

Tackling Inequality in Access to Essential Medicines and Vaccines in Developing Countries: A Review of SDG3.b and Available Solutions

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Background / Objective: More than 400 million people lack access to basic health services, with over 1.6 billion living in settings with weak national capacity, leading to challenges in delivering essential medicines and vaccines, especially in developing countries. This paper aims to explore the underlying causes of these issues, evaluate the implementation of SDG 3.b, and propose solutions to improve healthcare.

Methods: We conducted a systematic review of the literature for studies evaluating access to essential medicines and vaccines in developing countries, specifically referring to the United Nations' official list of Least Developed Countries. The literature search was conducted across multiple databases, including PubMed, ScienceDirect, and Google Scholar, building on foundational research from the 1970s through contemporary studies. Studies were included if they addressed barriers to access, affordability, or policy implementation regarding essential medicines. Studies were excluded if they focused solely on high-income countries or already developed countries.

Results: Developing countries, challenged with inaccessible and unaffordable essential medicines, need assistance because they lack the necessary funding and resources. Vaccines, which are crucial medicines, were especially found to be in need. This situation can be addressed through solutions like national programs, research centers, and support from international collaborators and non-profit organizations.

Conclusion: Addressing the lack of access to essential medicines and vaccines requires a combination of solutions. Fostering partnerships and country-specific solutions can improve access to vital healthcare resources globally.

Keywords: Essential Medicines, Vaccines, Developing Countries, Healthcare Inaccessibility, Medicine Unaffordability, SDG 3.b. (selected based on a review of existing literature and global health reports)

1 Introduction

At least 400 million people have no access to basic health services, and nearly 40% of the world population lacks social protection. In addition, more than 1.6 billion people, or 22% of the global population, live in insubstantial settings with weak national capacity. Delivering basic health services is a significant challenge, especially in developing countries, and many residents there tend to face hardships such as unaffordable and unequal access to essential medicines and vaccines. This paper aims to explore the rationale behind these issues, research how the SDG 3.b goal is being implemented to target the problem, and propose several solutions.

We conducted a systematic review of the literature, focusing on studies that evaluate access to essential medicines and vaccines in developing countries. Our approach involved searching both peer-reviewed papers in research databases and grey literature, using key terms such as “developing countries,” “essential medicines,” “vaccines,” “access,” and “inequality.” The search was designed to capture a broad range of perspectives on the

challenges and solutions related to unequal access. The findings were synthesized and presented in the form of an editorial commentary, highlighting key issues and potential strategies for addressing the problem.

As a result, a total of 36 resources were identified and selected based on review, with solutions summarized. Solutions range from essential medicine-based to vaccine-based, which can be implemented both on the local and the global level.

2 Discussion

2.1 The needs of developing countries

A developing country has low living standards and is economically and socially less advanced. Developing countries seek to become more sophisticated and stable with up-to-date technologies and social infrastructures. With poor conditions, residents in developing countries usually face limitations when it comes to quality healthcare, as most developing countries cannot implement Information and Communication Technologies (ICT)

into their healthcare. ICT tools, such as health information portals and patient data, allow medical professionals to access and monitor patients' health information and are crucial for clinical care processes.

The Human Development Index, or HDI, specifically measures the countries' achievements in categories like health, education, and standard of living. HDI is determined by an assortment of the country's scores of life expectancy, literacy rate, population, GDP, and more. The HDI serves an important purpose of determining which least-developed countries are most in need of assistance because, when comparing HDI, developed countries had higher scores than least-developed countries. Most developed countries like Switzerland and Norway had an HDI score of 0.8 or above, while the least-developed countries, such as Somalia and South Sudan, had an HDI score below 0.55¹. These developing countries had unstable governments, widespread poverty, poor education, and limited access to health care.

2.2 Lack of access to essential medicines

To these developing countries, medical assistance is desperately and much needed. The World Health Organization (WHO) defines essential medicines as those that "satisfy the priority health care needs of the population," intended to be "available in functioning health systems at all times, in appropriate dosage forms, of assured quality and at prices individuals and health systems can afford"².

Vaccines, which are also on the essential medicines list, are an especially valuable tool. Every year, about 4 million deaths worldwide are prevented by childhood vaccination, and it is predicted that more than 50 million deaths can be prevented through vaccine immunization over the period of 2021 and 2030³. Additionally, vaccination accounted for 40% of the decline in global infant mortality, and 52% of that was in the African region⁴. Vaccines train the body's immune system by exposing the body to weakened or inactive parts of a pathogen. This triggers the immune system to produce antibodies that can defend against a disease. Overall, vaccines provide immunity to serious diseases without the risk of serious illness⁵.

Around 81% of countries worldwide have an essential medicines list, but universal health coverage is not near the target for least-developed countries. Having a list of the essential medicines is important, but even more so is providing full access to the medicines. The availability rate of essential medicines is still significantly low in developing countries, and no country has reached the target availability rate of 80% for noncommunicable diseases in Essential Medicines for Children⁶.

Vaccines are vital in strengthening primary health care, as they can save lives from preventable infectious diseases. But citizens of least-developed countries are at a lack of access to them. In 2023, there were more than 14.5 million children under the

age of 1 who were not vaccinated, which is almost 2.7 million more than in 2019. Out of these zero-dose children, almost all of them live in low and middle-income countries like Angola, Afghanistan, the Democratic Republic of the Congo, Ethiopia, India, Indonesia, Nigeria, Pakistan, Sudan, and Yemen³. This highlights the need for equal access to essential medicines and vaccines in developing countries.

2.3 Unaffordability: Hindrance to the poor

On top of the unavailability of essential medicines in developing countries is the unaffordability of those medications. This means that even if people had access to medicines and vaccines, they wouldn't be able to afford them because of the price. Data from numerous developing countries show that there are significant gaps in the availability of medicines in both the public and private sectors, in addition to a wide variation in prices, all above the international reference prices (IRPs)⁷.

Australia, for example, is considered to be a developed country. But it still faces challenges with the affordability of essential medicines. By 2027, expensive medicines are estimated to represent 55% of total medicine spending in Australia. However, these medicines only treat 2-3% of patients, meaning that high-cost medicines cause more money to be spent on fewer patients. According to an Australian study, 22% of patients 45 years of age or older who were prescribed medication did not take them because of cost during the preceding year, and of those patients, 18% said that they had to make financial choices like skipping meals, not paying bills, borrowing money, and selling belongings to afford their medicines⁸. If this situation persists, only the wealthiest people will be able to afford essential medicines.

A WHO study shows that nearly one-third of the global population lacks access to essential medicines⁹. Amin et al. conducted a comprehensive search of studies evaluating the price affordability and availability of essential medicines in Asia, finding that the overall availability in public and private sectors for essential medicines in Asia, specifically in China, Jordan, Pakistan, Indonesia, Vietnam, Bangladesh, and Yemen falls below the targets set by the WHO global action plan¹⁰.

Specifically, research was conducted in Lahore, Pakistan, to evaluate the availability and affordability of 50 essential medicines in the area, surveying 16 public and 16 private health facilities. Data from the study indicated "poor availability" of both originator brands (OB) and lowest price generics (LPGs) "in public and private sector facilities," which was "far below the WHO global action plan targets of 80% availability of essential medicines by 2025"¹¹. In addition, standard treatment cost with OBs was "unaffordable," being "above a single daily wage," suggesting that efforts to improve availability and affordability of essential medicines are crucial¹¹.

2.4 Other barriers to essential medicines and healthcare

In addition to accessibility and affordability, other important barriers hinder the spread of essential medicines in developing countries. First, difficulties persist in maintaining the cold chain, which, according to the Pan American Health Organization, is a set of procedures that “ensure the proper storage and distribution of vaccines to health services from the national to the local level,” responsible for maintaining the vaccines’ potency by storing them in the right conditions, like the recommended temperature¹². In developing countries such as Ethiopia, the cold chain system is at great risk because they do not have facilities with reliable power. In Ethiopia, vaccine-preventable diseases contribute to under-five mortality, the major issue being that vaccines lose their potency during storage despite being effective upon arrival¹². In a study by Erassa et al. that aims to assess vaccine cold chain management at public health facilities and district health offices, it was found that “good knowledge of cold chain management had a positive association with cold chain management practice,” indicating that this challenge should be addressed through a keen focus on cold chain management knowledge, temperature control, route optimization, proper packaging, and regulation¹³.

Another barrier to effective public health interventions in developing countries is the mistrust of health officials. In a study that interviewed 961 adults selected using multistage random sampling in Beni and Butembo, Democratic Republic of Congo, results showed that “low institutional trust and belief in misinformation were associated with a decreased likelihood of adopting preventive behaviours, including acceptance of Ebola vaccines”¹⁴. This indicates that a lack of trust in health institutions and administrators – a key social determinant of health – can negatively impact the outcome of immunization efforts. As Michael Marmot emphasizes in his work on health equity, addressing social determinants such as poverty is “necessary not only to improve health, but such improvement will indicate that society has moved in a direction of meeting human needs”¹⁵. This holistic perspective of incorporating social and justice-oriented approaches is essential for sustainable and equitable health systems.

2.5 How SDG 3.b is addressing the accessibility and affordability problems

The United Nations’ Sustainable Development Goal (SDG) 3.b aims to address shortages and unequal access to essential medicines. SDG 3.b targets to support research, development, and universal access to affordable vaccines and medicines. Research was done on the robustness of SDG 3.b., and data on the availability and prices of child medicines from ten historical datasets were gathered. The study results confirmed that the SDG indicator 3.b.3 is robust and appropriate¹⁶. This means that SDG 3.b is in its effective place and is acting as a guideline

for countries to follow.

A specific example of SDG 3.b addressing the essential medicines problem is the Doha Declaration on the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) with the World Trade Organization (WTO)¹⁷. With this policy in place, developing countries can use the TRIPS flexibilities to increase access to needed medicines for all. This can be done by lowering trade barriers and increasing global trade. SDG 3.b will help the least-developed, vulnerable countries be put back on track to meet even more SDGs.

3 Future implications and possible solutions

Numerous organizations have developed possible solutions to help the globe, including developing countries, to help meet SDG 3.b. These solutions include the National Immunization Program, the Gavi Alliance, and international research centers such as the Swiss Tropical and Public Health Institute and Fundação Oswaldo Cruz (Fiocruz). Nigeria has developed several country-specific solutions to help address this problem, including Zezeeta, mPharma, Ilara Health, and Helium Health. Finally, each program should not only ensure access and affordability, but also address surveillance to confirm that they are quantifying the impact of its solutions.

3.1 National Immunization Program (NIP)

The National Immunization Program, or NIP, contributes to decreasing the mortality from vaccine-preventable diseases and improving public health outcomes. In the United States, the National Vaccine Program (NVP) ensures a stable supply of recommended vaccines, access to them, and better use of them in the United States. The program coordinates immunization activities among federal agencies and other stakeholders to decrease the risk of preventable infectious diseases¹⁸. In addition, the Expanded Programme on Immunization (EPI) has prevented 154 million deaths since and has saved 90 billion life-years and 10.2 billion years of full health⁴. These programs in the U.S. are proving their effectiveness, and implementing such programs and services in developing countries can strengthen the countries’ healthcare systems and increase basic vaccination coverage rates. Cuba, for example, which is considered a developing country, has implemented its NIP and has saved “560,000 children” from infectious diseases¹⁹. In fact, immunization programs are among the most cost-effective health interventions that yield “very high rates of return on investments”²⁰. While Spain is not a developing country, its NIP case shows a benefit-cost ratio of “€4.58 and €2.91 per €1 invested” for the 2020 NIP and the 2024 NIP, respectively²¹. Even with Spain’s recent expansion of its National Immunization Program, the societal benefit-cost ratios were positive, indicating that it is an effective public health measure to increase immunization. For the

best implementation of NIPs into developing countries, limiting factors such as vaccine costs, available supply, and cold chain maintenance should be considered, as well as packaging, record-keeping, and continued monitoring for coverage and impact²².

3.2 Gavi, the Vaccine Alliance (GAVI)

Gavi, the Vaccine Alliance has goals to expand global access to vaccines, especially to vulnerable children in developing countries. In partnership with the Gates Foundation, World Health Organization, UNICEF, the World Bank, and more, it is geared towards increasing the equitable and sustainable use of vaccines. Introducing new vaccines and medications in low-income countries is a slow process, and because of this, thousands of residents in developing countries die from preventable deaths due to the lack of access to medicines²³. GAVI has helped to increase the accessibility of vaccines, introducing over 200 vaccines to 1 billion children in 78 low-income countries, preventing more than 17.3 million deaths²⁴. Ensuring fair pricing and availability of the needed vaccines can help protect the lives of future generations, specifically for those underprivileged in developing countries. Interventions from organizations such as GAVI can have positive long-term effects, such as improved health outcomes, but they also risk reinforcing dependency on external funding if local systems are not sustainably built. In response, GAVI has a co-financing policy that helps prepare countries for self-sufficiency once its support ends. Obligations increase as countries' economies grow. Initially, low-income countries pay a small share (\$0.20 per dose), but once they reach lower-middle income status, payments increase "15% per year." Finally, after exceeding GAVI's eligibility threshold, countries' payment obligation "increases by 15% for one more year (the grace year) and then ramps up steeply over the next four years (when it is in the accelerated transition category)"²⁵. This co-financing policy by GAVI ensures that developing countries that received support are well-prepared to transition out of support. Another challenge during this transition is the potential for higher vaccine costs, but some manufacturers have agreed to maintain GAVI-level pricing for a limited time after support ends, fully allowing countries to adjust and finance accessible and affordable medicine and vaccines for their citizens. With Gavi, low-income countries can get support and prioritization for being an area with the highest need.

3.3 International research centers

International research centers are responsible for developing innovative medicines without patent protection so that they can be used to plan for high-level interdisciplinary applied research based on the needs of healthcare systems worldwide. This proposal can accelerate advancements in global health security and reduce the cost. Healthcare costs cause financial hardship for

more than 930 million people and leave 90 million struggling in extreme poverty each year. With this current trend, the WHO predicts that up to 5 billion people will be unable to access or afford health services by 2030²⁶. International research centers can further benefit from partnerships between developed and underdeveloped countries. Because developing countries face challenges like limited facilities, resources, and trained medical professionals, it is important for research centers to be utilized in collaboration with affected regions. Some examples of this include the Swiss Tropical and Public Health Institute, which conducts research on tropical diseases and health issues prevalent in developing countries, and Fundação Oswaldo Cruz (Fiocruz), which is a Brazilian research institution that focuses on infectious diseases, particularly aimed at developing countries²⁷. Building international research centers to allocate resources to the most needed countries will work as a knowledge exchange center for innovations and can additionally help ensure access and affordability of medicines, all while treating a variety of dangerous diseases. However, international research centers will have to address challenges of international cooperation at multiple levels for sustained impact.

3.4 Comprehensive solutions

Nigeria is among the many least-developed countries, and research on the country's environment and settings has added effective solutions into the mix. There are infrastructural deficiencies in developing countries, which include problems like inadequate laboratory facilities and insufficient human resources that cause public health risks and jeopardize patient safety. In areas like this, regulatory capacity should be improved through training programs and collaboration between regulatory agencies, pharmaceutical manufacturers, and healthcare providers²⁸. While promising, these reforms face challenges such as limited funding and multiple layers of partnership, which can delay implementation. In addition to this, public awareness campaigns can play an important role in educating consumers to make informed decisions. For example, Pakistan has one of the lowest rates of routine childhood immunization globally, but after a 3-month mobile-based campaign involving short audio dramas encouraging the importance of vaccines and parental responsibilities in Quetta, Pakistan, there was a "significant 30% increase over the comparison mean in the number of fully vaccinated children in campaign areas on average"²⁹. This shows that such public campaigns are successful in changing perceptions about vaccination and leading to greater acceptance and adherence. Having these benefits in consideration, it is important to design campaigns using culturally appropriate and context-specific messaging, utilizing media channels suited to local populations. Continual evaluation and adaptation to local literacy levels will also be necessary for the betterment of health and sustained impact. With these comprehensive solutions, developing coun-

tries like Nigeria and Pakistan can supplement their medication quality control and foster a stable and reliable healthcare environment.

3.5 Innovation entrepreneurship

One way that countries can help address the gap in medication coverage and accessibility is through the use of technology and innovation. A wave of new companies has started to address this gap by brainstorming solutions to address medication shortages and unavailability. For example, Vezeeta uses technology to connect patients with healthcare providers by making it easier to book appointments online³⁰. Vezeeta presents digital tools to patients as well, such as medical articles. Another example is mPharma, a pan-African healthcare technology company based in Ghana, which aims to give every person on the continent full access to safe and accessible medicine by using the network of pharmacies to negotiate lower prices with manufacturers to stock pharmacy shelves in Africa with no payment required upfront³¹. The company has also updated its digital health app, mutti, to offer a more user-friendly environment that helps personalize one's health journey. Another health tech startup is Ilara Health. This startup in Kenya provides equipment including ultrasound machines, X-rays, laboratory equipment, and more³². Ilara Health further trains medical professionals to use the equipment. Similarly, the Nigerian startup Helium Health offers a cloud-based electronic health record (EHR) system³³. Both healthcare providers and patients can use the digital platform efficiently to record and access medical information. These companies have raised 40million, 17 million, 13million, and 12 million in funding, respectively³⁴. These innovative startups using technologies to address problems in underserved countries can significantly benefit underserved countries. While the implementation of Health Information Technology (HIT) in developing countries will be useful, there are barriers to its adoption. Limitations include the "lack of infrastructure, cost, time and benefit analysis, lack of skilled workforce, national policies and motivation of health-related personnel," in addition to low digital literacy rates and the digital divide³⁵. Despite these challenges, digital health technologies such as Vazeeta, mPharma, Ilhara Health, and Helium Health are redefining healthcare delivery in developing regions by increasing access and strengthening data management. Bridging the gaps of digital literacy, the digital divide, and inadequate infrastructure through investments and digital education can address these issues and help such innovative entrepreneurship to advance developing countries.

3.6 Post-vaccine surveillance

Even after implementing the needed solutions for the pressing problem of unavailable and unaffordable essential medicines, evaluating the long-term impact is just as important for im-

provement. Post-vaccine surveillance can help monitor trends to improve health coverage, eventually shrinking the gap between developing and more advanced countries. Specifically, for health intervention programs to prevent morbidity and mortality in developing countries, it is crucial that "effective vaccine safety monitoring systems are in place... following immunization"³⁶. Such measures have been shown to be "useful in all developing countries"³⁶. In Vietnam, for instance, when a system that monitored vaccine safety after immunization was implemented, investigators were able to evaluate Adverse Event Following Immunization (AEFI) for measles vaccines, and this further boosted public confidence in vaccination programs³⁶. By empowering developing countries with accessible medicines and going a step further with post-vaccine surveillance, residents in developing countries can be treated with vital vaccines and medications to protect themselves against the worst diseases. The continued monitoring of progress will strive for a step forward in equal access to essential medicines and universal health coverage.

4 Conclusion

Developing countries lack health needs like essential medicines that are vital to a healthy life. We have discussed the importance of essential medicines, primarily focused on vaccines, and delved into the unaffordability and unavailability of them. In addition, we introduced other barriers present in developing countries, including challenges with cold chain management and public mistrust. As SDG 3.b is in place to address this problem, developed countries can assist least-developed countries by sharing knowledge about effective solutions. Developing countries should implement solutions like the National Programme on Immunization, support from international organizations like the Gavi Alliance, develop international research centers and collaborations, form comprehensive solutions like education and campaigns, as well as post-vaccine surveillance to monitor progress. Finally, country-specific innovation resulting in startup companies in these countries, similar to mPharma's growth in Ghana, may provide a model for how developing countries can create their own home-grown solutions to this important issue.

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