

PRECISION HEALTH: OVERVIEW

Collaboration with Harvard Consulting on Business and the Environment

The Challenge



Despite improvements in survival and nutrition over recent decades, too many children still suffer and die from preventable and treatable diseases.



Sub-Saharan Africa and Oceania (excl. AU and NZ) have the highest regional mortality rates among 5–24-year-olds in 2021.¹



Diarrhoeal diseases, malaria, TB, and HIV remained among the top 10 causes of child deaths in 2019.²

Key Takeaways

- Precision health, an emergent field of healthcare, offers novel interventions to tackle persistent communicable, non-communicable, and rare diseases that affect millions of children and young people.
- Next-generation diagnostics technologies and advances in genomics, gene editing techniques, and RNA therapeutics are changing the way we diagnose and treat diseases from malaria, tuberculosis, HIV/AIDS, asthma, and childhood cancer.
- If precision health is to realize its full potential, it needs to address the risk of exacerbating current health inequalities.

Context

Health lives and well-being is a fundamental human right and a goal of the Agenda 2030 for sustainable development. Advances in life sciences, medicine, and technology offer a new model of healthcare: precision health.³ The current model of healthcare is designed for the average patient and based on 'signs-and-symptoms'. The one-size-fits-all treatments can be successful for some patients but not for others, and some even experience negative side effects. Precision health, on the other hand, is an emerging field of healthcare that considers differences in people's genes, environments, and lifestyles and formulates prevention strategies and treatments based on their unique backgrounds and conditions.

Innovation: What is precision health?

- **Precision health** seeks to develop proactive and personalized solutions to health problems that integrate variability in genetic, behavioral, socio-economic, and environmental determinants.
- The aim is to improve the detection, prevention, and management of disease; moving from a one-size-fits-all approach to an integrated, comprehensive, and personalized approach to keep people healthier for longer.
- Precision health is characterized by the 4Ps:
 - **predictive** (identifying and understanding intrinsic and extrinsic risk factors),
 - **preventive** (addressing risk and protective health factors before the development of disease),
 - **personalized** (optimizing treatments and interventions to an individual's needs),
 - **participatory** (involving patients in decision-making processes).⁴
- Precision medicine is a sub-field within precision health.
- Precision health emphasizes the early detection and prevention of disease before it strikes while precision medicine deals with disease management and treatment after the fact.
- Precision health helps to strengthen health systems by offering holistic and personalized insights into internal and external disease factors and responses, and by introducing innovative medical products, vaccines, and technologies that improve health outcomes.⁵

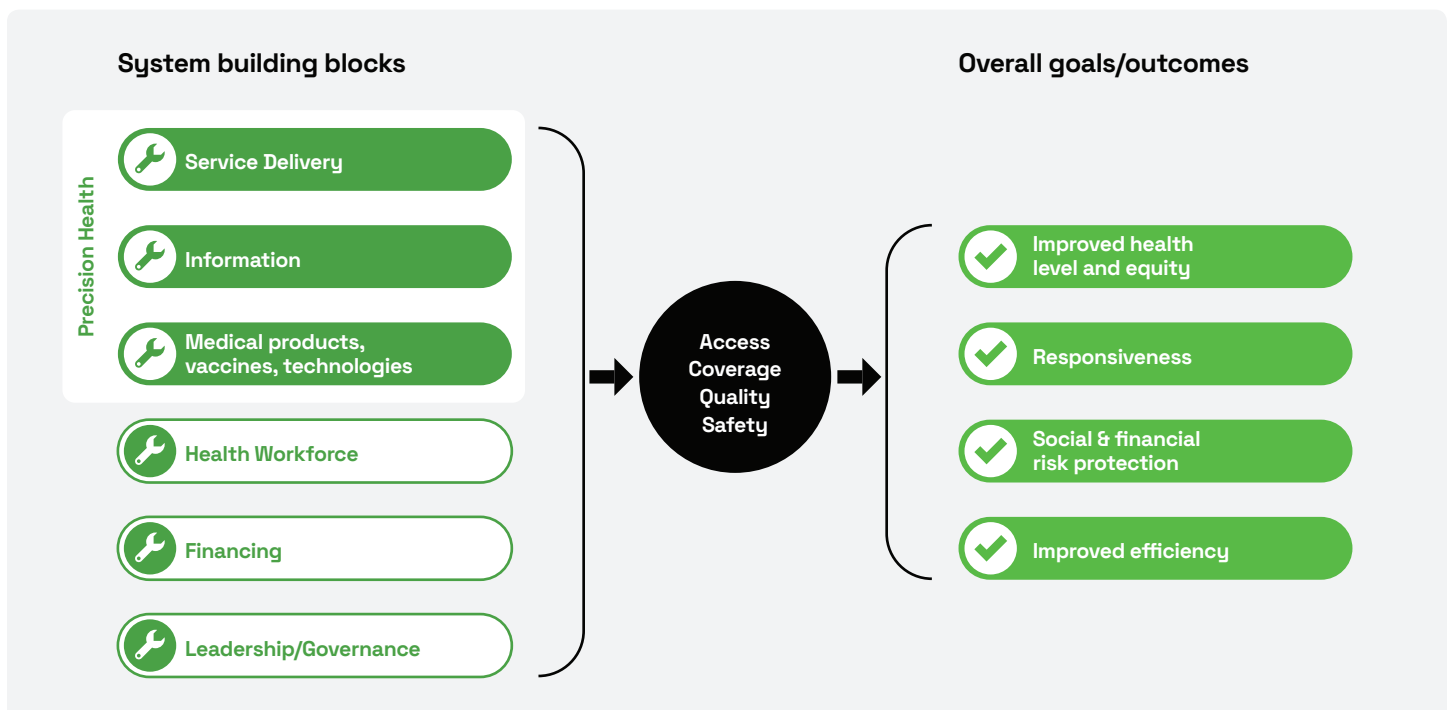


Figure 1: How precision health can contribute to health systems strengthening

Source: UNICEF

Understanding our internal and external environment

Internal

- An essential basis of precision health is knowledge about the biological systems and their interaction and evolution. The Human Genome Project and advancements in systems biology, data science, and biotechnology have unraveled the internal biological underpinnings of health and disease and enabled molecular profiling of diseases through omics technologies.⁶
- Omics is an evolving area of biology that refers to the assessment of various molecular systems such as genomics, transcriptomics, proteomics, metabolomics, epigenomics, and microbiomics, thereby paving the way for rapid health and disease discoveries.⁷

Impact

- Research in biomarkers, genetics, multi-omics, and next-generation diagnostic and wearable technologies have enabled continuous improvement in the early detection of diseases and the development of personalized prevention approaches.
- An area of research with potential transformational impact on children is genomics surveillance for large-scale virus detection, tracking, and control. Recent large-scale infectious disease epidemics have expanded the application of genomic technologies for pathogen sequencing during infectious disease outbreaks and improved the capability to track and understand pathogen transmission evolution and interaction.⁸
- Precision health enables early detection and accurate diagnosis by integrating a multitude of clinical and other data; optimized treatments to improve dosage and reduce side effects; and accelerated developments of new drugs and therapies by understanding the underlying health and disease mechanisms.

External

- Health is influenced by genetic code and post code (area code). The onset, progression, and recurrence of disease is influenced by biological information, environmental and behavioral characteristics, and the socio-economic and cultural context of individuals.

- The potential applications of precision medicine for children and adolescents include communicable diseases such as malaria, diarrhoeal diseases, tuberculosis, pneumonia, and HIV/AIDS; non-communicable diseases such as asthma, and childhood cancer, and rare diseases such as sickle cell anaemia. Many of the diseases are major health concerns for children. Some are among the top ten causes of death.
- The speed with which effective COVID-19 vaccines become available demonstrates the potential of precision health technologies to be applied to public health needs at scale globally.
- There is a risk that precision medicine could increase health inequalities as many interventions are currently very expensive. An equitable approach for precision health would consider two core principles: maximize benefits and mitigate disadvantages.

See Insight Report No. 3 for more information on precision health, including the potential applications of innovations and technologies for the humanitarian and development sector.

Opportunities

Policies and initiatives to guide the translation of genomic and other precision health technologies into the public health system would catalyze transformative change in the application and delivery of clinical services.

- The integration of a life course approach to precision health with an emphasis on unfolding health trajectories of individuals as influenced by their exposure to a range of protective and risk factors. This approach, which stresses the importance of acting early in the life course, helps to position children and adolescents at the center of precision health.
- North-South and South-south cooperation and partnerships are critical. Countries with significant capacity in precision health research should be encouraged or

incentivized to collaborate with under- and unrepresented countries. These must be mutual learning experiences where equitable arrangements are made to ensure fair benefit sharing, respectful data, and sample handling. There should also be significant capacity building so that countries in the global south can lead their precision health initiatives.

- The need for business model and value chain innovations that resolve the tension between affordability and profitability. Precision health technologies and innovations are expensive and can require up to 30 years of financial and intellectual investment, all without guarantee of success. Much work is needed to develop business models and incentives that improve health equity and de-risk R&D investment.

Insights Briefs

Innovation Nodes Insights Briefs serve as resource for practitioners and decision makers to quickly get up-to-speed on new and unknown areas of potential innovation for children.

Publication produced by the Innovation Nodes aim to facilitate the exchange of knowledge and stimulate discussion. The findings, interpretations and conclusions

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For more information on Innovation Nodes and collaboration opportunities:

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Notes

1. United Nations Inter-agency Group for Child Mortality Estimation (UNIGME), Levels & Trends in Child Mortality: Report 2022.
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3. König I.R., et al., 'What is precision medicine?', European Respiratory Journal 2017, vol. 50, doi:10.1183/13993003.00391-2017.
4. United Nations Children's Fund, 'Strengthening health systems', <<https://www.unicef.org/health/strengthening-health-systems>>, accessed 03 May 2023.
5. United Nations Children's Fund, 'Strengthening health systems', <<https://www.unicef.org/health/strengthening-health-systems>>, accessed 03 May 2023.
6. The Human Genome Project (1990-2003) is an international collaboration that successfully determined, stored, and rendered publicly available the sequences of almost all the genetic content of the human genome (gene + chromosomes). This landmark collaboration provided fundamental information about the human blueprint, which has since accelerated the study of human biology and improved the practice of medicine.
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