

## Future Priorities for Health Research in Europe

This position paper complements the overarching [Helmholtz FP10 position](#) from 02/2024.

### Introduction

The health of European citizens remains critically important, and the rapid accumulation of scientific knowledge does not automatically translate into benefits for patients. Old and new threats to citizens' health require prevention, diagnostics, and treatment options to keep Europeans healthy, and to help those who got sick. World-class health research requires a European framework that encourages and promotes discovery along the entire value chain, including the freedom to choose appropriate *in vitro* and *in vivo* models and the possibility to collaborate across borders easily and effectively in an international context.

In an ever-changing environment marked by overarching trends like climate change and ageing populations, risks to human health interact with each other, highlighting the need for interlinked approaches, especially at the EU level. The following three priorities - Biomedical Engineering, Digital Health, and Precision Prevention, are intricately linked - scientifically and clinically. The EU must advance in all three in order to succeed.

### Future Directions

**Biomedical Engineering:** Novel solutions through efficient translation require a strong solution-driven and problem-solving culture to complement the culture of discovery in the biomedical sciences. Fostering such a culture goes beyond collaborations between scientists, clinicians, and entrepreneurs, and necessitates the development of transdisciplinary solution-driven professionals, i.e. bioengineers trained in both engineering and the natural sciences. Biomedical engineering encompasses multiple fields such as mechanical, electrical, chemical engineering, materials science, chemistry, mathematics, physics, and computer science with a focus on improving individual and planetary health.

To make Europe a global leader in this field, the EU must enable this cross-research field and cross-border activity through the funding of innovative key technological concepts rather than individual tools. This support needs a commitment to promote collaboration and industry partnerships with flexible, easily accessible instruments to create a vibrant ecosystem that fosters innovative ideas and overcomes traditional silos so that new tools and solutions will benefit patients and society.

Only the EU can enable this cross-disciplinary and cross-border endeavor, which will in turn make the EU a global leader in advancing health through accelerating the translation of biomedical discoveries into solutions. Investing in education and training as well as research will allow the EU to integrate academic knowledge generation with a problem-solving culture and high-risk venture investments.

**Digital Health:** In the biomedical sciences and clinical medicine, data-driven methods offer new avenues to accelerate research, find new hypotheses, and generally improve healthcare through novel diagnostic and treatment procedures. Appropriate processes, standards, pipelines, as well as data and AI ecosystems are required to harness and propel the EU's potential. Cross-border cooperation that balances mobility of data and federated analysis concepts will accelerate the development and use of state-of-the-art data-driven methods, including AI, irrespective of differing core applications in each organization, region, or country.

Another key direction is the move towards an EU-wide foundation model of patient state, trained with usable data from across the continent, as a basis for many downstream use cases. This requires common resources and shared infrastructure on the EU level. All steps along the development of such a model must be based on the European AI Act, a European approach regarding technologies, frameworks, and values, including a respect for privacy and a focus on the needs of patients and healthcare providers.

Top-class infrastructures across the healthcare sector are required for the future healthcare system powered by digital solutions. These include jointly developed, run, and interoperable digital infrastructures, such as data spaces uniting electronic health records with multi-omics, imaging and cohort data. EU researchers will also address overarching needs such as harmonized metadata, legal frameworks and the professionalization of said infrastructures to accelerate translational biomedicine with the unified goal of superior solutions for healthcare, including precision prevention and personalized medicine.

**Precision Prevention:** As our ageing society faces evolving health challenges, investment in prevention research is crucial for fostering future health. Key components include the analysis of risk factors and fundamental mechanisms of disease emergence, stratification of individuals, discovery and evaluation of preventive interventions, and implementation. The EU must empower its researchers to harness the power of big data, digital health and AI approaches, population-scale and disease cohorts as well as wildlife disease monitoring, and interventional trial infrastructures. A successful prevention research strategy has to be adaptive, integrate cutting-edge technologies, foster interdisciplinary collaborations, and align with public health policy to ensure the translation of research findings into practical, impactful interventions for the benefit of global health.

The EU must support the key drivers of success going forward, which include

- **Disease Prevention and Early Detection:** prioritizing research initiatives aimed at preventing diseases e.g. through vaccination, early intervention, and imaging technologies;
- **Data-driven Insights:** harnessing the power of big data and advanced analytics (genomics, multi-omics, biomedical engineering) to gain deeper insights into personalized health trends, risk factors, and emerging threats, including through easy access to cohorts and samples and the sharing of advanced computational approaches and AI tools;
- **Innovation in Digital Health:** fostering research on digital health technologies, enabling personalized health monitoring and realizing the potential of AI in health state prediction.

In contrast to national activities, a European approach in Precision Prevention research will include the sheer sample size of Europe's large population with a much higher genetic and environmental diversity to identify clinically actionable strata of individuals, develop novel endpoints for targeted preventive interventions and build integrated prediction models. EU-wide actions will leverage the multidisciplinary expertise across the continent. It is imperative that recommendations, guidelines, and policies be developed at the EU level to benefit all Europeans, and thus ensure significant improvement in EU citizens' health.

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