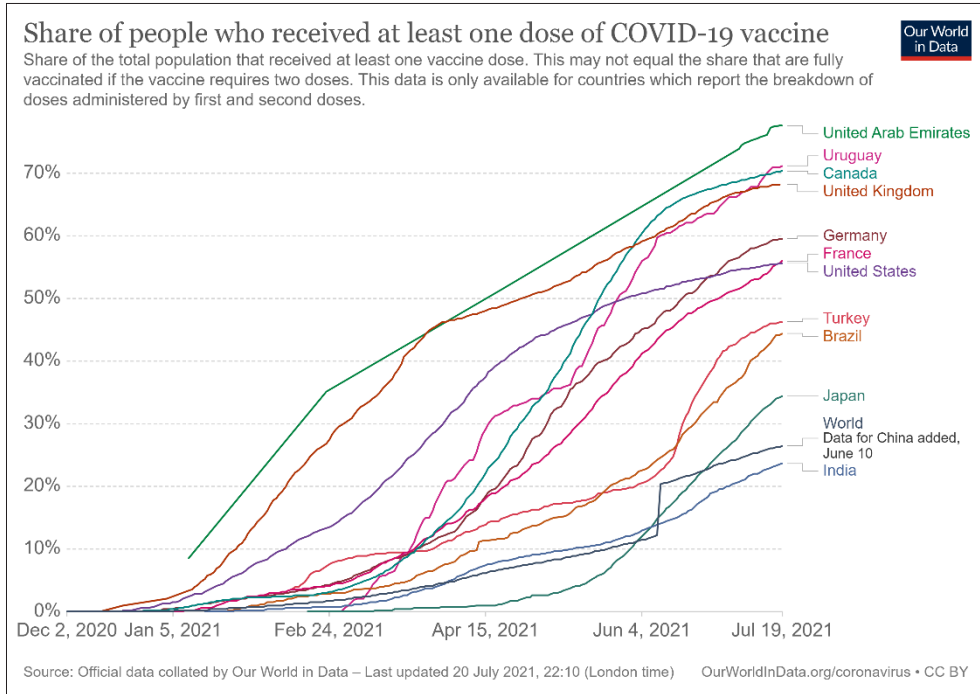
In mid-2020, some countries began the emergency use of the COVID-19 vaccines on a small scale among high-risk groups. The Chinese government's "Joint Prevention and Control Mechanism" approved the emergency use of inactivated vaccines from Sinopharm(Beijing) and Sinovac. In July, it began to promote the vaccination of target focus groups. It was the first country in the world to initiate mass vaccinations. Following this,

the Federal Drug Control Service of Russia approved its Russian Sputnik vaccine on December 5, 2020, and then began to promote domestic inoculations. Russia was the second country in the world to initiate mass vaccination on this scale¹. In December 2020, China sped up and completed the COVID-19 vaccination work for the country's target focus group before the 2021 Spring Festival. The World Health Organization approved the Pfizer Vaccine as the first COVID-19 vaccine for emergency use on December 31, 2020, initiating vaccine administration with international approval and certification.². As of July 20, 2021, 3.7 billion doses of COVID-19

1 "Coronavirus: Russia rolls out COVID vaccination in Moscow," Deutsche Welle, December 5th, 2020.

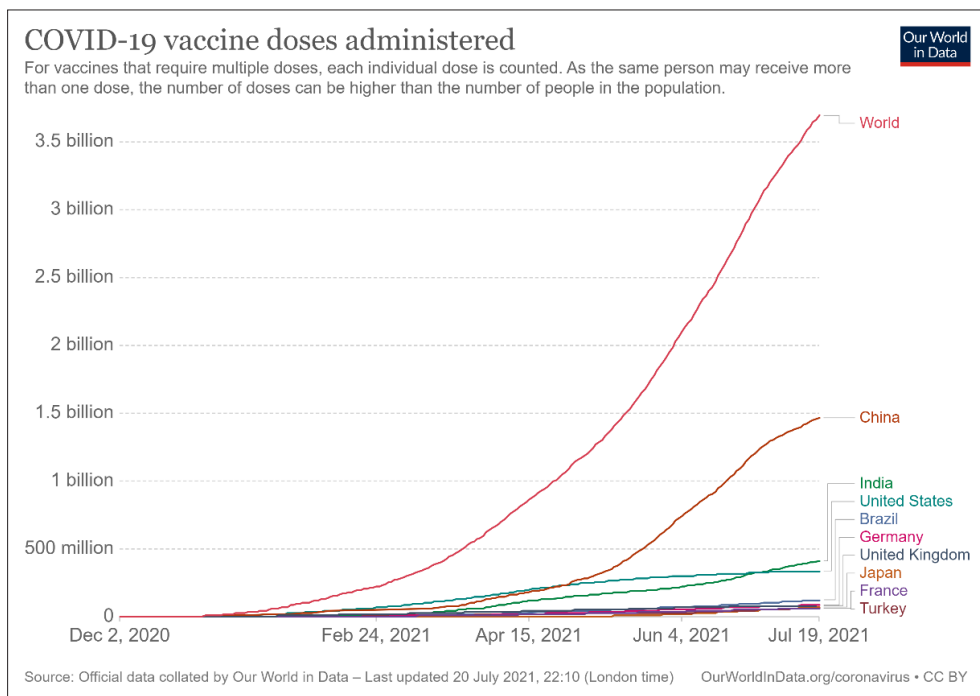
2 World Health Organization, "WHO issues its first emergency use validation for a COVID-19 vaccine and emphasizes need for equitable global access," <https://www.who.int/news/item/31-12-2020-who-issues-its-first-emergency-use-validation-for-a-covid-19-vaccine-and-emphasizes-need-for-equitable-global-access>, access time: June 17, 2021.

Fig 3: Proportion of the population receiving at least one dose of the COVID-19 vaccine



Source: Our World in Data¹

Fig 4: Doses of vaccines administered globally



Source: Our World in Data²

1 Our World in Data, <https://ourworldindata.org/covid-vaccinations#what-share-of-the-population-has-received-at-least-one-dose-of-the-covid-19-vaccine>, access time: July 21, 2021.

2 Our World In Data, <https://ourworldindata.org/covid-vaccinations#how-many-covid-19-vaccination-doses-have-been-administered>, access time: July 21, 2021

vaccines had been administered globally; with 26.5% of the global population receiving at least one dose of the COVID-19 vaccine¹. At least 209 countries and regions began to promote vaccinations, but they are at different stages of inoculation roll outs.

China has a world-leading number of vaccinations

On June 19, 2021, the amount of vaccinations in China exceeded 1 billion doses, which was more than one-third of the total doses administered worldwide. By July 13, China had exceeded 1.4 billion doses. China accounts for more than half of the 38 million doses of vaccination administered every day in the world. The vaccination rate of more than 20 million doses per day in China has received widespread attention from the international community. According

to media such as Bloomberg News, such a large scale of vaccination is unparalleled in the world. This reflects China's strong capacity in production, distribution, and social mobilization. The Chinese Center for Disease Control and Prevention predicts that China is expected to complete vaccination of at least 70% of the target population by the end of 2021. However, although the number of vaccinations in China far exceeds that of other countries, the overall rate in China is still low due to the huge population base.

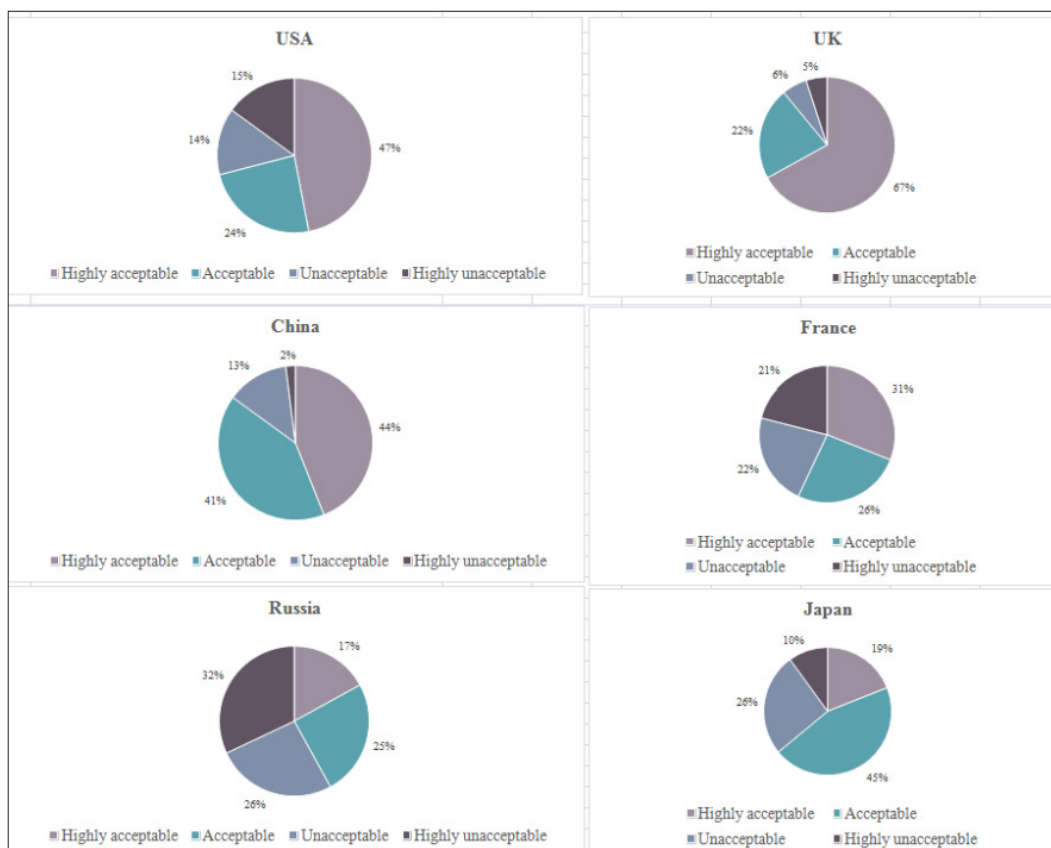
Western developed countries generally lead other countries in vaccination rates, but they have not yet fully reached the herd immunity threshold

Among the countries where the share of the population fully vaccinated is more than 30%, Europe and North America account

¹ Our World in Data, <https://ourworldindata.org/covid-vaccinations>, access time: July 20, 2021.

Fig 5: People's acceptance on vaccination by countries¹

People's acceptance on vaccination in certain countries



for the majority. (see Appendix 2 for details). As of July 19, 2021, the share of people partly vaccinated against COVID-19 in Canada, the United Kingdom, Spain, and Italy is respectively more than 60%; in Germany, France, the United States, and Saudi Arabia this figure

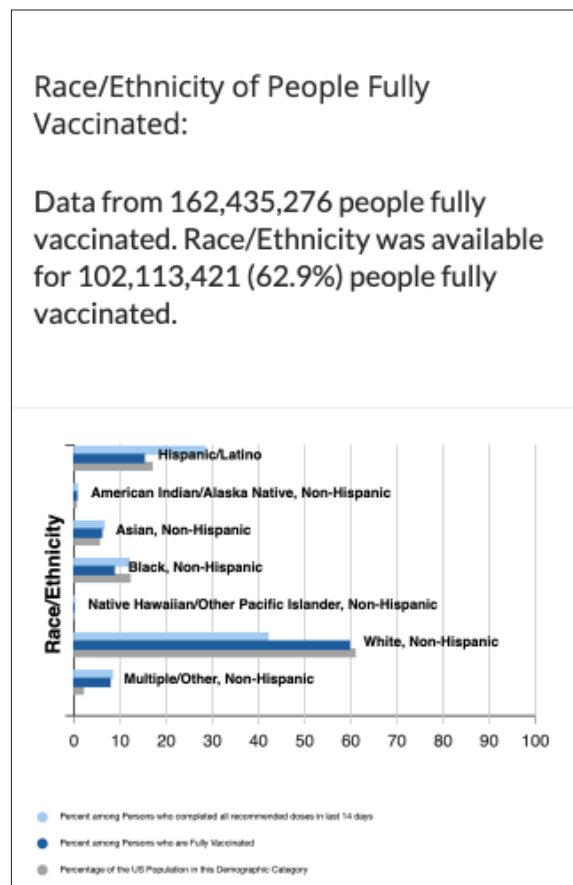
is respectively more than 50%².

However, in western developed countries including the United States, France, and the United Kingdom, the vaccination rate has slowed down significantly after

¹ Nicolas Boyon, Kate Silverstein, "Global attitudes: COVID-19 vaccines," ipsos, February 9th, 2021.

² Our World In Data, "Share of people vaccinated against COVID-19, Jul 19,2021," <https://ourworldindata.org/covid-vaccinations>, access time: July 21, 2021

Fig 6



Source: US CDC¹

maintaining relatively high growth momentum. The US had set a target of administering at least one shot to 70% of adults across the country by July.4th. However, the US has failed to achieve this goal².

According to a poll done by ABC News/Washington Post, nearly 30% of American adults indicated that they are hesitant or unlikely to get vaccinated.³ This phenomenon is worrying for some countries

1 Centers for Disease Control and Prevention, Demographic Characteristics of People Receiving COVID-19 Vaccinations in the United States, <https://covid.cdc.gov/covid-data-tracker/#vaccination-demographic>, access time: July, 21, 2021.

2 Nate Rattner, “Biden is on track to fall short of vaccinating 70% of American adults by the Fourth of July”, CNBC, June 17th, 2021

3 Gary Langer, “Vaccine-hesitant Americans reject delta variant risk, posing questions for pandemic recovery: POLL,” ABC News, July 4, 2021.

when the vaccination rate has not yet reached the herd immunity threshold. The reason is that some people still distrust or worry about the vaccines. Figure 5 shows the proportion of people in select countries who harbor skepticism about vaccines.

The vaccination situation is also quite different among developed countries. The vaccination rate in Japan is much lower than that of developed countries in Europe and North America. Although Japan has the world's leading research and development capabilities and medical insurance system, it has not led in the development of COVID-19 vaccines. The Japanese society is still discussing to what extent should the government intervene in dealing with the pandemic¹.

In the US, vaccination rates vary

greatly among different racial and ethnic groups. According to the US Center for Disease Control and Prevention, the proportion of Black, Latinos, and Asians who are fully vaccinated is significantly lower than that of Whites. The table below shows the proportion of different racial groups that have been fully vaccinated in the United States. Whites account for 60.1%, Latinos 15.4%, Blacks 9.0%, and Asians 6.2%. The vaccination rate of whites is 44.7% higher than Latinos, 51.1% than Blacks, and 53.9% than Asians.

From a global perspective, vaccination presents a serious global imbalance, and the vaccination rate in underdeveloped regions is far behind that in developed regions

Underdeveloped countries and regions are unable to ensure

¹ Boao Forum for Asia, <https://www.boaoforum.org/newsdetail.html?itemId=0&navID=3&itemChildId=undefined&detailId=9347&pdf>

vaccine supplies solely by themselves in the short term due to the relative backwardness in R&D capability, production capacity, and medical resources. Vaccines provided by developed countries to developing countries are far behind what is needed, and their promises are far from being fulfilled. Given the uneven distribution of vaccines in the international community, the vaccination rate in underdeveloped countries and regions is generally low. Vaccines already administered in Africa are less than 2% of the world's¹. Only 0.9% of the population in low-income countries have received at least one dose of the COVID-19 vaccine. African countries such as Chad, Burkina Faso, and Tanzania urgently need vaccine assistance from the outside world.² However, international vaccine aid is difficult to reach

countries such as Haiti due to their lack of vaccine storage capacity. Under such circumstances, the gap in vaccination rates between underdeveloped countries and developed countries is constantly widening.

Faced with the severe shortage of vaccines in developing countries, the international community has widely called for attention and support. At the 74th World Health Assembly in May 2021, many countries called for increased support for the WHO.³ On June 1, the heads of the WHO, the World Bank, the International Monetary Fund, and the World Trade Organization jointly called for a fair distribution of vaccines.

On the same day, the BRICS

1 World Health Organization, "Less than 2% of world's COVID-19 vaccines administered in Africa," <https://www.afro.who.int/news/less-2-worlds-covid-19-vaccines-administered-africa>, access time: June 24, 2021.

2 "Developing countries wait for first Covid-19 jabs as wealthy nations' vaccination programs move ahead", ABC news, May 11, 2021.

3 Sina Financ: The 74th World Health Assembly: Countries Call for More Support for WHO, Vaccine Accessibility Requires Cooperation between Major Countries, May 24, 2021.

Foreign Ministers' Meeting issued a joint statement calling for the rapid development and distribution of vaccines, especially to promote the availability and affordability of vaccines in developing countries. On the eve of the G7 Summit, 230 celebrities around the world including former British Prime Ministers Gordon Brown and Tony Blair, former United Nations Secretary-General Ban Ki-moon, and former leaders and dignitaries

of more than 100 countries signed a joint letter urging G7 countries to help poor countries get vaccinated.

Mass vaccination in developing countries remains difficult due to multiple factors¹. How to improve the availability and affordability of vaccines in developing countries is the most prominent problem facing the international community in the fight against the pandemic.

1 "Coronavirus (COVID-19) vaccines for developing countries: An equal shot at recovery", OECD, February 4th, 2021.

III. Impact of vaccine application on pandemic control

Achieving universal vaccination is the only way to quickly end the COVID-19 pandemic. However, many countries and regions still lack sufficient supplies of COVID-19 vaccines. The application of vaccines has a direct impact on how the pandemic evolves—to either die or incubate and mutate into more lethal forms.

Vaccines have shown obvious effects in curbing the pandemic

Past historical experiences in the prevention and control of many infectious diseases have proven that establishing an immune barrier through vaccination to protect susceptible populations is the most effective prevention and control measure. Vaccinations can

suppress the spread of diseases and reduce the possibility of virus mutation during transmissions.

Case studies from relevant countries have shown the obvious negative correlation between the vaccination rate and the incidence of new cases. Countries with higher vaccination rates have a significant reduction in the incidence of new cases. Israel is the global front-runner in vaccination. In Israel, more than half (5.3 million) of the residents have been vaccinated, and another 830,000 people have acquired natural immunity due to past virus infections. In total, about 68% of the people are likely to have antibodies, making the country one of the first to approach the threshold of herd immunity¹.

¹ Rachel Schraer, "Covid: 'Israel may be reaching herd immunity'," BBC News, April 14, 2021.

Israel saw a subsequent sharp fall in daily new cases and deaths. The Butantan Institute in the State of São Paulo, Brazil, announced on May 31 the results of a study on the effectiveness of CoronaVac, a COVID-19 vaccine of Sinovac after its use in Serrana, a small town in southeastern Brazil. The results showed that after taking two doses of CronoVac, the number of deaths caused by COVID-19 in the area fell by 95%, the number of hospitalizations fell by 86%, and the number of cases with symptoms fell by 80%¹. These numbers are in sharp contrast to the unvaccinated areas around the town.

However, as long as the "immunization gap" between underdeveloped countries and developed countries still exists, the world will still face public health risks

The World Health Organization stated that the global vaccination rate must reach at least 70% to achieve herd immunity and prevent the pandemic from being further prolonged.² As long as some countries still have not reached the herd immunity threshold, the pandemic will continue to spread in areas with low vaccination rates; and new virus mutations may appear. Those fully vaccinated areas will always face the possibility of counterattack by mutated viruses.

Vaccines are still the most effective method to resist the virus, although their effectiveness has been challenged by new viral mutations

Since 2021, some variant strains

¹Butantan Instituto, "CoronaVac é a vacina que mais previne mortes no Brasil, afirma estudo," <https://butantan.gov.br/noticias/coronavac-e-a-vacina-que-mais-previne-mortes-no-brasil-afirma-estudo>, access time: June 23, 2021.

²The Straits Times. "Coronavirus pandemic won't be over until 70% are vaccinated". The Straits Times News, May 28, 2021. <https://www.straitstimes.com/world/europe/pandemic-wont-be-over-until-70-are-vaccinated-who>

of COVID-19 such as "B.1.1.7" (Alpha), "B.1.351" (Beta), "P.1"(Gamma), and "B.1.617" (Delta), which spread faster and are more toxic, have appeared in many parts of the world. The surge in confirmed cases of mutant viruses has caused a rebound in the pandemic in many countries and regions around the world. The WHO stated on July 7 that the "Delta" strain of COVID-19 had spread to 104 countries around the world due to its stronger virulence. Even Israel has seen a sudden increase in cases after it maintained zero new cases for several consecutive days in June of this year with massive inoculation efforts. Globally, more than 70% of the new cases are related to the "Delta" virus. In fact, many of the new infection cases are people who have already been vaccinated, although they are not dying in

doves and their symptoms are mild with fewer hospitalizations¹. In addition, a new mutant strain "Delta-plus" has appeared, with dozens of people in India confirmed to have this infection.² The virus mutation may continue to appear in many places and spread to other regions of the world. The risk of breaking through the defenses of existing vaccines can't be ruled out.

But as of now, there is limited evidence about how the new mutant virus will impact the effectiveness of current COVID-19 vaccines. The WHO says that the vaccine is still effective in preventing severe illness and reducing deaths.³ Currently, the approved new vaccines can cause a wide range of immune responses, but they at least provide a certain degree of protection against the

1 Marianne Guenot, "Israel says the Delta variant is infecting vaccinated people, representing as many as 50% of new cases. But they're less severe." Yahoo! news, June 24,2021

2 Sumitra Debroy, "20 cases of new Delta-plus variant in India, 8 in Maharashtra", Times Of India, June 21, 2021.

3 Xinhua News Agency: WHO Experts: "Delta mutant strains" spread to 92 countries but vaccines are still effective. Published on Xinhua.net, June 22, 2021.

mutant virus strains now raging.¹ The mutation of the virus is unlikely to make the vaccine completely ineffective. If any of the existing vaccines prove to be less effective against one or more mutant viruses, the composition of the vaccine can also be changed to protect against these mutations. The World Health Organization and other countries' health officials and scientists are continuing to collect and analyze data on new variants of the virus to understand the degree to which these variants will impact vaccine effectiveness.

How long the global COVID-19 pandemic will continue now depends largely on whether the development and distribution of vaccines can keep up with the speed of the virus's spread and new mutations. WHO Director-

General Tedros Adhanom Ghebreyesus said that the world needs 11 billion doses of vaccines to achieve the goal of having 70% of the world's population inoculated². The global total production capacity of COVID-19 vaccines is expected to reach this number by the end of 2021. But the question is whether or not the vaccines can be reasonably distributed globally. As mutated virus strains weaken the protection of the vaccines, it is necessary to improve the existing vaccines to enhance their defense against the mutated virus. In the future, after the global pandemic is basically under control, more data is needed to verify whether COVID-19 will always exist like the flu — but with reduced infectiousness and lethality. This will also determine the global demand for COVID-19

1 World Health Organization, "The effects of virus variants on COVID-19 vaccines," https://www.who.int/news-room/feature-stories/detail/the-effects-of-virus-variants-on-covid-19-vaccines?gclid=CjwKCAjwwqaGBhBKEiwAMk-FtDUgpzJVRcR5JNUnCJzqluXwJ2pcvKN9PZF72BeCqc8tr80Pg_SUchoCPT4QAvD_BwE, access time: June 17, 2021.

2 Global News, 'We need more': WHO chief says COVID-19 vaccine needs outstrip G7 promises, <https://globalnews.ca/news/7945100/who-covid-vaccine-g7/>

vaccines in the future.

With the gradual progress of vaccinations, many countries have begun to ease lockdown restrictions

With the progress of the universal vaccination process, the United States has begun to ease lockdown restrictions. The US Centers for Disease Control and Prevention issued guidance on June 17, which says that people who are fully vaccinated can resume activities without wearing a mask or keeping social distancing, except where required by federal, state, local, tribal or territorial laws, rules, and regulations including local business and workplace guidance¹. As of June 15, six states in the United States had completely lifted the state of pandemic emergency, among which California announced

the full opening of economic activities.

Britain made "four steps" for lockdown easing. In February 2021, the British government announced a roadmap in which it made four steps and a timetable to lift restrictions in England. This stipulated that before each step is carried out, data should be reviewed and the impact of the last step must be evaluated. The UK Health Secretary said that the last step of the originally planned lockdown easing would be postponed to July 19 from June 21.² On July 19, despite facing huge controversy, the British government officially lifted the final step of easing lockdown restrictions, cancelling all restrictions on social distancing measures.

France started unlocking from

1 Centers for Disease Control and Prevention, "When You've Been Fully Vaccinated," <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated.html>, access time: June 25, 2021.

2 Becky Morton, "Covid:Lockdown easing in England delayed to 19 July", BBC News, June 14, 2021.

May 11 in stages and by regions. They will be adjusted anytime with observations. The provinces of France make their own assessments and label them as "green" or "red" areas to decide if more loose or strict control measures shall be taken. The "first stage" is from May 11 to June 2. In the "green areas" where the epidemic has eased, schools, businesses, and shops have reopened, and travel restrictions have been further relaxed. On June 17, France began to drop mandatory mask-wearing outdoors. However, people must still wear masks in outdoor crowded places and in enclosed spaces while indoors. On June 20, France halted the curfew.

Faced with the issue of international restriction easing, some countries have begun to implement the "vaccine passport" mechanism.

This is being done in order to restore international travel through mutual certification of vaccinations. However, the question of ensuring the uniformity of certification will become a problem

On May 3, 27 EU countries approved a proposal by the European Commission to relax the criteria for determining "safe" countries and allow tourists from other regions who have been fully vaccinated to enter the country with "electronic vaccine passports". On May 19, European Union countries agreed to ease travel restrictions on tourists from non-EU regions. This opened the door for all vaccinated British and American travelers to enter the European Union.¹ On July 1, the European Union officially launched the "Digital COVID Certificate" ("Vaccine Passport"), which covers the 27 EU member states, as well

¹ Philip Blenkinsop, "EU agrees to open doors to vaccinated foreigners", Reuters, May 19, 2021.

as Iceland, Norway, Switzerland, and Liechtenstein^{1 2}. The certificate can be displayed on mobile devices (including mobile phones). This will indicate if the holder has been vaccinated, tested negative, or has been infected with COVID-19 but ultimately recovered. Certificate holders are allowed to travel to the above mentioned countries. The UK and Canada are also considering using some form or a "Vaccine Passport".

The US hasn't had its plan for a "vaccine passport", but President Biden has ordered government agencies to assess the feasibility of building a digital system that links COVID-19 vaccine certifications to other vaccination documents³. China issued an "International

Travel Health Certificate" that includes information on the holder's nucleic acid test result and vaccination status⁴.

While countries are trying to promote a viable "vaccine passport", there has been controversy in the fairness of certification and ways of using it. Any "vaccine passport" may face problems, including creating social inequality, increasing the unfair distribution of vaccines, and issues of privacy disclosure. Considering the evaluation of the effects of different types of vaccines, in addition to professional factors, there are also political factors involved.

1 European Council, EU digital COVID certificate: how it works, <https://www.consilium.europa.eu/en/policies/coronavirus/eu-digital-covid-certificate/>, access time: July 21, 2021.

2 Global Times: EU fully launches Vaccine Passport amid controversy <https://finance.huanqiu.com/article/4313V7cknyc>.

3 Y. Tony yang, "A Digital COVID_19 Vaccine Passport System Is Still Premature," *The Regulatory Review*, April 5, 2021.

4 Consular Service Net: Good News! The Chinese Version of "International Travel Health Certificate" Officially Launched, <http://cs.mfa.gov.cn/gyls/lsgz/fwxx/t1859289.shtml>, access time: July 21, 2021.

The international community has not yet reached a unified standard agreed upon by all parties. The two vaccines developed by Sinovac and Sinopharm that have been certified by the World Health Organization are accepted by South Korea. This allows the vaccinated people to be exempted from quarantine when entering South Korea.¹

However, these two vaccines are not recognized by European Union.² Obviously, it has become a very difficult project for

countries to reach mutual trust on the "vaccine passport" issue. The World Health Organization said that they are "creating an internationally trustworthy framework" for safe travels, but a "vaccine passport" is not one of their conditions. The head of the WHO's Health Emergencies Program stressed that the current global vaccine equity issue. If the "vaccine passport" is introduced, poorer countries might be isolated because of their limited access to vaccine supplies³.

1 LengShumei, "S.Korea trusts Chinese vaccines, will allow quarantine-free travels for vaccinated," Global Times, June 15, 2021.

2 Chicago Suntimes, "EU says not all COVID vaccines equal", July 13, 2021 <https://chicago.suntimes.com/2021/7/13/22575625/eu-not-all-covid-vaccines-equal>

3 Latika Bourke, "WHO urges against vaccine passports, even for international travel," The Sydney Morning Herald, April 7, 2021.

IV. Policies and actions of major countries on the international distribution of vaccines

After the introduction of vaccines and their obvious effects on curbing the pandemic, the issue of solving the uneven distribution of vaccines on a global scale has become of grave importance to the international community. On this issue, different countries have different opinions and are taking a variety of actions.

Global concern is rising that they United States has stockpiled a huge quantity of vaccines, yet there is a gap between its capability and how many it has provided to others around the world

The United States officially

announced the provision of AstraZeneca vaccines to its neighbors Canada and Mexico as early as March 18, 2021.¹ However, it is worth noting that the AstraZeneca vaccine has not been approved by the U.S. Food and Drug Administration for domestic use in the United States. The media believes that the US decision to provide vaccines was directly related to other countries' efforts in "vaccine diplomacy". According to the researchers from Duke University's Center for Global Health Innovation, by the end of July 2021, the United States may have a surplus of 300 million doses, or more of COVID-19 vaccines².

1 Natalie Kitroeff, "U.S. to Send Millions of Vaccine Doses to Mexico and Canada,"TheNewYork Times, March 18,2021.

2 Mark McClellan, "Reducing Global COVID Vaccine Shortages: New Research and Recommendations for US Leadership," Duke Global Health Innovation Center, April 15, 2021.

The Wall Street Journal reported on May 17 that the United States only exported 3 million doses of COVID-19 vaccines, accounting for less than one percent of the US vaccine production.¹ Facing increasing pressure from around the world, the Biden administration announced on June 3 that the U.S. government had begun to provide the first 25 million of the 80 million doses of vaccines they promised to donate.²

The recipients of these donations are countries and regions in Asia, Central and South America, as well as Africa. On July 2nd, AP News reported that the US had shipped less than 24 million doses of vaccines to the recipient countries, even though the Biden administration originally set

a goal of providing 80 million doses by the end of June.³ On July 13, the Washington Post published an article stating that the US government had stockpiled a large number of vaccines. It noted that millions of surplus vaccines that were supposed to be shipped to the other countries were thrown away due to their expiration dates.⁴

The vaccine distribution policy of EU countries aims to ensure the internal vaccination rate of EU member states. Exports of vaccines mainly go to middle-income and high-income countries

As of July 21, 2021, total of more than 502 million doses of COVID-19

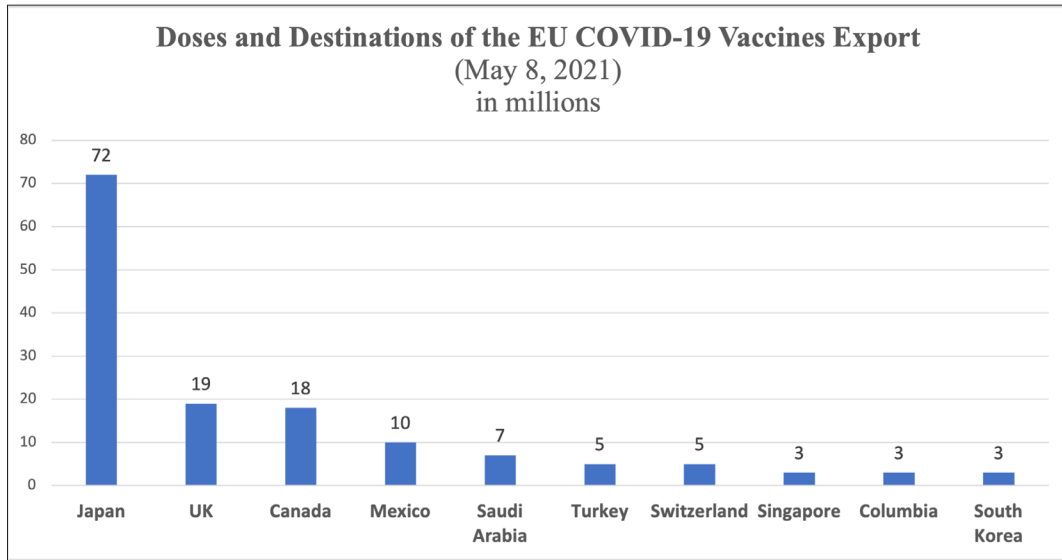
1 Yuka Hayashi, "U.S. to Increase Covid-19 Vaccine Exports Amid Global Pressure," The Wall Street Journal, May 17, 2021.

2 The White House, "FACT SHEET: Biden-Harris Administration Unveils Strategy for Global Vaccine Sharing, Announcing Allocation Plan for the First 25 Million Doses to be Shared Globally," <https://www.whitehouse.gov/briefing-room/statements-releases/2021/06/03/fact-sheet-biden-harris-administration-unveils-strategy-for-global-vaccine-sharing-announcing-allocation-plan-for-the-first-25-million-doses-to-be-shared-globally/>, access time: June 24, 2021.

3 ZEKE MILLER, "Biden misses vaccine-sharing goal, cites local hurdles", The Associated Press, July 2, 2021

4 Marty Makary, "Opinion: The U.S. is far too fixated on vaccinating Americans. It must focus on the world," The Washington Post, July 13, 2021.

Fig 7: Doses and Destinations of the EU COVID-19 vaccine export



Destinations and doses of the EU COVID-19 vaccine export. Source: European Council¹

vaccines were distributed to EU/ EEA countries. This was done under the joint procurement strategy and programs that emphasizes internal coordination and sharing². In early March 2021, European Commission President Ursula von der Leyen threatened to stop vaccine exports to the UK unless AstraZeneca fulfills the EU orders. According to the previous commercial order, AstraZeneca is required to provide 300 million doses

of vaccines to the EU in the first half of 2021.

However, the company later broke the contract, saying that it could only provide 100 million doses because of production problems³. Although in the end, the EU did not implement the export ban on the UK. This conflict about vaccine supplies shows Europe's dilemma in terms of

1 European Parliament, Motion For A Resolution 2.6.2021. B9-0311/2021, https://www.europarl.europa.eu/doceo/document/B-9-2021-0311_EN.pdf, access time: June 24, 2021.

2 European Centre for Disease Prevention and Control, "Covid-19 Vaccine Tracker," <https://qap.ecdc.europa.eu/public/extensions/COVID-19/vaccine-tracker.html#uptake-tab>, access time: July 21, 2021.

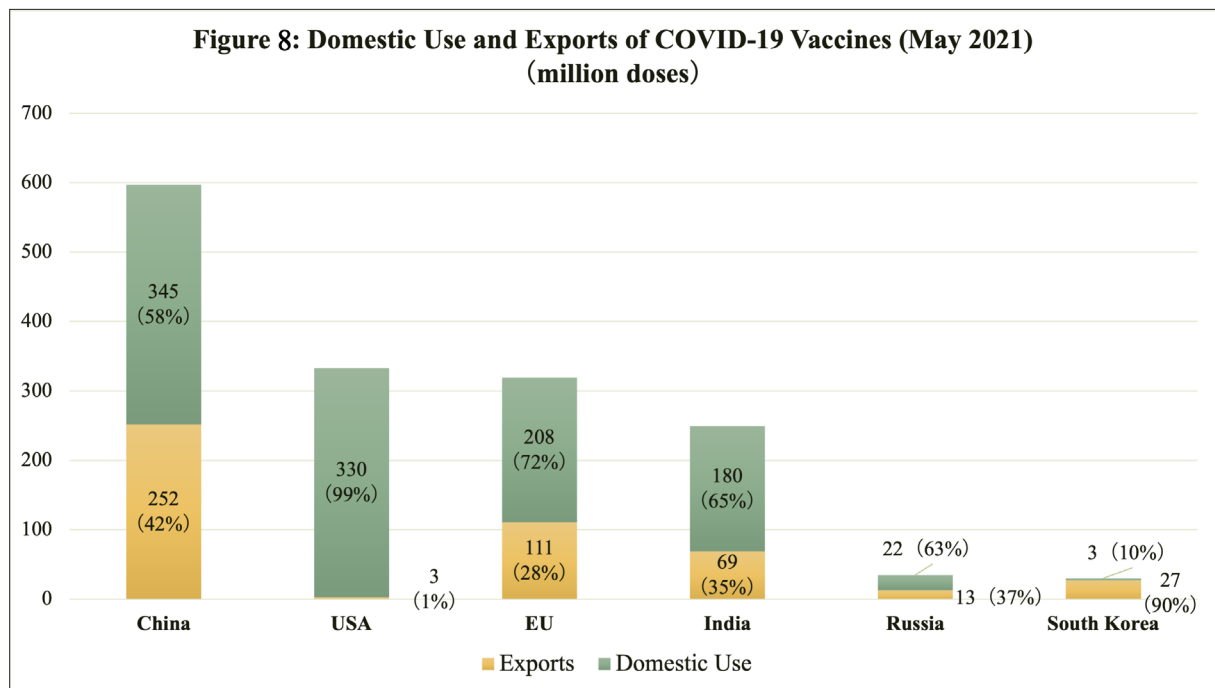
3 Chris Morris, "Covid-19: EU warns UK over vaccine exports," BBC News, March 17, 2021.

international vaccine distribution.

The unbalanced economic and technological development among the member states of the EU, as well as the EU's relatively open policy on the flow of people and logistics carries concerns. It makes ensuring the internal distribution of vaccines and the increasing vaccination rate of the member states become a top policy goal of EU countries.

In the case that internal supply and distribution matters cannot be effectively guaranteed, the export of European vaccines and the scale of assistance will continue to be limited.

The main export destinations of European Union vaccine include: Japan (72 million doses), the United Kingdom (19 million doses), Canada (18 million doses), Mexico (10 million doses), and Saudi Arabia (7 million



¹ "China COVID-19 Vaccine Tracker," Bridge Consulting, May 24, 2021.

² 中华人民共和国外交部，2021年7月12日外交部发言人赵立坚主持例行记者会，https://www.fmprc.gov.cn/web/fyrbt_673021/t1891432.shtml

doses). It is worth noting that most of these countries are relatively wealthy countries. Yet developing countries that are relatively poor and are in urgent need of vaccine assistance are excluded.

On June 13 2021, the Group of Seven (G7) summit promised to donate 1 billion doses of COVID-19 vaccines to poor countries by the end of 2022. However, this is still far from the global demand for vaccines

Among the 1 billion doses of vaccine aid plan, the United States has pledged to provide 500 million doses, while United Kingdom has committed to providing 100 million doses.¹ However, as an international organization composed of the seven most developed economies in the world, one billion doses of vaccine assistance is not enough to solve the problem of uneven distribution

of vaccines in the world. During the G7 summit, WHO Director-General Tedros Adhanom Ghebreyesus said that the leaders of the G7 countries need to set a target of having 70% of the world's population vaccinated. However, the G7's commitment is not enough to achieve this goal.² This timetable of achieving this target before the end of 2022 is also largely lagging behind the current urgent vaccine demands. Former British Prime Minister Gordon Brown said that the G7's pledges are more like "passing round the begging bowl" instead of a real solution.³

China's vaccine aid and exports have exceeded the total of other countries, with developing countries constituting the primary export destinations

In May 2020, just as the global COVID-19 pandemic began to

1 Elizabeth Piper, "‘We need more’: UN joins criticism of G7 vaccine pledge," Reuters, June 13, 2021.

2 "G7 COVID-19 vaccine pledge 'is not enough', says WHO, IMF," EuroNews, June 13, 2021.

3 Elizabeth Piper, "Failed: UK's ex-PM Brown says G7 COVID vaccine plan offers no solution," Reuters, June 11, 2021.

rise, Chinese President Xi Jinping announced at the opening ceremony of the 73rd World Health Assembly video conference that China will make its vaccines a global public goods once the R&D is complete and put into use. President Xi is the first among the world leaders to propose building "a Global Community of Health for All" and making vaccines a global public goods. Under the guidance of this thought, China has taken strong practical actions. As of July 2021, China has donated more than 26 million doses of vaccines¹, providing more than 500 million vaccines and stock solutions to more than 100 countries and international organizations. This is the equivalent to one-sixth of the total global COVID-19 vaccine production².

The comparison chart of vaccine production and export of the major countries in the world listed below

shows that by May 2021, China had led the world in vaccine production and export volume, the number one among all major countries. China's vaccine exports are 227% more than Europe's vaccine exports, and 84 times higher than the United States's donations. At the same time, China's vaccine exports as a percentage of production also far exceed that of both the EU and the US.

Regionally, China mainly exports vaccines to three regions: Southeast Asia, Latin America, and Africa. Compared with other vaccine exporting countries, China has made far more distinguished contributions to Latin America and Africa. China has direct vaccine distribution and cooperation relationships with 18 Latin American countries. China has donated more than 1 million doses of COVID-19 vaccines, exporting

1 "China COVID-19 Vaccine Tracker," Bridge Consulting, May 24, 2021.

2 The Ministry of Foreign Affairs of the People's Republic of China, Foreign Ministry Spokesperson Zhao Lijian presided over a regular press conference on July 12, 2021. https://www.fmprc.gov.cn/web/fyrbt_673021/t1891432.shtml

Policies and actions of major countries on the international distribution of vaccines

nearly 280 million doses to the region. In Africa, 31 countries have accepted vaccines purchased and donated from China. This number is also steadily increasing. Compared with other regions, China has mainly provided vaccines to Africa through donations. Besides the export of vaccines, China is also providing developing countries with raw materials for vaccines, helping them establish independent vaccine production systems as soon as possible. On July 5, Egypt announced that it has already completed the first batch of 1 million doses of China's Sinovac vaccine with local production.¹

¹ CCTV.com, "Egypt completes the localized production of the first batch of 1 million doses of China's Sinovac Vaccine", July 6, 2021

V. The International Vaccines Coordination Mechanism

At present, the international community has two representative international vaccine coordination mechanisms: the World Health Organization's "Emergency Use Listing" and COVAX.

The World Health Organization's "Emergency Use Listing" evaluates the performance of vaccines in multiple aspects. It is the most universal vaccine certification mechanism in the world, providing guidance for countries to speed up regulatory approval of vaccine import and vaccination

The WHO Emergency Use Listing (EUL) assess the quality, safety, and efficacy of COVID-19 vaccines

as well as risk management plans and their applicability. This assists interested UN procurement agencies and the Member States in determining the acceptability of using specific products based on an essential set of available quality, safety, and efficacy and performance data.¹ There are currently 8 vaccines listed in the "Emergency Use Listing": Pfizer/BioNTech, AstraZeneca (EU), Janssen (Johnson & Johnson), Moderna, Sinopharm and Sinovac², SKBio (Korea), and AstraZeneca by Serum Institute of India.

As an international cooperation program involving more than two-thirds of the world's countries,

1 World Health Organization, "Emergency Use Listing," <https://www.who.int/teams/regulation-prequalification/eul>, access time: June 24, 2021.

2 World Health Organization, "Status of Covid-19 Vaccines within WHO EUL/PQ Evaluation Process," June 16, 2021, pp.1-2.

The International Vaccines Coordination Mechanism

COVAX (COVID-19 Vaccines Global Access) is the world's largest and widest international distribution plan for COVID-19 vaccines

The World Health Organization, the Coalition for Epidemic Preparedness and Innovation (CEPI), and the Global Alliance for Vaccines and Immunization (Gavi) jointly initiated and led the "COVID-19 Vaccines Global Access" ("COVAX"). This is sponsored by the United Nations Children's Fund (UNICEF). Under the COVAX plan, Gavi reached an order agreement with vaccine manufacturers on behalf of COVAX, and CEPI is responsible for providing candidate vaccine product portfolios for COVAX.

The goal of COVAX is to equitably

distribute 2 billion doses of vaccines worldwide by the end of 2021. It further aims to provide vaccine supplies to at least 20% of the population in countries that are in urgent need of vaccines¹. With the joint efforts of multiple coordination mechanisms, COVAX shipped the first batch of vaccines to Ghana in West Africa on February 24, 2021. As of July 20, 2021, it had provided 135 million doses of vaccines to 136 countries and regions around the world.²

As India's COVID crisis intensified, the Serum Institute of India (SII), which is the largest supplier to COVAX, suspended their planned shipments. This has clearly resulted in a severe interruption in the COVAX vaccine-sharing scheme.³ However, with the frequent occurrences of virus mutations on

1 Seth Berkley, Gavi, "Covax Explained," <https://www.gavi.org/vaccineswork/covax-explained>, access time: June 24, 2021.

2 Gavi, "Covax Vaccine Roll-Out," <https://www.gavi.org/covax-vaccine-roll-out>, access time: July 20, 2021.

3 Tulip Mazumdar, "India's Covid crisis hits Covax vaccine-sharing scheme," BBC News, May 17, 2021.

a global scale, COVAX urgently needs to expedite promoting the global use of vaccines. To that endeavor, COVAX urges wealthy countries to donate surplus vaccines as soon as possible. On the other hand, it is attempting to effectively solve existing issues of supply and demand gaps. On July 12, COVAX signed purchase agreements with Sinopharm and Sinovac, and two companies immediately provided 110 million doses of vaccine starting from July.¹

However, the WHO's "Emergency Use Listing" and the existing COVAX vaccine distribution plan

are not mandatory for governments from all countries. On July 1st, the WHO and COVAX issued a joint statement that urged all countries, regions, and governments to see all COVID-19 vaccines certified by WHO with equal recognition.² In the face of the continuous impact of the pandemic on the world, the international community urgently needs to establish a fair and efficient international vaccine distribution mechanism to ensure the universal supply of vaccines on a global scale. This is especially urgent to increase the availability and affordability of vaccines in developing countries.

1 Gavi, "Gavi signs agreements with Sinopharm and Sinovac for immediate supply to COVAX", <https://www.gavi.org/news/media-room/gavi-signs-agreements-sinopharm-and-sinovac-immediate-supply-covax>, access time: July 15, 2021

2 Gavi, "Joint COVAX Statement on the equal recognition of vaccines", <https://www.gavi.org/news/media-room/joint-covax-statement-equal-recognition-vaccines>, access time: July 6, 2021

VI. The Impact of Vaccine Use on International Relations

The COVID-19 pandemic has changed world history right before our eyes. One year after the global pandemic engulfed our world, vaccines have become one of the greatest concerns of the international community. This is not only because vaccines are critical to whether or not humans can overcome the pandemic. This cuts to the heart of some of the deep-seated problems that already exist in international relations, in many ways exacerbating fissures yet allowing for new friendships to be forged.

The application and distribution of COVID-19 vaccines have become a prominent issue in international relations

Before the pandemic outbreak, vaccines against various diseases,

including other global infections, had never become a core issue to define international relations with such high stakes. However, since the outbreak of the COVID-19 pandemic, the uneven development among countries has been exposed in a more cruel way. The development, application, and distribution of vaccines reflect the level of science and technology, social mobilization capabilities, and foreign policy orientations of various countries—these have gone far beyond the field of health. In all international political and economic conferences that have so far transpired this year, vaccines have been at the front and center of all discussions. For example at both the G7 summit held in June and APEC leaders meeting in July, the international distribution of vaccines was one of the most important issues that came up in

crucial dialogues.

Propositions and actions on the international distribution of vaccines have an impact on the soft power and international image of countries

On the issue of vaccine development and distribution, the international community not only pays attention to whose vaccines are developed quickly and are of higher quality, but also who uses the advantages of science and technology to solve urgent problems of global vaccine accessibility and affordability to address public health issues. However, it is not a contest of “whoever” does better will get more praise. China has taken concrete actions to effectively improve the availability of vaccines in underdeveloped regions. This has also increased China's popularity in relevant countries. However, this is called by some media as evidence of China's "vaccine diplomacy". This

only reflects the different views and propositions of various countries and media on vaccine distribution.

International discussions on vaccine allocation have highlighted different views on the private and public attributes of vaccines

Some media see the provision of vaccines as political capital and diplomatic means of vaccine-producing countries. In fact, a vaccine, no matter who developed it, shall be the wealth of the world. The development and distribution of a vaccine with strong effectiveness and low side effects play a vital role in fighting against the pandemic globally. An article entitled "As the West competes for vaccines, China exports jobs and expands soft power" published by France 24 on January 30, 2021, pointed out that compared with the West's priority in stockpiling vaccines, China's position of making vaccines a "global public goods" is more in line

with the multilateralism called for by the WHO¹.

In a May 5 statement, the Biden Administration supported efforts to temporarily waive intellectual property rights for COVID-19 vaccines². Public opinion generally believes that the US move is intended to reverse its image on the vaccine issue. Experts point out that negotiations on a waiver of intellectual property rights for COVID-19 vaccines require multilateral negotiations under the framework of the WTO. This is a very complicated process and is not a decision to be unilaterally determined by any single country.³ This US initiative was opposed by its European allies. The Chinese

Ministry of Foreign Affairs stated on May 17 that China fully understands and supports developing countries' call for waiving intellectual property rights for COVID-19 vaccines⁴. On July 16th, China's President Xi Jinping said at the APEC leaders' meeting that China would support the waiver of intellectual property rights for COVID-19 vaccines. China further emphasized that it would be willing to work with all parties to promote the WTO and other international institutions to make a decision as soon as possible.

The "vaccine diplomacy" argument is the latest manifestation of the politicization of the fight against the pandemic

1 Romain Brunet, "Covid-19: As the West competes for vaccines, China exports jobs and expands soft power," France 24, January 30, 2021.

2 The White House, "Statement by President Joe Biden on Global Vaccine Distribution," <https://www.whitehouse.gov/briefing-room/statements-releases/2021/06/03/statement-by-president-joe-biden-on-global-vaccine-distribution/>, access time: June 24, 2021.

3 David Lawder, "WTO vaccine waiver could take months to negotiate, faces opposition -experts," Reuters, May 7, 2021.

4 Ministry of Foreign Affairs: Spokesperson Zhao Lijian Hosts Routine Press Conference on May 17, 2021. https://www.fmprc.gov.cn/web/wjb_673085/zzjg_673183/gjs_673893/gjzz_673897/lhgyffz_673913/fyrh_673921/t1876269.shtml, access time: June 24, 2021.

Since the outbreak of the COVID-19 pandemic, some countries have publicly passed on their responsibilities in their responses to it. They have made no secret of their intention to suppress competitors using the pandemic as an excuse. While the international community has expressed concern over stockpiling vaccines in some countries and the serious imbalance in the international distribution of vaccines, some countries have begun to again raise the issue of the “origins of COVID-19”. On May 27, President Biden ordered US intelligence agencies (not scientific research institutions) to find out within 90 days whether the coronavirus was leaked from the Wuhan virus laboratory¹. This was asked despite the WHO research report about COVID-origin findings

clearly showing that this is extremely unlikely.

A senior WHO official said on May 28 that the investigation into the origin of COVID-19 is “poisoned by politics”². On July 5th, 24 world-renowned medical experts issued a joint statement in the authoritative medical journal called “the Lancet”. They refute the lab leak assumption, and state that they believe, “the strongest clue from new, credible, and peer-reviewed evidence in the scientific literature is that the virus evolved in nature, while suggestions of a laboratory-leak source of the pandemic remain without scientifically validated evidence that directly supports it in peer-reviewed scientific journals”³. However, on July 15, the WHO Director-General ignored the

1 The White House, “Statement by President Joe Biden on the Investigation into the Origins of COVID-19,” <https://www.whitehouse.gov/briefing-room/statements-releases/2021/05/26/statement-by-president-joe-biden-on-the-investigation-into-the-origins-of-covid-19/>, access time: June 24, 2021.

2 ManojnaMaddipatla, “Search for origin of COVID-19 'poisoned by politics', says WHO expert,” Reuters, May 29, 2021.

3 The Lancet, Science, not speculation, is essential to determine how SARS-CoV-2 reached humans, [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(21\)01419-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)01419-7/fulltext)

conclusions of the previous WHO investigation report and even proposed to come to China again to carry out an investigation of where the virus came from. Public opinion believes that this indicates that the WHO is under tremendous political pressure.

The "vaccine diplomacy" argument also reflects the trend of ideologicalization in international relations

On the one hand, the COVID-19 pandemic has further proved that human beings live in the same "global village", on the other hand, it has also exacerbated to a certain degree the trend of reversing globalization and rising nationalism. The non-cooperative opinions of the "zero-sum game" prevail in some countries, trying to draw

ideological lines between different countries.

Some media also regard the international distribution of vaccines as a means for different sides to compete for global influence in what is dubbed a "major powers competition." On June 23, 2021, the New York Times published a report stating that many countries relied on COVID shots from China, and yet they're still battling a surge in infections.¹

However, the article did mention a single word about the fact that the new variant "Delta" is raging across the world. In fact, people who have been vaccinated with other vaccines also have cases of infections. When CNN reported in June 2021 that China had more than 1 billion people vaccinated,

¹ Ruili Huang, "They Relied on Chinese Vaccines. Now They're Battling Outbreaks," The New York Times, June 23, 2021.

some Americans accused the media outlet of helping with Chinese propaganda.

"Vaccine nationalism" has continuously widened the inequality in vaccine distribution among countries and has seriously delayed the progress of the international fight against the pandemic

Nikkei Asia said in an article published on April 5 that the US, UK, and other developed nations have produced enough

doses to inoculate their combined populations twice over. Meanwhile, the European Union has secured enough jabs to immunize over 1 billion people and accounts for more than 20% of all contracted vaccine doses¹. An article published by Medical News Today on April 9 reported that, "herd immunity may take 4.6 years due to vaccine nationalism"². The Economist forecast in an article dated January 27 that more than 85 poor countries will not have widespread access to coronavirus vaccines before 2023 if the current situation continues³.

1 Anna Nishino, "China emerges as big winner in vaccine outreach," Nikkei Asia, April 5, 2021.

2 Jennifer Huizen, "Herd immunity may take 4.6 years due to vaccine nationalism," Medical News Today, April 9, 2021.

3 "More than 85 poor countries will not have widespread access to coronavirus vaccines before 2023," The Economist, January 27, 2021.

VII. Recommendations for the International Community

After a comprehensive analysis of the global vaccine use landscape, this report makes the following suggestions for the international community in terms of future vaccine-related policymaking.

First, countries should always keep increasing vaccination rates as their primary goal while maintaining their routine epidemic prevention policies

In countries that are capable of mass vaccination efforts, it is necessary to increase the public's awareness of safe inoculations through vaccine-related education. This also means increasing the vaccination rate in remote and rural areas. Before the vaccination rate reaches a target required for herd immunity, countries should be cautious in relaxing prevention

measures to prevent the epidemic from rebounding.

Second, the international community should establish a coordination mechanism to effectively solve the problem of vaccine availability in underdeveloped countries

The world's major vaccine producing countries and major international cooperation mechanisms, such as the Group of Twenty (G20), should hold special intergovernmental meetings on vaccine supply, summarize and sort out the vaccine demand of the world, especially of the developing countries, They should further make a global vaccine distribution plan combining bilateral and multilateral cooperation on a fair and reasonable basis.

The implementation of specific work can be done through the existing WHO and COVAX plans. Countries with relatively advanced medical technology and relatively leading domestic vaccination rates should assume responsibilities and do their best to assist the international community. Developed countries in Europe and the United States should lift vaccine export restrictions and substantially increase vaccine exports to developing countries. The G7 should formulate a specific plan for donating vaccines to underdeveloped countries in accordance with the commitments made at its summit, and carry it out as soon as possible.

Third, the international community should actively explore the mechanism of mutual certification of vaccines

On the issue of "vaccine passport", major multilateral mechanisms such as the United Nations should

play a greater role to coordinate on fair and effective travel plans for the international community on the basis of the current plan of the World Health Organization. This can help end inconveniences caused by international travel restrictions as soon as possible.

Fourth and finally, the international community should continue to promote the COVID-19 vaccine as a "Global Public Goods" initiative

The international community should unite and oppose the politicization of the vaccine issue to avoid delaying the progress of the international fight against the virus due to "vaccine nationalism". The "Global Public Goods" initiative is more in line with the essence of the COVID-19 pandemic as a global health crisis and has been recognized by many countries and international institutions. The emphasis on the public nature of vaccines will help the

Recommendations for the International Community

international community to carry out more inclusive cooperation on related issues. International public opinion should also guide the public awareness of vaccines from "commercial attributes" to "public attributes".

Appendix 1: Comparison on the feature of the world's major vaccines					
Company	Type	Dose Needed	Storage Time and Temperature	Efficacy	Assessment by the WHO
Oxford–AstraZeneca (UK/Sweden)	Non Replicating Viral Vector (transgenic virus)	2	2°C ~8°C (6 months)	62%~91%	Approved
Moderna (United States)	RNA vaccine (RNA, part of the genetic code of virus)	2	-25°C ~-15°C (6 months)/ 2°C ~8°C (30 days)	95%	Approved
Pfizer/ BioNTech (US & Germany)	RNA vaccine	2	-80°C ~-60°C (6 months)/ 2°C ~8°C (5 days)	95%	Approved
Covishield (India)	Non Replicating Viral Vector	2	2°C ~8°C	90%	Approved
Sinopharm (China)	Inactivated	2	2°C ~8°C	79%	Approved
Sinovac (China)	Inactivated	2	2°C ~8°C	50.38%~91.25%	Approved
Janssen Johnson (USA & Belgium)	Non Replicating Viral Vector	1	2°C ~8°C (3 months)	66%~72%	Approved
Novavax (United States)	Protein Subunit	2	2°C ~8°C	89.3%	Pending for review
Cansino (China)	Non Replicating Viral Vector	1	2°C ~8°C	90.98%	Clinical trial data submitted
Camaria–Sputnik V (Russia)	Non Replicating Viral Vector	2	-18.5°C (liquid)/ 2°C ~8°C (solid)	92%	Pending for data and observation
Covaxin (India)	Inactivated	2	2°C ~8°C	81.00%	Pending for assessment

Appendix 2: Vaccination Rate by Country (data as on July 22, 2021)			
Country	Total doses given	People fully vaccinated	% of population fully vaccinated
Bahrain	2.25 million	1.04 million	63.1%
Chile	24.8 million	11.7 million	61.9%
Uruguay	4.57 million	2.09 million	60.3%
Israel	11 million	5.26 million	58.1%
U.K.	82.6 million	36.2 million	54.4%
Hungary	10.9 million	5.31 million	54.4%
Mainland China	1.48 billion	223 million	52.9%
Spain	51.7 million	24.3 million	51.9%
Canada	46 million	19.4 million	51.7%
Belgium	13.2 million	5.7 million	49.8%
U.S.	338 million	162 million	49.2%
Singapore	6.84 million	2.79 million	49%
Germany	87.1 million	39.3 million	47.3%
Denmark	6.62 million	2.71 million	46.7%
Portugal	11.1 million	4.79 million	46.6%
Austria	9.12 million	4.12 million	46.5%
Netherlands	18.8 million	7.92 million	45.8%
Italy	62.7 million	27.2 million	45.1%
Switzerland	8.55 million	3.85 million	45.1%
Greece	9.88 million	4.69 million	43.7%
Poland	33.1 million	16.4 million	43.3%
France	65.6 million	28.5 million	42.5%
Czech	9.7 million	4.37 million	41%
Serbia	5.44 million	2.66 million	38.2%
Sweden	9.87 million	3.82 million	37.4%
Slovenia	1.65 million	0.773 million	37.1%
Slovakia	4.1 million	1.89 million	34.6%
Norway	4.91 million	1.68 million	31.5%
Finland	5.16 million	1.58 million	28.6%
Turkey	63.9 million	21.2 million	25.9%

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