Commentary
Volume 15:03, 2025

Journal of Bioengineering & Biomedical Science

ISSN:2155-9538 Open Access

The Role of Biomedical Engineering in Achieving Universal Health Coverage in the Global South

Larissa Mehmet*

Department of Biomedical Engineering, Hanoi University of Science and Technology, Ha Noi, Vietnam

Introduction

Universal Health Coverage (UHC), defined as ensuring all individuals and communities receive the health services they need without suffering financial hardship, is a cornerstone of the global health agenda. In the Global South encompassing much of Africa, South Asia, Latin America and Southeast Asia achieving UHC remains a formidable challenge. The hurdles are manifold: fragile health infrastructure, limited workforce capacity, inequitable access to essential services and dependence on imported, costly medical technologies. Yet within these constraints lies a transformative opportunity for biomedical engineering. By designing context-appropriate, affordable and scalable health technologies, biomedical engineers can address systemic barriers to care delivery and play a pivotal role in realizing health equity. Biomedical engineering, traditionally associated with high-end medical devices in wealthier nations, must now pivot towards inclusive innovation tailored for low-resource settings. This commentary highlights the critical but often underemphasized contribution of biomedical engineering to UHC goals in the Global South. It emphasizes the need for transdisciplinary collaboration, local manufacturing capacity and community-centered design. More than a technical discipline, biomedical engineering in this context becomes a tool of empowerment, capable of reshaping health systems from the bottom up. The future of equitable healthcare may very well depend on how innovatively and inclusively this field rises to meet the moment [1].

Description

Biomedical engineering offers an array of solutions uniquely positioned to address the inequities in health systems across the Global South. Diagnostic devices, point-of-care testing kits, mobile health platforms and low-cost surgical tools are just a few examples of how engineering innovations can improve access, quality and continuity of care. Unlike traditional medical technologies that are often expensive, power-dependent and complex, appropriate biomedical engineering emphasizes affordability, simplicity and local relevance. Innovations like solar-powered oxygen concentrators, smartphone-based ECG monitors and frugal prosthetics have already demonstrated how context-driven design can bridge critical care gaps. Moreover, open-source hardware and software platforms allow local innovators and clinicians to adapt and iterate solutions in real-time, fostering a culture of technological self-reliance. In countries where a single biomedical engineer may be responsible for maintaining all hospital equipment, robust, easy-to-maintain technologies are essential. In this light, biomedical engineers are not just inventors, but systems integrators tasked with aligning technical innovation with economic constraints, policy frameworks and cultural expectations. Furthermore, biomedical engineering education must be reimagined to prepare graduates for the realities of under-resourced environments. Curricula that prioritize global health challenges, design thinking and field immersion can foster a generation of engineers better equipped to serve where the need is greatest. To be truly impactful, however, technology must be developed in partnership with end-users patients, providers and local health authorities to ensure sustainability and acceptance. Biomedical engineering, therefore, is not a silver bullet, but a powerful lever in a broader strategy to democratize healthcare in underserved regions [2].

Despite its promise, the potential of biomedical engineering to drive UHC in the Global South is still largely untapped due to structural, financial and policy limitations. A major bottleneck is the underinvestment in research and development that is locally led and regionally relevant. Most medical devices used in low-income countries are imported, expensive and often poorly suited to local conditions. In some cases, equipment sits idle due to a lack of spare parts, appropriate power sources, or trained personnel to operate and maintain them. To overcome these challenges, national governments and international donors must support ecosystems that encourage innovation from within. This includes funding innovation hubs, providing incentives for local manufacturing and creating regulatory pathways that expedite the approval of homegrown technologies. Collaborations between universities, hospitals, NGOs and the private sector are critical in bridging the gap between invention and implementation. Moreover, integrating biomedical engineering into national health strategies as a core component rather than an auxiliary support can promote systemic resilience and reduce dependency on foreign aid. Biomedical engineers must also be involved in health policy discussions, especially in designing equitable procurement systems, maintenance protocols and capacity-building programs. Global partnerships, while valuable, must prioritize technology transfer, skills development and intellectual property sharing rather than perpetuating one-way models of innovation. The shift toward decolonizing global health must also encompass the design and deployment of technology, ensuring it reflects and respects the lived realities of those it aims to serve. In this way, biomedical engineering can transition from being a peripheral asset to a central engine in the pursuit of health for all [3-4].

Equipping the biomedical engineering discipline to contribute effectively to UHC also requires a rethinking of its ethical foundation. In low-resource contexts, engineers are confronted not only with technical problems but also with ethical dilemmas who gets served first, how to allocate scarce resources and how to prioritize conflicting needs. Technologies that are not grounded in the values of justice, inclusivity and dignity risk exacerbating rather than reducing disparities. Thus, global health ethics must be embedded in biomedical engineering education and practice, urging professionals to ask: who benefits, who is left out and who decides? This ethical lens also extends to environmental sustainability. In a world facing climate change and resource depletion, biomedical technologies must minimize environmental impact while maximizing social return. Designing for circular economies using recyclable materials, reducing waste and extending device lifespans can ensure that technological progress does not come at the planet's expense. Additionally, gender-sensitive design, disability inclusion and participatory development must

***Address for Correspondence:** Larissa Mehmet, Department of Biomedical Engineering, Hanoi University of Science and Technology, Ha Noi, Vietnam, E-mail: mehmet.larissa@hanoi.vt*

Received: 02 June, 2025, Manuscript No. jbbs-25-171765; **Editor Assigned:** 04 June, 2025, PreQC No. P-171765; **Reviewed:** 16 June, 2025, QC No. Q-171765; **Revised:** 23 June, 2025, Manuscript No. R-171765; **Published:** 30 June, 2025, DOI: 10.37421/2155-9538.2025.15.479

become non-negotiable aspects of engineering protocols. Biomedical engineers must see themselves not only as technologists but as advocates, co-creators and stewards of public trust. As countries in the Global South strive to meet Sustainable Development Goal 3 good health and well-being the contribution of biomedical engineering will be critical. However, its impact will depend not only on what is designed, but how, for whom and with what intention. Elevating biomedical engineering as a driver of UHC is not a matter of technology alone it is a call for systemic transformation anchored in equity, justice and human-centered design [5].

Conclusion

Biomedical engineering holds enormous promise in helping the Global South achieve Universal Health Coverage. By fostering context-appropriate, affordable and inclusive technologies, the field can address critical gaps in healthcare infrastructure, diagnostics and treatment. However, to fulfill this promise, biomedical engineers must move beyond traditional paradigms and embrace a more ethical, participatory and locally grounded approach to innovation. Governments, academic institutions and international stakeholders must actively support the integration of biomedical engineering into national health strategies, education systems and policy frameworks. Achieving UHC is not only a technical goal it is a moral imperative. In the effort to ensure health equity, biomedical engineering can be a force not just for innovation, but for justice.

Acknowledgment

None.

Conflict of Interest

None.

References

1. Abdulmalik, Jibril, Saheed Olayiwola, Sumaiyah Docrat and Crick Lund, et al. "Sustainable financing mechanisms for strengthening mental health systems in Nigeria." *Int J Ment Health Syst* 13 (2019): 38.

2. Funk, Colin D., Craig Laferriere and Ali Ardakani. "A snapshot of the global race for vaccines targeting SARS-CoV-2 and the COVID-19 pandemic." *Front Pharm* 11 (2020): 937.

3. Domapielle, Maximillian Kolbe, Joshua Sumankuuro and Frederick Der Bebelleh. "Revisiting the debate on health financing in Low and Middle-income countries: An integrative review of selected models." *The Int J Health Plan Manag* 37 (2022): 3061-3074.

4. Yang, Yongshi, Fujun Peng, Runsheng Wang and Kai Guan, et al. "The deadly coronaviruses: The 2003 SARS pandemic and the 2020 novel coronavirus epidemic in China." *J Autoimmun* 109 (2020): 102434.

5. Perehudoff, S. Katrina, Nikita V. Alexandrov and Hans V. Hogerzeil. "Legislating for universal access to medicines: a rights-based cross-national comparison of UHC laws in 16 countries." *Health Policy Plan* 34 (2019): iii48-iii57.

How to cite this article: Mehmet, Larissa. "The Role of Biomedical Engineering in Achieving Universal Health Coverage in the Global South." *J Bioengineer & Biomedical Sci* 15 (2025): 479.