

**INVITED
REVIEW**

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The Wealth of Nations during the Pandemic: The Vaccine Equity

ABSTRACT

Aggressive global dissemination of the coronavirus indicated the urgency of the development of vaccines at an unprecedented rate and scale. The limited production and short supply of vaccines which were reserved mostly for the advanced economies were the greatest problems of 2021. For emerging economies, this timeline will stretch to late 2022 or early 2023. As a part of systematic immunization programs, the development, licensing, and implementation of the vaccines against the Covid-19 virus started to address health service inequalities among countries. While on one hand vaccination is regarded to be one of the most cost-effective interventions in public health during the pandemic, on the other hand, the introduction and sustainable supply of vaccines needed to be supported and ensured by decision-makers and governments. Due to the weak economic conditions of developing countries, they could not provide enough financial and health support to their citizens during this period. However, since the global GDP loss from not inoculating all countries is higher than the cost of manufacturing and distributing vaccines globally, there has been a growing demand to international cooperation to have global vaccination without omitting any countries.

This paper focuses on the economic and social costs and benefits of vaccinations during the Covid-19 pandemic period in advanced, middle, and low-income countries. Accordingly, macroeconomic and social impacts of vaccination will be discussed and some policy suggestions will be put forth to get more benefits from the vaccination both for economic and health outcomes.

Keywords: Covid-19 Pandemic, Vaccine, Developing Countries.

Pandemi Döneminde Milletlerin Zenginliği: Aşı Eşitliği

ÖZET

Amaç: Koronavirüsün küresel ölçekte agresif bir şekilde yayılması, salgını kontrol altına almaya yönelik aşıların geliştirilmesinin aciliyetini ortaya koymuştur. Çoğunlukla gelişmiş ekonomiler için ayrılan sınırlı üretim ve aşı yetersizliği, 2021 yılının önemli bir küresel sorunlarıydı. Gelişmekte olan ekonomiler için aşılama takviminin 2022'nin sonlarına, hatta 2023'ün ilk aylarına kadar uzaması beklenmektedir. Bağışıklığı artırmaya yönelik uygulamaya konan programların bir parçası olarak, aşı geliştirme, lisanslama ve aşıların uygulanması, ülkeler arasındaki sağlık hizmeti kalite farkı, aşı eşitsizliğinin derinliğini ortaya koymuştur. Aşılama, bir yönüyle pandemide halk sağlığının korunmasında en düşük maliyetli stratejilerden biri olarak kabul edilirken, diğer yönüyle aşıların tanıtımı ve sürdürülebilir tedarikinin karar vericiler ve hükümetler tarafından desteklenmesi ve sağlanması gerekmektedir. Gelişmekte olan ülkelerin zayıf ekonomik koşulları nedeniyle bu süreçte vatandaşlarına yeterli finansal ve sağlık desteği sağlayamamışlardır. Bununla birlikte, tüm ülkelerde aşılama yapamamaktan kaynaklanan küresel hasıla kaybı, aşıları küresel olarak üretme ve dağıtma maliyetinden daha yüksek olacaktır. Bu nedenle, hiçbir ülkeyi atlamadan küresel aşılama yönelik uluslararası işbirliğinin artırılması hayati öneme sahiptir.

Bu makale, yüksek, orta ve düşük gelirli ülkelerde Covid-19 pandemi döneminde aşılamanın ekonomik ve sosyal faydalarına odaklanmaktadır. Aşı eşitsizliğinin sadece sağlık boyutu ile değil, asinine küresel etkinliğini de önemli ölçüde zedeleyecek bir sorun olduğundan hareketle, aşılamanın makroekonomik ve sosyal etkileri tartışılacak ve aşılama hem ekonomik hem de sağlık açısından daha fazla fayda sağlanması için bazı politika önerileri ortaya konulacaktır.

Anahtar Kelimeler: Covid-19 Pandemisi, Aşı, Gelişmekte Olan Ülkeler.

INTRODUCTION

The Covid-19 pandemic has created a devastating uncertainty shock – larger than the 2008 financial crisis and more similar in magnitude to the 1929 Great Depression. All of the countries were caught unprepared and unsuccessful to prevent the fast spread of the virus. The cost was very high. All countries had to experience not only uncertainties such as infectiousness, the lethality of the virus, prevalence, and the availability of antibody tests but also the financial panic due to shutdowns and economic contractions accompanying the infections and deaths. The medical authorities, bureaucrats and policymakers had just lockdown policies in their hands. It is surely beyond doubt that this policy was unsustainable. Thus, one year after the outbreak, the policymakers had to give a critical decision about turning back to normal lives. It was inevitable to initiate the economic activities for both economic and health needs. To continue health support to society, governments needed to have funds. Due to quarantine precautions, governments had to deprive themselves of the tax revenues which were the greatest sources of all public services including health services. The policymakers were actually between the two fires. There were great lockdowns, lack of government revenues, and economic constraints that will probably result in a great economic crisis on one side, and a growing spread and having more infected people due to initiating economic activities on the other side. To get rid of this vicious circle, vaccination was the best way to get out of the pandemic.

Many studies indicated that public health can provide a remarkable boost to economic growth which can create additional resources to invest in health. No doubt that healthy people tend to work more productive on job creation and technological progress, save more, and attract more investment to contribute to capital accumulation. Although health authorities only consider direct health benefits, economy authorities consider medical cost savings and care-related productivity gains. Moreover, in the long-term many social and economic outcomes such as decreasing fertility, macroeconomic stability, and improving educational performance are expected outcomes of immunization programs (1, 2).

Since wearing masks, good ventilation indoors, physically distancing and long-lasting curfews will not be enough to overcome the pandemic, equitable access to safe and effective vaccines is crucial to fight the coronavirus outbreak. They are expected to change the duration and lethality of the pandemic. Some of the international pharmaceutical companies initiated research to develop vaccines in the early days of the pandemic. However, it is to vaccinate every individual all over the world, not to just develop vaccines and keep them just for one's our benefit.

Unless all nations receive vaccines and rollout to protect their population, the pandemic is not over (3).

WHO (6) expresses that *“No one is safe unless everyone is safe. Vaccine doses must be shared globally and immediately”*. Nevertheless, poor countries are very vulnerable in getting equal vaccines. Although majority of the population of developed countries have been vaccinated, new variants of concern create new risks of infection not only unvaccinated people but also the people of vaccinated countries. Thus, vaccine equity will accelerate the end of the outbreak.

Providing sufficient healthcare services, economic support, and supplying enough vaccine are mostly related to the macroeconomic stability of local economies. Unfortunately, the pandemic hit the developing countries more than the developed ones not only through lack of the healthcare services but also vulnerable macroeconomic conditions (4, 5).

This paper is built on three key premises: First, we will explain a theoretical framework that underlines the economic and health benefits of vaccination. In this vein, the importance of vaccination and making the vaccine globally available will be expressed. Also, the role of vaccination in promoting population health and economic performance will be analyzed. This is necessary for not only health and moral issues but also for economic reasons since there may be a great economic cost in the absence of global vaccinations. Second, by benefiting global and country-specific data we will express the magnitude of these benefits. We will conclude with policy implications and policy recommendations for vaccination policies that are necessary for robust health and economic well-being.

Economic Effects of Vaccination: The prevention of outbreaks, diseases, and death by vaccines has been accepted as one of the most applicable health services. Particularly global commitments among the governments are necessary for pandemics since vaccination should be accepted as a fundamental human right (2). Hence, investing in immunization programs in advanced and developing countries increased in recent years. This interest led to more expenditure on immunization. Thus, microeconomic justifications and evaluations that compare the economic cost of implementing a vaccine program against the health and economic benefit of vaccination are necessary to convince national and multinational stakeholders. The fact is that vaccine reduces disease, death, disability, and inequity globally. Immunization programs improve the primary care infrastructure, decrease mortality in

childhood, and empower the workforce. The economic performance of workers can be better through lower morbidity, and mortality. Besides, since vaccination increases life expectancy, people can work and live longer and healthier which contributes the prosperity. However, especially in low-income countries, infectious diseases are still one of the greatest reasons for death. This shows that health inequalities are highly related to economic growth differences. Although disease control, elimination, and eradication can save both lives and billions of dollars, the allocation of vaccination is always limited in low-income countries (8).

Besides, the full benefit of vaccination is not only preventing disease but also has social and economic outcomes. Many theoretical and empirical studies in the literature indicated that health is one of the major drivers of economic performance and economic growth (8, 9, 10, 11, 12). Improving health quality may bring a positive impact on economic outcomes and social well-being. In their study, Ozawa et al. (10) included 73 low and middle-income countries to analyze the economic impact of vaccination during the period 2001-2020. The researchers concluded that vaccination could prevent more than 20 million deaths and saved approximately \$350 billion in the cost of diseases. The prevention of death resulted in lifelong productivity gains of \$330 billion. Vaccination also provided an \$820 billion save in treatment costs.

European Council recognized the vaccination as an effective tool in public health (13). The effective tool stands for a cost-effective, safe, efficient, and evidence-based vaccination system. The positive effects of vaccination are both public health and economic terms. Reducing healthcare costs, reducing labor hours and productivity losses, and contributing to social and economic wellbeing are some of the positive effects of vaccines. As an example, if workers live longer and can work a long period of time, there may be higher productivity with longer working hours, higher social inclusion, and lower health costs. Besides, it is a critical decision to prefer either concentrating on keeping people healthy or waiting to treat people until they become sick. Actually, this is a very critical decision and dilemma that governments and national budget holders confront to allocate the limited financial resources as efficiently as possible for the public's benefit.

Many pieces of research showed that keeping people healthy is more economical than treating them when they get ill. Thus, prevention is one of the most effective ways of keeping people living healthier and increasing their productivity. Occasionally, preventive health care programs are vulnerable to budget cuts since their expected benefits are not immediately identifiable. Instead, policymakers prefer to dedicate the funds to short-term programs which do not consider future public health or productivity gains. Therefore, modern healthcare policies need to change the focus from illness management to healthcare management through cost-effective preventive interventions (14). Actually, elimination of the costs can be collected under five categories (10): (i) elimination of treatment costs; (ii) elimination of transportation costs of seeking care; (iii) elimination of loss of care-providers economic output; (iv) elimination of losses of productivity because of premature death; and (v) elimination of loss of survivors' productivity because of disability and handicaps. Thus, in the economic evaluations of vaccination, cost-effectiveness analysis had the priority. In this evaluation, health is compared with its financial costs, i.e. placing a monetary value on life. Besides, presenting and sustained use of a newly introduced vaccine needs to be supported by policymakers, health, and economy bureaucrats who have full knowledge of the economic and health benefits of the vaccine to convince the public (10).

Traditionally, evaluation of health economics used to consider just the health services sector. However, many diseases such as cholera or the Covid-19 pandemic may affect many sectors such as transportation, tourism, and manufacturing. The countries with high outbreak effects may benefit from vaccination to get a substantial effect on demand, supply, production, investment, and trade (15, 11). In their study, Krigia et al. (15) investigated 12,5018 cases of cholera notified to WHO by countries of the African Region in 2005. The real total economic loss was US\$64.2 million, assuming a regional life expectancy of 73 years. The 203,564 cases of cholera notified in 2006 led to a total economic loss of US\$156 million. The 110,837 cases of cholera notified in 2007 resulted in an economic loss of US\$72.7 million, for 73 years of life expectancy.

In Table-1, alongside the health benefits, economic and other social benefits of vaccination are categorized.

Table 1. Economic and Social Benefits of Vaccination

Benefits	Description	Outcome measures
Benefits of vaccination to individuals <ul style="list-style-type: none"> • Health quality gains • Health care cost savings 	Reduction in mortality and morbidity Reduction in the direct cost of health care from the public sector and private individuals	No more cases or deaths due to diseases The cost saved by a health care provider as well as less health care costs by individuals
Productivity benefits <ul style="list-style-type: none"> • Productivity gain due to care • Productivity gains due to health quality • Productivity gain due to non-utility capabilities 	Reduction in loss of working days due to caring for the sick patient Reduction in loss of working days due to sickness of worker or death of the patient. Increasing lifetime productivity due to improved capabilities	Higher level of productivity Friction costs, potential lifetime earnings, opportunity to have more education, cognitive outcomes
Health system improvement externalities	Health improvement in an unvaccinated society due to improved immunity, eradication, and reduced antibiotic usage	Indirect vaccine protection, the prevalence of antibiotic resistance, the future cost of the disease is reduced
Equity	Equal distribution of health services and outcomes	Distribution of health outcomes
Financial sustainability	Improving financial sustainability due to higher synergy with other health care programs	Financial security and benefit
Household security	Improving financial security will bring the lower risk of catastrophic expenditure	Financial security and comfort
Valuing a healthier life and having a longer life expectancy	Long-term benefits of vaccination through eliminating vaccine-preventable disease	A productive, safer, and healthier society
Mitigating the severity of disease	When vaccinated people are caught in the outbreak, the disease generally has milder effects than in non-vaccinated patients	Mitigating the harmful effects of disease and having healthier individuals
Herd protection	The vaccine reduces disease among unimmunized individuals through herd protection. Herd protection of the unvaccinated occurs when enough proportion of the group is immune	Mitigating the spread of an infectious agent by reducing the amount and duration of pathogen shedding by vaccines to provide a healthier community
Safe travel and mobility	Global air/rail/road traveling increases the risk of exposure to infectious diseases. Travelers transmit outbreak, as has been observed in the case of the Covid-19 pandemic	Mitigating the dissemination of infection
Epidemic prevention savings	Benefits through saved costs of prevention of epidemic	Improving cost-effectiveness
Positive externalities for the community (health and economic outcomes)	Vaccinating whole society	Securing public health and controlling contagious effects. More vaccinated people, healthier workers, more cost-effective economic activities
Behavioral improvement	Vaccination brings not only physical health improvement but also psychological wellbeing	Since vaccination improves physical and mental health, individuals can invest in education, social interaction, and other personal improvement strategies
Risk aversion	Reducing spread risk	Less certainty for the future, gain on welfare
Other economic indicators <ul style="list-style-type: none"> • Changes in household behavior • Public sector budget effect • Short-term macroeconomic effect • Long-term macroeconomic effect 	Economic improvement because of changes in household preferences such as consumption/saving, better quality child care Change in an individual's net transfer to the national budget over his lifetime Changes to national income and production due to short-term exogenous shocks to the economy Changes to national income and production due to long-term changes to drives such as foreign direct investment and labor supply	Productivity increase, female worker participation, household investment, child dependence ratio More investment Improvement in GDP per capita, change in sectoral output Higher GDP per capita

Source: (1, 8, 16, and modified by the authors)

The Economic Effects of Covid-19 Pandemic: Pandemic period impacted all countries. However, the developing countries were affected more than the others due to their vulnerable

economic and social conditions. In Figure-1, the economic growth performances of the countries groups with different economic performances are illustrated.

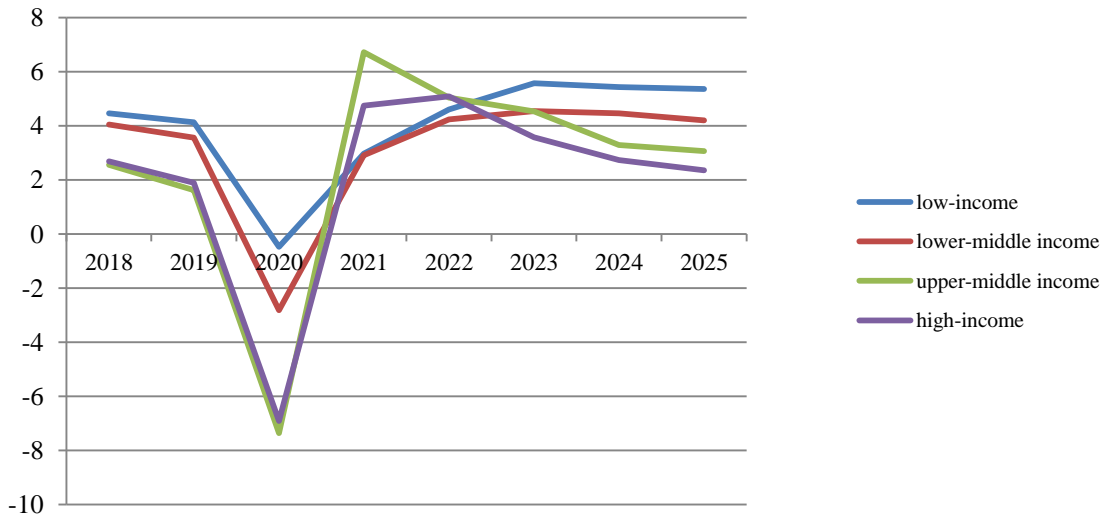


Figure 1. GDP growth performance of developed and developing countries

Source (17); *countries are classified as low-income (26 countries), lower-middle income (48 countries), upper-middle income (50 countries), and high-income countries (62 countries) based on World Bank classification. *2022-2025 are forecasted.

According to the figure-1, high-income and upper-middle income countries have more economic downturns and negative GDP growth rates. However, low-income countries and lower-middle income countries have been affected more than the former ones. Low-income countries have limited resources to allocate during the economic shutdown periods. Thus, they could not support their population neither through healthcare nor economic supports.

The reasons behind these differences can be classified as follows (18, 19, 20):

- i. Developing countries have the lower fiscal capacity
- ii. Developing countries have younger populations
- iii. There are more informal sectors than well-defined social security and insurance facilities in developing countries
- iv. Developing countries have weak healthcare capacity
- v. More person-to-person contact both at work and at home in developing countries

Governments in developing and developed countries reacted differently during the Covid-19 pandemic lockdowns. As millions of workers had to stay home during this period, the governments of developed countries sent not only regular social insurance payments but also direct transfers which were more than 10% of GDP in those countries. Advanced economies could provide these supports to their citizens by providing a public good and market transfer. They trusted their strong macroeconomic conditions and their ability to raise tax revenues. In response to the deep recession,

while advanced economies engaged in fiscal transfer programs, emerging economies could have very limited fiscal space due to chronic macroeconomic problems. In fact, many developing countries such as Argentina, Lebanon, and Ecuador have defaulted on their sovereign debt (21). Therefore, developing countries could not mimic the advanced countries due to the lack of fiscal capacity to provide transfers to most-affected segments of their societies for a long period. Developing countries are lack of ability to enforce tax payments and have limited tax revenues. Furthermore, they have a huge informal sector that is hard to tax. The lack of tax revenue causes the lack of quality health services. Besides, low-skilled workers from informal sectors are actually the desperate ones who do not have any social support or insurance (19). Hence, they need to spend their savings during the lockdowns. Miserable economic and social conditions urged them to perform marginal tasks that hardly generate adequate income. The inability to raise taxes in these countries also leads to limited borrowing which in turn reduces the ability to make payments to furloughed employees. In those countries, the share of the younger generation is higher and those people are not offered enough job opportunities as well as a lower fiscal capacity to cover the needs of those unemployed people. Moreover, there is a large proportion of the informal sector in those countries that caused the more dramatic economic conditions in these countries. Besides, due to crowded households and intergenerational dwellings, there is more probability of transmission among the household members. Therefore, there

was not enough care for lockdown precautions during the quarantine period in developing countries (22, 23, 19). Since low-income countries have a younger population, the mortality risk due to the Covid-19 virus is lower. On the contrary, the mortality risk in developed countries increases sharply due to aging societies. Many studies indicated that the Covid-19 virus has dramatically greater mortality risks to elderly people, in particular those over the age of 65 (24, 25). In their study on Latin America and Caribbean countries, Pagés et al. (20) indicated that the mortality rate among those infected aged between 70 and 79 (5.1%) is thirty times greater than for that infected aged between 40 and 49.

What is more, the limited infrastructure in their health systems brings low-income countries in a more disadvantageous position. Those countries are less capable to absorb the increasing number of infected patients by their current health service performance. Furthermore, since the economic welfare level is lower in these countries, the poor individuals have to accept higher risks to earn a living than richer people who may access social welfare systems and enjoy savings during lockdown periods. Besides, workers in low-income countries are either self-employed or in the informal sector where employees are dependent on daily wages to look after their families. If there is no social security and insurance, the cost of lockdowns may

have more impact on family budgets. The poor may face deprivation or even hunger. In the absence of such social protections, the poor households need to violate the lockdown precautions to continue to earn a living, mostly in informal economic activities, causing the continued spread of the virus (19).

There is no doubt that the outbreak caused great challenges for local economies. To control the spread of the pandemic, countries had to initiate mitigation strategies such as social distance, quarantine precautions, and economic shutdowns. Although these precautions were expected to control the highly contagious disease, they also resulted in deep contractions in economic activities. Furthermore, the pandemic caused long-lasting uncertainties. The actual capacity of healthcare services to meet the excessive needs, production of effective and economic vaccines, the time needed to develop safety, the duration and effectiveness of social distancing, the duration of economic shutdowns, if the temporary government interventions and supports will continue, the impact on the business environment and the factors that affect the economic activities over the medium and long period are some of the uncertainties still the global economy could not answer yet (26). With all these uncertainties, the economic impacts of the Covid-19 pandemic are illustrated in figure-2.

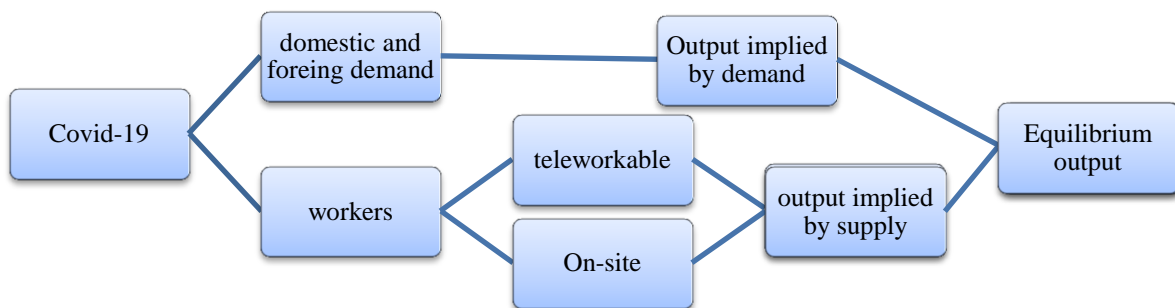


Figure 2. The economic impacts of the Covid-19 pandemic.

Source: (7)

According to the figure-2, the Covid-19 pandemic first impacted the domestic and foreign demand substantially that directly impacted the production of commodities. Lack of demand and supply affected both number of employees within the companies and their working conditions. To decrease the virus transmission risk, teleworking conditions were preferred in suitable sectors. Quarantine precautions also altered the consumers' preferences. During the pandemic period, people mostly preferred food, beverage, and electronic devices. The reasons behind this preference are long-lasting quarantine periods that impacted social activities and lack of income due to job losses (7).

Current Situation of Covid-19 Vaccination: World Health Organization (WHO)

(6) expressed that unless there is enough dose sharing and boost supply in low-income countries, Covid-19 vaccine inequality may have a long-lasting negative impact on recovery in all countries. The spread of the virus among the unvaccinated people may also threaten the vaccinated people, i.e. citizens of developed countries and it would be even harder and more costly to overcome the virus. With current situation, developing countries could not vaccinate all their workers and most of their at-risk population may not reach their pre-Covid-19 levels before 2024. Furthermore, variants of the virus such as Delta and Omicron urge governments to reinstate strict health measures again. These precautions bring even more negative impacts on social and economic conditions, particularly for the

most vulnerable and marginalized individuals. Hence, a well-designed vaccination policy will reduce mortality, protect the health system, reduce outbreak burden, and lower the risk to set strict measures. Tedros Adhanom Ghebreyesus, Director-General of the WHO confirmed the vaccine inequality and stated that *“Vaccine inequity is the world’s biggest obstacle to ending this pandemic and recovering from Covid-19. Economically, epidemiologically and morally, it is in all countries’ best interest to use the latest available data to make lifesaving vaccines available to all”*. New Global Dashboard on Covid-19 Vaccine Equity revealed that low-income countries need \$38 billion to their GDP for 2021 if they had the same vaccination rates as high-income countries. It was also added that global economic recovery may have a greater risk if vaccines are not equally manufactured and implemented. To confirm this policy, UNDP Administrator Achim Steiner stated that *“In some low- and middle-income countries, less than 1% of the population is vaccinated. It’s time for collective action – this will provide governments, policymakers, and international organizations with unique insights to accelerate the global delivery of vaccines and mitigate the devastating socio-economic impacts of the pandemic.”*. Thus, to have a global economic recovery, it may be a wise policy to share vaccine doses with developing countries quickly. Removing barriers to vaccine manufacturing and financial support will engage sustainable access to doses with reasonable prices in these countries. In this vein, the Global Action Plan for Healthy Lives and Well-being for All (SDG3 GAP), which aims to improve collaboration across the multilateral system to support an equitable and resilient recovery from the pandemic and drive progress toward the health-related SDGs is expected to be a good global strategy to fight with the pandemic (27).

World Bank supported the vaccination efforts as well. The initial Global Covid-19 Response Program for the pandemic was initiated on April 2, 2020, with \$6 billion (the program was

also called the Covid-19 Strategic Preparedness and Response Program, SPRP). The program could reach 100 countries with emergency operations to prevent, detect and respond to the coronavirus pandemic. The program also aimed to strengthen the systems for public health preparedness. After the acceptance of the need for vaccines, the World Bank approved an additional fund of \$12 billion for developing countries to finance the acquisition and distribution of the vaccines. In the mid-2021, for vaccine financing, \$20 billion were provided by the World Bank (28). World Bank also declared that 192,1 million doses were delivered to 49 countries in 2021, and 64,6 million doses were delivered to these countries in Q1 of 2022. United Nations (UN) also provides financial support to the least developed countries. UN declared that \$23 billion in 2021 has been spent to fight with coronavirus spread in these countries an increase from \$16 billion in 2020. Indeed, the least developed countries have been more disadvantageous during this period compared with middle and upper-middle-income developing countries. Despite 14% of the world population has been living in these countries, only 1,2% of global coronavirus vaccine doses have been applied in these countries. Unfortunately, just 3,1% of the total population could receive at least one dose of vaccine. Even some of them have just begun receiving vaccines (29). According to Our World in Data (30), 61,4% of the world population has received at least one dose of a Covid-19 vaccine. However, just 10% of people living in low-income countries have been shut at least once by the date 06 February 2022. Figure-3 illustrates the total number of people vaccinated against Covid-19 virus (fully or partially) in selected developed and developing countries. According to Figure-3, while UAE vaccinated almost all its population, Nigeria could vaccine just 4,53% of total population. Another low-income country Ethiopia had a low performance with 17,78% (fully vaccinated). The world average full vaccinated people was recorded as 58,24%.

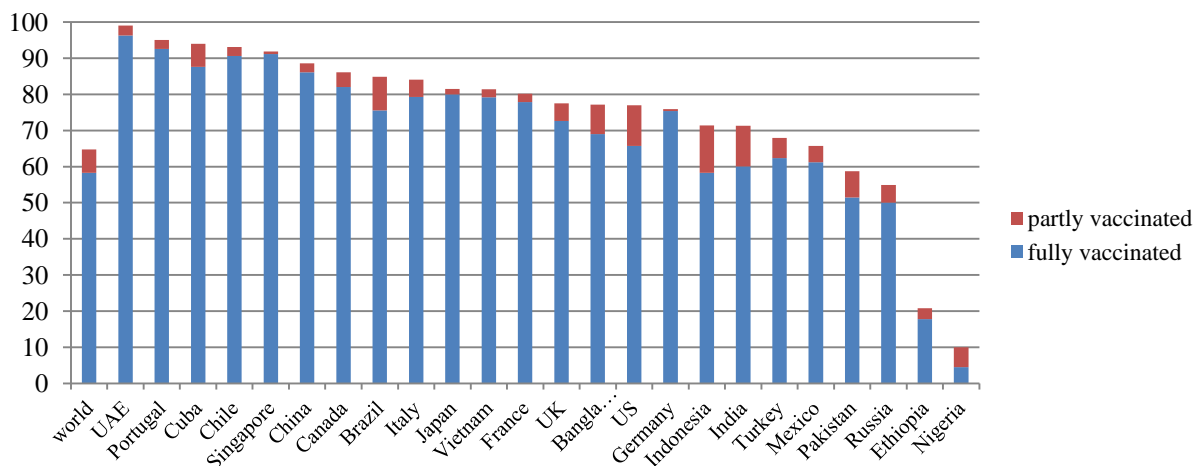


Figure 3. Percentage of People Vaccinated Against Covid-19 (07 April 2022) Source: (30)

As shown in Figure-3, there are still some challenges to vaccine access and delivering it to all countries, particularly the less developed ones. Furthermore, delays in vaccination worsen the inequalities both within and between countries and deepen poverty. World Bank (31) declared that poverty will continue to rise during the pandemic and an additional 150 million people are expected to live in extreme poverty due to the prevailing outbreak. According to the World Bank (31), the pandemic also caused a contraction in global GDP per capita. Accordingly, the least developed countries located in Sub-Saharan Africa would be one of the most affected regions with an addition of almost 40 million people to be pushed into extreme poverty. Due to the shutdowns in economies, many companies went bankruptcy and hence, there has been a sharp decline in labor incomes.

Equal Shot to Global Recovery: To stop the transmission of the virus globally, every individual should have equal right to get vaccine. Therefore, obstacles should be overcome. Basic challenges confronted by developing countries during the vaccination period are barriers to the availability of the vaccine, cost and production of the vaccine, and infrastructural problems (32, 33).

1. *Availability of vaccines:*

Advanced economies could purchase a high proportion of available vaccine doses that is sufficient to vaccinate their entire population. On the contrary, developing economies could not guarantee to get enough vaccine doses for their entire citizens. Furthermore, while rich countries tried to reserve vaccines more than their populations, developing countries could not even start to vaccinate their citizens. The reason is not only because developed countries purchased the greatest share of it but also because low-middle income developing countries and least developed countries do not have enough financial power to purchase. In 2020 and 2021, the supply of vaccines was far from satisfying the excessive demand towards it. There were around 12,5 billion doses were pledged to deliver by vaccine producers in 2021 (31). Although the bulk of the adult population in developed countries will be vaccinated by mid-2022 and middle-income citizens will be finished by the end of 2022, poor countries' timelines will stretch to 2024. In other words, mass immunization will take more time in these countries.

2. *The economic and political power of countries*

The rich countries including the UK, the US, most of the European countries, Russia, and China immunized their population before the rest of the world. Since Russia and China could develop their own vaccines, they could provide immunization faster than the other developing countries. The fact is that rich countries have administered 100 times as many coronavirus vaccines as poorer economies.

Developing countries and poorer ones need to wait at the back of the queue. With all these efforts, mass immunization will be completed by the late-2022. Those countries that will not have vaccinated 60% of their population by mid-2022 will face GDP losses of approximately US\$2.3trn by 2025 (34).

3. *Cost of vaccine*

Although some pharmaceutical companies offer lower vaccine prices for developing countries (or even without any profit during the pandemic), many developing countries still cannot afford to buy enough vaccines. To support the least developed countries and the countries with great budgetary problems, some pharmaceutical companies have set lower vaccine prices or planned to sell without profit for the duration of the pandemic. However, the cost of vaccine rollout is more than the price of the product and most of the developing economies may have difficulty in financing the additional expenditures such as transport, delivery and distribution costs, extra payments for healthcare workers during the coronavirus-induced recession period that depleted fiscal resources with high budget deficits. And also, although vaccine producer companies can modify their products, immunization campaigns should be repeated for the next shots if necessary.

4. *Barriers to domestic production*

Although some of the developing countries have the capacity to manufacture vaccines, intellectual property rights and the reluctance of the vaccine producer companies to transfer their technologies remain barriers to building local production capacity. This leads to waiting for the rich countries to satisfy their needs first.

5. *Infrastructural challenges*

Developing countries with poor infrastructure and insufficient healthcare workers are disadvantageous in vaccinating their citizens. Since they cannot produce and apply the vaccine, in many poor countries, the rollout of vaccines will not be finalized before 2023.

6. *Vaccine diplomacy and the effect on international relations*

Pfizer (US)-BioNTech (Germany), Moderna (US), and AstraZeneca-Oxford University (UK) are the most preferred Covid-19 vaccines all over the world. Not only the producer companies but also their countries have the power on sharing and distributing vaccines. Chinese and Russian vaccines were also rolled out both domestically and to emerging countries such as Turkey and Egypt via diplomatic bilateral deals. China and Russia benefited from vaccine diplomacy to bolster their global status through vaccine support to needy countries. Both countries use coronavirus shots as a bargaining chip to advance their national interests. For example, Italy accused the EU of being slow in supporting and providing aid over the pandemic. Italy's ambassador to the EU said that "*No EU country has responded to the European*

Commission's call for aid to be sent to us. Only China unilaterally offered assistance. This is not a good sign for European solidarity at all". While Germany and France imposed limits on the export of protective medical equipment, China offered to sell all necessary equipment. Health diplomacy turned to vaccine diplomacy in a short time. Italy and Serbia declared to have more economic and trade relations with China after China's support to these countries during the pandemic crisis. In this context, developing countries need to follow wise and balanced diplomatic relations with these countries while dealing with huge economic and healthcare problems in their countries.

Once these challenges are overcome, there will be a greater opportunity to have equity in vaccinating all nations. To have an equal vaccination strategy in both developed and developing countries, the following policies can be suggested to the policy-makers (33, 35):

1. The inequality gaps within and between countries should be taken into account. The fact is that recovery will be faster and resilience to new waves will be sounder if vaccines are rolled out equitably to both developed and developing countries, including the poorest and most vulnerable ones.
2. During the vaccination period, the support should be both funds provided to developing countries and ensuring transparency on bilateral contracts and through dose sharing.
3. R&D investments in vaccines and production capacity are concentrated in a few developed countries. Thus, those countries have priority in vaccination and international trade processes. A global consensus for equitable access is strongly needed to provide a fair supply of the vaccine.
4. In every country, there may be unique challenges in vaccine access for the population. In addition to income inequalities, there may be gender or ethnic inequality to reach the vaccine. Besides, there have been growing anti-vaccination movements that negatively affect vaccination efficiency all over the world. Well-organized cooperation between the vaccine provider and demander countries, these challenges can be overcome.
5. Strengthening the health of developed nations is not enough to have a global immunization. Thus, development outcomes for vulnerable populations will provide indirect benefits for the whole world.
6. Strengthening the cooperation with local civil society organizations and NGOs will provide to reach every individual in the society easily.
7. Since countries are not hidden islands, the international trade and economic interdependencies of economies, devastating effects of the pandemic can only be mitigated through international coordination to ensure equitable access to vaccines and tests.
8. Developed countries should speed up the distribution of vaccines globally by eliminating the potential for supply and demand shocks in third countries to result in aggravating the spread of the virus.
9. Some vaccines require storage at temperatures ranging from -60 to -80 degrees Celsius. Distribution and storage of vaccines may be difficult for least developed countries. The advanced economies and vaccine producer companies may support these countries in providing cold storage equipment (36).

CONCLUSION

The Covid-19 pandemic has created a devastating shock that is larger than the financial crisis of 2008-2009 and the Great Depression of 1929-1933. Due to the vulnerable macroeconomic conditions of developing countries, they are deeply impacted by the pandemic crisis. These countries have larger informal sectors that cannot provide enough social coverage to the workers, weaker healthcare services, and lower fiscal capacity. Due to the lack of resilience and poor financial support to workers by the governments of the developing countries, they had to continue working even during the lockdown periods. This led to both a great economic loss and the increasing spread of the virus through workers in developing countries.

On the contrary, developed countries initiated financial and social support for their population during quarantine periods. Pensions and financial transfers kept the people safe. Meanwhile, they also concentrated on vaccine programs. While the developed countries initiated economic support and vaccine programs, low-income and developing countries had to wait in the queue for the developed countries.

However, global immunization can be provided by vaccinating every individual in the world. In other words, vaccinating whole country is not enough since there will be international trade and international transportation. New variants of the coronavirus and global movement of the people bring the necessity to vaccine everybody to get rid of the spread of the virus.

Hence, equal vaccination is a must for global safety. Policymakers in developed countries should adopt more coherent strategies on the scale and speed of vaccination programs. This includes both financial and health service support, sharing vaccines, as well as multilateral cooperation among the countries. Otherwise, there will be insufficient global immunization which may cause ongoing health security threats and long-lasting vulnerability among the developing countries. The global recovery can be threatened through developing countries by lack of vaccination, poor healthcare services, and falling far behind in the integration with the global economy.

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