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# HARNESSING THE POWER OF VACCINES ADVANCING

SUSTAINABLE DEVELOPMENT  
GOALS AND PLANETARY HEALTH



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# Harnessing the Power of Vaccines: Advancing Sustainable Development Goals and Planetary Health

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## Introduction

The significance of vaccines in safeguarding human health is indisputable. Over time, vaccines have demonstrated a remarkable reduction in infant mortality caused by infectious diseases, previously responsible for claiming the lives of a third of children before their fifth birthday. Their utilization played a pivotal role in the complete eradication of smallpox, a disease that had inflicted death upon a staggering 300 million individuals during the past century <sup>(1)</sup>. Beyond this achievement, vaccines have also contributed to eliminating polio, minimizing instances of pneumococcal and meningococcal diseases in children, averting cervical cancer in women, and curbing the prevalence of influenza, and herpes zoster infections among adults. These examples underscore the profound positive impact vaccines wield on human life.

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1. <https://doi.org/adf1093>

Notably, during the recent COVID-19 pandemic, vaccines emerged as heroes, preventing an estimated 20 million fatalities, while also salvaging the global economy by saving trillions of dollars and reinstating the freedoms that had been curtailed during lockdowns<sup>(2)</sup>.

However, the necessity of vaccines transcends mere infection prevention, especially given the looming threat of climate change to human well-being and survival. While the impact of SARS-CoV-2 has been substantial, it's important to acknowledge that it might not be the final novel pathogen to emerge due to ecological shifts. Factors such as rampant deforestation, erratic temperature variations, shifts in animal and human populations, and the ever-expanding scope of globalization are intensifying the vulnerability of populations to rapid and widespread infection by viruses and bacteria. In light of this, it is pertinent to inquire whether vaccines can contribute to safeguarding the health of our planet on a larger scale. This viewpoint delves into how vaccines can mitigate the repercussions of pathogen spillovers, expedited by climate change, and how they contribute to the preservation of microbial diversity by curtailing the excessive use of antibiotics. Furthermore, the discussion extends to how vaccines play a role in reducing poverty and fostering sustainable development.

It is asserted that vaccines serve as an environmentally friendly tool that can be incorporated into the arsenal of solutions aimed at preserving the planet, while simultaneously elevating the overall health and well-being of its inhabitants, both human and animal alike. The intricate relationship between vaccines and climate change holds particular significance in the context of countries like Bangladesh. Marked by its dense population and vulnerability to climate-related challenges, underscores the critical interplay between these two domains.

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2. <https://www.imf.org/en/Blogs/Articles/2020/04/14/blog-weo-the-great-lockdown-worst-economic-downturn-since-the-great-depression>

Bangladesh faces a dual-challenge-grappling with the adverse impacts of climate change and striving to ensure widespread vaccine coverage <sup>(3)</sup>. Rising sea levels, intensified cyclones, and flooding are among the pressing climate change-related issues that this low-lying nation contends with. These environmental shifts not only disrupt livelihoods but also contribute to the proliferation of diseases, creating a precarious health landscape. In such a context, the importance of vaccines becomes even more pronounced. Vaccination acts as a defense mechanism against diseases that can surge in the wake of climate-induced disasters.

By maintaining robust vaccination programs, Bangladesh can better fortify its population against these health threats, particularly among the most vulnerable groups. Moreover, vaccines offer a vital tool in addressing climate-driven changes that could lead to the emergence of new diseases. Climate change adaptation and resilience efforts can benefit from a healthier population <sup>(5)</sup>. Addressing the link between vaccines and climate change requires a holistic approach and Bangladesh serves as a vivid illustration of how the convergence of vaccines and climate change holds immense implications.

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3. <https://www.imf.org/en/Blogs/Articles/2021/07/09/what-covid-19-can-teach-us-about-mitigating-climate-change>
  4. <https://www.worldbank.org/en/news/press-release/2013/06/19/warming-climate-to-hit-bangladesh-hard-with-sea-level-rise-more-floods-and-cyclones-world-bank-report-says>
  5. <https://www.nytimes.com/2014/03/29/world/asia/facing-rising-seas-bangladesh-confronts-the-consequences-of-climate-change.html>

**Table 1: Impact of vaccines in Bangladesh**

Healthcare Cost Reductions	<ul style="list-style-type: none"> <li>• Prevent diseases, reducing medical expenses</li> <li>• Avert out-of-pocket healthcare costs for families</li> <li>• Particularly impactful for families already facing challenges</li> </ul>
Disaster Resilience	<ul style="list-style-type: none"> <li>• Strengthen population resilience after climate-related disasters</li> <li>• Prevent outbreaks of diseases following cyclones, floods, etc.</li> <li>• Faster recovery, maintaining a healthy workforce for rebuilding</li> </ul>
Economic Productivity	<ul style="list-style-type: none"> <li>• Keep people healthy, enhancing workforce productivity</li> <li>• Individuals can actively participate in economic activities</li> <li>• Boosts household income and overall economic growth</li> </ul>
Long-Term Economic Benefits	<ul style="list-style-type: none"> <li>• Childhood vaccines lead to healthy growth, cognitive development</li> <li>• Better education and earnings potential</li> <li>• Contributes to sustainable economic growth, reduces reliance on social support</li> </ul>
Population Stabilization and Carbon Footprint	<ul style="list-style-type: none"> <li>• Reduce child mortality, influencing family size</li> <li>• Smaller families over generations lower carbon emissions</li> <li>• Less strain on resources and environmental sustainability</li> </ul>
Resilience Against Climate-Related Diseases	<ul style="list-style-type: none"> <li>• Proactively defend against emerging diseases from climate change</li> <li>• Safeguard public health, reduce healthcare burden</li> <li>• Indirectly contribute to poverty reduction by lowering healthcare costs</li> </ul>

Source: *The World Bank | Warming Climate to Hit Bangladesh Hard* <sup>(4)</sup>

### **Vaccines Contribute to Poverty Alleviation and Carbon Footprint Reduction**

Beyond the life-saving potential, vaccines and immunizations hold significant economic advantages that can help combat poverty in Bangladesh. The country lacks robust universal

healthcare systems, often leaving citizens to bear substantial medical costs. Even before the emergence of the COVID-19 pandemic, nearly one billion people worldwide were burdened by catastrophic health expenses, defined as medical costs surpassing twenty percent of household budgets. This predicament was predominantly faced by households teetering on the poverty threshold without access to subsidized medical care. The aftermath of the pandemic, compounded by self-paid medical spending due to disrupted livelihoods, resulted in approximately 500 million people globally slipping into poverty by close to 2021<sup>(6)</sup>. The amplified income inequality stemming from COVID-19 disproportionately affected the most underprivileged, with a reported income reduction in two-thirds of households with children.

For example, childhood vaccinations yield a secondary, longer-term economic dividend for those inoculated. Infections during the initial 2 to 3 years of life can impede child growth and cognitive development <sup>(7)</sup>. Measles, for instance, can compromise innate immunity against other diseases for an extended period, hindering childhood advancement. A set of resilient observational studies across low and middle-income countries indicates that childhood vaccines by preventing disease occurrences, can bolster physical growth, cognitive development, education attainment, and eventual earnings over an individual's lifetime. These studies consistently link childhood vaccines to an additional 0.2 to 0.3 years of schooling across diverse nations, with even more pronounced effects among socioeconomically disadvantaged groups<sup>(8)</sup>. Fresh evidence establishes a connection between national childhood vaccination programs in the United States, Bangladesh, India, and Mexico and a 1-13% elevation in future earnings<sup>(8)</sup>.

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6. <https://www.who.int/news/item/13-10-2020-impact-of-covid-19-on-people's-livelihoods-their-health-and-our-food-systems>

7. <https://doi.org/10.23750/abm.v92i1.11346>

8. <https://doi.org/10.1016/j.socscimed.2020.112885>

## **Preserve Human and Global Microbial Variety by Curbing Antibiotic Utilization**

Human activities have irrefutably transformed Earth's ecosystems, propelling biodiversity into a swift decline. Often overlooked, microorganisms constitute a vital component of the planet's biodiversity, contributing to the operation, stability, and resilience of ecosystems. While much remains unknown about the impact of human activities on microbial diversity, these microorganisms hold fundamental significance for planetary health. The host microbiome serves crucial roles in both human and animal health, supporting processes like digestion, nutrient metabolism, endocrine functions, gut integrity, and the development of immunity. The interconnected microbiomes are essential for human survival, yet they remain exquisitely vulnerable to human-induced disturbances. Urgent research is required to establish metrics that assess key microbiota functions, guiding interventions to conserve and safeguard this vital microbial diversity.

Having a new approach would promote the development of new vaccines and expanded use of existing ones to prevent infectious diseases, potentially synergizing the new antimicrobials to thwart the emergence of drug resistance and safeguard functional microbial diversity. Achieving this necessitates collaborative endeavors. Taking action to harness the potential of vaccines in effectively addressing this escalating global health crisis is imperative.

## **Vaccines' Contribution Towards Achieving UN Sustainable Development Goals**

Preserving the well-being of our planet demands a comprehensive strategy, substantial investments, and global collaboration. To foster these endeavors, the United Nations (UN) established 17 sustainable development goals (SDGs) in 2015, aiming to enhance human welfare, foster prosperity, and safeguard planetary health by 2030. It's noteworthy that immunization is not specifically addressed within the 17 SDGs but immunization is intrinsically tied to SDG 3-Ensure healthy lives and promote well-being for all at all ages (Fig 1). This

connection is evident in the World Health Organization (WHO) Immunization Agenda 2030, where the pivotal objective of achieving “good health and well-being” directly aligns with SDG 3. By influencing SDG 3, vaccines’ role can extend to other SDGs. This perspective is echoed in the 2017 report “Monitoring Health for SDGs”, recognizing the reciprocal impacts of SDG 3 on the other SDGs. The report highlights the challenges in obtaining comprehensive health-related data for effective monitoring. Without such data, the impact of immunization on SDG 3 and beyond remains obscure<sup>(9)</sup>.

**Figure 1: 17 UN Sustainable Development Goals (SDGs)**



Source: UN Development Goals | Uronav <sup>(10)</sup>

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9. <https://sdgs.un.org/goals>  
10. <https://www.euronav.com/en/sustainability/our-approach/un-development-goals/>



While each of the 17 SDGs pursues distinct aims, there is evident synergy among them. For instance, advancement in the economy, both national and global has positive repercussions for health, and vice versa. Similarly, educational improvements, particularly for women, yield economic and health benefits, potentially influencing family size. In the unique context of Bangladesh, where development and health challenges are distinct, the correlation between immunization and broader SDGs becomes even more critical. Bangladesh’s pursuit of SDG is intricately linked with its drive to improve healthcare access, mitigate poverty, and enhance overall well-being. Vaccination campaigns play an indispensable role in achieving these objectives.

**Table 2: Vaccine Role in Advancing SDGs in Bangladesh**

Healthcare Access and Well-being	Immunization programs in Bangladesh significantly contribute to SDG3 by preventing the spread of infectious diseases, improving overall public health, and ensuring well-being across various age groups
Gender Equality and Reduced Inequalities	Vaccination efforts, particularly those aimed at children, positively impact gender equality and reduce inequalities by safeguarding the health and future of both girls and boys, irrespective of their backgrounds
Quality Education and Economic Growth	By reducing the prevalence of diseases, vaccines ensure children’s regular attendance in schools, which is crucial for SDG 4. Moreover, improved health due to

	vaccines positively influences economic growth, contributing to SDG 8
Climate Action and Sustainable Cities	While not immediately evident, the positive health outcomes resulting from vaccines contribute indirectly to SDG 13 by enhancing people's resilience to health-related challenges posed by environmental changes
Partnerships and Global Cooperation	Bangladesh's collaboration with international organizations, like WHO and UNICEF, to strengthen its immunization program aligns with SDG 17

In the context of Bangladesh, it's clear that immunization impact extends beyond SDG 3, encompassing various interconnected SDGs that collectively shape the nation's sustainable development landscape. While quantifying immunization's precise contribution to each SDG is complex, recognizing its role and ensuring the availability of accurate data to measure this impact are critical steps. By leveraging the potential of immunization to achieve multiple SDGs, Bangladesh can justify increased investment in vaccination programs, fostering a healthier, more prosperous future for its citizens.

**Conclusion**

In the context of Bangladesh, the significance of vaccines extends beyond individual health and economic progress, encompassing the broader realm of planetary health and sustainability. This importance is amplified by the interconnectedness of the well-being of its population and the health of the environment. However, the COVID-19 pandemic has led to disruptions in implementing these goals due to socioeconomic challenges. Nevertheless, the pandemic has

underscored the pivotal role of vaccines in restoring public health and freedom. Vaccination efforts, being effective tools in reducing poverty and enhancing human welfare, hold direct relevance to various SDGs, accelerating progress toward these critical objectives. For Bangladesh, incorporating vaccines into the revised SDGs can think of an approach to amplify investment in vaccine research and development, prevent potential pandemics by ensuring equitable research and development capacity as well and enhance vaccine manufacturing and distribution capabilities. Simultaneously, strategies to reduce antimicrobial usage in human, animal, and agricultural sectors must be implemented<sup>(11)</sup>. These insights can inform ongoing SDG evaluations, providing robust evidence of vaccines' pivotal role in advancing UN SDG objectives, fortifying planetary health, and enhancing the well-being of the Bangladeshi population as a whole.

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11. <https://doi.org/10.1016/j.jvacx.2023.100320>