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Contents

Oct. 2025, Volume.2 No.3

Perspectives

- 149 Leadership in Science: Reflections by Dr. John Ioannidis
John P.A. Ioannidis
- 152 Humanitarian Aid in Action: A Global Commitment to Health
Byron Scott

Review Articles

- 155 Advancing Nursing Education in Low- and Middle-Income Countries: Lessons from Bangladesh for Sustainable Global Health
Taewha Lee, SangA Lee
- 165 Health inequalities in children: A comprehensive review
Soojin Ahn, Hae Young Kim, Jae Il Shin, Lee Smith

Article

- 178 Student Involvement in SDG Projects: Seven Years of Yonsei University's Social Engagement Fund (2018–2025)
Sarah Soyeon Oh, In Han Song, Shinki An

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Perspective

Leadership in Science: Reflections by Dr. John Ioannidis

John P.A. Ioannidis

Professor of Medicine, of Epidemiology and Population Health, and (by courtesy) of Biomedical Data Science
 Co-Director, Meta-Research Innovation Center at Stanford (METRICS)
 Stanford University

Leadership is a concept that has evolved over time. In the past, a leader was often the warrior at the front line—the best fighter, the most powerful, the bravest, and sometimes the first to die because of excessive risk. Later, leadership was embodied in kings. Over time, these kings transformed from warrior figures into bureaucrats—remote and inapproachable, surrounded by ministers and officials. Today, leaders are often insulated by layers of administrators and sub-leadership structures.

Leadership now extends across many domains: research, education, medicine, health care, public health, and policy. Those of us in academia often attempt to do too much, and I frequently realize I do many things not particularly well. I am constantly pressed to ask: What do I want to do, and what do I want to inspire others to do?

My first response is enthusiasm. What excites me? What excites those around me? What do they want to do with their lives and their time? Many of our activities as professors might seem eccentric to an outsider—waking after midnight with an idea, rushing to the lab, working endlessly with numbers and equations. But enthusiasm makes these actions worthwhile. It convinces us that this is the best investment of our time and effort, and the best contribution we can make to others.



Knowing Next to Nothing

What I state openly, even on my website, is that I know next to nothing. When asked who my role model was, I said: “Role model? What is that?” I encourage people to pursue what excites them, not to imitate others.

Still, I admire many people, both living and dead. If I had to choose one role model, it would be Socrates. He wrote nothing himself. His disciple Plato published dialogues in which Socrates was the central figure, but Socrates himself had no time to

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write. In this regard, I failed my role model: I have published over a thousand papers, adding to the flood of literature.

Socrates also said: “The only thing I know is that I know nothing.” My version is: “I know next to nothing.” I like to be reminded of that. I am not yet good enough to say, “I know nothing.” Perhaps, if I improve, I will be able to admit that Socrates was completely correct.

Science does make progress. We discover things that change the world, health, and the quality of life. So I would not say we know absolutely nothing. But as individuals, and as leaders, we must constantly remind ourselves that we know very little, and that we must continue to learn—not only out of curiosity but to help others.

Curiosity and Fun

Leadership must also include curiosity and fun. I cannot live without fun. Every day I need to do things that I enjoy.

Fun does not mean perfection. A scientist is, above all, someone who makes mistakes. If you are a good scientist, you make many mistakes. Ideally, you recognize them, correct them, and improve over time. Perfection, however, is never within reach.

I enjoy starting things I can test myself: seeing how they work—or how they fail. I dread the day when I no longer feel the urge to test a dataset, check a hypothesis, or collect information myself. That may not be a conventional model of leadership. It may even be a poor one. But it is the way I lead.

Failure as a Path to Success

In my experience, failure is far more common than success. Talking with Nobel laureates, I find many share this view. Failure is frequent, but it is what makes life and work interesting.

Sometimes the door needs to close. I often plan my life like a five-year program: I will do this, then that, then move on to the next step. But plans are never fully accomplished. Deviations occur, and those deviations often turn out to be the best thing that happens.

Early in my career I worked in mathematics, medicine, epidemiology, and even in laboratories handling dangerous viruses. The common denominator was error. Mistakes are everywhere—measurement error, laboratory error, field study error, bias.

Even in mathematics I once built a model predicting that people with advanced HIV would live 800 years. In reality, the correct number was 0.8 years. A single misplaced sign in my equations caused the error. That mistake was obvious. Many others are not. The lesson remains: preventing and correcting errors must be central to research. That realization became the foundation of my work in meta-research.

Collaboration and Convergence

Collaboration offers enormous opportunities. I see two main kinds.

The first is within a field. Instead of many small, fragmented, underpowered studies, researchers join forces. They share data, agree on standards, replicate results, and produce evidence that is rigorous and reliable.

The second is across fields. This is harder but more fascinating. Teams from different disciplines—sometimes speaking entirely different “languages”—sit at the same table. Astrophysicists, geneticists, and epidemiologists may work together. It feels like translating between languages. But when it works, it produces disruptive and transformative science.

Both types of collaboration demand persistence, openness, and enthusiasm. They require humility: alone we know next to nothing, but together we can learn more.

A Cosmopolitan Life

I belong to different cultural spheres—American, European, Greek—and this has been both good and difficult. There is a Greek word, *nostalgia*, which combines *nostos* (the journey home) and *algos* (pain). It is the pain of longing to return home. I often feel that longing, though I am not sure where “home” is. I have lived in many places. I feel at home in many, and foreign in many.

Another Greek word, *cosmopolitan*, combines *cosmos* (the world, a jewel of beauty) and *polites* (citizen). To be cosmopolitan is to be a citizen of the world. I believe we are all citizens of the world.

Being in Korea has been a joy. My hosts have shared majestic places and traditions with me, reminding me how little I know, and how much more there is to learn.

Acknowledgments

At the GEEF for All 2025 Special Seminar, held at Yonsei

University in Seoul, South Korea on June 4, 2025, John P.A. Ioannidis delivered a thought-provoking lecture on the meaning of leadership in research and academia. As part of the "Leadership Workshop Series" organized in collaboration with the Institute for Global Engagement & Empowerment, the seminar brought together students and faculty to reflect on how evidence, truth-seeking, and humility shape leadership in a globalized era. This paper presents a refined transcript of Dr. Ioannidis's remarks.

Dr. Ioannidis is among the most cited scientists in the world and has been widely recognized for reshaping debates on evidence-based medicine, reproducibility, and research integrity. His landmark 2005 paper, *"Why Most Published Research Findings Are False,"* has been viewed over three million times and cited more than 14,000 times. He is a member of several prestigious academies and has served as President of the Association of American Physicians. At Yonsei University, he emphasized that true leadership requires enthusiasm, collaboration, humility, and the courage to embrace mistakes as part of the scientific journey.

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Perspective

Humanitarian Aid in Action: A Global Commitment to Health

Byron Scott

President & Chief Operating Officer, Direct Relief

At Direct Relief, we operate on a simple but powerful belief: health is a human right, and humanitarian aid is an essential tool to make that right a reality for the world's most vulnerable people. Headquartered in Santa Barbara, California, Direct Relief was founded by a refugee who fled the horrors of World War II in Eastern Europe. From those humble beginnings, we've grown into one of the largest humanitarian aid organizations in the United States—and, in terms of air-freighted humanitarian supplies, one of the largest in the world.



The Intersection of Health and Peace

You can't have health without global peace. It's something we see every day. War, displacement, poverty—these are not just political or economic crises; they are health emergencies. At Direct Relief, we're focused on addressing the root causes that impact people's well-being. The social determinants of health—things like where you live, your education level, your access to clean water or nutritious food—are just as important as medicine or doctors. These are the conditions that define people's chances of living a healthy life, and they're often taken for granted in more developed nations.

The Power of Cold Chain: Delivering Hope

A key area where we've been able to make a significant impact is through cold-chain logistics—transporting temperature-sensitive medical supplies such as vaccines, insulin, and oncology drugs. These products save lives, but they require incredibly precise handling. We've built systems that allow us to move these vital medicines across continents without compromising their efficacy. And we do it for the people who need it most.

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For example, through our *Life for a Child* initiative, we now provide insulin to over 50,000 children in nearly 50 countries around the world. It's not just about getting the insulin. It's about making it sustainable—working in partnership with pharmaceutical companies who donate the insulin, and logistics partners who help us ship it where it needs to go. That's the power of collaboration.

Advancing Care for Cancer and Rare Diseases

In pediatric cancer, we've made strides by building partnerships with some of the largest pharmaceutical companies in the world. We're working in five African countries, supported by a major children's hospital in Texas, to deliver pediatric oncology drugs and provide training for local providers. It's not just about delivering medicine; it's about building systems of care that last.

We're also stepping up our support for children suffering from rare diseases—conditions that often require extremely expensive, highly specialized drugs. Again, these are children who live in parts of the world where those treatments would otherwise be out of reach.

Supporting the Most Vulnerable

The work we do is guided by one core principle: serve the most vulnerable. That includes children, pregnant women, the elderly, and people living in crisis zones. Over the last decade, we've developed specific humanitarian kits that target high-need populations. For example, we've distributed over 5,000 midwife kits, supporting more than 225,000 safe births in some of the most remote areas of the globe. That's the power of generosity—combined with listening, learning, and responding to real needs on the ground.

Transparency and Trust

At Direct Relief, transparency isn't just a value—it's a practice. We take pride in being accountable and responsible with every dollar donated. In fact, over 50% of our funding comes from individual donors—people who believe in what we do and want to be part of the solution. The remaining support comes from foundations and corporate partners, many of whom donate not just money but also products and services that amplify our impact.

A Global Effort, One Human at a Time

Our work is possible because people care—because they act. Whether it's a corporation offering vital medications, a foundation funding a new project, or an individual sending what they can, the story of Direct Relief is a story of collective human effort.

We don't pretend to have all the answers. But we do have a deep commitment to listening, responding, and showing up where we're needed most. Humanitarian aid in action means being present, being prepared, and being persistent. Because every person deserves access to health—regardless of where they live or what they've been through.

In service and solidarity,

Acknowledgments

As part of the GEEF for All 2025 series hosted by Yonsei University in Seoul, South Korea, Dr. Byron Scott delivered a powerful lecture on the role of humanitarian aid in advancing global health equity. Drawing on his leadership at Direct Relief, Dr. Scott emphasized the critical links between health, peace, and the social conditions that shape human well-being. This article is adapted from his presentation.

Byron Scott, MD, MBA, is President and Chief Operating Officer of Direct Relief, one of the world's leading humanitarian medical organizations. A board-certified emergency physician and nationally respected healthcare executive, Dr. Scott brings decades of experience in clinical care, health system leadership, and quality improvement. He previously served as Deputy Chief Health Officer at IBM Watson Health, Associate Chief Medical Officer at Truven Health Analytics, and Executive Vice President at EmCare. He is board certified in Emergency Medicine and Healthcare Quality Management, a Certified Physician Executive, and a Fellow of the American College of Emergency Physicians. In addition to his executive leadership, he teaches healthcare quality and patient safety at Thomas Jefferson University and healthcare performance improvement at the University of Massachusetts Amherst. He serves on the boards of Accuray, Providence Health Plan, and Rady Children's Hospital–San Diego, and holds cybersecurity and board governance certifications from the National Association of Corporate Directors (NACD).

** As part of the GEEF for ALL 2025 series hosted by Yonsei

University in Seoul, South Korea, Dr. Byron Scott delivered a powerful lecture on the role of humanitarian aid in advancing global health equity. Drawing on his work with Direct Relief, Dr. Scott emphasized the critical links between health, peace, and the social conditions that shape human well-being. This article is adapted from his presentation.

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Review Article

Advancing Nursing Education in Low- and Middle-Income Countries: Lessons from Bangladesh for Sustainable Global Health

Taewha Lee, SangA Lee*

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Global disparities in the nursing workforce threaten progress toward sustainable and equitable health systems. This paper presents three initiatives from Bangladesh—including the establishment of the National Institute of Advanced Nursing Education and Research, Chittagong Youngone Nursing College, and Shields Nursing Education Program—to illustrate how coordinated public, private, and international partnerships can strengthen nursing education in low- and middle-income countries. These efforts expanded educational capacity, advanced competency-based curricula, and enhanced faculty development, research, and leadership. Lessons from Bangladesh underscore the importance of embedding nursing within national health strategies, investing in faculty development, strengthening governance systems, integrating digital innovation, fostering responsible partnerships, and elevating the professional recognition of nurses. The Bangladesh case demonstrates that investing in nursing education is a strategic pathway to resilient, self-sustaining health systems and sustainable global health.

Keywords

Nursing education, Nursing workforce, Global health, Sustainable development goals

INTRODUCTION

The sustainability of global health systems is fundamentally dependent on the availability of a well-trained and adequately staffed health workforce. The World Health Organization (WHO) has emphasized this reality with the assertion

that “there is no health without a workforce,” underscoring that the strength of any health system and the achievement of universal health coverage (UHC) rest heavily on human resources for health (Campbell et al., 2013). Despite this recognition, the persistent shortage and inequitable distribution of health care professionals (HCPs) remain among the

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most pressing challenges in global health.

Nurses represent the largest segment of the global health workforce, yet nursing shortages constitute a particularly chronic and enduring crisis, especially in low- and middle-income countries (LMICs). A recent WHO report projects a worsening global nursing deficit, with nearly 70% of the shortfall expected to be concentrated in Africa and the Eastern Mediterranean by 2030 (WHO, 2025a). The magnitude of this disparity is reflected in striking differences in workforce distribution: in 2020, high-income countries (HICs) such as Norway and Switzerland had approximately 165 and 187 nurses and midwives per 10,000 population, respectively, whereas LMICs such as Bangladesh (6.6), Malawi (5.1), and Ethiopia (12.2) fell far below the global average of 37.7 per 10,000 (WHO, 2025b).

This inequity is further exacerbated by the persistent out-migration of nurses from LMICs to HICs, a phenomenon commonly referred to as “brain drain.” Between 2011 and 2021, the proportion of foreign-trained nurses employed across OECD countries nearly doubled, rising from 5% to 9%, with most originating from LMICs (Organisation for Economic Co-operation and Development [OECD], 2023). The United Kingdom alone recruited more than 23,000 foreign-trained nurses between 2021 and 2022, with significant increases from the Philippines, India, Nigeria, Ghana, and Zimbabwe (Nursing and Midwifery Council, 2022). Similar reliance on internationally recruited nurses has been observed in the United States, Ireland, New Zealand, Switzerland, Germany, and Canada (OECD, 2023). While such migration alleviates workforce gaps in destination countries, it critically exacerbates shortages in source nations, undermining already fragile health systems. Consequently, LMICs face a dual burden: severe domestic shortages alongside the external pull of global labor markets.

Structural vulnerabilities in LMICs further compound this imbalance. In many of these settings, primary healthcare (PHC) serves as the cornerstone of public health strategy, yet PHC systems remain chronically underfunded and heavily reliant on external aid (Hanson et al., 2022; Oleribe et al., 2019). Nurses—who comprise the backbone of PHC delivery—are both understaffed and under-supported. Weak workforce governance, limited academic infrastructure, and constrained public health budgets have rendered health systems fragile and ill-equipped to respond to both current demands and emerging health threats (Bvumbwe & Mtshali, 2018; WHO, 2025b).

Thus, the global nursing workforce imbalance is not merely a matter of numerical disparity but a structural impediment to achieving equitable and sustainable health outcomes. Addressing this inequity is not optional; it is an urgent imperative for global health.

THE IMPERATIVE OF STRENGTHENING THE NURSING WORKFORCE IN LMICS

Addressing the global nursing shortage—particularly in LMICs—requires more than simply increasing the number of nurses. It demands a strategic shift toward strengthening nursing capacity by developing autonomous, skilled professionals capable of leading, innovating, and responding effectively to complex public health challenges.

In many LMICs, nurses frequently serve as the primary—and sometimes the only—point of contact for patients within healthcare systems. Far beyond auxiliary roles, nurses are essential HCPs whose responsibilities encompass disease prevention, infection control, maternal and child health, chronic disease management, health education, and community-based care. During public health emergencies such as the COVID-19 pandemic, nurses demonstrated their indispensable role at the frontlines by leading triage, vaccination, mental health support, and risk communication efforts (Kang et al., 2024; O'Regan-Hyde et al., 2024). In such contexts, nurses act as critical agents of equitable healthcare access and system resilience (International Council of Nurses, 2021).

Realizing the full potential of the nursing workforce requires robust educational pathways and sustained professional development. Strategies must address both quantity and quality. Rapid scale-up without adequate standards, supervision, and clinical competencies risks producing a workforce that is numerically sufficient but professionally under-prepared (Buchan & Catton, 2023). Conversely, highly trained but insufficiently staffed systems face burnout, attrition, and bottlenecks (Buchan et al., 2022). Effective workforce development therefore necessitates a dual commitment: expanding access to nursing education while ensuring that training is competency-based, context-specific, and aligned with national health priorities (Buchan et al., 2022; Buchan & Catton, 2023).

Moreover, locally educated and retained nurses are more likely to remain within their communities, thereby contributing to sustainable health system strengthening. Reliance on for-

eign-trained nurses not only raises ethical concerns but also fails to provide long-term workforce sustainability (Bourgeault et al., 2023; OECD, 2008). In contrast, investment in home-grown nurse leadership and domestic education systems enhances resilience and mitigates workforce migration pressures (Sharplin et al., 2025).

Sustainable solutions must therefore prioritize the local production and long-term capacity building of nursing professionals within the cultural, clinical, and policy contexts of LMICs. Training should extend beyond clinical competence to include public health, leadership, policy advocacy, and interprofessional collaboration. Such preparation enables nurses to serve as system thinkers and change agents (Clarke, 2023; Maragh, 2011; Stucky et al., 2022). This approach not only strengthens national health systems but also improves population health outcomes, economic resilience, and global health security, while advancing progress toward UHC and the Sustainable Development Goals (SDGs) (High-Level Commission on Health Employment and Economic Growth, 2016).

Ultimately, nursing education is not a peripheral operational concern; it is a foundational pillar of health system development. Without a strong nursing workforce, investments in infrastructure, technology, or disease-specific programs risk being undermined by workforce gaps. Investing in nursing education is, therefore, investing in the quality, equity, and sustainability of healthcare systems.

CASE STUDY: EXPERIENCES IN BANGLADESH

Bangladesh, with a population of approximately 160 million, faces persistent disparities in healthcare service delivery due to an acute shortage of HCPs (Nuruzzaman et al., 2022). Compared with the global minimum threshold of 0.5 physicians and 1.5 nurses and midwives per 1,000 population, Bangladesh reports only 0.6 nurses and midwives per 1,000 population, alongside an inverted physician-to-nurse ratio of 0.86:1—far below the OECD average of 8.4 (World Bank, 2025). According to the Bangladesh Nursing and Midwifery Council (BNMC), approximately 71,000 nurses were registered nationwide in 2020. Their distribution, however, is highly uneven: urban areas employed 5.8 nurses per 10,000 population, while rural areas had only 0.8 per 10,000, reflecting a sharp geographic imbalance (Ahmed et al., 2015). Additionally, about 92% of registered nurses hold only a diplo-

ma-level qualification, 6% a Bachelor of Science in Nursing (B.Sc.), and only a small fraction holds graduate degrees (Rony, 2021). This skewed educational profile constrains professional capacity and constitutes a major barrier to the provision of high-quality, advanced healthcare services.

To address these systemic shortages and educational gaps, initiatives were undertaken in both the public and private sectors. First, the Korea International Cooperation Agency (KOICA), Korea's governmental agency for official development assistance (ODA) that provides grant aid to support sustainable development worldwide, supported the establishment of the Bangladesh National Institute of Advanced Nursing Education and Research (NIANER). During the COVID-19 pandemic, a collaborative curriculum in infection prevention and control was subsequently developed with NIANER. Second, the private-sector partner Youngone Corporation established a four-year Bachelor of Science in Nursing program through the creation of the Chittagong Youngone Nursing College (CYNC). Third, Yonsei University Health System (YUHS) introduced a short-term clinical training initiative, the Shields Nursing Education Program (SNEP), to provide Bangladeshi nurses with exposure to advanced hospital practices.

Collectively, these multi-sectoral initiatives—led by KOICA, Ministry of Health and Family Welfare (MOHFW), the BNMC, Yonsei University, and Youngone Corporation—laid the foundation for sustainable nursing workforce development. The following sections highlight three representative initiatives spearheaded by Yonsei University College of Nursing (YUCN): NIANER, CYNC, and SNEP (Table 1).

The National Institute of Advanced Nursing Education and Research (NIANER)

The establishment of the NIANER originated when Prime Minister Sheikh Hasina officially requested support for nursing workforce development during her visit to Korea in 2010 (Wang, 2018). Following this request, the KOICA launched the project in 2012 with YUCN as a project management consultant (PMC). The initiative was implemented over a seven-year period, with a total budget of USD 13.75 million, and culminated in the formal inauguration of NIANER in Dhaka in 2018 as the first postgraduate-level nursing education institution in Bangladesh (KOICA, 2022).

The project entailed the construction of a seven-story educational and dormitory complex with a total floor area of

Table 1. Goals and Outcomes of the Three Initiatives in Bangladesh

	Goals	Outcomes
NIANER	To establish the first postgraduate-level nursing institution in Bangladesh	- A 2-year Master's in nursing program 50 students/year - A seven-story educational and dormitory complex - Faculty development - Course syllabi, teaching manuals, and clinical practice guidelines - A specialized curriculum in infection prevention and control
CYNC	To establish a flagship nursing college in Chittagong	- A 4-year Bachelor of Science in Nursing program 50 students/year - Two educational buildings and one dormitory - Course syllabi, timeline, and clinical practicum guidelines
SNEP	To provide Bangladeshi nurses with intensive exposure to advanced healthcare practices	- A 2-month training course 8 nurses - Direct clinical practice and observation-based learning

9,163.85 square meters, equipped with advanced simulation laboratories, lecture halls, libraries, and other state-of-the-art facilities. More than 600 categories of educational equipment, including simulation-based training devices and electronic systems, were installed to ensure that the training environment met international standards while remaining adapted to local contexts. Alongside infrastructural investments, the project placed a strong emphasis on capacity building. Nursing administrators and policymakers participated in short-term training programs in Korea, nursing faculty members undertook 12-week intensive programs to strengthen their teaching and research skills, and senior government officials attended a leadership training designed to expand the administrative capacity for nursing development. Importantly, Bangladeshi nurse educators pursued doctoral education at YUCN, successfully completing their PhDs and returning to the NIANER as faculty members. As of today, YUCN has supported the training of five doctorally prepared Bangladeshi nursing faculty members who now contribute to NIANER's academic leadership.

Academic program development was another cornerstone of the project. In 2016, the master's curriculum designed at NIANER was officially accredited by the Bangladeshi government. The program, structured as a two-year course requiring 48 credits including a thesis, was competency-based and reflected both international standards and domestic healthcare priorities. It incorporated six core competency domains—quality patient care, education and consultation, research capacity, leadership, collaboration and cooperation, and lifelong learning—across six majors: adult nursing, women's health nursing, child health nursing, psychiatric,

community health nursing, and nursing management. The curriculum was re-certified in 2018 to reflect evolving needs in clinical practice and education. By 2019, NIANER had admitted four cohorts, comprising a total of 200 students. Graduates from the program went on to occupy senior nursing positions in hospitals and community health centers, contributing directly to improvements in healthcare delivery and service quality.

Taken together, NIANER represents a landmark achievement in the advancement of Bangladesh's nursing education system. It not only filled a structural void by offering the country's first master's program in nursing but also created a sustainable ecosystem for faculty development, research advancement, and community engagement. By producing highly skilled nurses with leadership and academic competencies, NIANER has become a cornerstone in Bangladesh's efforts to strengthen its health system through sustainable investment in nursing education.

Building upon the institutional foundation of NIANER, a collaborative initiative was launched by YUCN and NIANER, with support from the National Research Foundation (NRF) of Korea, to develop a specialized graduate-level curriculum in infection prevention and control (IPC). This initiative emerged during the COVID-19 pandemic, reflecting the urgent need to address Bangladesh's high vulnerability to infectious disease outbreaks by cultivating advanced practice nurses capable of leading infection control in both clinical and community settings.

The development process was guided by the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The analysis phase involved a situational as-

assessment of IPC practices in Bangladeshi hospitals, identification of the roles and competencies of practicing nurses, and recognition of the growing demand for infection control nurse specialists. In the design and development stages, a structured 48-credit curriculum was created, integrating theoretical courses, laboratory simulations, and clinical practicums. Five IPC-specific courses were developed: three theory-based (*Advanced Infection Prevention and Control Nursing I and II*; *Clinical Microbiology and Immunology*, 9 credits) and two practicums (*Advanced IPC Nursing Practicum I and II*, 6 credits). The theory courses introduced global IPC standards and extended them to population- and setting-specific contexts, while the practicums emphasized the translation of theoretical knowledge into practice, incorporating best practices across diverse hospital departments, community-based interventions, and policy decision-making relevant to outbreak response in Bangladesh. The elective course *Clinical Microbiology and Immunology* further strengthened students' understanding of infectious diseases prevalent in Bangladesh and provided them with competencies to independently investigate and implement prevention strategies. Learning objectives were aligned with international infection control standards while remaining tailored to Bangladesh's healthcare environment. To ensure quality and sustainability, faculty teaching manuals and clinical practice guidelines were also developed to support consistent program delivery and evaluation.

This curriculum represented the first systematic effort in Bangladesh to train advanced practice nurses in IPC. By equipping nurses with specialized competencies, the program sought to improve individual clinical practice, enhance institutional infection control capacity, and strengthen the resilience of the national health system. Moreover, it established a pipeline for developing nurse leaders who could contribute to national health policy, nursing education, and research in IPC. Importantly, the project was initiated during the COVID-19 pandemic, enabling a timely response to an unprecedented public health crisis. By developing educational models that are both contextually relevant and globally benchmarked, the initiative not only addressed immediate clinical needs during the pandemic but also reinforced Bangladesh's preparedness and long-term capacity to respond to future infectious disease outbreaks.

Chittagong Youngone Nursing College (CYNC)

The CYNC was established in Bangladesh's second largest city, Chittagong, as part of a broader initiative to expand high-quality nursing education beyond the capital. The project was initiated by Youngone Corporation in collaboration with the YUHS and implemented within the Korean Export Processing Zone (KEPZ) medical cluster ([The Guru, 2024](#)). Chittagong was strategically chosen for its potential to function as a regional medical hub, integrating healthcare and industrial development within a single ecosystem. The vision of CYNC was to establish a flagship nursing college within the KEPZ medical cluster that would systematically cultivate highly skilled nurses and thereby elevate both regional and national healthcare standards.

To realize this vision, YUCN was commissioned to provide comprehensive consultancy across the entire process between August 2023 and July 2025, ensuring the successful establishment and long-term sustainability of the college. This support encompassed the review of national standards for nursing colleges, guidance on approval and accreditation processes, planning of campus facilities and space allocation, curriculum design, development of faculty recruitment criteria, and formulation of student admissions policies. Collaboration with key stakeholders—including the Chittagong Medical University (CMU), the MOHFW, the Directorate General of Nursing and Midwifery (DGNM), and the BNMC—was also essential for obtaining regulatory approval and embedding CYNC within the national nursing education framework.

The established CYNC campus consists of two academic buildings and one dormitory, designed to provide an environment conducive to both learning and residential life. The college officially opened in July 2025, launching a four-year Bachelor of Science in Nursing (B.Sc.) program with an annual intake of 50 students (total 200 students across four cohorts). The program was developed in line with the BNMC's latest standards, comprising an academic calendar of four years with 26-week semesters, six instructional days per week, and six hours of daily theory and laboratory instruction or eight hours of clinical practicum. Detailed course syllabi and practicum guidelines were prepared to ensure consistent delivery of both theoretical and clinical training.

The establishment of CYNC illustrates an innovative model of how private sector leadership, international academic expertise, and local governance can converge to address

systemic health workforce shortages. Its creation is expected to strengthen the supply of qualified nurses in Chittagong, expand access to higher education for local students, and reduce regional disparities in healthcare human resources. Together with national-level institutions such as NIANER, CYNC highlights how government bodies, academic institutions, and private corporations can collaborate to strengthen health systems in LMICs through investment in nursing education.

Shields Nursing Education Program (SNEP)

In addition to the establishment of formal academic institutions such as NIANER and CYNC, a complementary initiative, the SNEP, was undertaken to strengthen the clinical competencies of Bangladeshi nurses through targeted training opportunities outside Bangladesh. The SNEP was implemented at YUHS under the leadership of its Department of Nursing, within the framework of the Avison International Fellowship in 2017 (YUHS Medical Mission Center, 2022). The program was designed to provide Bangladeshi nurses with intensive exposure to advanced healthcare practices in a high-resource setting.

Since 2017, the program has annually invited two Bangladeshi nurses to participate in a two-month intensive training course, with a total of eight nurses trained to date. The program covered multiple clinical departments, including pediatrics, obstetrics, the emergency department, intensive care units, and the disaster medical education center. Training encompassed both direct clinical practice and observation-based learning, with a particular emphasis on patient safety, infection prevention and control, and electronic medical record (EMR)-based nursing documentation. By situating nurses in highly specialized and technologically advanced hospital units, the program enabled participants to develop hands-on experience with modern clinical protocols and equipment rarely available in their home institutions.

A distinctive feature of the SNEP was its alignment with the healthcare needs of Bangladesh. While participants were introduced to global best practices in patient care and hospital management, the curriculum also encouraged critical reflection on how these practices could be adapted to the resource-constrained context of Bangladeshi hospitals. In this way, the program functioned not only as a skills transfer initiative but also as a platform for professional exchange, enabling nurses to contextualize learning and implement im-

provements upon returning home. The outcomes extended beyond individual professional development: participants expressed a strong commitment to disseminating their newly acquired knowledge and skills within their institutions, thereby creating ripple effects across local healthcare systems. Moreover, exposure to interdisciplinary teamwork and a culture of patient safety contributed to shifting professional attitudes, fostering leadership and evidence-based practice in their workplaces.

As a complementary initiative to the NIANER and CYNC, the SNEP demonstrates how short-term international clinical training can reinforce the objectives of long-term academic investment. By bridging advanced hospital practices in Korea with the realities of the Bangladeshi health system, the program contributed to building a cadre of nurses who are not only clinically competent but also capable of acting as change agents in their home country's evolving healthcare environment.

LESSONS LEARNED AND RECOMMENDATIONS FOR STRENGTHENING NURSING EDUCATION IN LMICSCs

Achievements in Bangladesh

The Bangladesh experience demonstrates that strengthening the nursing workforce requires simultaneous attention to both numerical expansion and qualitative enhancement of education. The establishment of institutions such as the NIANER and CYNC has significantly increased enrollment capacity at both graduate and undergraduate levels, thereby addressing the quantitative shortage of nurses. Most notably, NIANER emerged as the country's first graduate-level nursing institution, introducing structured master's programs that created a precedent for advanced nursing education in Bangladesh.

In parallel, initiatives such as the development of an IPC curriculum and short-term international training opportunities through the SNEP have contributed to qualitative improvements. These efforts enhanced clinical competencies, research skills, and leadership capacity while exposing Bangladeshi nurses to internationally benchmarked practices adapted to local system needs.

Faculty development further consolidated these achievements. Five Bangladeshi nurse educators successfully com-

pleted doctoral training at YUCN and returned to NIANER as academic leaders. Their contributions extended beyond teaching to include the advancement of research capacity in nursing, while joint research initiatives between Bangladeshi and Korean scholars generated publications on nursing, health systems, and disease-specific challenges. Graduate students were also supported to present at regional and international conferences, enhancing their academic visibility and professional confidence.

Taken together, these achievements illustrate that Bangladesh has progressed beyond the expansion of nurse numbers. Through a combination of institutional development, curricular innovation, faculty training, and opportunities for scholarly engagement, the country has laid the foundation for a workforce that is not only larger but also more skilled, research-competent, and capable of leadership in both national and international contexts.

Key Considerations for Strengthening Nursing Education in LMICs

The Bangladesh case highlights several considerations relevant to LMICs seeking to strengthen their nursing education systems.

1. Contextualized yet globally aligned curricula: Programs must remain responsive to national health priorities while maintaining alignment with international standards to ensure that nurses are competent to address both domestic and global health challenges (Davey, 2023).
2. Financial sustainability: Long-term viability requires diversified funding models, combining government allocations, international assistance, and private sector investment (Inaoka, 2024).
3. Integration of education and practice: Strong clinical training environments should be institutionalized by linking nursing schools with hospitals, community health centers, and primary care facilities to ensure that theoretical knowledge is consistently translated into practice.
4. Career development and retention pathways: Reducing workforce attrition necessitates strategies for continuing education, leadership development, and professional recognition (Malema et al., 2018).
5. Role of international partnerships as enablers: International partners should reinforce local systems and safeguard national ownership through long-term, context-sensitive support.

Beyond structural elements, cultural and social dynamics also shape workforce development. In many LMICs, including Bangladesh, nursing remains undervalued compared to medicine, contributing to challenges in social recognition and professional status (Joarder et al., 2021; Moghbeli et al., 2025). Advocacy, community engagement, and visible demonstrations of nurses' contributions are therefore essential for elevating the image of nursing and attracting new entrants.

Political and administrative contexts—including governance structures, decentralization, and bureaucratic capacity—further influence the feasibility and pace of workforce reforms (Menon et al., 2025; s, 2019). Strengthening nursing education thus requires partnerships with national governments, ministries of health, and regulatory councils to ensure that reforms are embedded within institutional structures and aligned with broader socio-political contexts. Addressing these structural, cultural, and political dimensions in tandem creates the enabling conditions for workforce expansion and the elevation of nursing as a respected profession within LMIC health systems.

Recommendations for Policy and Practice

The lessons from Bangladesh carry several implications for both national policymakers in LMICs and international development partners:

1. Integration of nursing into national health strategies: Ministries of Health should position nursing education and workforce planning as core components of national health policies rather than ancillary professional development activities. Embedding nursing priorities within broader UHC and SDG strategies can elevate visibility and attract sustainable funding.
2. Faculty development as a cornerstone of sustainability: Expanding access to doctoral education and leadership training for nurse educators is essential. Without a cadre of highly trained faculty, the expansion of nursing schools risks outpacing the availability of qualified instructors. Investment in academic leadership ensures that workforce growth is accompanied by improved quality.
3. Strengthening governance and regulatory frameworks: Nursing councils and professional associations must be empowered to set accreditation standards, regulate practice, and ensure accountability. Strong governance

structures reduce fragmentation and safeguard educational quality across institutions.

4. Leveraging partnerships strategically: Public–private partnerships, as demonstrated in Bangladesh, can mobilize resources and expertise while aligning with national needs. However, they must operate within a coherent governance framework to prevent inequities in access or duplication of efforts.
5. Harnessing digital innovations: The adoption of digital learning platforms, tele-mentoring, and simulation-based education can help address faculty shortages and extend access to quality training in resource-constrained settings. Such technologies should complement, rather than replace, in-person clinical training.
6. Fostering a culture of professional recognition: Elevating the social and professional status of nursing through advocacy, media engagement, and demonstration of nurses' contributions to population health can improve recruitment, reduce attrition, and shift long-standing hierarchies in LMIC health systems.

By implementing these policy and practice recommendations, LMICs can move beyond temporary solutions and build sustainable nursing education systems that contribute to stronger, more resilient health systems.

CONCLUSION

The Bangladesh experience highlights the imperative of moving beyond short-term interventions toward the long-term construction of a resilient health workforce. Strengthening nursing education is critical not only for expanding the number of trained nurses but also for enhancing their competencies in clinical practice, leadership, research, and policy engagement. Sustainable progress requires that nursing education be firmly embedded within national health strategies, supported by international cooperation that prioritizes capacity building while respecting local contexts and governance structures. Looking forward, global solidarity and collaborative partnerships in nursing education will be essential to preparing nurses for evolving health challenges, including demographic transitions, emerging diseases, and the growing complexity of health systems.

References

Ahmed, S. M., Alam, B. B., Anwar, I., Begum, T., Huque, R., Khan,

J. A. M., & Nababan, H. (2015). *Bangladesh Health System Review, Dhaka*. World Health Organization.

Bourgeault, I. L., Spitzer, D. L., & Walton-Roberts, M. (2023). Complexities of health and care worker migration pathways and corresponding international reporting requirements. *Human Resources for Health*, 21, 2. <https://doi.org/10.1186/s12960-022-00780-7>

Buchan, J., & Catton, H. (2023). *Investing in the nursing workforce for health system effectiveness*. International Council of Nurses. https://www.icn.ch/sites/default/files/2023-07/ICN_Recover-to-Rebuild_report_EN.pdf

Buchan, J., Catton, H., & Shaffer, F. A. (2022). *Sustain and retain in 2022 and beyond: The global nursing workforce and the COVID-19 pandemic*. International Council of Nurses. <https://www.icn.ch/sites/default/files/2023-04/Sustain%20and%20Retain%20in%202022%20and%20Beyond-%20The%20global%20nursing%20workforce%20and%20the%20COVID-19%20pandemic.pdf>

Bvumbwe, T., & Mtshali, N. (2018). Nursing education challenges and solutions in Sub-Saharan Africa: An integrative review. *BMC Nursing*, 17, 3. <https://doi.org/10.1186/s12912-018-0272-4>

Campbell, J., Dussault, G., Buchan, J., Pozo-Martin, F., Guerra, M., Leone, C., Siyam, A., & Cometto, G. (2013). *A universal truth: No health without a workforce. Forum report, Third Global Forum on Human Resources for Health, Recife, Brazil*. Global Health Workforce Alliance & World Health Organization. https://cdn.who.int/media/docs/default-source/health-workforce/ghwn/ghwa/ghwa_auniversaltruthreport.pdf

Clarke, S. (2023). Nurses and health policy: Time for a look inward and a deeper dive. *Nursing Outlook*, 71(4), 102034. <https://doi.org/10.1016/j.outlook.2023.102034>

Davey, A. K. (2023). Internationalisation of the curriculum in health programs. *BMC Medical Education*, 23(1), 285. <https://doi.org/10.1186/s12909-023-04271-8>

Hanson, K., Brikci, N., Erlangga, D., Alebachew, A., De Allegri, M., Balabanova, D., Blecher, M., Cashin, C., Esperato, A., Hipgrave, D., Kalisa, I., Kurowski, C., Meng, Q., Morgan, D., Mtei, G., Nolte, E., Onoka, C., Powell-Jackson, T., Roland, M., & Wurie, H. (2022). The Lancet Global Health Commission on financing primary health care: Putting people at the centre. *The Lancet Global Health*, 10(5), e715–e772. [https://doi.org/10.1016/S2214-109X\(22\)00005-5](https://doi.org/10.1016/S2214-109X(22)00005-5)

High-Level Commission on Health Employment and Economic Growth. (2016). *Working for health and growth: Investing in the health workforce*. World Health Organization. <https://www.who.int/publications/i/item/9789241511308>

- Inaoka, E. (2024). *Strengthening the financial sustainability of disease programs: Health finance approach of the global fund*. Friends of the Global Fund. https://fgfj-en.jcie.or.jp/wp-content/uploads/2024/11/FGFJ-Issue-Brief_GFHealthFinance_English.pdf
- International Council of Nurses. (2021). *Nurses: A voice to lead – A vision for future healthcare*. International Council of Nurses. https://www.icn.ch/system/files/documents/2021-05/ICN_Full_report_2021_EN.pdf
- Joarder, T., Parvage, M. A., Rawal, L. B., & Ahmed, S. M. (2021). A policy analysis regarding education, career, and governance of the nurses in Bangladesh: a qualitative exploration. *Policy, Politics, & Nursing Practice*, 22(2), 114-125. <https://doi.org/10.1177/1527154420988003>
- Kang, B., Oh, E. G., Kim, S., Kim, H., & Lee, S. (2024). Roles and experiences of nurses in primary health care during the COVID-19 pandemic: a scoping review. *BMC Nursing*, 23, 740. <https://doi.org/10.1186/s12912-024-02406-w>
- Korea International Cooperation Agency. (2022). *The establishment of the Bangladesh National Institute of Advanced Nursing Education and Research: Final report*. https://koica.go.kr/sites/evaluation_kr/article/view/1014
- Malema, R. N., & Muthelo, L. (2018). *Literature review: Strategies for recruitment and retention of skilled healthcare workers in remote rural areas* (Report No. 115). EQUINET & University of Limpopo. <https://www.equinet africa.org/sites/default/files/uploads/documents/EQ%20Diss%20115%20HR%20ret%20litrev%20Sep%202018.pdf>
- Maragh, K. A. (2011). The nurse leader as change agent and role model: Thoughts of a new nurse manager. *Nurse Leader*, 9(3), 39-42. <https://doi.org/10.1016/j.mnl.2010.09.007>
- Menon, A., Kavanagh, N. M., Falkenbach, M., Wismar, M., & Greer, S. L. (2025). The role of health and health systems in shaping political engagement and rebuilding trust in democratic institutions. *The Lancet Regional Health – Europe*, 53, 101326. <https://doi.org/10.1016/j.lanepe.2025.101326>
- Moghbeli, G., Gardashkhani, S., & Soheili, A. (2025). Public image of nursing: An integrative review of challenges and solutions. *BMC Nursing*, 24(1), 573. <https://doi.org/10.1186/s12912-025-03160-3>
- Nursing and Midwifery Council. (2022). *Internationally trained professionals joining the NMC register*. https://www.nmc.org.uk/globalassets/sitedocuments/annual_reports_and_accounts/2022-annual-reports/international-joiners-data-report-2021-2022.pdf
- Nuruzzaman, M., Zapata, T., De Oliveira Cruz, V., Alam, S., Tune, S. N. B. K., & Joarder, T. (2022). Adopting workload-based staffing norms at public sector health facilities in Bangladesh: evidence from two districts. *Human Resources for Health*, 19(Suppl 1), 151. <https://doi.org/10.1186/s12960-021-00697-7>
- Oleribe, O. O., Momoh, J., Uzochukwu, B. S., Mbofana, F., Adebisi, A., Barbera, T., Williams, R., & Taylor-Robinson, S. D. (2019). Identifying key challenges facing healthcare systems in Africa and potential solutions. *International Journal of General Medicine*, 12, 395-403. <https://doi.org/10.2147/IJGM.S223882>
- Organisation for Economic Co-operation and Development. (2008). *The looming crisis in the health workforce: How can OECD countries respond?* OECD Health Policy Studies. OECD Publishing, Paris. <https://doi.org/10.1787/9789264050440-en>
- Organisation for Economic Co-operation and Development. (2023). *Health at a glance 2023: OECD indicators*. OECD Publishing. <https://doi.org/10.1787/7a7afb35-en>
- O'Regan-Hyde, M., Dalton-O'Connor, C., Flynn, A., Murphy, A., & McCarthy, V. J. C. (2024). Nurses' experiences of the caring role during the COVID-19 pandemic: a scoping review of qualitative research. *Journal of Nursing Management*, 2024(1), 7147203. <https://doi.org/10.1155/2024/7147203>
- Rony, M. K. K. (2021). Diploma in nursing or bachelor of science in nursing: contradictory issues among nurses in Bangladesh. *Belitung nursing journal*, 7(1), 57-58. <https://doi.org/10.33546/bnj.1250>
- Sharplin, G., Clarke, J., & Eckert, M. (2025). *Assessing the global sustainability of the nursing workforce: A survey of national nurses' association presidents within the International Council of Nurses*. International Council of Nurses. https://www.icn.ch/sites/default/files/2025-04/ICN_NNA-Presidents-Survey-Report_EN_FINAL.pdf
- Shiffman, J. (2019). Political context and health financing reform. *Health Systems & Reform*, 5(3), 257-259. <https://doi.org/10.1080/23288604.2019.1633894>
- Stucky, C. H., Wymer, J. A., & House, S. (2022). Nurse leaders: transforming interprofessional relationships to bridge healthcare quality and safety. *Nurse Leader*, 20(4), 375-380. <https://doi.org/10.1016/j.mnl.2021.12.003>
- The Guru. (2024, August 12). *Building hospital and college, Youngone Corporation increases the investment in Bangladesh* [News article]. THE GURU. <https://www.theguru.co.kr/news/article.html?no=75733>
- Wang, G. (2018, May 14). *Korea built the first nursing graduate school* [News article]. Yonhap News Agency. <https://www.yna.co.kr/view/AKR20180514103800371>
- World Bank. (2025). *Global health workforce statistics database*. World Health Organization. <https://www.who.int/data/gho/data/>

themes/topics/health-workforce

World Health Organization. (2025a). *State of the world's nursing 2025: Investing in education, jobs and leadership*. World Health Organization. <https://iris.who.int/bitstream/handle/10665/381329/9789240110236-eng.pdf?sequence=1>

World Health Organization. (2025b). *Nursing and midwifery per-*

sonnel (per 1,000 population). WHO Global Health Observatory.

[https://www.who.int/data/gho/data/indicators/indicator-details/GHO/nursing-and-midwifery-personnel-\(per-10-000-population\)](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/nursing-and-midwifery-personnel-(per-10-000-population))

YUHS Medical Mission Center. (2022). *Report series 10* [Unpublished report]. Yonsei University Health System.

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Review Article

Health inequalities in children: A comprehensive review

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Health inequalities, defined as systematic, avoidable, and unfair differences in health outcomes between populations, pose a major challenge to public health. This review examined how socioeconomic status, geographical location, and educational attainment affect children's physical and mental health. It also highlights how the COVID-19 pandemic has exacerbated these inequalities. Children from lower socioeconomic backgrounds experience less access to healthcare and a higher rate of chronic diseases compared to those from higher socioeconomic backgrounds. Differences in geographical location also increase these gaps, particularly in rural or underdeveloped areas where resources are limited. Limitations in Educational attainment also have a further impact on health by limiting opportunities for health literacy and access to services. The present review explores interventions implemented by governments, hospitals, and schools to address these disparities. While nutritional programs and hospital-based initiatives have achieved some positive progress, challenges remain due to inconsistencies in implementation and funding allocation. In particular, differences in oral health and access to cancer care highlight gaps in existing measures. To overcome these disparities, a coordinated strategy that tackles the socioeconomic determinants of health is required. Politicians, healthcare providers, and educators must work together to guarantee fair allocation of resources and services. Thus, sustained commitment to these activities is required to ensure a healthier and more equitable future for all children.

Keywords

Health inequalities, Socioeconomic status, Geographical disparities, Educational attainment, Children, COVID-19 pandemic, Healthcare access

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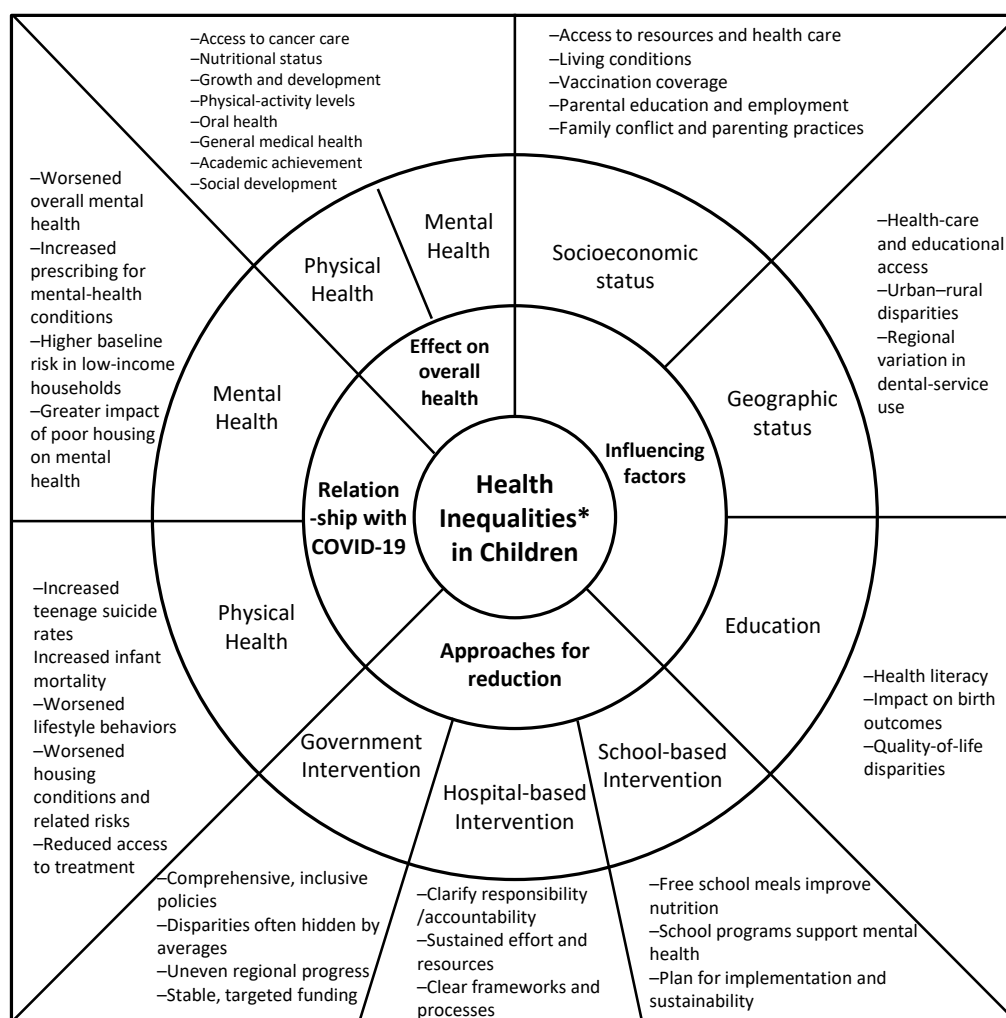
INTRODUCTION

Health inequalities are systemic, avoidable, and unfair differences in health outcomes across populations (McCartney et al., 2019). These disparities pose a serious threat to both public health and healthcare systems. While socioeconomic deprivation is often the most visible driver, inequalities also arise from other social factors such as disability, race, sexual orientation, and religion. These dimensions frequently overlap, compounding disadvantage and deepening their impact on health.

Inequalities often emerge early in life and persist into childhood and adulthood. Children who grow up in low-income families face a substantially higher risk of chronic illness and developmental challenges than their wealthier peers (Currie

& Rossin-Slater, 2014). Such disadvantages shape health trajectories over the long term, as consistently documented across diverse populations. Addressing these gaps is therefore critical not only to improve individual outcomes but also to reduce the wider social and financial burdens they create.

This review focuses on three major determinants of childhood health inequality: socioeconomic status, geographical disparities, and educational attainment. It also examines how the COVID-19 pandemic has intensified these vulnerabilities, further marginalizing disadvantaged populations. By synthesizing evidence across these domains, the review underscores the urgent need for coordinated, long-term strategies to promote equity in child health. An overview of the key determinants and outcomes of child health inequalities is presented in Figure 1.



Health Inequalities: systemic, avoidable, and unfair differences in health outcomes between populations.

Figure 1. Conceptual Framework of Health Inequalities in Children.

THE EFFECT OF HEALTH INEQUALITY ON OVERALL CHILDREN'S HEALTH

Health inequalities have a significant impact on children's physical and mental health outcomes. This section explores these effects by examining current research that highlights disparities and their implications for children's overall health.

Physical Health

Disparities in children's physical health are especially concerning because they frequently reflect broader environmental and social inequalities. These differences may lead to long-term health problems that compromise children's development, growth, and overall quality of life throughout their entire lifespan. A national cross-sectional study in China demonstrated that children from lower socioeconomic backgrounds had reduced access to cancer care services, which was linked to higher incidence rates of pediatric cancer (Ni et al., 2022). This finding suggests that disparities in healthcare access contribute significantly to poorer physical health outcomes among disadvantaged children. In addition, an analysis of health, nutrition, and well-being among Afro-descendant children across ten Latin American and Caribbean countries concluded that consistent gaps persist between Afro-descendants and non-Afro-descendants (Costa et al., 2022). These differences were especially evident in indicators

such as nutritional status and overall health, highlighting the urgent need for targeted interventions to address these inequities.

Stunting, a widely recognized indicator of poor physical health, also varied significantly across socioeconomic determinants, particularly among under-five children in Tanzania (Musheiguza et al., 2021). The study found that children from socioeconomically disadvantaged households experienced a much higher prevalence of stunting compared to their more advantaged peers. Another example involves children and young people with type 1 diabetes. Research shows that minority ethnic communities consistently report higher HbA1c values than white children, and this gap has been increasing over the last six years, reflecting a worsening trend in health inequalities (Ng & Evans, 2021). Lastly, differences in physical activity provide further evidence of inequality: a study examining activity levels among children and youth in Scotland found clear disparities by socioeconomic status, reinforcing that disadvantage has a direct influence on physical health behaviors and outcomes (Bardid et al., 2022). Collectively, these studies underscore the persistent and multifaceted ways in which socioeconomic and social factors drive disparities in children's physical health. To provide an integrated overview, Table 1 summarizes key studies on both physical and mental health inequalities in children, highlighting their design and major findings across diverse contexts.

Table 1. List of Studies Examining the Impact of Health Inequalities on Children's Physical and Mental Health

Author, Year	Study design	Main study findings
Ni et al., 2022	Cross-sectional study in China	Children from low-income families were more likely to be diagnosed with cancer and had less access to appropriate treatment compared with wealthier peers.
Costa et al., 2022	Multi-country household surveys in Latin America and the Caribbean	Afro-descendant children consistently showed poorer nutrition and well-being than non-Afro-descendants.
Musheiguza et al., 2021	Cross-sectional survey in Tanzania	Disadvantaged households had higher rates of stunting in under-five children.
Ng & Evans, 2021	Retrospective cohort study in the United Kingdom	Minority ethnic children with type 1 diabetes had worse HbA1c than white children, with inequalities widening.
Bardid et al., 2022	Population-based study in Scotland	Children from disadvantaged families engaged less in physical activity.
Stahlmann et al., 2022	Cross-sectional study in Germany	Poorer areas with fewer social facilities showed more frequent child mental health difficulties.
Ball et al., 2023	Administrative records analysis in Scotland	Prescriptions and referrals for mental health were disproportionately higher among children from deprived areas.
Melchior, 2021	Review/editorial in Europe	Socioeconomic inequalities in child mental health are long-standing and appear to be widening.

Mental Health

Disparities in children's mental health are equally concerning since they can have a significant impact on social development, academic success, and general well-being. Evidence from Germany, for instance, shows that children living in socioeconomically disadvantaged areas with fewer opportunities for social and recreational activities are more likely to experience mental health problems, with these inequalities persisting through adolescence (Stahlmann et al., 2022). Such findings highlight how disadvantage becomes embedded in daily life, reinforcing disparities over time.

Patterns of healthcare use also reveal inequality. In Scotland, an analysis of prescribing and referral data found that children from deprived communities were more likely to be given psychiatric medication and referred to specialist services compared with peers from more affluent backgrounds (Ball et al., 2023). Although these differences partly reflect greater need, they also raise concerns about whether disadvantaged children are receiving the right type of support at the right time, or whether they are encountering systems that intervene only after problems have escalated. European evidence further illustrates these inequalities. Research shows that socioeconomic disadvantage has long been associated with higher risks of psychological difficulties in children and adolescents, and that these gaps have widened in recent years (Melchior, 2021).

Together, this evidence demonstrates how social inequalities shape children's mental health in multiple ways: by increasing the likelihood of emotional and behavioral problems, by producing unequal patterns of service use, and by sustaining long-term disparities in well-being. Tackling these divides requires improvements in clinical care, along with sustained action on the underlying social and economic determinants that drive them. As noted in Table 1, these disparities span both physical and mental health outcomes, underscoring their broad and systemic impact.

THE COVID-19 PANDEMIC AND HEALTH INEQUALITIES IN CHILDREN

The COVID-19 pandemic has magnified vulnerabilities and deepened health inequalities worldwide, affecting both the physical and mental health of children (Rebouças et al., 2021; Marmot, 2021).

Physical Health

Evidence from multiple regions shows that the pandemic amplified the effects of socioeconomic disadvantage. In Japan, infant mortality and adolescent suicide rose among low-income families, while wealthier households were less affected (Takeuchi et al., 2024). Similar patterns were observed in Canada, where gaps in children's diet and physical activity widened during school closures (Maximova et al., 2023). European studies also report that disadvantaged children faced greater barriers to maintaining healthy behaviors and accessing healthcare throughout the crisis (Geweniger et al., 2022; Lorthé et al., 2023).

Mental Health

The pandemic also widened inequalities in mental health outcomes. In the UK, longitudinal data revealed that children aged 5–8 experienced worsening mental health during this period, despite some disparities narrowing (Miall et al., 2023). In Europe, socioeconomic inequalities also deepened in developmental outcomes, with disadvantaged children showing higher risks of overweight and language delays (Weyers et al., 2023). In Spain, families with limited education and financial resources reported poorer housing conditions during lockdowns, compounding children's difficulties across physical, emotional, and social domains (Sancho et al., 2021).

Taken together, global evidence shows that the pandemic did not create disparities but acted as an amplifier, revealing and worsening inequities in healthcare, nutrition, and education. Children in disadvantaged households were not only more exposed to risks but also had fewer protective resources. Thus, the pandemic highlighted the fragility of existing support systems. Table 2 summarizes the key studies that illustrate how the pandemic exacerbated inequalities in children's health across different regions. The next section examines structural determinants—socioeconomic status, geography, and education—that shape outcomes both during and beyond the pandemic.

FACTORS THAT INFLUENCE CHILDREN'S HEALTH INEQUALITIES

Health inequalities stem from long-standing socioeconomic, geographic, and educational disparities that have shaped

Table 2. List of Studies Examining the Impact of the COVID-19 Pandemic on Children's Health Inequalities

Author, Year	Study design	Main study findings
Takeuchi et al., 2024	National cohort study in Japan	Infant mortality and adolescent suicide increased among low-income families, while higher-income households were less affected.
Maximova et al., 2023	Cross-sectional study in Canada	Socioeconomic gaps in children's diet and physical activity widened during the pandemic.
Geweniger et al., 2022	Cross-sectional survey in Germany	Disadvantaged children had fewer opportunities for healthy behaviors and faced greater barriers to healthcare access during the pandemic.
Lorthe et al., 2023	Population-based cohort in France	Socioeconomic disadvantage was associated with greater barriers to maternal and child healthcare during COVID-19.
Miall et al., 2023	Longitudinal cohort in the United Kingdom	Mental health worsened in children aged 5–8 during the pandemic, although some disparities narrowed.
Weyers et al., 2023	Population-based cohort in Europe	Socioeconomic inequalities widened in child development outcomes, such as overweight and language delay, during the pandemic.
Sancho et al., 2021	Parental survey in Spain	Families with limited education and financial resources reported poorer housing conditions during lockdown, which negatively impacted children's well-being.

child health outcomes for decades ([McCartney et al., 2019](#)). Addressing such structural determinants is essential for developing durable strategies to reduce disparities in child health outcomes. Key studies underpinning these conclusions, including study designs and succinct findings, are summarized in [Table 3](#).

Socioeconomic status

Socioeconomic status is one of the most powerful forces shaping child health, influencing everything from daily living conditions to access to medical care ([Gautam et al., 2023](#)). Families with fewer resources often struggle with overlapping disadvantages, including poor housing, financial stress, and limited access to healthcare. These cumulative pressures make children especially vulnerable to poorer outcomes. Evidence from Bangladesh illustrates this clearly. Children in low-income households were far less likely to be fully vaccinated, with barriers linked to parental education and employment ([Srivastava et al., 2022](#)). Preventive care that should be universal becomes a privilege tied to wealth.

The same pattern emerges in other settings. For example, in Brazil, mothers from socioeconomically disadvantaged families were more likely to hold negative views of their children's oral health, reflecting how poverty shapes not only health outcomes but also parental perceptions and expectations ([Karam et al., 2023](#)). Beyond individual households, broader family dynamics such as parental mental health, conflict, and parenting practices can reinforce inequalities

across generations ([Blume et al., 2021](#)). These findings illustrate a cycle: disadvantage influences parental attitudes, which in turn feed back into children's well-being.

Further studies show how access to treatment also follows these gradients. In Ethiopia, children from rural or less educated families were less likely to be hospitalized for pneumonia ([Shibre et al., 2021](#)). This underscores how educational and geographic barriers compound vulnerability. Meanwhile, in urban environments, the absence of safe parks or sports facilities has been linked to higher rates of mental health problems in children, showing how structural deprivation translates directly into daily stressors ([Rittsteiger et al., 2021](#)). Health inequalities are not just about medical care but about the environments in which children grow and interact.

Geographical location

Geographical location often intersects with socioeconomic factors to influence children's health outcomes. For instance, evidence from Nigeria shows how location magnifies disadvantage. According to the study, children in rural and underserved regions face significantly higher risks of mortality before age five, reflecting both limited health infrastructure and persistent poverty ([Okoli et al., 2022](#)). In China, disparities are also evident between urban, rural, and migrant populations. Using data from the Chinese Education Panel Survey, [Wang et al. \(2019\)](#) found that rural and migrant children had poorer health outcomes, measured by lower height-for-age scores, compared to urban children. Importantly, the father's

Table 3. List of Studies Examining Structural Determinants of Children's Health Inequalities

Author, Year	Study design	Main study findings
Gautam et al., 2023	Systematic literature review in multi-countries	Lower socioeconomic status was consistently linked to unhealthier behaviors and poorer access to resources, shaping child and adolescent health.
Srivastava et al., 2022	Comparative DHS analysis in Bangladesh	Children from low-income households were significantly less likely to receive full vaccination, with disparities tied to parental education and employment.
Karam et al., 2023	Birth cohort study in Brazil	Mothers from socioeconomically disadvantaged families were more likely to report negative perceptions of their children's oral health, reflecting SES-driven disparities.
Blume et al., 2021	Scoping review in multi-countries	Family factors such as parental mental health, conflict, and parenting styles mediated or reinforced socioeconomic health inequalities in children.
Shibre et al., 2021	Repeated cross-sectional DHS analysis in Ethiopia	Under-five children from rural and less educated families were less likely to be hospitalized for pneumonia, reflecting SES and educational barriers.
Rittsteiger et al., 2021	Cross-sectional survey in Germany	Children from wealthier families were more likely to access sports facilities and participate in physical activity, reducing mental health risks.
Okoli et al., 2022	Cross-sectional analysis in Nigeria	Children in rural and underserved regions had significantly higher risks of under-five mortality, reflecting limited infrastructure and persistent poverty.
Wang et al., 2019	Cross-sectional survey analysis in China	Rural and migrant children had poorer health outcomes (lower height-for-age scores) compared to urban peers; fathers' education moderated these disparities.
Aravena et al., 2021	Cross-sectional secondary data analysis in Peru	Access to dental services varied widely across natural regions, with rural and low-income children experiencing the most barriers.
Haag et al., 2021	Secondary data analysis in Australia	Children from disadvantaged and remote households showed higher oral disease rates and greater reliance on acute rather than preventive dental care.
Viner et al., 2012	Narrative review in multi-countries	Education shapes health through social determinants; adolescence is a key period where disparities form, influencing long-term outcomes.
Behrman & Rosenzweig, 2002	Cohort study using U.S. twin data in the United States	Maternal education was a strong predictor of children's health and schooling; higher maternal education broke cycles of disadvantage across generations.
Raghupathi & Raghupathi, 2020	Cross-national analysis of OECD countries	Higher educational attainment was associated with lower chronic illness and better mental health; lower education was linked to wider disparities.
Elgar et al., 2015	Time-series analysis of HBSC data in 34 countries	Socioeconomic inequalities in adolescent health persisted across decades, highlighting structural disadvantages.
Kennedy et al., 2020	Cross-country comparative analysis in LMICs and global samples	Gender inequalities in health and well-being emerge in early childhood and persist through adolescence, with larger gaps in LMICs.
Daghigh Yazd, 2023	Ecological analysis in global datasets	Higher societal gender inequality correlated with poorer child health outcomes, underscoring systemic gender effects.
Hunter & Flores, 2021	Systematic review in the global literature	Poverty, parental education, and limited healthcare access increased the risk of adverse child outcomes, including maltreatment and chronic illness.
Van Cleave et al., 2022	Narrative/clinical review in the United States	Children with special healthcare needs face compounded effects of poverty and structural barriers, magnifying inequality.
Viner et al., 2020	Rapid systematic review in multi-country evidence	COVID-19 school closures and service disruptions disproportionately harmed disadvantaged children, amplifying existing disparities.

level of education moderated these disparities, suggesting that geographic disadvantage is compounded by intergenerational educational inequalities.

Moreover, regional disparities are also evident in Latin America. A study in Peru found that children's access to dental services varied widely across natural regions, with rural and low-income communities facing the most barriers (Ara-vena et al., 2021). Evidence from Australia highlights another layer of inequity since children from disadvantaged or geographically remote households not only had higher rates of oral disease but also relied more heavily on acute dental services rather than preventive care (Haag et al., 2021).

These findings underscore that health inequalities are not evenly distributed but are closely tied to geography. Whether through rural–urban divides, regional disparities in infrastructure, or the compounded effects of remoteness and poverty, place fundamentally shapes children's health outcomes and reinforces broader social inequalities.

Education

Education is another fundamental determinant of child health, influencing outcomes through health literacy, resource accessibility, and the capacity to adopt healthier lifestyles. Its impact is not only immediate but also intergenerational. It shapes both children's present well-being and their long-term opportunities (Viner et al., 2012).

Evidence from the United States shows that maternal education strongly predicts children's health and educational attainment. Mothers with more years of schooling were significantly more likely to raise healthier children, highlighting how disparities in parental education perpetuate inequalities across generations (Behrman & Rosenzweig, 2002). This finding underscores the role of parental education in setting the foundation for children's health trajectories from birth onward.

At the global level, comparative analyses across OECD countries demonstrate that higher levels of educational attainment are consistently associated with improved health indicators, including lower prevalence of chronic illness and better mental health. Conversely, lower levels of education are linked to poorer outcomes and broader health disparities (Raghupathi & Raghupathi, 2020). These cross-national patterns show that education functions as a protective factor, buffering children against the risks posed by socioeconomic and geographic disadvantage.

Taken together, the evidence emphasizes that improving

access to equitable, high-quality education is not simply a matter of social policy but a public health imperative. Strengthening educational opportunities, particularly for disadvantaged families, is central to breaking cycles of inequality and ensuring healthier futures for all children.

Additional factors

Beyond socioeconomic, geographic, and educational determinants, children's health is also shaped by intersecting influences such as gender, poverty, and systemic barriers in healthcare. Long-term international evidence shows that health inequalities among adolescents have not diminished but persisted across decades, pointing to deeply embedded structural disadvantages (Elgar et al., 2015).

Gender inequities are especially significant. A Lancet Global Health analysis found that gender inequalities in health and well-being emerge during early childhood and persist through adolescence, particularly in low- and middle-income countries (Kennedy et al., 2020). Similarly, Daghigh Yazd (2023) demonstrated that higher levels of gender inequality within societies are correlated with poorer health outcomes among children, underscoring how systemic discrimination reinforces disparities.

These inequities are also compounded by broader social determinants. A systematic review revealed that factors such as poverty, parental education, and limited healthcare access increase children's vulnerability to adverse outcomes, including maltreatment and chronic illness (Hunter & Flores, 2021). Further evidence shows that children with special healthcare needs are disproportionately affected by poverty and structural barriers. This emphasizes how overlapping disadvantages can magnify inequality (Van Cleave et al., 2022).

Inequalities are further reinforced by the ways health systems respond to crises. During the COVID-19 pandemic, for example, school closures and disruptions in essential services disproportionately harmed children from disadvantaged households, illustrating how systemic barriers intersect with social disadvantage to amplify disparities (Viner et al., 2020).

These findings show that child health inequalities cannot be understood through a single lens. Gender, poverty, healthcare access, and systematic responses all interact to create complex disparities that require long-term, multisectoral interventions.

APPROACHES TO TARGET HEALTH INEQUALITIES IN CHILDREN

Reducing health inequalities in children is a complex challenge that requires urgent cooperation among hospitals, schools, and governments. There are still major obstacles in successfully implementing policies targeting these health inequalities (Brewster et al., 2024; Hammami et al., 2022). This emphasizes the necessity of strong regulations and ongoing initiatives in this public health issue. We can integrate various research to highlight the improvements made so far and the existing challenges in tackling these disparities (Holding et al., 2021). Key study designs and findings for policy, hospital, and school approaches are summarized in Table 4.

Government Intervention

The effective development of various government interventions plays a crucial role in solving health inequalities among children (Ball et al., 2023; Holding et al., 2021). However, there are still notable challenges that need to be targeted. English national policy approaches to health inequalities often suffer from significant absences and narrow framings of inequality (Griffin et al., 2022). Although policies do exist, this review suggests that they may not be inclusive or extensive enough, indicating the need for more detailed and comprehensive policy frameworks.

Regional averages can obscure important health inequalities between countries, and national estimates may hide even greater disparities between subgroups (Sanhueza et al., 2021). It is extremely important to have precise data and focused treatments to successfully address particular vulnerabilities within populations (Holding et al., 2021).

On the other hand, there have been significant reductions in disparities for most nutritional indicators among Brazilian preschool children from 2006 to 2019, except for an increase in childhood anemia in the North region (Cardoso et al., 2023). This suggests that although improvement is possible, it is frequently uneven and that more attention may be needed in certain areas than others. Together, these results demonstrate the complexity of governmental actions and the requirement for ongoing policy review and modification.

Hospital-Based Interventions

Hospitals also play a critical role in addressing health in-

equalities, but face substantial challenges. For instance, hospital staff in England consider resolving health inequities as a shared but unclear responsibility (Brewster et al., 2024). Leaders across England's integrated care systems similarly report conceptual, cultural, capacity, and resource barriers, indicating that better alignment of policy, processes, and resources is required for hospital-based interventions to be effective (Alderwick et al., 2024).

Children's hospitals serve as effective sites for public health interventions, particularly those with committed staff and comprehensive methods (Brennan et al., 2024). Hospitals can make an important contribution to reducing health inequalities among children if they are given the right resources and organized initiatives (Brewster et al., 2024).

Despite improvements in the reduction of infectious diseases, they persist as a significant risk to children's health in low- and middle-income countries (LMICs), especially for disadvantaged groups, according to Besnier et al. (2019). Thus, hospitals are responsible for putting in continuous efforts in the prevention and treatment of infectious diseases, particularly in environments with limited resources. Although hospitals have the ability to address health inequalities, they require consistent funding and targeted strategies to do so effectively (Brennan et al., 2024; Besnier et al., 2019).

School-Based Interventions

Schools are effective platforms for narrowing health gaps when interventions target diet and mental well-being together. A Norwegian school-meal trial found that providing a free, healthy lunch for one school year increased children's intake of nutritious foods, with larger gains among lower-SES pupils (Vik et al., 2019). Broader policy evidence points the same way: systematic reviews of universal free school meals (UFSM) report higher meal participation and signals of improved health/behavioral outcomes, though effects on some endpoints remain mixed—underscoring the need for rigorous implementation and evaluation (Cohen et al., 2021; Spill et al., 2024).

By reducing loneliness, providing nutritious food, and offering opportunities for social engagement, school holiday interventions also reduce socioeconomic disparities in mental health and well-being (Morgan et al., 2019). Schools can be highly beneficial in reducing the negative effects that socioeconomic deprivation has on children's psychological well-being.

Table 4. List of Studies Examining the Approaches to Reducing Health Inequalities in Children

Author, Year	Study design	Main study findings
Brewster et al., 2024	Qualitative study with hospital staff in England	Tackling inequalities is viewed as a shared yet ill-defined responsibility; clearer organisational frameworks and support are needed.
Hammami et al., 2022	Longitudinal HBSC trend analysis in Canada	Socioeconomic and gender health gaps among adolescents persisted/widened, underscoring the need for robust, targeted policy action.
Holding et al., 2021	Evidence synthesis/policy commentary in LMIC contexts	Funding, delivery, and monitoring gaps hinder implementation; calls for context-fit strategies.
Ball et al., 2023	Retrospective cohort using administrative data in Scotland	Rising child mental-health prescribing/referrals post-COVID highlights the need for equitable, earlier access to support.
Griffin et al., 2022	Narrative policy review in England	National inequality policies adopt narrow framings and omit key drivers; more inclusive, comprehensive frameworks are needed.
Sanhueza et al., 2021	Comparative analysis of population estimates in Latin America/global	Regional/national averages mask subgroup gaps; disaggregated data are required to target vulnerabilities.
Cardoso et al., 2023	Trend analysis of nutrition indicators in Brazil	Most preschool nutrition disparities narrowed (2006–2019), but childhood anaemia rose in the North, showing uneven progress.
Alderwick et al., 2024	Qualitative interviews with system leaders in England	Conceptual, cultural, capacity, and resource barriers limit system-wide inequality work; alignment of policy, processes, and resources is required.
Brennan et al., 2024	Grey-literature scoping review in international children's hospitals	Children's hospitals are mobilising public-health actions; success depends on governance, dedicated resources, and sustained commitment.
Besnier et al., 2019	Global evidence review in LMICs	Infectious diseases remain major risks for disadvantaged children; hospitals must sustain prevention/treatment in low-resource settings.
Vik et al., 2019	One-year school-meal intervention trial in Norway	Free, healthy school lunches increased nutritious intake, with larger gains among lower-SES pupils.
Cohen et al., 2021	Systematic review of UFSM in multi-country evidence	UFSM improves participation and shows signals of health/behaviour benefits; effects vary, stressing rigorous implementation.
Spill et al., 2024	Systematic review/meta-evidence on UFSM in multi-country evidence	UFSM is associated with improved meal uptake and several student outcomes; equity and program quality matter for scale-up.
Morgan et al., 2019	Population-based study of adolescents in Wales	Summer experiences (hunger, loneliness, low activity) explain SES gaps in well-being; holiday provision can reduce disparities.
Heinrich et al., 2023	Review of school mental-health implementation in multi-country/US-heavy settings	Funding, capacity, and evaluation-framework gaps commonly blunt program impact.
O'Byrne et al., 2024	Process-evaluation framework for complex school PA/nutrition interventions in multi-country evidence	Practical guidance to design, implement, and evaluate programs for durable, equitable scaling.

Scaling school-based programs consistently runs into funding, implementation, and administrative hurdles. Reviews of school mental-health and nutrition initiatives note gaps in implementation capacity, evaluation frameworks, and long-term financing. These are barriers that can blunt impact even when interventions are promising ([Heinrich et al., 2023](#); [O'Byrne et al., 2024](#)). Although school-based interventions show potential, their successful growth and sustainability require careful design and strong support ([Vik et al., 2019](#)).

Reducing child health inequalities ultimately requires coor-

ordinated action across policy, hospitals, and schools. On the provider side, children's hospitals worldwide are mobilizing but highlight the need for clearer frameworks and resources to address inequities effectively ([Brennan et al., 2024](#)). School systems, for their part, can reduce nutritional and psychosocial risks when programs are properly funded and delivered at scale ([Cohen et al., 2021](#); [Spill et al., 2024](#))

CONCLUSION

Health inequalities in childhood are patterned by social,

economic, and environmental conditions, and they emerge early, compound over time, and span both physical and mental health. Across settings, we identified consistent gradients by socioeconomic position, geography, and education, with disadvantaged children facing lower access to preventive care, higher exposure to adverse environments, and more barriers to timely treatment (see Table 3). The COVID-19 pandemic did not create these gaps but amplified them, exposing how fragile protections can be for families with the fewest resources.

Closing these gaps requires action on two fronts. First, address the conditions that create risk: fairer social and educational systems, and targeted, place-based investment where need is greatest. Second, improve the services children encounter: earlier access pathways, clear equity mandates, and sustained resources in hospitals and schools. The strongest levers we reviewed align with these goals—more inclusive policies, hospital initiatives with explicit accountability for inequalities, and school programmes that combine nutrition with psychosocial support and are built for scale, quality, and reach (see Table 4).

In conclusion, progress requires disciplined implementation and continuous learning. Disaggregated monitoring reveals who benefits and who does not. A genuine partnership with communities ensures cultural and contextual fit. Finally, evaluation must track outcomes and equity, not one without the other. Reducing child health inequalities is not a single intervention but a coordinated, long-term project. With sustained policy commitment, accountable health systems, and strong school–community partnerships, we should guarantee that every child, regardless of their social or economic circumstances, has the chance to develop their full potential by addressing these disparities effectively.

Take home messages

Addressing childhood health inequalities is crucial for achieving Sustainable Development Goal 3 (Good Health and Well-Being). These disparities, driven by socioeconomic status, geographical location, and educational access, impact both physical and mental health. The COVID-19 pandemic worsened existing inequalities, disproportionately affecting children in marginalized communities. Targeted policy interventions—including expanding healthcare access, improving health literacy, and integrating social support services—are necessary to bridge these gaps. Governments,

hospitals, and educational institutions must collaborate to develop sustainable solutions that ensure equitable health outcomes for all children.

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Data Availability

The data supporting the findings of this review are based on previously published studies and publicly available data, as detailed in the references section.

References

- Alderwick, H., Hutchings, A., & Mays, N. (2024). Cross-sector collaboration to reduce health inequalities: a qualitative study of local collaboration between health care, social services, and other sectors under health system reforms in England. *BMC Public Health*, 24(1), 1-19. <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-024-20089-5>
- Antonovics, K. L., & Goldberger, A. S. (2005). Does increasing women's schooling raise the schooling of the next generation? comment. *American Economic Review*, 95(5), 1738-1744. <https://doi.org/10.1257/000282805775014353>
- Aravena-Rivas, Y., & Carbajal-Rodríguez, G. (2021). Geographical and socioeconomic inequalities in dental attendance among children in Peru: Findings from the Demographic and Family Health Survey 2017. *Community Dentistry and Oral Epidemiology*, 49(1), 78-86. <https://doi.org/10.1111/cdoe.12580>
- Ball, W. P., Black, C., Gordon, S., Ostrovska, B., Paranjothy, S., Rasalam, A., Ritchie, D., Rowlands, H., Rzewuska, M., Thompson, E., Wilde, K., & Butler, J. E. (2023). Inequalities in children's mental health care: analysis of routinely collected data on prescribing and referrals to secondary care. *BMC Psychiatry*, 23(1),

22. <https://doi.org/10.1186/s12888-022-04438-5>
- Bardid, F., Tomaz, S. A., Johnstone, A., Robertson, J., Craig, L. C. A., & Reilly, J. J. (2022). Results from Scotland's 2021 report card on physical activity and health for children and youth: Grades, secular trends, and socio-economic inequalities. *Journal of Exercise Science & Fitness*, 20(4), 317-322. <https://doi.org/10.1016/j.jesf.2022.07.002>
- Behrman, J. R., & Rosenzweig, M. R. (2002). Does Increasing Women's Schooling Raise the Schooling of the Next Generation? *American Economic Review*, 92(1), 323-334. <https://doi.org/10.1257/000282802760015757>
- Berasategi Sancho, N., Idoiaga Mondragon, N., Dosil Santamaria, M., & Eiguren Munitis, A. (2021). The Well-being of children in lock-down: Physical, emotional, social and academic impact. *Children and Youth Services Review*, 127(127), 106085. <https://doi.org/10.1016/j.childyouth.2021.106085>
- Besnier, E., Thomson, K., Stonkute, D., Mohammad, T., Akhter, N., Todd, A., Jensen, M. R., Kilvik, A., & Bamba, C. (2019). Which public health interventions are effective in reducing morbidity, mortality and health inequalities from infectious diseases amongst children in low-income and middle-income countries (LMICs): protocol for an umbrella review. *BMJ Open*, 9(12), e032981. <https://doi.org/10.1136/bmjopen-2019-032981>
- Blume, M., Rattay, P., Hoffmann, S., Spallek, J., Sander, L., Herr, R., Richter, M., Moor, I., Dragano, N., Pischke, C., Iashchenko, I., Hövener, C., & Wachtler, B. (2021). Health inequalities in children and adolescents: a scoping review of the mediating and moderating effects of family characteristics. *International Journal of Environmental Research and Public Health*, 18(15), 7739. <https://doi.org/10.3390/ijerph18157739>
- Brennan, L., Stres, D. P., Egboko, F., Patel, P., Broad, E., Brewster, L., Lunn, J., & Isba, R. (2024). How do children's hospitals address health inequalities: a grey literature scoping review. *BMJ Open*, 14(1), e079744. <https://doi.org/10.1136/bmjopen-2023-079744>
- Brewster, L., Brennan, L., Hindocha, A., Lunn, J., & Isba, R. (2024). Understanding responsibility for health inequalities in children's hospitals in England: a qualitative study with hospital staff. *BMJ Open*, 14(4), e081056. <https://doi.org/10.1136/bmjopen-2023-081056>
- Cardoso, M. A. (2023). Time-trend analysis (2006 to 2019) of nutritional indicators among Brazilian pre-school children: making progress on child health inequalities. *Cadernos de Saúde Pública*, 39, e00122423. <https://doi.org/10.1590/0102-311XEN122423>
- Cohen, J. F. W., Hecht, A. A., McLoughlin, G. M., Turner, L., & Schwartz, M. B. (2021). Universal school meals and associations with student participation, attendance, academic performance, diet quality, food security, and body mass index: a systematic review. *Nutrients*, 13(3), 911. <https://doi.org/10.3390/nu13030911>
- Costa, J. C., Mujica, O. J., Gatica-Domínguez, G., Pino, S. del., Sanhueza, A., Caffé, S., Victora, C. G., & Barros, A. J. D. (2022). Inequalities in the health, nutrition, and wellbeing of Afrodescendant women and children: A cross-sectional analysis of ten Latin American and Caribbean countries. *The Lancet Regional Health – Americas*, 15, 100345. <https://doi.org/10.1016/j.lana.2022.100345>
- Currie, J., & Rossin-Slater, M. (2014). Early-life origins of life-cycle well-being: research and policy implications. *Journal of Policy Analysis and Management*, 34(1), 208-242. <https://doi.org/10.1002/pam.21805>
- Elgar, F. J., Pfortner, T. -K., Moor, I., De Clercq, B., Stevens, G. W. J. M., & Currie, C. (2015). Socioeconomic inequalities in adolescent health 2002-2010: a time-series analysis of 34 countries participating in the Health Behaviour in School-aged Children study. *The Lancet*, 385(9982), 2088-2095. [https://doi.org/10.1016/s0140-6736\(14\)61460-4](https://doi.org/10.1016/s0140-6736(14)61460-4)
- Gautam, N., Dessie, G., Rahman, M. M., & Khanam, R. (2023). Socioeconomic status and health behavior in children and adolescents: a systematic literature review. *Frontiers in Public Health*, 11, 1228632. <https://doi.org/10.3389/fpubh.2023.1228632>
- Geweniger, A., Barth, M., Haddad, A. D., Högl, H., Insan, S., Mund, A., & Langer, T. (2022). Impact of the COVID-19 pandemic on mental health outcomes of healthy children, children with special health care needs and their caregivers—results of a cross-sectional study. *Frontiers in Pediatrics*, 10, 759066. <https://doi.org/10.3389/fped.2022.759066>
- Griffin, N., Wistow, J., Fairbrother, H., Holding, E., Sirisena, M., Powell, K., & Summerbell, C. (2022). An analysis of English national policy approaches to health inequalities: "transforming children and young people's mental health provision" and its consultation process. *BMC Public Health*, 22(1), 1084. <https://doi.org/10.1186/s12889-022-13473-6>
- Haag, D., Schuch, H., Ha, D., Do, L., & Jamieson, L. (2021). Oral health inequalities among indigenous and non-indigenous children. *JDR Clinical & Translational Research*, 6(3), 317-323. <https://doi.org/10.1177/2380084420939040>
- Hammami, N., Azevedo Da Silva, M., & Elgar, F. J. (2022). Trends in gender and socioeconomic inequalities in adolescent health over 16 years (2002-2018): findings from the Canadian Health Behaviour in School-aged Children study. *Health Promotion and Chronic Disease Prevention in Canada*, 42(2), 68-78. <https://doi.org/10.1177/2380084420939040>

- org/10.24095/hpcdp.42.2.03
- Heinrich, C. J., Colomer, A., & Hieronimus, M. (2023). Minding the gap: evidence, implementation and funding gaps in mental health services delivery for school-aged children. *Children and Youth Services Review*, 150(107023), 107023-107023. <https://doi.org/10.1016/j.childyouth.2023.107023>
- Holding, E., Fairbrother, H., Griffin, N., Wistow, J., Powell, K., & Summerbell, C. (2021). Exploring the local policy context for reducing health inequalities in children and young people: an in depth qualitative case study of one local authority in the North of England, UK. *BMC Public Health*, 21(1), 887. <https://doi.org/10.1186/s12889-021-10782-0>
- Hunter, A. A., & Flores, G. (2021). Social determinants of health and child maltreatment: a systematic review. *Pediatric Research*, 89(2), 269-274. <https://doi.org/10.1038/s41390-020-01175-x>
- Karam, S. A., Francine, Correa., Bertoldi, A. D., Barros, F. C., & Demarco, F. F. (2023). Socioeconomic inequalities related to maternal perception of children's oral health at age 4: Results of a birth cohort. *Community Dentistry and Oral Epidemiology*, 51(5), 872-878. <https://doi.org/10.1111/cdoe.12779>
- Kennedy, E., Binder, G., Humphries-Waa, K., Tidhar, T., Cini, K., Comrie-Thomson, L., Vaughan, C., Francis, K., Scott, N., Wu-lan, N., Patton, G., & Azzopardi, P. (2020). Gender inequalities in health and wellbeing across the first two decades of life: an analysis of 40 low-income and middle-income countries in the Asia-Pacific region. *The Lancet Global Health*, 8(12), e1473-e1488. [https://doi.org/10.1016/s2214-109x\(20\)30354-5](https://doi.org/10.1016/s2214-109x(20)30354-5)
- Lorthe, E., Richard, V., Dumont, R., Loizeau, A., Perez-Saez, J., Baysson, H., Zaballa, M.-E., Lamour, J., Pullen, N., Schrepft, S., Barbe, R. P., Posfay-Barbe, K. M., Guessous, I., Stringhini, S., Amrein, D., Arm-Vernez, I., Azman, A. S., Bal, A., Balavoine, M., & Barbe, R. P. (2023). Socioeconomic conditions and children's mental health and quality of life during the COVID-19 pandemic: an intersectional analysis. *SSM - Population Health*, 23, 101472. <https://doi.org/10.1016/j.ssmph.2023.101472>
- Marmot, M. (2021). Editorial Perspective: Health inequalities, children and young people and the pandemic. *Child and Adolescent Mental Health*, 26(3), 267-268. <https://doi.org/10.1111/camh.12492>
- Maximova, K., Wu, X., Khan, M. K. A., Dabravolskaj, J., Sim, S., Mandour, B., Pabayo, R., & Veugelers, P. J. (2023). The impact of the COVID-19 pandemic on inequalities in lifestyle behaviours and mental health and wellbeing of elementary school children in northern Canada. *SSM - Population Health*, 23, 101454. <https://doi.org/10.1016/j.ssmph.2023.101454>
- McCartney, G., Popham, F., McMaster, R., & Cumbers, A. (2019). Defining health and health inequalities. *Public Health*, 172, 22-30. <https://doi.org/10.1016/j.puhe.2019.03.023>
- Melchior, M. (2021). Social inequalities in children's mental health: isn't it time for action. *European Child & Adolescent Psychiatry*, 30(9), 1317-1318. <https://doi.org/10.1007/s00787-021-01855-x>
- Miall, N., Pearce, A., Moore, J., Benzeval, M., & Green, M. J. (2023). Inequalities in children's mental health before and during the COVID-19 pandemic: findings from the UK Household Longitudinal Study. *Journal of Epidemiology and Community Health*, 77(12), jech-220188. <https://doi.org/10.1136/jech-2022-220188>
- Morgan, K., Melendez-Torres, G., Bond, A., Hawkins, J., Hewitt, G., Murphy, S., & Moore, G. (2019). Socio-economic inequalities in adolescent summer holiday experiences, and mental wellbeing on return to school: analysis of the school health research network/health behaviour in school-aged children survey in wales. *International Journal of Environmental Research and Public Health*, 16(7), 1107. <https://doi.org/10.3390/ijerph16071107>
- Musheiguza, E., Mahande, M. J., Malamala, E., Msuya, S. E., Charles, F., Philemon, R., & Mgongo, M. (2021). Inequalities in stunting among under-five children in Tanzania: decomposing the concentration indexes using demographic health surveys from 2004/5 to 2015/6. *International Journal for Equity in Health*, 20(1), 46. <https://doi.org/10.1186/s12939-021-01389-3>
- Ng, S. M., & Evans, M. L. (2021). Widening health inequalities related to type 1 diabetes care in children and young people in the UK: A time to act now. *Diabetic Medicine*, 38(11), e14620. <https://doi.org/10.1111/dme.14620>
- Ni, X., Li, Z., Li, X., Zhang, X., Bai, G., Liu, Y., Zheng, R., Zhang, Y., Xu, X., Liu, Y., Jia, C., Wang, H., Ma, X., Zheng, H., Su, Y., Ge, M., Zeng, Q., Wang, S., Zhao, J., & Zeng, Y. (2022). Socioeconomic inequalities in cancer incidence and access to health services among children and adolescents in China: a cross-sectional study. *The Lancet*, 400(10357), 1020-1032. [https://doi.org/10.1016/s0140-6736\(22\)01541-0](https://doi.org/10.1016/s0140-6736(22)01541-0)
- O'Byrne, Y., Dinneen, J., & Coppinger, T. (2024). Methodology for evaluation of complex school-based health promotion interventions. *Journal of Public Health Policy*, 45(4), 623-638. <https://doi.org/10.1057/s41271-024-00510-4>
- Okoli, C. I., Hajizadeh, M., Rahman, M. M., & Khanam, R. (2022). Geographic and socioeconomic inequalities in the survival of children under-five in Nigeria. *Scientific Reports*, 12(1), 8389. <https://doi.org/10.1038/s41598-022-12621-7>
- Raghupathi, V., & Raghupathi, W. (2020). The Influence of Education on health: an Empirical Assessment of OECD Countries for the Period 1995–2015. *Archives of Public Health*, 78(1), 1-18.

- <https://archpublichealth.biomedcentral.com/articles/10.1186/s13690-020-00402-5>
- Rebouças, P., Falcão, I. R., & Barreto, M. L. (2021). Social inequalities and their impact on children's health: a current and global perspective. *Jornal de Pediatria*, 98 Suppl 1(Suppl 1), S55-S65. <https://doi.org/10.1016/j.jped.2021.11.004>
- Rittsteiger, L., Hinz, T., Oriwol, D., Wäsche, H., Santos-Hövenner, C., & Woll, A. (2021). Sports participation of children and adolescents in Germany: disentangling the influence of parental socioeconomic status. *BMC Public Health*, 21(1), 1446. <https://doi.org/10.1186/s12889-021-11284-9>
- Sahar Daghigh, Yazd, Oroszlányová, M., & Nilüfer Pekin, Alakoç. (2023). Understanding how gender inequality may affect children's health: an empirical study across 161 countries. *Cogent Social Sciences*, 9(1), 2209982. <https://doi.org/10.1080/23311886.2023.2209982>
- Sanhueza, A., Carvajal-Vélez, L., Mújica, O. J., Vidaletti, L. P., Victoria, C. G., & Barros, A. J. (2021). SDG3-related inequalities in women's, children's and adolescents' health: an SDG monitoring baseline for Latin America and the Caribbean using national cross-sectional surveys. *BMJ Open*, 11(8), e047779. <https://doi.org/10.1136/bmjopen-2020-047779>
- Shibre, G., Zegeye, B., Idriss-Wheeler, D., & Yaya, S. (2021). Trends of inequalities in care seeking behavior for under-five children with suspected pneumonia in Ethiopia: evidence from Ethiopia demographic and health surveys (2005–2016). *BMC Public Health*, 21(1), 258. <https://doi.org/10.1186/s12889-021-10232-x>
- Spill, M. K., Trivedi, R., Thoeirig, R. C., Balalian, A. A., Schwartz, M. B., Gundersen, C., Odoms-Young, A., Racine, E. F., Foster, M. J., Davis, J. S., & MacFarlane, A. J. (2024). Universal Free School Meals and School and Student Outcomes. *JAMA Network Open*, 7(8), e2424082-e2424082. <https://doi.org/10.1001/jamanetworkopen.2024.24082>
- Srivastava, S., Muhammad, T., Rashmi, R., & Kumar, P. (2022). Socioeconomic inequalities in non- coverage of full vaccination among children in Bangladesh: a comparative study of Demographic and Health Surveys, 2007 and 2017–18. *BMC Public Health*, 22(1), 183. <https://doi.org/10.1186/s12889-022-12555-9>
- Stahlmann, K., Mena, E., Kuhnert, R., Conrad, A., & Bolte, G. (2022). Social inequalities in the association between social infrastructure and mental health: an observational cross-sectional analysis of children and adolescents in germany. *International Journal of Environmental Research and Public Health*, 19(11), 6760. <https://doi.org/10.3390/ijerph19116760>
- Takeuchi, H., Satoh, Y., Raman, S., & Spencer, N. (2024). Did inequalities in mothers' and children's health and well-being in Japan increase through the pandemic. *Evidence from Nationwide Surveys and Routinely Collected Data. Children*, 11(3), 330. <https://doi.org/10.3390/children11030330>
- Van Cleave, J., Taft, K., Ware, A., & Stille, C. (2022). Assessing and addressing social determinants of health among children and youth with special health care needs. *Academic Pediatrics*, 22(2), S28-S33. <https://doi.org/10.1016/j.acap.2021.07.006>
- Vik, F. N., Van Lippevelde, W., & Ørby, N. C. (2019). Free school meals as an approach to reduce health inequalities among 10-12- year-old Norwegian children. *BMC Public Health*, 19(1), N.PAG-N.PAG. <https://doi.org/10.1186/s12889-019-7286-z>
- Viner, R. M., Ozer, E. M., Denny, S., Marmot, M., Resnick, M., Fatusi, A., & Currie, C. (2012). Adolescence and the social determinants of health. *The Lancet*, 379(9826), 1641-1652. [https://doi.org/10.1016/s0140-6736\(12\)60149-4](https://doi.org/10.1016/s0140-6736(12)60149-4)
- Viner, R. M., Russell, S. J., Croker, H., Packer, J., Ward, J., Stansfield, C., Mytton, O., Bonell, C., & Booy, R. (2020). School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. *The Lancet Child & Adolescent Health*, 4(5), 397-404. [https://doi.org/10.1016/s2352-4642\(20\)30095-x](https://doi.org/10.1016/s2352-4642(20)30095-x)
- Wang, D. (2019). Reduction but not elimination: health inequalities among urban, migrant, and rural children in China-the moderating effect of the fathers' education level. *BMC Public Health*, 19(1), 1219. <https://doi.org/10.1186/s12889-019-7522-6>
- Weyers, S., & Rigó, M. (2023). Child health and development in the course of the COVID-19 pandemic: are there social inequalities? *European Journal of Pediatrics*, 182(3), 1173-1181. <https://doi.org/10.1007/s00431-022-04799-9>

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Article

Student Involvement in SDG Projects: Seven Years of Yonsei University's Social Engagement Fund (2018–2025)

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Background: The Institute for Global Engagement & Empowerment (IGEE) at Yonsei University established the Social Engagement Fund (SEF) in 2018 to align with institutional commitments to the UN Sustainable Development Goals (SDGs). This study examines how IGEE's student-led projects as part of Yonsei University's SEF program have expanded SDG coverage over the past seven years and identifies factors contributing to improved integration across multiple goals.

Methods: We analyzed all 49 SEF projects implemented between 2018 and 2025, coding each project for SDG alignment and tracking coverage patterns over time. Annual SDG engagement was measured using two indicators: (1) the total number of SDGs addressed per year and (2) the average number of SDGs addressed per project.

Results: The number of SEF projects increased steadily from 5 in 2018 to 12 in 2025, reflecting growing student participation and institutional support. Over the same period, annual SDG coverage expanded from 9 total SDG mentions in 2018 to 59 in 2025, demonstrating a marked diversification of focus areas. The average number of SDGs addressed per project rose from 1.8 in the early years (2018–2021) to 4.9 in 2025, peaking at 8.3 in 2022. Early projects primarily centered on institutional and educational goals such as SDG 4 (Quality Education) and SDG 9 (Industry, Innovation, and Infrastructure), while later years showed stronger engagement with SDG 10 (Reduced Inequalities), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). Some goals—including SDG 6 (Clean Water and Sanitation) and SDG 14 (Life Below Water)—remained relatively underrepresented.

Conclusions: Student engagement initiatives like SEF can significantly broaden and deepen SDG coverage through structured mentorship, interdisciplinary collaboration, and targeted project funding. By enabling applied, student-driven practice, IGEE's SEF model demonstrates how universities can translate institutional SDG commitments into measurable and expanding impact across a wide range of sustainability goals.

Keywords

Sustainable development goals, Student engagement, Higher education, Social innovation, Yonsei University

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1. Introduction

The Institute for Global Engagement & Empowerment (IGEE) at Yonsei University is dedicated to planning and implementing various social engagement programs that contribute to achieving the Sustainable Development Goals (SDGs). As a leading research institute, IGEE strives to solve issues arising in different sectors of society and seeks practical solutions for a better future through community engagement and global partnerships. This is in alignment with Yonsei University's goals to encourage innovative higher educational programs that promote sustainability and progress for global citizens and communities (Shin et al., 2024).

IGEE launched the Social Engagement Fund (SEF) program in July 2018 to support a wide range of research activities that contribute to achieving the SDGs (Rhee & Oh, 2025). A central part of IGEE's vision since its inception has been to integrate social engagement into the university curriculum by prioritizing research, teaching, and services that contribute to sustainable development (An, 2024). Through the SEF initiative, IGEE calls for students and researchers from Yonsei University to submit research and project proposals that emphasized implementing and evaluating the impact of the SDGs; acknowledging that universities can serve as fundamental catalysts for creating positive impact by embedding sustainability into business strategies, decision-making processes, and practices that improve accountability among stakeholders (Mori et al., 2019).

Under IGEE's guidance, the SEF program supports students' awareness of global social issues and helps transform their ideas for solutions in to real, impactful change. Notably, since IGEE established the SEF program, 49 SEF projects have been funded across diverse contexts. Thus, this study examined whether IGEE's SEF has successfully expanded SDG coverage over its seven-year history to identify factors contributing to improved SDG integration across multiple

goals.

2. Materials and Methods

We analyzed all SEF projects from 2018-2025, extracting data on SDG alignment, project themes, and geographic focus. Annual SDG coverage breadth (number of distinct goals addressed) and the average number of SDGs per project were identified. Project documentation included original proposals, progress reports, and final summaries submitted to IGEE.

All data analysis and visualization were performed using Rstudio, enabling reproducible and transparent examination of patterns across projects, and selected visualizations were further refined using Google Gemini's Canvas feature to enhance clarity and presentation.

3. Results

Table 1 shows the general characteristics of SEF projects by year (Table 1). From 2018 to 2025, the number of projects generally increased alongside the number of international projects and SDGs covered per project.

Early years addressed 1-2 SDGs, and were split into research (3) and student (2) teams (Figure 1). Notable outcomes of the 2018 SEF was the creation of a prototype for Yonsei University's Energy Platform Service which still monitors campus carbon movements to date (Figure 2) (Cho, 2019). Developed as part of the 2018 SEF Researchers' Cohort, YEPS is a platform that allows real-time monitoring of electricity consumption across 44 major buildings on Yonsei University's Sinchon Campus. With support from the Sinchon Campus Facilities Department, the YES project gathered real-time electricity data—daily and monthly—for each measurable building on campus, and visualized the building energy consumption data. YEPS has since enhanced acces-

Table 1. General Characteristics of SEF Projects by Year

Year	Total Projects	Domestic	International	SDGs Addressed	SDGs per Project
2018	5	3	2	9	1.8
2019	3	2	1	5	1.7
2020	3	3	0	8	2.7
2021	4	4	0	8	2.0
2022	4	2	2	33	8.3
2023	9	5	4	22	2.4
2024	9	5	4	30	3.3
2025	12	10	2	59	4.9

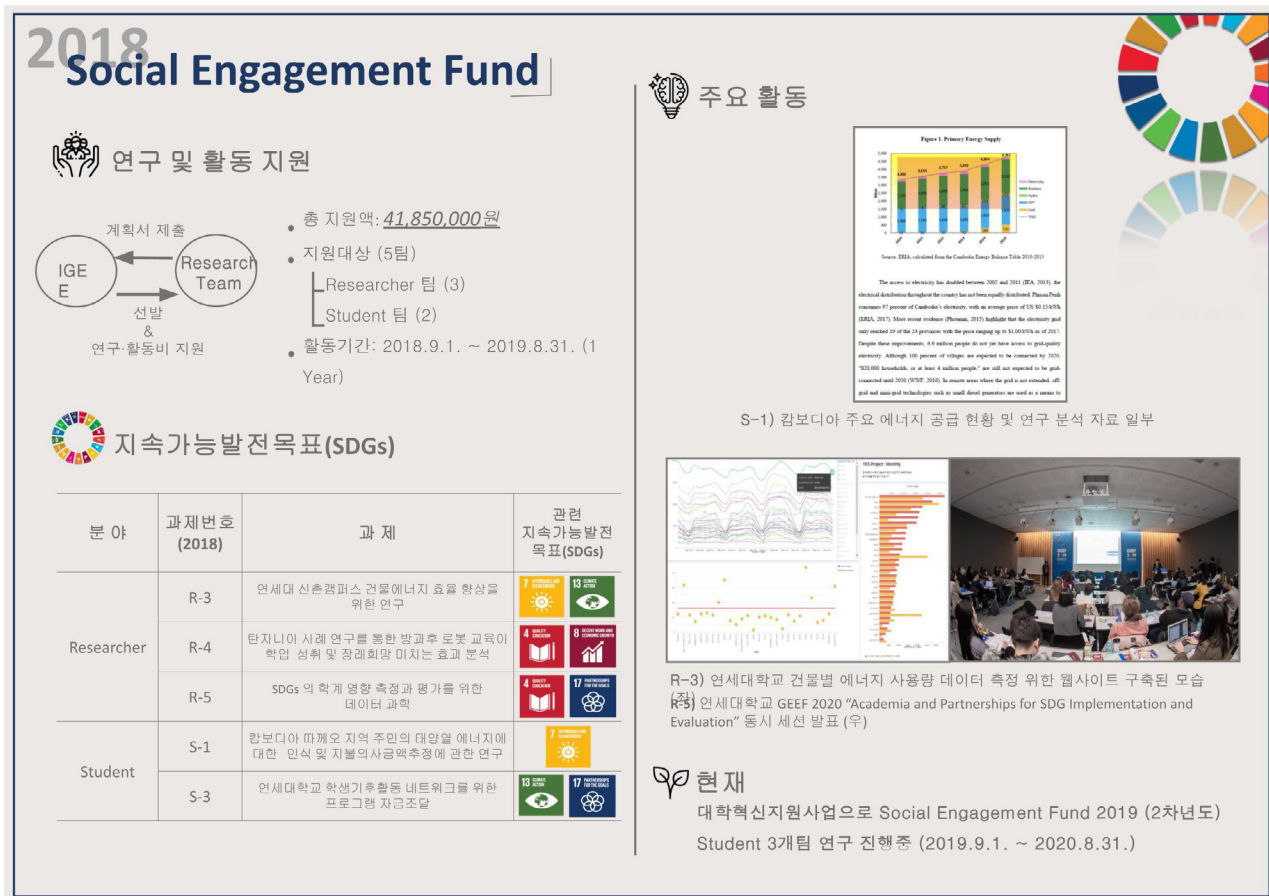


Figure 1. 2018 Social Engagement Fund.



Figure 2. Yonsei University Energy Platform Service (YEPS).

Table 2. SEF Projects by Cohort (2018-2025)

Year	Projects	Projects (Korean / English – translated from Korean for following study)
2018	5	- 연세대 신촌캠퍼스 건물에너지 효율 향상을 위한 연구 (Research improving energy efficiency of buildings on Yonsei's Sinchon campus) - 탄자니아 사례 연구를 통한 방과후 로봇 교육이 학업 성취 및 장래희망에 미치는 효과 분석 (Effect of after-class robot education on academic outcomes and career aspirations: Field evidence from Tanzania) - SDGs의 학제 영향 측정과 평가를 위한 데이터 과학 연구 (Research for UN 2030 Development Agenda: Understanding where we stand for SDG implementation through text mining) - 캄보디아 따카오 지역 주민의 태양열 에너지에 대한 인식 및 지원 의사유무에 관한 연구 (Perceptions and willingness to support solar energy adoption among residents in Takao, Cambodia) - 연세대학교 학생기후활동 네트워크를 위한 프로그램 자금조달 (Funding for the Yonsei University Student Climate Action Network Program)
2019	3	- 캄보디아의 성별 불평등 해소를 위한 교육 모델 개발을 통한 SDG 4 실현 (Developing an educational model to reduce gender inequality in Cambodia for SDG 4) - 디지털 디바이스를 활용한 보건 교육 자료 개발 및 활성화 연구 (Developing and promoting health education materials using digital devices) - 필수 의약을 위한 대학 연합 연세대 지부(UAEM) 운영 (Operating Yonsei's chapter of Universities Allied for Essential Medicines for essential medicines)
2020	3	- 교통약자를 위한 의료 스쿠터 마이크로 모빌리티 서비스 기획 (Planning a medical scooter micro-mobility service for transportation-vulnerable groups) - E-waste 재사용을 통한 사회적 소외계층 온라인 기회 지원 (Supporting marginalized communities online via e-waste reuse, linked with RC programs) - 포스트 코로나 시대 생활 플라스틱 폐기물 감소 플랫폼 구축 (Building a platform to reduce household plastic waste in the post-COVID era)
2021	4	- 한국 전통 건축의 지속가능한 건물 디자인 적용 방식 제언 (Applying sustainable design from traditional Korean architecture) - 사회적 우울감과 혐오의 연쇄를 끊기 위한 정책 모델 연구 (Policy model to break the chain of social depression and hate) - 환경 인식 개선을 위한 그린하우스 보드게임 효과 검증 (Testing environmental awareness improvement via "Greenhouse" board game) - 온라인 학습 확대에 인한 장애인 학습권 배제 개선을 위한 에듀테크 활용 연구 (Using EdTech to support learning rights for disabled students after COVID-19)
2022	4	- 대학 내 다화용컵 순환을 통한 일회용컵 저감 가능성 연구 (Reducing disposable cups through reusable cup circulation on campus) - 지속가능한 식량 생산을 위한 미국의 수직 농업 현황 및 소비자 인식 연구 (Study of U.S. vertical farming and consumer perceptions) - 식용 곤충을 활용한 식품으로 마다가스카르 아동 영양실조 해결 방안 연구 (Developing insect-based foods to address child malnutrition in Madagascar) - 난민 및 인도적 체류자 건강 증진 방안 연구 (Health promotion for refugees and humanitarian stay residents in Itaewon)
2023	9	- 삼불화질소 온실가스 법제화 검토 및 통합 환경 관리 계획서 설계 (NF₃ greenhouse gas regulation & environmental plan for carbon neutrality) - 국내 거주 외국인을 위한 종합 웹사이트 구축 (Comprehensive website for foreign residents in Korea) - 학교 밖 청소년을 위한 시사 정체성 형성 프로젝트 (Identity formation via current affairs for out-of-school youth) - 담배꽂초 수거함 개발로 도시 환경 개선 (Developing cigarette butt bins to prevent urban littering) - 친환경 원용 음료 활성화 플랫폼 개발 (Platform promoting reusable beverage containers) - 탈북 여성 해외 건강 상담 (Health consultation for North Korean women abroad) - 푸드 업사이클링 기반 대체 식품 지속가능성 연구 (Exploring sustainable alternative foods via food upcycling) - 경북 테마 도시 시범 운영 통한 지방소멸 완화 (Piloting themed cities to counter rural depopulation) - 산호 백화 현상 및 복원 전략 연구 (Coral bleaching and restoration strategies under global warming)
2024	9	- 자폐스펙트럼장애 (ASD) 환자의 웹 접근성 향상 연구 (Improving web accessibility for people with ASD) - 고령층의 디지털 문해력 문제 해결 (Improving digital literacy among the elderly) - 길잡이섬: 지속가능한 미래 교육 프로그램 ("Giljabi Island" cross-disciplinary sustainability education in Jeju) - 돌봄 노동자의 건강과 삶의 균형 연구 (Health and work-life balance among care workers) - 미혼모 정신건강 관리 시스템 구축 (Integrated mental health system for single mothers) - 시각장애인 근로자 근무환경 실태 조사 및 협업 툴 개발 (Work environment study and collaboration tool for visually impaired workers) - AIoT 담배꽂초 처리 기반 스마트시티 솔루션 (Smart city solution for cigarette waste via AIoT) - 몽골 기후 난민의 지속가능 마을 설립 방안 (Sustainable village plans for Mongolian climate refugees) - 대한민국 풍력발전 현황 및 분석 (Wind energy in Korea for global renewable expansion)
2025	12	- 국내 활동 팀 (Domestic Team): 인지행동치료 어플리케이션을 이용한 숏폼 시청 억제 효과의 신경영상기법적 증명 연구 (Neuroimaging study on inhibiting short-form video use via CBT app) - 청년 우울·불안 완화를 위한 디지털 피노타이핑 기반 CBT 게임 연구 (Effectiveness of CBT and digital phenotyping puzzle games for youth depression/anxiety) - AI 기반 지속가능 세계시민교육 프로그램 설계 (AI-based global citizenship education program for students in Songdo) - REGREEN: 지역 균형 발전을 위한 기후 행동 활성화 (REGREEN: Regional climate action for balanced development) - GIS-ESG 분석을 통한 불평등 없는 도시 만들기 (GIS & ESG analysis for equitable sustainable cities) - 에코스텝: 지속가능한 미래를 위한 작은 걸음 (EcoStep: Small steps toward sustainable futures) - SafeZone: 조현병 환자의 사회 적응을 위한 게임형 챗봇 개발 (SafeZone: Game-based chatbot for schizophrenia social adaptation) - 신촌·연희동 SDGs 로컬 매핑 프로젝트 (SDG local mapping project in Sinchon & Yeonhui) - 연세 에코 서비스: 축제 의상 대여 및 업사이클링 시스템 (Yonsei Eco Service: Costume rental & upcycling system for festival sustainability) - 호기심이 이끄는 윤리적 소비 (Curiosity-driven ethical consumption on disability perceptions & behavior) - 해외 활동 팀 (International Team): 인도 텔랑가나 농촌 마을 기후 적응 연구 (Decentralized climate adaptation in rural Telangana, India) - 우간다 전기 이륜차 전환 장벽 분석 (Analysis of barriers and incentives for electric two-wheelers in Uganda)

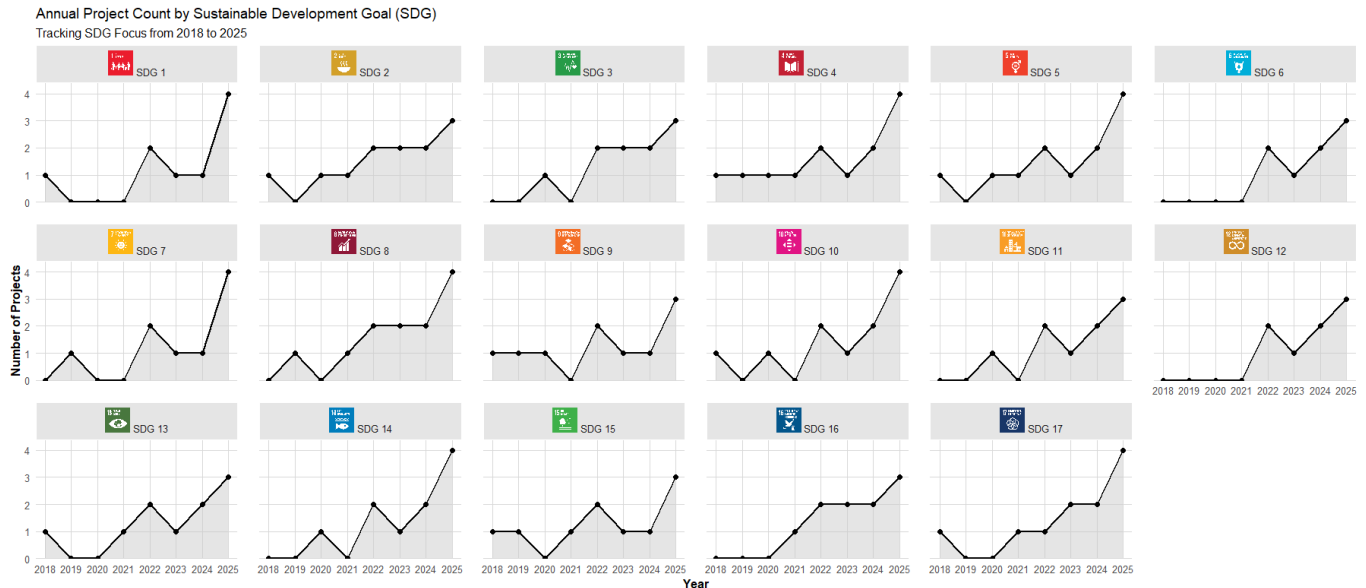


Figure 3. Projects by SDG over Time.

sibility by introducing diverse and intuitive process (Cho, 2019).

Since 2018, total project numbers have gradually increased, with the largest cohort ($n=12$) selected for 2025. This trend reflects IGEE's program maturation toward selective, impact-driven integration rather than volume maximization (Table 2). Cross-national initiatives addressing mental health, digital inclusion, and climate adaptation spanning countries such as India, Uganda, Cambodia, Tanzania, Madagascar, Mongolia, and the United States, highlight SEF's evolution from a locally focused student scholarship program into a globally engaged, interdisciplinary platform fostering collaboration across sustainability, technology, and public health domains.

While earlier projects concentrated on institutional and educational goals such as SDG 4 (Quality Education) and SDG 9 (Industry, Innovation and Infrastructure), later years demonstrated stronger engagement with SDG 10 (Reduced Inequalities), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). Several goals, including SDG 6 (Clean Water and Sanitation) and SDG 14 (Life Below Water), remain relatively underrepresented (Figure 3).

4. Discussion and Conclusions

The substantial improvement in SDG coverage observed over the seven-year period reflects several interconnected

factors that contributed to IGEE's program evolution. Since SEF's launch in 2018, the number of research projects and international collaborations have greatly increased. Emphasis on cross-disciplinary team formation may have played a role in expanding SDG coverage; for example, the Mongolian Ger District project combined expertise from the Yonsei University School of Business, School of Chemical and Biomolecular Engineering, and School of Electrical and Electronic Engineering, to create an integrated village planning approach that addressed five different SDGs (Song et al., 2025).

Our pattern matches external evidence that students lead best when backed by embedded processes. Briggs et al. (2019) demonstrate how partnerships between universities and students at Keele University enabled sustainability projects to overcome common barriers—such as volunteer turnover, siloed operations, and short project lifespans—by embedding initiatives in institutional systems while preserving student leadership (Briggs et al., 2019). Notable SEF projects including the 2018 YEPS platform are still being used by the university portal system to-date, emphasizing how initiatives like the SEF can achieve long-term institutional integration when aligned with the SDGs. Similarly, Mittal and Bansal (2024) highlight through a series of case studies that even small-scale student-led projects can generate transformative community outcomes when given institutional support and opportunities for youth agency (Mittal and Bansal,

2024). Taken together, these findings suggest that sustainable impact emerges where student creativity is coupled with institutional scaffolding, creating both short-term innovation and pathways for longer-term SDG integration.

While the SEF program currently has many contributions to Yonsei University's sustainable development initiative, our findings are yet to measure the long-term real-world impacts of these student projects, and the time frame between 2018–2025 does not capture post-project outcomes or the meaningful lasting effects that communities may have experienced following project initiation. Another limitation lies in the variation of SDG selection guidelines across the study period: some SEF cohorts were advised to focus on one or two primary SDGs, while others were encouraged to address multiple or all 17 goals—potentially influencing the diversity and comparability of projects in this study.

Despite such limitations, we believe that the SEF program provides a valuable foundation for understanding how higher education institutions can drive sustainable development. Future studies analyzing both the long-term community impacts of projects and the evolving balance between curricular and co-curricular SDG engagement are essential to fully capture this lasting value.

References

- An, S. (2024). The urgent call for academic action: Rebooting SDGs to reset our future. *IGEE Proceedings*, 1(1), 20-31. <https://doi.org/10.69841/igee.2024.003>
- Briggs, S. J., Robinson, Z. P., Hadley, R. L., & Laycock Pedersen, R. (2019). The importance of university, students and students' union partnerships in student-led projects: A case study. *International Journal of Sustainability in Higher Education*, 20(8), 1409-1427. <https://doi.org/10.1108/IJSHE-01-2019-0050>
- Cho, S. (2019, August 30). *Research improving energy efficiency of buildings on Yonsei's Sinchon campus* [Unpublished report]. Center for Sustainable Buildings, Yonsei University.
- Mittal, P., & Bansal, R. (2024). Case studies: Successful student-led sustainability projects. In *Community engagement for sustainable practices in higher education: From awareness to action* (pp. 107-123). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-63981-4_7
- Mori, R., Fien, J., & Horne, R. E. (2019). Implementing the UN SDGs in universities: Challenges, opportunities, and lessons learned. *Sustainability: The Journal of Record*, 12(2), 129-133. <https://doi.org/10.1089/sus.2019.0004>
- Rhee, E. K., & Oh, S. S. (2025). Introducing the 2024 'Social Engagement Fund' cohort. *IGEE Proceedings*, 2(2), 64-67. <https://doi.org/10.69841/igee.2025.019>
- Shin, J. E., Rhee, E. K., An, S., Kang, Y., Lee, K., & Song, I. H. (2024). Establishing the ESD and GCEd system in higher education: Analyzing the holistic approach of Yonsei University in South Korea. *IGEE Proceedings*, 1(1), 6-19. <https://doi.org/10.69841/igee.2024.002>
- Song, E., Bazarragchaa, K., Kim, G., & Lee, S. (2025). Establishment plan for sustainable villages through resolving Mongolian Ger district issues. *IGEE Proceedings*, 2(1), 68-82. <https://doi.org/10.69841/igee.2025.014>

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Enacted: September 9, 2024

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