



The Matching Mechanism of Covid-19 Vaccines as the Public Goods

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Abstract. The rapid development of a new Covid-19 vaccine has brought hope to the world to contain the epidemic. Governments and international organizations such as the World Health Organization subsequently started a series of discussions on the distribution of new vaccines after production with the surge of the nationalism and vaccine protectionism. When the world is shrouded in anxiety caused by the spread of the epidemic, how to reasonably allocate the production capacity of the new vaccine after the development and production of the new vaccine has become a problem that needs to be solved urgently in the world. This paper combines domestic distribution with global supply with a different way of thinking including immediate acceptance and deferred acceptance theory. The principle in this article discusses that the vaccine distribution around the world should depend on increasing the actual utility of vaccines based on ethical criteria while the citizens of vaccines producing countries should have the right to ask their government give priority to domestic demand in some extent and eventually balance the inner and outer demand. This paper hopes to offer some references for organizations when facing some major epidemic situations.

Keywords: The Covid-19 vaccines · Distribution of vaccines · Balance the demand · The Fair Priority Model

1 Introduction

As the development of the new vaccine accelerates, its huge role in global social and economic recovery continues to highlight. At this point, how to establish a fair and efficient distribution mechanism across the world has become an unavoidable problem. Governments and international organizations are trying to solve this problem. For example, the New Canopy Pneumonia Vaccine Implementation Plan COVAX [1], led by the World Health Organization, GAVI and the Alliance for Innovation in Epidemic Preparedness and the “Fair Priority Model” proposed by 19 health experts in the United States, represented by Emanuel J. Ezekiel and others, for the global distribution of the new vaccine. The two programs aim to distribute vaccines equitably across countries as a public good to fight against the nationalism and vaccine protectionism. There are also many studies of vaccine distribution within a country. The theory suggests that some people have vaccines, some people don't, and somewhere in between, eligibility for vaccines should be

proportionate between “risk” and “due” and should ensure that this “priority” is “due”, “just” and can achieve maximum relief benefits. The former studies respectively discusses the criteria for the distribution of domestic and international vaccines, but few studies have looked at how to balance the inner and outer demand for vaccines in the face of scarcity.

The vaccines’ matching should be based on the rationality of the country ensuring their own citizens’ need in advance, and the government should abide the ethical requirements of cooperation among all countries in the face of the epidemic at the same time. This paper focuses on using IA and DA distribution theory to construct a mechanism to pursue a kind of balance between how to cooperate with the whole world to fight with the epidemic and safeguard the interests of its own nationals, hoping that the mechanism will provide governments, international organizations and vaccine producers with a practical way to fulfill their pledges to distribute the vaccine fairly. Eventually it is going to make a slight difference to help to the world epidemic prevention process.

2 Mechanism for Vaccine Distribution Between Countries

As the epidemic continues to spread and worsen around the world, the new vaccine is becoming the most effective way to fight against the virus. The United Nations has repeatedly called for global solidarity and solidarity, calling on major countries to share their experience in fighting the epidemic. At present, countries around the world are paying particular attention to the distribution of the new vaccine, and many health experts and scholars have put forward some constructive proposals. The two plans which plays an essential role is the COVAX [1] led by the World Health Organization, GAVI and the Alliance for Innovation in Epidemic Preparedness and the “Fair Priority Model” proposed by 19 health experts in the United States, represented by Emanuel J. Ezekiel and others.

For the COVAX plan, it advocates absolute equity and distribution in two phases: the first phase provides vaccines to all countries according to the population base, mainly for front-line health care workers. The second phase will provide vaccine coverage of 20% of the country’s population, giving priority to the elderly, patients with basic diseases and other high-risk groups. The whole plan seems a good response to the vaccine nationalism by calling on the idea of racial equality.

However, from the perspective of reality, the plan is not perfect and facing many problems. Firstly, distributing vaccines depending on the number of people in a country could aggravate the problem of vaccine inequality because the severity of the epidemic varies from country to country Secondly, the current scarcity of effective vaccines makes it difficult to secure a basis for the wide distribution. Thirdly, allocating vaccine to countries that lack the infrastructure to manage vaccines would waste life-saving resources. Fourthly, since the plan is led by the developed countries, it may fail ultimately because the powerful countries intend to give priority to protect their own interests.

In order to improve the mechanism of vaccine distribution, while maintaining the establishment of the global immune system, a number of experts have jointly proposed an ethical criteria for the distribution of global vaccines which is published in the magazine “Science” to introduce “Fair Priority Model” [2]. The model has concluded 3 main

principles which are benefiting people and limiting harm, prioritizing the disadvantaged and equal moral concern respectively [2].

There are also 3 phase goals should be achieved throughout the process. The first phase is to reduce mortality especially the premature death. The second phase aims to reduce the sustained harm of the outbreak to patients so as to decline the influence on the economy and society. The third phase is intended to reduce transmission across the neighborhood [2].

During the whole period, what is the most urgent thing is to prevent the premature death which means a people could barely experience less and attaining less than normal death [3, 4]. And that is to emphasize the phase 1. For that, the experts decided to utilize measurement data Standard Expected Years of Life Lost (SEYLL) as an index of premature death [5]. The magazine's authors emphasize that there are three advantages to use SELLY data. Firstly, it reflects the idea of equality as the same age measuring factor is set in every country, despite there are differences in healthy situation and life expectancy around the world. Secondly, the special attention has been paid to premature death, which could give priority to the most disadvantaged. Because premature death is more common in low-income countries, as well for the disadvantaged. Finally, it is also a measure of the global burden of disease [6]. The second phase of the plan uses the increase in national income as well as the narrowing of the gap between the rich and the poor with the help the vaccine to measure the marginal impact of the vaccine on the country's recovery of society and economics. In the phase 3, priority should be given to countries with high rates of virus infection, while ensuring that all countries around the world have access to ample vaccine to block community transmission. Eventually, the goal is to achieve global liberation and mutual open unconditionally.

By contrast, there are still some existing problems. Initially, the plan may encourage some countries to exaggerate their epidemics in hopes of obtaining more vaccines. In addition, in some underdeveloped countries with poor infrastructure, inadequate vaccine storage systems result in pointless waste of vaccines, contrary to the purpose of the plan [6]. So, when distributing vaccines to these countries, the organization should also try to help them build the infrastructure that makes vaccines work effectively.

In conclusion, although there are still some difficulties, the model aims to prevent the distribution of global vaccines from being dominated by market supremacy, nationalism and monopolies, which could reduce the effectiveness of the fight against the epidemic and lead to more deaths. Moreover, the model emphasizes the value of life and appeals all countries, especially major countries, work jointly to alter the attribute of vaccines based on the notion of a community of shared future for mankind. It is more willing to give vaccine the definition as a public good to improve its accessibility, affordability and non-monopoly.

3 Mechanism for Vaccine Distribution Within a Country

The distribution of vaccines within a country should be based firmly on fairness and justice, while should not depend on external factors such as identity, wealth, gender, nation and so on. Additionally, it is rational to make a flexible response when following the basic principles of distribution among countries in line with considering the epidemic situation in the country.

The principles of justice, greatest benefit to life and reasonable priority should be followed as far as possible in the formulation of vaccine distribution mechanism since the epidemic situation of each country and the economic development situation in each region are different. When governments developing the sequence of vaccination for their citizens, they are supposed to ensure that the priority between the group is deserved, fair and can achieve the benefits of helping patients to the greatest extent. As a scarce resource, the distribution of the Covid-19 vaccine should be equitable and proportionate whether globally or within a country. As the vaccine is scarce, it is likely that some people will have it while others will not so that there should be a correspondence between risk and acquirement.

When the allocation scheme is being developed, the overall framework should be operable, not abstract as well as not completely specific and rigid. The sequence in which vaccines are obtained requires medical standards assessment and should emphasize collectivism. The first level is the group whose injection is likely to save lives or the team fighting on the front line of anti-epidemic, such as the elderly, the medical workers and those who play an important role in community vaccination [6]. The second level is the group with stronger immunity, which is easier to beat the virus. The third level is most powerful group, no vaccine can also beat the virus.

With the gradual overcoming of scarcity, the allocation of resources presents a dynamic and reasonable change. So, the policy is not unchangeable but going to cover everyone with the increase of the vaccine resource. On the contrary, presuming that the vaccine shortage is continuing to aggravate, the distribution mechanism should also alters by the logic.

From another perspective, for the current stage of disease control situation within a country, the authors believe the degree that the general public trust in the government plays an essential role. In some countries with high government trust, people can effectively implement government control measures, such as wearing masks and having regular nucleic acid testing [11]. Conversely, the countries most affected by the epidemic tend to be those in which public reaction to government policies is low and pessimistic [12].

In Asian countries such as China and South Korea, the country has organized teams of health care workers to block the area and conduct indiscriminate nucleic acid testing at the beginning of the outbreak. In Addition, the country will set up a nationwide national risk assessment system to closely track contacts who may be infected. Simultaneously, the people's high confidence in the government and the high level of policy implementation have become the guarantee for the policy to play the key role. Although the two countries have different ideologies and political systems, the common heritage of millennia-old Confucianism has led to a perception among their citizens that collective interests prevail over individual interests. Moreover they are willing to believe that government policies are designed to protect the common collective interest. So these countries can be the vanguard of the world epidemic prevention process [6].

However, countries who appeals to small government and individualism seem unable to emulate such success. In the United States, for example, at least one-third of the population resists to accept government vaccination. A common characteristic of these

people is that they do not trust the purpose of policy and experts which represents a deep lack of confidence on the government and the social system from the origin.

On the whole, as the general trust in governments in many OECD countries is diminishing with the low capability, reliability, integrity and justice degree [14]. The author suggests that the government should balance paying attention to how to improve their credibility in the perception of their citizens with establishing effective vaccine distribution systems based on their own epidemic situation to jointly ensure that the vaccination program can be completed smoothly.

4 How to Handle National Favoritism Properly and Balance Domestic and Foreign Demand for the Vaccine

The scarcity of vaccines has led to the prevalence of national priorities and nationalism in recent years. In some developed countries and groups within the country, there has even been a rise in principle called “vaccine nationalism” [7] in which parties seek to erect barriers to preserve as much of their own vaccine as possible, while taking advantage of both economic and political advantages to acquire vaccines available worldwide. The British Commonwealth countries, for example, have locked in large numbers of vaccines based on their populations [8, 9]. The United States has also launched a campaign called “Rush Operation”, in which it invests directly in companies producing vaccines to gain options on about 600 million doses of the vaccine [10].

A proper degree of national favoritism is not unreasonable at all. Citizens belonging to the same country have the common government, live on the common land, utilize the common infrastructure. They have associations that no one else has called “associative ties” [15, 16]. The initial function of a government is supposed to defend the legitimate interests of its citizens [15]. It can be said that the government and the state itself is the collection and sublimation of its own nationals.

However, the national favoritism should not be unrestricted, nor it should not be equated with nationalism which is the violation and destruction of the ethical standards of the world. Common government can give its citizens a proportionate priority in vaccination, but it must not be unconditional and complete priority [15]. This prior acquirement should be given to patients in the country who really need the vaccine, but not to hoard it meaninglessly or make it a tool to earn the profit which is lack of the respect to the lives worldwide. Apart from it, governments have the obligation to lend a help to weak countries in the prevention of global epidemic and should jointly build a united league of mankind in the face of the epidemic under the process of global village.

Here, the author tries to construct a mechanism to balance national priorities with the help based on global ethics by using Immediate Acceptance (IA) and Deferred Acceptance (DA) theory. Recalling to the above paper, the process of the vaccination is divided to three parts no matter within a country or across the world. For the domestic, it is supposed to provide vaccination to the group whose injection can probably save their lives at first. Subsequently to group with stronger immunity, which can help them to fight against the Covid-19. And finally, the strongest ones. For the worldwide, the first phase of the vaccine will be used to reduce premature deaths and other irreversible direct and indirect health impacts. The goal of the second phase is to reduce severe economic

and social losses, as well as diminishing the wealth gap. The ultimate phase will seek to reduce community transmission and halt transnational infections.

In this situation, the theory Immediate Acceptance symbolizes an absolute order which means the vaccine can be used in the next stage only after it has completely resolved the problem at this stage. On the contrary, the theory called Deferred Acceptance denotes an elastic mechanism that the distribution of vaccines between the two can be coordinated according to shortage of vaccine on one side or other different situations.

Suppose a developed country X has the capacity to produce the vaccine it needs, and sometimes even has excess stocks of vaccine. At the same time, one less developed country Y is currently in short supply of vaccines.

The whole plan should be started from step 1. In this step, the most urgent and desirable thing to do is to save human lives as it is recognized that human health generally takes precedence over economic and social development as well as the death is the most devastating loss. There is no doubt that every nation will put the lives of its own citizens before any other which is a justified respond to the national favoritism. Therefore, it is rational to use IA to connect X and Y in this period which means that only after the country X has completed all the vaccination for those who have the possibility to save because of the vaccine, if there is a surplus stock, it will give help to the country Y. At the same time, the distribution within X and Y should follow the theory of DA. Whether for the infected elderly with underlying diseases or the front-line health care workers, the government should coordinate the distribution of vaccines to ensure the gap where the shortage is greatest can be replenished in time. When the premature death situation is significantly better which can be reflected by data SEYLL [5]. The plan is going to move to step 2 implemented with step 3 which is intended to reduce economic, social loss and diminish community, transnational infection respectively at the same time. The author put the step 2 and step 3 into DA because economic development and the reduction of cross infection are mutually reinforcing. More specifically, economic development provides a solid financial basis for reducing transmission while low infection rates provide a healthy environment for economic recovery. During the process of step 2, theory IA is supposed to connect country X and Y for the reason that each country will race to recover its own economy so as to gain a head start in the battered international markets. The promotion of the data GNI can be a good measure of the results in this phase Simultaneously, within the country X and Y, government should give vaccination priority to the group who have proper immunity so that the vaccine can help a lot to fight the virus rather than the group with strongest body whose life is slightly affected by the epidemic. This form of IA can maximize the effectiveness of vaccines and reduces the waste of vaccines. By contrast, during the process of step 3, the author utilizes DA to connect the X and Y because the vaccine should be given priority to countries with the highest infection rate to help alleviate the epidemic while reducing the impact of civil unrest on the global community at this stage. Inside of the both country, governments should carry out nationwide macro-control of vaccine resources while paying special attention to areas with severe epidemics and tracking contacts, implementing strict blockade policies on areas with high epidemics which can learn from the corresponding experience of China [6]. As the three-stage goal of vaccination tend to be completed, people around the world will take a big step forward in the fight against the epidemic.

At last, the above plan is an ideal situation after all. There are absolute more than two countries involved in the vaccine distribution at the mean time in reality. It will also be difficult for vaccine supplies to eventually meet the needs of all countries in different stages. No matter how complicated the situation is, the most sensible method to achieve the balance between national priorities and the help to the weak based on global ethics is vaccinating the most needed part of the population for all countries, not the whole population in some countries.

5 Conclusion

In present international environment, if vaccine distribution is carried out in isolation with absolute national priorities and self-interest, the global response to the epidemic will be significantly reduced. At the same time, it will also aggravate the spread of the epidemic. Because for the virus, there is no country, culture, race, political preference and other characteristics. The virus is the “most equal” that this kind of indiscriminate spread also give mankind face great challenges,

Therefore, the basic principles of global vaccine distribution need to be worked out. Countries have the obligation to break the existing distribution unfair status quo. On the premise of accepting the rationality of proper national priority, developed countries are obliged to provide minimum vaccine guarantees to backward countries and regions as well as countries with severe epidemics. At the same time, it is necessary to actively build a constructive vaccine distribution framework taking into account fairness and efficiency within a country. Fairness cannot be at the expense of the rights and interests of the powerful groups, nor can efficiency be the cost of the interests of vulnerable groups.

The advisement is of three parts. First, the role of WHO should be valued and brought into play. WHO has made an important contribution to addressing global public health since its establishment at the end of World War II. It can act as a hub between countries to coordinate the deployment of medical resources in the global epidemic. Second, strengthening global health cooperation and regional health cooperation mechanisms. In addition to WHO, it is of great significance to establish global and regional health cooperation institution to form effective response mechanisms in information sharing, medical cooperation and response to large health emergencies. Strengthening global cooperation and regional synergy should enable mankind to exert its “overall wisdom” in responding to the health crisis. Third, we need to give full play to the responsible of major countries. In the context of globalization, countries become the most basic political unit, but different countries do not play an equal role in the international world. This difference makes major countries need to bear more responsibility. For one thing, it needs to play its due role in vaccine research and medical assistance. For another, major countries should play a leading role in formulating distribution rules. This lead is not a dictatorship, but to try to play the role of global justice and humanitarian.

At last, there is no doubt about the triumph against the epidemic. However, when this victory will come depends on how mankind unites and cooperate. Only by building a just COVID-19 vaccine distribution plan and effectively implementing it in practice will the dawn of victory come a day earlier. After all, “only the last country coming out of the epidemic means the final victory of the global fight against the epidemic”.

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References

1. World Health Organization, A Global Framework to Ensure Equitable and Fair Allocation of COVID-19 Products and Potential implications for COVID-19 Vaccines, June 18, 2020. <https://bit.ly/32rhHPb>.
2. Emanuel, An Ethical Framework for Global Vaccine Allocation: The Fair Priority Model Offers a practical Way to Fulfil Pledges to Distribute Vaccines Fairly and Equitably, Science, 2020.
3. D. Ottersen, O. Mbilinyi, Maestad, O. F. Norheim, Health Policy 85, 218, 2008.
4. A. Tsuchiya, P. Dolan, R. Shaw, Soc. Sci. Med. 57, 687, 2003.
5. J. Marshall, Standard Expected Years of Life Lost as a Measure of Mortality: Norms and Reference to New Zealand Data, Australian and New Zealand Journal of Public Health, vol.4, 2020, pp.452–457.
6. Robert Walker, Who Will Receive the Covid-19 Vaccine first? Chinese Journal of Contemporary Values, 2020, pp. 108–110.
7. T. J. Bollyky, C. P. Bown, The Tragedy of Vaccine Nationalism. Foreign Affairs, July 27, 2020. <https://fam.ag/32sqwZ7>.
8. Biospace, Prime Minister Announces Funding to Advance the Development of Canadian COVID-19 Vaccine Technologies, Published, Oct 23, 2020.
9. D. Mancini, and C. Cookson, UK Secures Another 90m Doses of Potential Covid-19 Vaccines, Financial times, August 14, 2020. <https://www.ft.com/content/1e928cb6-57fb-4384-9c2c-9000c44eac0>
10. A. Phelan, M. Ecleston-Turner, M. Rourke, A. Maleche, and C. Wang, Legal Agreements: Barriers and Enablers to Global Equitable, The Lancet, September 19, 2020.
11. O. Bargain, and U. Aminjonov, Trust and Compliance to Public Health Policies in Times of COVID-19, Journal of Public Economics, 2020. [https://doi.org/10.1016/j.jpubeco.\(2020\).104316](https://doi.org/10.1016/j.jpubeco.(2020).104316).
12. J. Lazarus, S. Ratzan, A. Palayew, et al., COVIDSCORE: A Global Survey to Assess Public Perceptions of Government Responses to COVID-19 (COVID-SCORE-10), PLoS ONE, vol. 15, no.10, 2020. <https://doi.org/10.1371/journal.pone.0240011>

13. J. Newhagen, E. Bucy, Overcoming Resistance to COVID-19 Vaccine Adoption: How Affective Dispositions Shape Views of Science and Medicine, *The Harvard Kennedy School (HKS) Misinformation Review*, vol. 1, no. 6, 2020.
14. OECD, *Trust and Public Policy: How Better Governance Can Help Rebuild Public Trust*, OECD, 2017.
15. D. Miller, *Ethical Theory Moral Pract.* 8, 63, 2005.
16. A. Sangiovanni, *Philos. Public Aff.* 35, 3, 2007.

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