

The PROPHET project paves the way for personalized prevention in the future healthcare

Roberta Pastorino^a, Angelo Maria Pezzullo^a, Tommaso Osti^a, Roza Adany^b, Pascal Borry^c, Floris Barnhoorn^d, Eva Fadil^e, Mark Kroese^f, Andres Metspalu^g, Beatriz Perez-Gomez^{h,i}, Markus Perola^j, Daniela Quaggia^k, Serena Scollen^l, Mahsa Shabani^m, Stefan Swartling Petersonⁿ, Carla van El^o, Astrid Vicente^p and Stefania Boccia^{a,q}

European Journal of Cancer Prevention XXX, XXX:XXXX–XXXX

^aSection of Hygiene, University Department of Life Sciences and Public Health, Università Cattolica del Sacro Cuore, Rome, Italy, ^bELKH DE Public Health Research Group, Department of Public Health and Epidemiology, Faculty of Medicine, University of Debrecen, Debrecen, Hungary, ^cCentre for Biomedical Ethics and Law, Department of Public Health and Primary Care, KU Leuven, Leuven, Belgium, ^dEuropean Public Health Association (EUPHA), Utrecht, Netherlands, ^eG.A.C., Innovation Department., G.A.C. Group, Issy-les-Moulineaux, France, ^fPHG Foundation, University of Cambridge, Cambridge, UK, ^gEstonian Genome Center, University of Tartu, Tartu, Estonia, ^hConsortium for Biomedical Research in Epidemiology and Public Health, ⁱDepartment of Epidemiology of Chronic Diseases, National Centre for Epidemiology, Carlos III Institute of Health, Madrid, Spain, ^jGenomics and Biomarkers Unit, Department of Health, National Institute for Health and Welfare (THL), Helsinki, Finland, ^kAssociazione Cittadinanzattiva, Rome, Italy, ^lELIXIR Hub, Cambridge,

UK, ^mDepartment of Criminology, Criminal Law and Social Law, University of Gent, Gent, Belgium, ⁿKarolinska Institutet, Stockholm, Sweden, ^oAmsterdam UMC, Vrije Universiteit Amsterdam, Department of Clinical Genetics, Section Community Genetics, Amsterdam Public Health Research Institute, Amsterdam, The Netherlands, ^pDepartamento de Promoção da Saúde e Doenças Não Transmissíveis, Instituto Nacional de Saúde Doutor Ricardo Jorge, Lisbon, Portugal and ^qDepartment of Woman and Child Health and Public Health-Public Health Area, Fondazione Policlinico Universitario A. Gemelli IRCCS, Rome, Italy

Correspondence to Tommaso Osti, CA, Section of Hygiene, University Department of Life Sciences and Public Health, Università Cattolica del Sacro Cuore, Largo Francesco Vito, 1, Rome, 00168, Italy
Tel: +390630154396; e-mail: tommaso.osti01@icatt.it

Received 21 December 2023 Accepted 21 December 2023.

The advances in ‘omics technology, the reduction of genome sequencing costs, and the integration of digitalization have initiated a revolution in medicine and public health, transforming healthcare delivery towards an increased personalization (Williams *et al.*, 2020; Boccia *et al.*, 2021). These developments arrive at a critical time as European Member States face mounting pressure to provide effective and efficient healthcare from limited budgets, primarily due to the challenges posed by an aging population, the rise in chronic diseases, and the escalating costs of new therapies (Azzopardi-Muscat and Kluge, 2020).

One of the key challenges faced by healthcare systems and healthcare is the disproportionate impact of chronic conditions on the elderly population. With limited resources available, prevention becomes essential. Currently, one-third of adults in the European Union live with a chronic disease (Health at a Glance, 2019), highlighting the urgency of shifting focus towards effective prevention strategies that could, at least in principle, might benefit from incorporating data on behavioral elements, social and economic factors (level of education, income, etc.), environmental exposures and individual biomarkers to improve personal risk prediction (Grossman *et al.*, 2020; Boccia and Ricciardi, 2023). When added together,

these elements would allow us to maximize the impact in terms of health outcomes and resource optimization, building what is referred to as personalized prevention: ‘Personalized prevention aims to prevent onset, progression and recurrence of diseases through the adoption of targeted interventions that consider the biological information (e.g. genetic and other biomarkers, demographics, health conditions), environmental and behavioral characteristics, the socio-economic and cultural context of individuals. This should be timely, effective, and equitable in order to maintain the best possible balance in lifetime health trajectory’ (PROPHET website - A Personalized Prevention Roadmap for the Future Healthcare, 2022).

To develop a Strategic Research and Innovation Agenda (SRIA) for Personalized Prevention, supporting the implementation of innovative, sustainable, and effective personalized programs to prevent common chronic diseases, the European Commission funded the Coordinating and Support action titled ‘A Personalized Prevention roadmap for the future HEAlThcare’ (PROPHET) in September 2022 (PROPHET - A Personalized Prevention Roadmap for the future Healthcare, n.d.). The Università Cattolica Del Sacro Cuore in Rome, Italy, leads this ambitious initiative, which involves 18 partners, from the UK and 12 EU member states, including the European Public Health Association (EUPHA) and two infrastructure organizations (BBMRI and EMBL -ELIXIR). The project also perfectly fits within the activities in support of the European Beating Cancer Plan (EBCP), a pillar health initiative of the European Union, specifically

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

contributing to the objective ‘Ensuring High Standards in Cancer Care, Action 31.2 - Roadmap to personalized prevention’, mentioned within the EBCP Implementation Roadmap (European Commission, 2022).

The PROPHET project focuses on stakeholder engagement across various target groups and the co-creation process of the SRIA which includes three main strands of activities: mapping, assessment, and building. This comprehensive approach ensures that the strategies and guidelines developed within the project align with key stakeholders’ needs and expectations.

PROPHET’s mapping serves as the starting point, by providing a comprehensive overview of the current state of personalized prevention across the European Union and beyond. These activities explore various dimensions, including clinical and biomedical elements, policy development, regulation and market access, and educational initiatives. By identifying the latest advancements and promising approaches, the project aims to shed light on strategies that can be scaled up and implemented in real-world healthcare settings. This understanding empowers decision-makers and stakeholders to make informed choices regarding the integration of personalized prevention strategies within existing healthcare.

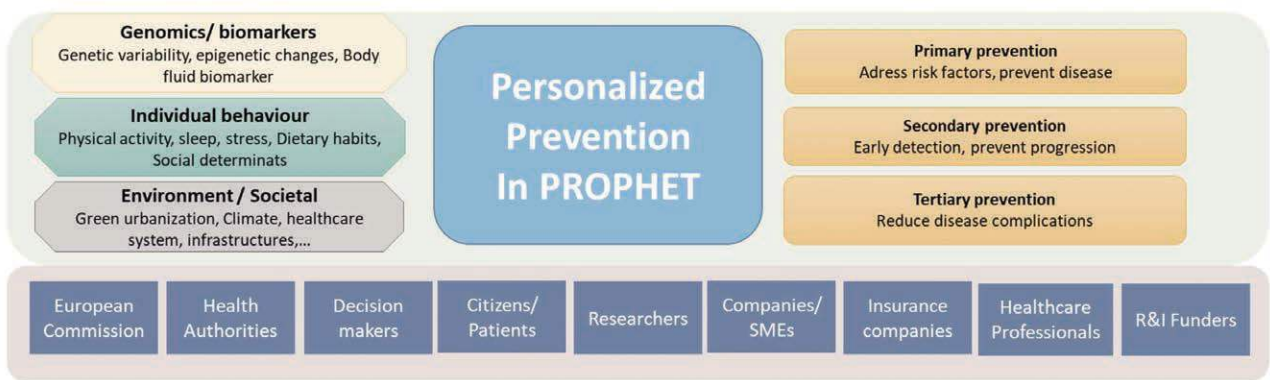
The assessment phase includes a significant component: the development of the PROPHET Framework, which will serve as a structured approach to evaluate personalized prevention strategies and their potential impact on public health. Drawing on the foundation of existing frameworks for multidisciplinary assessment, the PROPHET Framework will encompass ethical considerations, economic feasibility, and social acceptance. This framework will facilitate the decision-making process for policymakers and health authorities, enabling them to navigate the complex landscape of personalized prevention.

The insights obtained from the mapping activities and the PROPHET assessment Framework will be synthesized into the comprehensive SRIA. This agenda will provide clear and actionable recommendations for research and innovation in personalized prevention at the European level. It will also include specific action plans for implementing the PROPHET Framework across diverse healthcare settings, alongside guidelines for policymakers and capacity building initiatives to ensure the successful adoption of personalized prevention practices.

In addition, PROPHET recognizes the critical role of stakeholder engagement. By involving a diverse range of stakeholders, including healthcare professionals, patient organizations, service providers, and policymakers, the project aims to create a collaborative environment where ideas can be exchanged, challenges can be addressed, and solutions can be collectively developed. This inclusive approach increases the likelihood of the successful implementation and uptake of personalized prevention practices across the European Union.

Moreover, PROPHET underscores the importance of health literacy in empowering individuals to make informed decisions about their own health. At the same time, this process involves promoting research regarding risk communication related to individual and environmental factors that affect an individual’s development of chronic diseases: these include inherited biological traits, diet and physical activity data, and social factors. By incorporating strategies to elevate health literacy at a population level, the project aims to equip individuals with the necessary knowledge and skills to actively participate to prevention of their own health, both in terms of commitment to specific care pathways and adopting lifestyles appropriate to their level of risk. This emphasis on health literacy is expected to improve health outcomes and reduce the burden of chronic diseases.

Fig. 1



Personalized prevention approach in PROPHET.

The results of the Mapping and Assessment phases, refined and consolidated in the SRIA, will guide the Building phase, aimed at providing useful information for decision-makers to effectively target personalized prevention policies. The overarching goal of PROPHET is to provide concrete evidence and recommendations to decision-makers regarding the personalized prevention implementation across diverse health contexts within the European Union. Furthermore, the project seeks to collaborate with other ongoing and forthcoming initiatives at the EU level, fostering synergies and maximizing the impact of personalized prevention efforts.

All in all, the PROPHET project is set to make a substantial contribution to the field of personalized prevention in healthcare. Through its mapping activities, the development of the PROPHET Framework, robust stakeholder engagement, and focus on health literacy enhancement, the project aims to establish a solid foundation for the effective integration of personalized prevention strategies across the European Union. PROPHET aims so to enhance the overall quality of life of individuals, reduce chronic disease burden, and ensure the sustainability and innovation of healthcare systems. The project's success has the potential to shape the future of healthcare, paving the way for a personalized and preventive approach that empowers individuals and improves the overall health of the European population.

Acknowledgements

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the European Union's Horizon Europe research and innovation program under Grant agreement No. 101057721.

RP, AMP and TO wrote the first draft of the paper. RA, PB, GB, MD, EF, MK, MMTh, AD, CN, BPG, MP, DQ, SS, SM, VS, SPS, VEC and VA reviewed the manuscript. SB edited and produced the final version.

Conflicts of interest

There are no conflicts of interest.

References

- Azzopardi-Muscat N, Kluge HHP (2020). Public health in the eye of the storm: what can we learn from the COVID-19 pandemic experience to strengthen public health services in Europe? *Eur J Public Health* **30**:391–392.
- Boccia S, Ricciardi W (2023). Personalized prevention in oncology: integrating the current approaches for the benefit of population health. *Eur J Public Health* **33**:1–2.
- Boccia S, Adany R, Villari P, Cornel M, De Vito C, Pastorino R. Personalised health care: fostering precision medicine advancements for gaining population health impact. *SpringerBriefs in public health*; 2021.
- Grossman DC, Larson EB, Sox HC (2020). Integrating Personalized Medicine With Population Health Management. *JAMA* **324**:631–632.
- Williams GA, Liede S, Fahy N, Aittomaki K. Regulating the unknown: a guide to regulating genomics for health policy-makers. 2020.