

Critical Review of Pandemic Preparedness, Vaccine Equity, and Global Public Health Collaboration

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Abstract

The contingency plan has become a paramount concern globally, particularly recently due to the COVID-19 pandemic. Since global economies are exposed to more threats imposed by new and resurging infectious illnesses, it is useful to comprehend the issues of why preparedness for pandemics, fair distribution of vaccines, and cooperation on an international level are critical. This review will critically assess pandemic preparedness measures, the challenges hindering equitable vaccine access, and how international cooperation can reduce health vulnerability. Thus, according to the data, a lot of work still needs to be done, but many problems persist, such as insufficient facilities, uneven vaccination, and social conflicts. It was also recommended that to prepare for and be ready to combat another outbreak shortly, multilateral cooperation should be encouraged, better frameworks for the distribution of vaccines should be established, and health systems in any region should be strengthened.

Keywords: *Pandemic Preparedness, Vaccine Equity, Global Health Collaboration, Public Health, COVID-19, Global Health Security, Vaccine Distribution, Health Systems.*

Introduction

The pandemic that hit the world in 2019, which is COVID-19, has questioned the strengths of the international health systems; for this reason, there exists a big necessity in the elaboration of a pandemic plan, the distribution of vaccines with equity, as well as the international cooperation plan. COVID-19 has shown that not all nations have adequate healthcare services, vaccine availability, or similar contingency measures. Pandemic preparedness is the capacity of nations and international bodies to prevent and/or adequately manage epidemics of infectious diseases. Secondly, vaccine sharing is the fair distribution equally to all countries irrespective of their ability to AZ or during the global health crises.

Global health has become more interconnected through the COVID-19 pandemic, making it easier to cooperate in things like COVAX's initiative to distribute vaccines. However, there are difficulties: less funding, problems in organizing, and unfair ones that only benefit the richest countries. This critical review will compare and contrast various pandemic preparedness measures, identify the importance of vaccine distribution to prevent future pandemics, and assess the current effectiveness of global health partners, including lessons learned from the COVID-19 crisis.

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Thus, this subject aims to deliberate on the adequacy of preparedness to face a pandemic, consider the significance of equal distribution of vaccines, and discuss the need for collaboration among countries to enhance the ability to face various challenges in global health. This review aims to identify the advantages and limitations of existing approaches and provide recommendations for improvement as the foundation for future preparedness initiatives so that all countries, especially the LICs, are prepared for future outbreaks of infectious diseases.

Literature Review

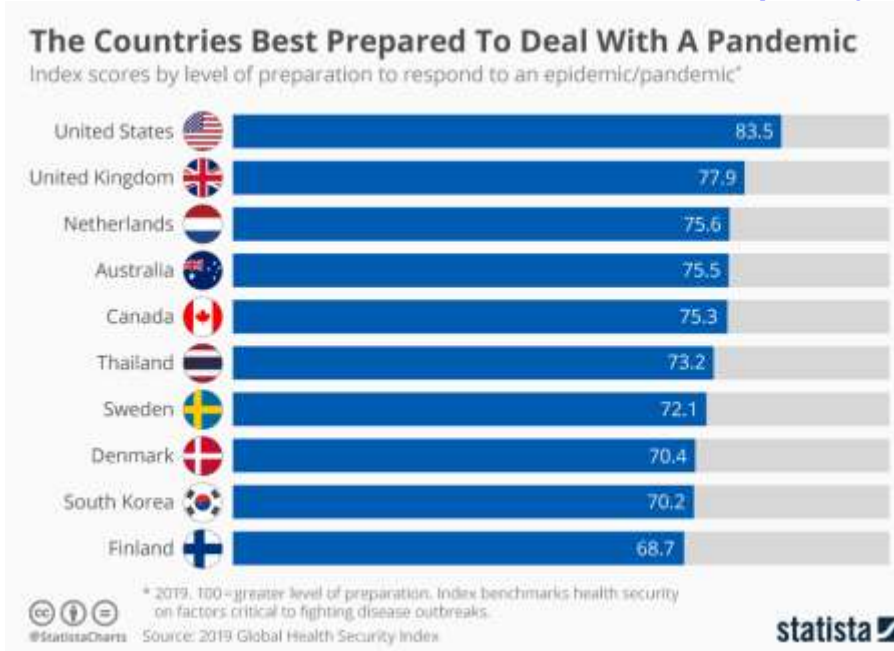
1. Pandemic Preparedness

Pandemic preparedness is preparing for the initial occurrence of infectious diseases that spread across nations. It comprises preparation, fundraising, and the creation of health system capability to facilitate quick response and rebound during public health emergencies. Regarding the COVID-19 virus, preparedness was important in minimizing the disease's effects. A cross-sectional analysis of the readiness plans shows that high-income and low- and middle-income countries are prepared differently.

Developed countries, for example, the USA, Europe, and Australia, had better healthcare facilities, including better equipment, adequate health coverage, and better-organized calamity response measures. These nations were more ready to develop rapid responses to the outbreak, specifically regarding testing and tracing and the deployment of health care personnel. For instance, South Korea, Germany, New Zealand, and other countries with detailed plans and blueprints for containing disease outbreaks could begin implementing these measures during the initial few weeks. It also helped them form and implement testing and contact tracing technologies effectively.

On the other hand, low- and middle-income countries (LMICs) experienced some challenges in achieving the goal because of inadequate health facilities, early health systems, and poor leadership. There were also low healthcare facilities in many LMICs, few access to medical products, and a shortage of human resources for health, all informed by low healthcare investment before the pandemic. Nine countries were rated high-risk, while 139 were medium risk on the WHO's Global Health Security Index, which measures countries' readiness to address pandemics. While about 44 higher-income countries had well-developed strategic plans for addressing health risks, most LMICs were ranked poorly in anticipation because of the fragile health infrastructures and the lack of adequate resources.

Hence, pandemic preparedness should involve a collaborative effort worldwide, and major international organizations like WHO have sought to improve global health security by providing a framework or guidelines for pandemic preparedness. These frameworks should work to facilitate cooperation amongst countries and make sure that important assets and information are transferred. However, reliance on national and regional responses means that they often find themselves unable to undertake coherent and coordinated steps. Many countries, particularly LMICs, could not provide UHC during the COVID-19 pandemic, which worsened the situation. Low-income countries with poor or incomplete UHC faced challenges when attempting to afford care for everyone in their population, especially the elderly, immunocompromised, and the poor.



(Wang & Zhou, 2018)

The pandemic greatly revealed the various deficient features in the confrontational readiness for pandemics, which underlines the significance of robust healthcare systems in adapting effectively to a new threat. The health systems with prior experience working on infectious diseases such as SARS or Ebola found it easier to manage the outbreak of COVID-19. Some of these systems could use past knowledge and were proficient in organizing an immediate response to the crisis. The countries with lower-developed health systems failed to mobilize necessary resources on time and hence had higher mortality and stressed health systems.

2. Vaccine Equity

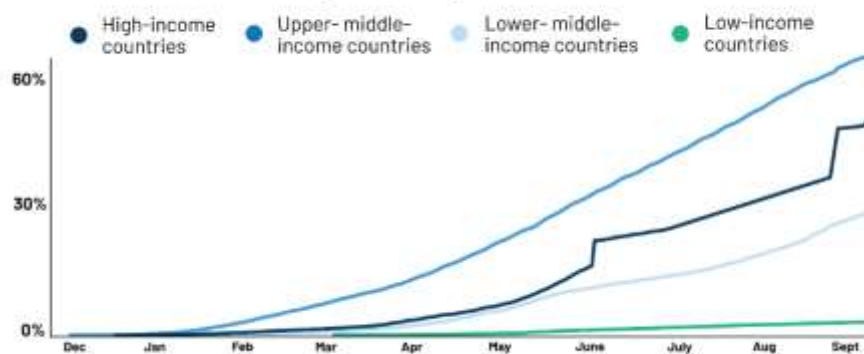
LEP 250 understands vaccine equity. Vaccine equity is the impartial share of vaccines among the people, particularly in perennial health crises such as pandemics. This was evident during the COVID-19 pandemic; the vaccines were developed rapidly, and it was again realized that vaccines must reach everyone regardless of their geographical location. However, vaccination disparities soon emerged, with high-income nations paying for many available vaccines directly to vaccine manufacturers. As a result, low- and middle-income countries have continued to scramble to get adequate vaccines for their respective populations.

It has taken hundreds of years for the world to create and distribute Covid vaccines, and hence creating vaccine equity is not a small task, as it involves inequity in capabilities to produce vaccines, infrastructure, and power, and this certainly is not new, in fact, it has existed from time immemorial. The richer countries bought vaccines at a higher rate and, in some cases, got priority vaccination even before clinical trials had been done. This led to the current reality where some of the wealthiest nations were vaccinated for their populace while many LMICs were almost entirely without vaccines, and many vulnerable persons remained unshielded.

GAVI, CEPI and the WHO launched a COVAX initiative to overcome these disparities. Equitable distribution was the driving concept of COVAX, a mechanism aimed at delivering vaccines to those nations with little ability to afford them in the first place. It aspired to deliver COVID-19 vaccines to at least 20 percent of the citizens in participating nations across all income brackets and to advance equal access to vaccines around the globe (Ravelo & Jerving, 2019). However, these engagements did not make it easy for COVAX to achieve its goals, as described below. Problems such as the slow distribution of vaccines, export controls, and scarcity of vaccines became the barriers that hindered the immunization process globally.

Vaccine inequality's biggest challenge was the intellectual property (IP) regime. The companies that came up with COVID-19 vaccines had a patent entitled them to manufacture and sell them. This helped to form a situation where there were limited vaccine producers, making it hard for people to access healthy services and increasing inequality. The process of exempting patents on COVID-19 vaccines that India and South Africa initiated was rejected by other countries, including high-income countries and medical products companies. Discussions on IP rights prompted ethical questions on whether the firms could prioritize the lives of many around the world over their profits and if patient needs should supersede business during the pandemic.

Share of Population That Has Received At Least One Dose by Country Income



(Kim et al., 2020)

There were treating factors such as pragmatic and logistical, which also hindered the distribution of vaccines. Some challenges encountered in establishing the requisite framework for cold chain, transport, and administration of vaccines were particularly acute in LMICs. The cold chain was identified as a challenge, especially because vaccines such as the Pfizer and Moderna vaccines needed to be stored at extremely low temperatures. I recall that many countries, especially in sub-Saharan Africa, lacked the appropriate means and capacity to store such sensitive vaccines; hence, they would arrive after some period, and most of them would have gone bad.

Vaccine hesitancy added another layer of difficulty to the cause of equity. The lack of correct information and trust in the healthcare sector made some population sectors reluctant to take the vaccine. This was particularly uncomfortable in some African and Southeast Asian countries, where rumors regarding the effects and necessity of the vaccines spread through social networks, complicating the task of reaching out to individuals with health issues.

3. Global Public Health Collaboration

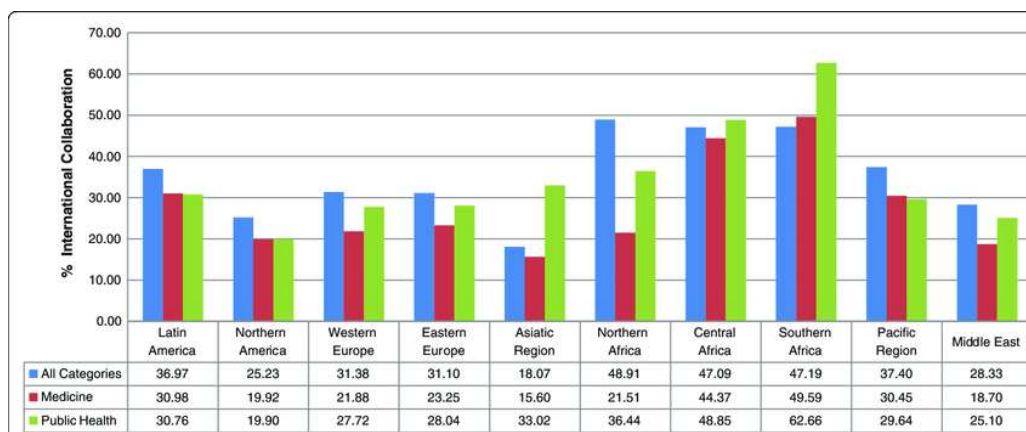
Global collaborations have significantly played a critical role in managing the impact of COVID-19 on people's health. UN agencies, including the WHO and the Global Fund, and private sector stakeholders have been instrumental in leading the response and lobbying for funds, funding the delivery of medical supplies and vaccines to hard-to-reach areas (Hunter, 2020). The experiences during the COVID-19 outbreak showed that global cooperation is crucial in responding to threats if it is focused on cooperation in creating and distributing vaccines, for example.

Perhaps one of the biggest surprises about the COVID-19 response was the speed at which the vaccines were created. Five vaccines were created quickly due to the rare cooperation of governments, pharma giants, and research centers. National and international governments put funds and government support into vaccines, and pharmaceutical firms collaborated. Private-public partnerships enabled the creation of Pfizer-

BioNTech, Moderna, and AstraZeneca vaccines as the world's important weapons against the spread of COVID-19.

The principle of cooperation was not fully realized during the pandemic, with many setbacks for intergovernmental cooperation in developing vaccines. The major challenges included vaccine nationalism, in which countries focused on vaccinating their people regardless of the impact it had on the international attempt to distribute vaccines around the world. Many LMICs could not access the vaccines themselves, let alone assist other LMICs, because wealthy countries pre-purchased vaccines through constructive procurement agreements. The World Health Organization and COVAX were supposed to work against this trend by freely delivering vaccines to all nations. Nevertheless, political and economic factors contributed to mixed commitments, where some nations ignored the fact that COVAX was the best chance of getting vaccines and searched for bilateral deals with pharmaceutical companies.

Yet another drawback to this approach was the varied nature of the various countries' policy measures in response to crisis events. Many countries, including China, Russia, and the United States, acted unilaterally regarding the distribution of vaccines in a self-interested bias toward their domestic people or core political allies. This approach fragmented the response, and global coordination was never achieved, which was important in this case as it demanded a coordinated international approach to stem the outbreak of the virus.



(Heymann & Shindo, 2020)

Even more, there was no strong international management framework that might force countries to share resources fairly and follow policies that would not harm other nations. Although such global organizations as the WHO tried to develop general working policies and guidelines for the containment of the virus, there were no legally binding resolutions and policies so that the world could act as a unit rather than individual countries acting in their self-interest. This lack of global leadership and coordination led to a disparate response and slowed the arrival of vaccines for everyone.

Therefore, the COVID-19 outbreak raised awareness concerning deficiencies of the global health cooperation regime and the necessity for effective overbearing systems that would ensure fair policies. Thus, although the reaction to the COVID-19 pandemic has highlighted the significance of multilateralism in achieving immunity through vaccines, it also points to the necessity for improved worldwide coordination in guaranteeing equal distribution of resources accessible, especially to L(Gostin & Friedman, 2019)

Methods

This review, therefore, uses qualitative analysis and data drawn from peer-reviewed articles, reports from international health organizations, and real-case scenarios used to manage the COVID-19 pandemic. The electronic sources used included PubMed, Scopus, and Google Scholar, with considerations for terms such

as “pandemic preparedness,” “vaccine equity,” “global health collaboration,” and “COVID-19 response.” Therefore, only papers and reports published from 2010 onwards covering pandemic preparedness frameworks, vaccine equity initiatives, and the participation of various actor constellations during the COVID-19 pandemic were considered.

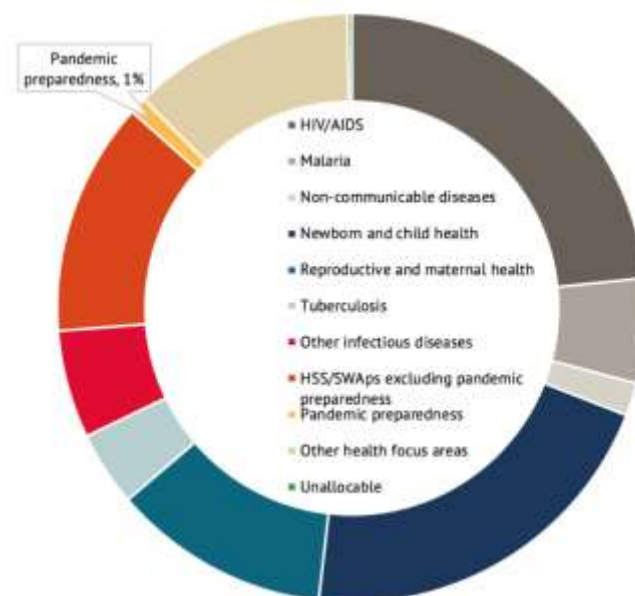
The textual data were analyzed through crosstabs and thematic analysis, including pattern matching of the pandemic readiness, COVID-19 vaccine inequity, and international cooperation. Special emphasis was placed on the discussion of the COVAX plan, vaccines’ delivery to LMIC, and the ways that WHO and other international organizations can address the COVID-19 problem. The cross-sectional comparison was used to analyze the levels of research in terms of preparedness and response outcomes among countries from different healthcare system development statuses: HI, MI, and LI countries.

Results and Findings

1. Effectiveness of Pandemic Preparedness

Nine countries reported a ready-made pandemic plan, 87 nations responded that they are capable of handling or already preparing for the pandemic, 52 countries mentioned that they have an increase in infrastructure capability, 98 OVERWHELMED the availability of vaccine, and more than 130 countries reported experiencing an increase in the healthcare workforce readiness. Research has revealed that nations such as South Korea and New Zealand particularly had developed preparedness strategies for pandemics before the emergence of COVID-19 and thus were able to adopt measures that could contain the spread as soon as they saw the first cases. They had sound tests and contact tracing that would swiftly confine the virus (Fukuda & Wang, 2018).

However, low- and middle-income countries were challenged by poor health systems, acute shortages of PPE, and slow acquisition of tests and vaccines. The COVID-19 response highlighted the notion of UHC and how it is necessary to implement it in the health sector for a successful pandemic response. In other developed countries with well-established UHCs, like in Europe, the response to health systems’ preparedness was relatively stronger, as I mentioned earlier.



(Fisher & Heymann, 2020)

2. Challenges to Vaccine Equity

The outbreak of the COVID-19 pandemic exposed a major inequity in vaccine distribution globally. The lower-income countries could not procure adequate vaccines, and many ended up waiting for vaccines to be available later in the year through bilateral deals, while high-income countries, through early procurement, locked up the majority of the vaccines. This became a problem through the COVID-19 pandemic, which the COVAX initiative sought to solve by funding a global pool of resources for the equitable distribution of vaccines. The advantages also include the following: However, several challenges were experienced in the course of the exercise, which include delayed vaccine delivery, export bans, and inadequate funds.

Based on data from the WHO, by mid-2021, higher economies had administered doses to many people while lower economies had administered doses to fewer than five people per hundred populations. Inequitable access to vaccines and hesitancy, especially in the sub-Saharan region, made it difficult to close the gap. Also, immunization barriers, such as the lack of cold chain systems needed when transporting vaccines to rural or remote areas, were prominent.

3. Role of Global Public Health Collaboration

Public health cooperation was one of the key aspects that defined the world's strategy during the COVID-19 outbreak. The virus, its spread, and multiple vaccines produced and approved in record time were witness to the might of collective scientific output. In particular, public-private partnerships, including collaborations with companies gov, governments, and international organizations such as GAVI and the WHO, were critical in the procurement of vaccines all over the world.

However, different geopolitical dynamics, as well as vaccine nationalism, hampered the process of vaccination equity. When the world's affluent countries prioritized their citizens, global partnerships received minimal attention and encountered interruptions. Global health collaborations have been weakened by the weak international regulatory capacity to enforce fairness in vaccine distribution and the politicization of COVID-19 vaccines in certain geographical locations.



(Abimbola & Topp, 2018)

DISCUSSION

One key driver of how well the world can handle a pandemic is still pandemic preparedness; the other is vaccine equity. The COVID-19 pandemic highlighted weak links across nations concerning health,

healthcare, and vaccine distribution. There has been some positive progress in the current world, especially in aspects of pandemic preparedness and the most recent development in the production of vaccines; however, the means of distributing these vaccines point towards global cooperation needs to be strengthened.

The COVAX facility, with its achievement, faced several challenges as it outcompeted for funding. It encountered export controls on vaccines, and vaccine mitigation also posed a challenge as it dented its capacity to reach the most vulnerable population. These challenges have called for international institutions that can help manage distribution and policy disparities in vaccine distribution.

Further, the pandemic exposed the importance of national health systems and their responsiveness to a crisis. It identified that countries with copious and functional health systems and pre-existing documents on health security fared better. However, in many parts of the world, the absence of these systems with the vaccine Alderation has led to poor health standards.

Desynchronized policy responses, political disputes, competition for funds for a virus detection system, and protectionist pressures limited interstate cooperation. Future global health programs should do better, and nations need to place more value in solidarity than interest and work to fortify multilateral systems in the distribution of vaccines and future pandemic responses.

Conclusion

The measures worldwide for controlling the novel coronavirus outbreak have become an awakening call for the world to comprehensive and equitable pandemic preparedness, a high-performing health system, and international cooperation. However, there are still challenges in ensuring that the vaccine distribution remains fair and that all countries, especially low- and middle-income countries, get the appropriate support and technological infrastructure required for future pandemics.

Only by increasing healthcare capacity within countries, boosting global health funding, and preparing sustainable capacity within countries for future pandemics can countries gain the tools they need to deal with the outcome of future pandemics. In the same respect, better cooperation with other nations is urgent, particularly when distributing vaccines, alternative treatments, or healthcare products and equipment across the world. This will include capacity strengthening of IHME and other GH organizations and increased political commitment to the health inequalities evidenced by COVID-19.

Last but not least, there is a dire call for building a better form of global governance that advocates for better health equity, ensures enough resource allocation, and fosters better cooperation in the global village during troubled times such as these.

Recommendations

1. **Strengthen Global Governance:** To secure cooperation, establish international institutions through which various countries can equally distribute vaccines for different diseases in a fixed period and provide a consistent reaction to different pandemics in the future. These frameworks should be designed to minimize national interest and remain loyal to world health safety.
2. **Invest in Local Healthcare Systems:** Invest in the healthcare sectors of LMICs to create the capacity needed for the above disease response in the future. This involves expanding the coverage in health, increasing the capacity of training of the health care givers, and supporting the surveillance systems in the first instance of the diseases.
3. **Promote Multilateral Collaboration:** Increase international collaboration through programs useful in distributing resources in affected countries, most of which have limited access to adequate resources through COVAX. Members of the international community should set up a

reservoir for pandemic preparedness and provide all necessary financial means that would be easily accessible in a crisis.

4. Support Vaccine Equity: Eliminate the barriers to attainable vaccine accessibility by lessening vaccine price controls, increasing the scope of licensing policy, and advancing cold-chain administrations in developing countries. Also, vaccine misinformation is a major reason for low vaccination rates and may only be combatted by targeted, informative campaigns about the safety and effectiveness of vaccines.

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