PROPHET

a PeRsOnalized Prevention roadmap for the future HEalThcare

D2.7 Workshop on Mapping Results

UCSC

Funded by the European Union

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Deliverable Abstract
This Deliverable aims to summarize all mapping activities presented during the **"Workshop on Mapping Results"** that took place remotely **on March 14, 2024** on the Teams platform. The Workshop was attended by all PROPHET Project Partners, Advisory Board members and several external Stakeholders.

Keywords
Workshop, Mapping Results

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Executive summary

This deliverable aims to summarize all mapping activities presented during the "Workshop on Mapping Results," held remotely on March 14, 2024, via the Teams platform. The workshop was attended by all PROPHET Project partners, Advisory Board members, and several external stakeholders. Within this Deliverable, readers can consult the AGENDA of the Mapping Results Workshop, which includes a detailed description of all planned interventions and the names of the speakers. Additionally, the complete list of meeting participants, including the names and affiliations of more than 40 connected stakeholders, is provided.

The latter part of the document details all the mapping results presented, following the order of the AGENDA. Finally, all slides presented during the Workshop on Mapping Results are attached to this document.

List of participants

WP2 Workshop on Mapping Results

March 14th, 2024

Remotely

Partners who attended the Workshop:

Name	Surname	Affiliation
STEFANIA	BOCCIA	UCSC
MARIO	MASIELLO	UCSC
TOMMASO	OSTI	UCSC
SARA	FARINA	UCSC
ALESSANDRA	MAIO	UCSC
BEDO	TAHAA	UCSC
LUIGI	RUSSO	UCSC
NICOLO'	SCARSI	UCSC
ANGELO	PEZZULO	UCSC
ANGELICA	VALZ GRIS	UCSC
MARTINA	PORCELLI	UCSC
MATTEO	DI PUMPO	UCSC
ROBERTA	PASTORINO	FPG
ARSHIYA	MARCHANT	ELIXIR
MAGDA	CHEGKAZI	ELIXIR
ALEXANDRA	GYLLENBERG	KI
MAHSA	SHABANI	UGENT
PATRICIA	CERVERA	UGENT
ANU	REIGO	TARTU
MERIKE	LEEGO	TARTU
EVA	VANSTEIJVOORT	KUL
ANJA	ROELOFSEN	VUMC
MARTINA	CORNEL	VUMC
TESSEL	RIGTER	VUMC

VERONIKA	ODINTSOVA	VUMC
LAURA	BLACKBURN	PHGF
PETER	MILLS	PHGF
CHANTAL	BABBDEVILLIERS	PHGF
EVA	FADIL	GAC
CHARLOTTE	ALCOUFFE	GAC
HELENA	KÄÄRIÄINEN	THL
PRAGATHY	KANNAN	THL
BEATRIZ	GOMEZ	CIBER
DAFINA	PETROVA	CIBER
ANGELA	DOMINGUEZ GARCIA	CIBER
BLANCO	ROJAS	ISCIII
CRISTINA	BARAHONA	ISCIII
NICOLAS FERNANDO	MARTINEZ	ISCIII
ORLANDO	HERNANDEZ	ISCIII
ANA	AVELLON	ISCIII
ELENA	PLANS	ISCIII
DANIELA	QUAGGIA	ACN
MICHAELA	MAYRHOFER	BBMRI
MARIANGELA	MASIELLO	BBMRI
MANUELA	PAUSAN	BBMRI
ROZA	ADANY	DEB
GIORDANO	BOTTA’	ALLELICA

Advisory Board members who attended the Workshop:

Name	**Surname**	**Affiliation**
CARLO	LA VECCHIA	UNIMI
ALEXANDER	ROEDIGER	MSD

Stakeholders who attended the Workshop:

Name	**Surname**	**Affiliation**
RAMON CIERCO	JIMENEZ	WHO

FREDERIQUE	DJURDJEVIC	WHO
PAUL DIEZ	ECHAVE	NHS FOUNDATION
ALLAN	DALE RECINOS	RRRC
JOAO	MACEDO	AZORES
IVANA	CATTANEO	Novartis
ALESSANDRO	GALLINA	EPHA
JAN	TRALLERO	IDIBGI
ELINA	SIVINA	Riga University
ALANA	O'CONNOR	KORDAMENTHA
WOUTER	SPEK	WAGENINGEN University
YIOLA	MARCOU	Bank of Cyprus Oncology Centre
CRISTINA RITA	TRINDADE COSTA	IHMT
UNA	RIEKSTINA	University of Latvia
YVAN	DEVAUX	LIH
TAMARA	MILAGRE	EVITA
TONI	ANDREU	AETRIS
FEDERICA	ROSSETTI	SCIENSANO
SOPHIE	DANOEL	SCIENSANO
INDRIDI	BENEDIKTSSON	European Commisson
TOMASZ	DYLAG	European Commisson
CARMEN	LA PLAZA SANTOS	European Commisson
ALEXANDRU	COSTESCU	European Commisson
SUSAN	GUO	Maddocks
LORETA	ZVIBAITE	Lietuvos Edukologijos Universitetas
HEATHER	BURNS	NCCP
DELIA	NICOARA	IOCN
MORTEN	FRYDENSBERG	Syddansk Sundhedsinnovation
J. MATT	MCCRARY	Prince of Wales Clinical School

VALENTINA	RANGEL SARMIENTO	IDIBELL
AMELIA	HURSEY	ParkinsonEurope
FIONA	MONTAGUE	ParkinsonEurope
MARIA JOSE	MARTINEZ	SANT PAU
SARAH	BERROCOSO	BIOSISTEMAK
SARANTIS	CHLAMYDAS	Geneva College of Longevity Science
STUART	FAULKNER	OXFORD University
MARIUS	GAENTA	Centre for Innovation in Medicine
BEATRICE	SALVATORI	Columbia University
MASSIMO	CERFEDA	NEGEDIA
KONSTANTINOS	MAKRIS	National Technical University of Athens
RUI AMARAL	MENDES	School of Dental Medicine

AGENDA WP2 WORKSHOP ON MAPPING RESULTS

Thursday 14th March 2023		
12.00	**Recap of the Workshop** *(10 minutes)*	**S. Boccia (UCSC)**
12.10	**Presentation of Mapping Results:** •Report on research on novel biomarkers for personalized primary and secondary prevention in chronic diseases. (**Dr. Beatriz Pérez Gómez, CIBER,** *10 minutes*) •Mapping the state-of-the-art and bottlenecks for the adoption of personalized preventive approaches in Europe and beyond. (**Dr. Sara Farina, UCSC** and **Dr. Maria Luis Cardoso, INSA,** *14 minutes)* •Report on existing Research Programmes and Projects in the field of Personalized Prevention. (**Dr. Alessandra Maio, UCSC,** *7 minutes)*	
12.41	**Discussion**	**All Partners and Stakeholders**
12.54	•How do researchers and institutions measure clinical utility in personalised prevention? Results from a scoping review. **(Dr. Angelo Pezzullo** and **Dr. Angelica Valz Gris, UCSC,** *10 minutes)* •Clinical utility of prevention biomarkers - where are we? (**Dr. Chantal Babb de Villiers, PHGF,** *9 minutes*)	
13.13	**Discussion**	**All Partners and Stakeholders**
13.24	•Mapping European public, patient, health professionals and policy makers engagement practices in personalised prevention. (**Dr. Carla van El** and **Dr. Loes Lindiwe Kreeftenberg, VUMC,** *9 minutes*) •The use of direct-to-consumer genetic testing in personalized prevention: public health impact & current policy approaches. (**Dr. Eva Van Steijvoort, KUL,** 6 *minutes*) •Data management and infrastructure requirements to bring research advances into Health Systems for personalised prevention, outlining challenges and best practices. (**Dr. Arshiya Merchant, ELIXIR**, 5 *minutes*) •Fair access to data-driven tools in personalized prevention: exploring the regulatory challenges and solutions. (**Dr. Patricia Cervera de la Cruz, UGENT,** 5 *minutes*)	
13.49	**Discussion and Conclusion**	**All Partners and Stakeholders**
14.00	**Adjourn**	

Description of results presented

The following contributions were presented during the WP2 Workshop on Mapping Results:

- **TITLE: Report on research on novel biomarkers for personalized primary and secondary prevention in chronic diseases. (CIBER)**

ABSTRACT:

Introduction: Personalised prevention aims to delay or avoid disease occurrence, progression, and recurrence of diseases through the adoption of targeted interventions that consider the individual biological (including genetic data), environmental and behavioural characteristics, as well as the socio-cultural context.

This research is part of the "Personalised Prevention roadmap for the future HEalThcare" (PROPHET) project, which seeks to highlight the gaps in current personalised preventive approaches, in order to develop a Strategic Research and Innovation Agenda for the European Union.

Objective: To systematically map and review the research activity of biomarkers that are available or under development in cancer, cardiovascular and neurodegenerative diseases that are or can be used for personalised prevention in the general population, in clinical or public health settings.

Methods: Three rapid scoping reviews were conducted in parallel (Feb – Jun 2023), based on a common protocol framework with adjustments to suit each specific condition (cancer, cardiovascular or neurodegenerative diseases). Medline and Embase were searched to identify publications between 2020 and 2023 for relevant biomarkers for risk prediction and stratification.

Results: Biomarker research is most extensive in cancer (843 articles included), followed by CVD (775 articles included). Fewer articles were identified for neurodegenerative diseases (286 articles included), there is a major focus on biomarker research for Alzheimer's disease. Molecular biomarkers were the most common category identified across all the diseases, but especially in cancer. Genetic/genomic biomarkers are extensively studied in primary prevention, while biochemical biomarkers are common in secondary prevention of all diseases. Imaging biomarkers are more relevant in secondary prevention, especially in neurodegenerative diseases. Digital technologies, focusing on AI and machine learning, are used primarily in molecular and imaging studies.

Conclusions: These three rapid scoping reviews summarize the main features of the research landscape on biomarkers for the primary and secondary prevention of cancer, cardiovascular and neurodegenerative diseases.

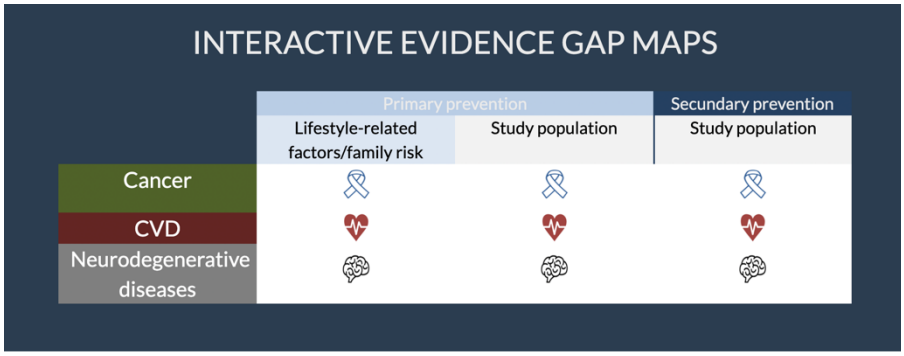

Figure 1. Interactive evidence gap maps

- **TITLE: Mapping the state-of-the-art and bottlenecks for the adoption of personalized preventive approaches in Europe and beyond. (UCSC)**

ABSTRACT:

Personalised prevention (PP) has gained prominence in the healthcare priorities of many nations, driven by advances in life sciences and digital technologies. This deliverable explores the outcomes of an extensive scoping review focused on personalised prevention approaches (PPA) and the insights from interviews and a survey targeted to stakeholders to identify primary bottlenecks and gaps that hinder PPA implementation, in Europe and beyond.

This activity has been conducted within the European Commission-funded project PROPHET (A PeRsOnalised Prevention roadmap for the future HEalThcare), that guides health systems in adopting innovative strategies for preventing chronic diseases sustainably. Findings reveal that cancer is the primary target for PPA, followed by cardiovascular diseases, diabetes, and other diseases. Notably, tertiary prevention, including personalised target therapies, is prominent in cancer, while primary prevention, emphasising lifestyle changes for high-risk individuals, prevails in cardiovascular diseases and diabetes.

However, many of these approaches are still in the trial phase and not completely implemented and adopted in clinical practice. Bottlenecks to PPA implementation, identified through literature and stakeholders consultations, encompass the lack of clinical utility and evidence, challenges in data management, limited omics science knowledge among healthcare professionals, and deficiencies in public health literacy and trust.

This work underscores the immense potential of PP to enhance population health and reduce chronic disease burdens on healthcare systems. To unlock these benefits, prioritising PP on research and policy agendas is crucial, ultimately benefiting citizens and patients alike. Addressing the identified bottlenecks is pivotal in realising the full potential of PPA and its transformative impact on public health.

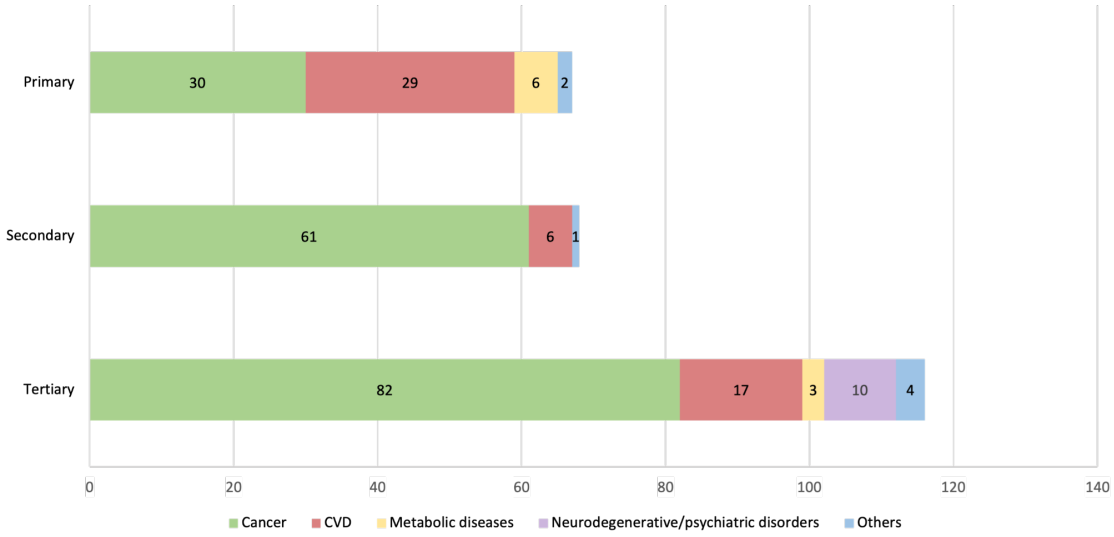

Figure 2. Number of approaches per disease and level of prevention

- **TITLE: Report on existing Research Programmes and Projects in the field of Personalized Prevention. (UCSC)**

ABSTRACT:

The deliverable reports the results of an extensive mapping research of the funding programmes and projects in the field of personalised prevention (PP) in Europe and internationally. Our methodology involved a meticulous two-step process, adhering to established review methodologies and incorporating expert consultation. The summarized results, presented in descriptive tables, provide information on PP research worldwide, facilitating program comparison, budget evaluation, and disease identification. The analysis highlighted five major funding programs, with 45 projects mapped exclusively in Europe. In particular, cancer research accounts for 40 percent of the projects, while cardiovascular and neuropsychiatric diseases each account for 20 percent. This summary serves as a resource for stakeholders, guiding future research priorities and contributing to the development of strategic interventions to address global public health challenges.

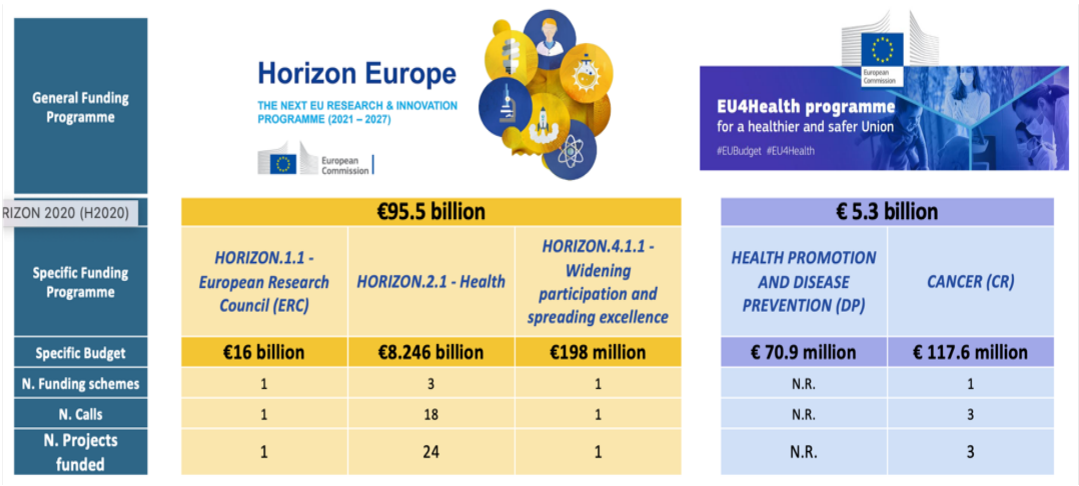

Figure 3. Mapping of existing Research Programmes

- **TITLE: How do researchers and institutions measure clinical utility in personalised prevention? Results from a scoping review. (UTARTU)**

ABSTRACT:

The Deliverable intend to identify outcome and process indicators for evaluating under what circumstances a technology used in science would be applicable in practice.

A critical obstacle preventing many recent promising scientific findings and new methodologies from entering the mainstream of preventive medicine is, in fact, the lack of widely accepted criteria and benchmarks for the official approval of these novel approaches. Process and outcome indicators are a mechanism for measuring the quality of healthcare delivery and health systems performance, aiming to allow the best possible efficacy of personalized medicine to reach everyday practices in prevention and care. This should support an important paradigm shift: understanding that healthcare starts long before a diagnosis in medical settings.

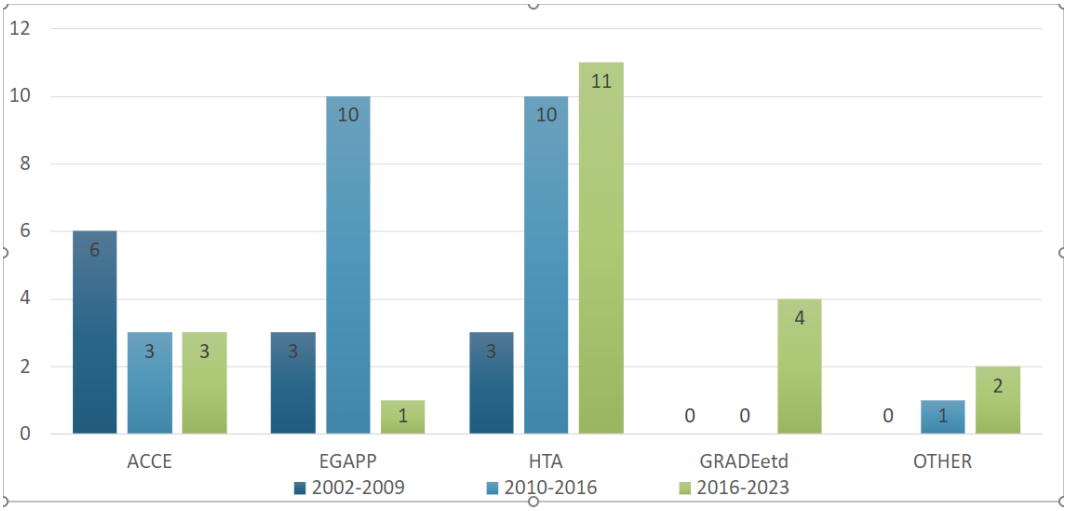

Figure 4. Formal assessments of omics technologies

- **TITLE: Clinical utility of prevention biomarkers - where are we? (PHGF)**

ABSTRACT:

Introduction: Personalised medicine and prevention are gaining traction within the context of health system strategy and delivery of care. Measures developed for personalised prevention, especially for chronic conditions such as cancer, cardiovascular diseases (CVD) and neurodegenerative diseases can be supported by the development of biomarkers that can identify individuals at risk of disease.

Aim: To undertake research and analysis to establish the level of evidence for clinical utility for personalised prevention of biomarkers identified in Task 2.1.1. in three disease groups: cancer, CVD and neurodegenerative diseases.

Methods: A prioritised biomarker list was created from the results of Task 2.1.1 based on the quality of research evidence. Test definitions were then established for each of the biomarkers in the prioritised list. Searches for these tests were conducted in relevant databases: Guideline Central; TRIP Pro; NIHR CRD database; International HTA database; and CEA registry, to identify guidelines or HTAs and CEAs indicating evidence supportive, or not, of clinical utility. General searches for genetic testing and polygenic risk scores for each disease group were also carried out.

Results: In cancer, 113 tests utilising 82 unique biomarkers were defined, of which 22 had evidence – 15 supportive and seven not supportive of clinical utility. Most tests with evidence for clinical utility were based on genetic biomarkers for familial cancers, namely prostate and colorectal cancers. For CVD, 59 tests utilising 33 unique biomarkers were defined, of which eight tests had evidence of clinical utility. These tests frequently considered longer-term risk prediction for CVD events and were associated with small changes to existing established tests or models (four tests) or were multi-factorial models (four tests). In neurodegenerative diseases, 32 tests utilising 25 unique biomarkers were defined. Evidence was found for one test only, and it was not supportive of clinical utility.

Conclusion: Our results demonstrate the evidence gaps between the research and translation of promising novel biomarkers for prevention into clinical care. Urgent attention to this gap and further initiatives are needed to accelerate the development of improved prevention interventions and programmes for the European population.

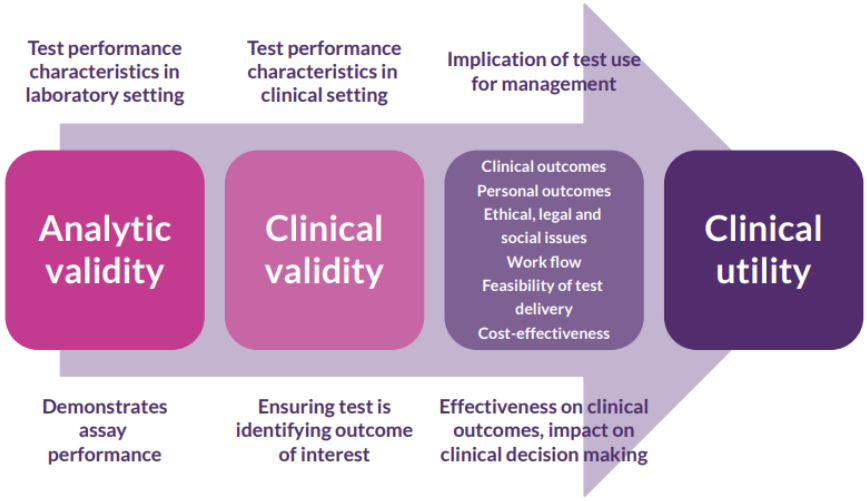

Figure 5. Predictive power and clinical utility of biomarkers

- **TITLE: Mapping European public, patient, health professionals and policy makers engagement practices in personalised prevention. (VUMC)**

ABSTRACT:

Background/Objectives: Personalised prevention using genomic information requires active involvement from the public and patients, who need to be well-informed and empowered to make decisions reflecting their personal values in deciding on health care and sharing data. This underscores the importance of their active participation in care, research, education, and governance for

meaningful engagement. We aimed to map engagement practices, and assess the extent and types of engagement methods utilised in the field of personalised prevention of common chronic conditions.

Methods: A scoping review selected literature (in Medline, Embase, Scopus, Web of Science, APA PsycINFO and IBSS) from 2015 to 2023 was performed. Articles included were practices of patient and public engagement in personalised prevention and genomics conducted in Europe focusing on cancer, cardiovascular diseases and neurodegenerative disorders.

Results: 23 engagement practices were selected. Analysis revealed diverse engagement levels, the majority falling into the low to medium engagement category, and showed mainly one directional methods of engagement, including dissemination and consultation. Most engagement activities related to cancer, and none to neurodegenerative diseases. The care domain exhibited the most publications, followed by research, research combined with care, and governance combined with education.

Conclusion: By elaborating on and implementing practices that engage and empower the patients and public at all levels of the engagement spectrum, fostering a more inclusive and participatory approach to personalised prevention, ultimately leads to improved health outcomes for individuals and communities.

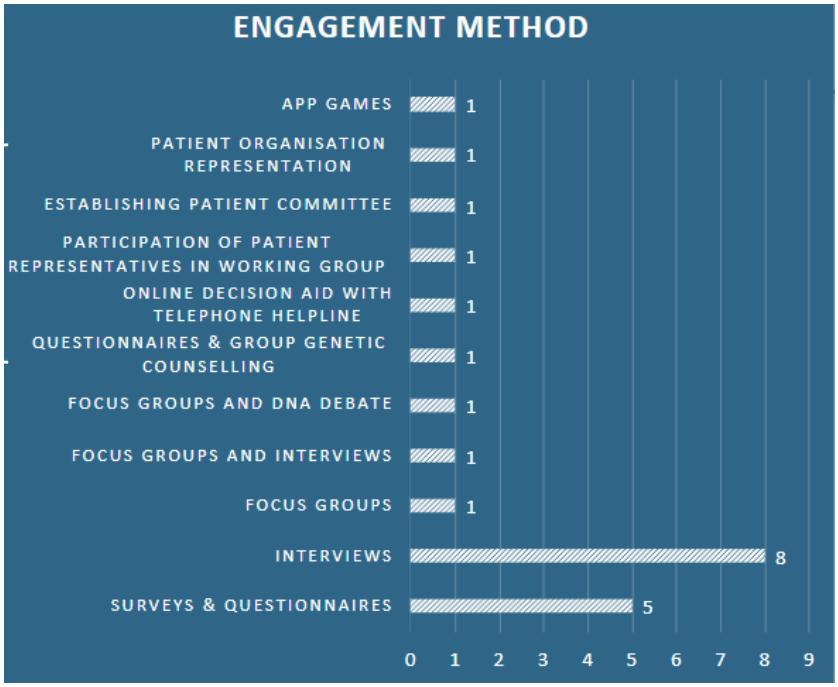

Figure 6. Mainly one directional methods of engagement

- **TITLE: The use of direct-to-consumer genetic testing in personalized prevention: public health impact & current policy approaches. (KUL)**

ABSTRACT:

This report provided an overview of the history of consumer genomics, the current DTC-GT landscape, the current evidence on the motivations of those that opt to have DTC-GT and the risks, benefits, limitations and concerns around DTC-GT. Furthermore this reserch provided an overview of possible regulatory approaches to evaluate DTC-GT offers before their entry into the market and analyze criteria used to evaluate DTC-GT offers for the use of their products in Personalized Prevention. Based on the results of our literature review, were found that while many consumers undergoing DTC-GT express intentions to adjust their lifestyle based on their genetic test results, actual behavioral changes appear to be limited or moderate. Long-term studies using validated measures are needed to ascertain the magnitude and sustainability of these changes over time. Despite initial concerns regarding the potential negative impact on public health, such as downstream tests and referrals to specialists, recent data suggest that these issues have not materialized as expected. Further international research is warranted to assess the current impact of DTC-GT on the public healthcare sector, especially considering that earlier research primarily represented early adopters and may not reflect the current population undergoing DTC-GT. Several studies have documented the diverse regulatory approaches employed by various European member states concerning genetic testing, encompassing facets such as medical oversight, genetic counseling, and informed consent. Although DTC-GT could potentially fall under these legal frameworks, whether partially or entirely, there is presently no specific EU or national legislation explicitly governing DTC-GT.

- **TITLE: Report on data management and infrastructure requirements to bring research advances into Health Systems, outlining challenges and best practices: A summary of the data management needs, in alignment with the B1MG (ELIXIR)**

ABSTRACT:

Personalised prevention, a transformative healthcare approach, tailors interventions based on an individual's unique genetic, lifestyle, and environmental factors. Influenced by genomic advancements and technology, it aims to mitigate the risk of diseases. This report addresses gaps and bottlenecks in data management and infrastructure, as well as a few best practices, influencing cross-border health and genomic data sharing in European health systems.

Semi-structured interviews with stakeholders and a thematic analysis were employed. Ethical considerations included strong informed consent procedures, pseudonymisation, and a focus on multi-stakeholder engagement. Stakeholders were selected based on relevance, coverage of key categories, and representation across nations.

Challenges in data management include the lack of standardisation, discoverability issues, variable accessibility, and data reproducibility. Infrastructure challenges include data storage, processing, security, and tools for sustainability. Implementation challenges involve integrating technical infrastructure into clinical settings, workforce issues, regulatory frameworks, and funding stream division. Ethical, legal, and societal considerations highlight GDPR interpretation variability, legislative mandates, and the need for nuanced ethical frameworks. The broader ecosystem theme emphasises cultural shifts, conservative attitudes, and challenges in promoting data-driven solutions.

The report underscores the complexity of implementing personalised prevention, offering critical insights and recommendations. Addressing these challenges requires a collaborative, multidimensional approach, emphasising standardisation, infrastructure sustainability, regulatory

alignment, and ethical considerations. The findings contribute significantly to shaping future initiatives in the evolving landscape of personalised prevention in European healthcare systems.

- **TITLE: Fair access to data-driven tools in personalized prevention: exploring the regulatory challenges and solutions. (UGENT)**

ABSTRACT:

The report aim to investigate the ELSI challenges and bottlenecks which may impact fair access to data-driven tools for personalized prevention in diverse groups and populations and the ways in which existing regulatory approaches at the EU level, including the GDPR, address these. Based on the results of literature review, the report focused on three important aspects to ensure fair access to data driven tools in the context of personalized prevention: the processing of sensitive attributes such as genetic data, the secondary use of health data and the use of non-traditional health data. This is an important undertaking as the use of data-driven tools in personalized prevention raises concerns about predictive accuracy due to the risk of algorithmic bias (especially in underrepresented populations) and subsequent discriminatory treatment, and about accessibility to interventions by the general public. The findings of this report should encourage researchers and healthcare professionals alike to address issues related to fair access in the use of personalized prevention approaches in healthcare.

A Recording of the entire Workshop is available on the PROPHET Website at the following link:

https://prophetproject.eu/latest_news/health-experts-gathered-in-workshop-on-personalised-prevention/

PROPHET

a PeRsOnalized Prevention roadmap for the future HEalThcare

Workshop on Mapping results

Thursday March 14th 2024

12.00 pm – 14.00 pm

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

AGENDA

Thursday 14th March 2023		
12.00	**Recap of the Workshop** *(10 minutes)*	**S. Boccia (UCSC)**
12.10	**Presentation of Mapping Results:** •Report on research on novel biomarkers for personalized primary and secondary prevention in chronic diseases. (**Dr. Beatriz Pérez Gómez, CIBER,** *10 minutes*) •Mapping the state-of-the-art and bottlenecks for the adoption of personalized preventive approaches in Europe and beyond. (**Dr. Sara Farina, UCSC** and **Dr. Alexandra Costa, INSA,** *14 minutes)* •Report on existing Research Programmes and Projects in the field of Personalized Prevention. (**Dr. Alessandra Maio, UCSC,** *9 minutes)*	
12.43	**Discussion**	**All Partners and Stakeholders**
12.54	•How do researchers and institutions measure clinical utility in personalised prevention? Results from a scoping review. (**Dr. Angelo Pezzullo** and **Dr. Angelica Valz Gris, UCSC,** *10 minutes)* •Clinical utility of prevention biomarkers - where are we? (**Dr. Chantal Babb de Villiers, PHGF,** *9 minutes*)	
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13.49	**Discussion and Conclusion**	**All Partners and Stakeholders**
14.00	**Adjourn**	

PROPHET

a PeRsOnalized Prevention roadmap for the future HEalThcare

The Project “A PeRsOnalized Prevention roadmap for the future HEalThcare (PROPHET)” has received funding from the European Union’s Horizon Europe programme (Grant Agreement n. 101057721)

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Funded by the European Union

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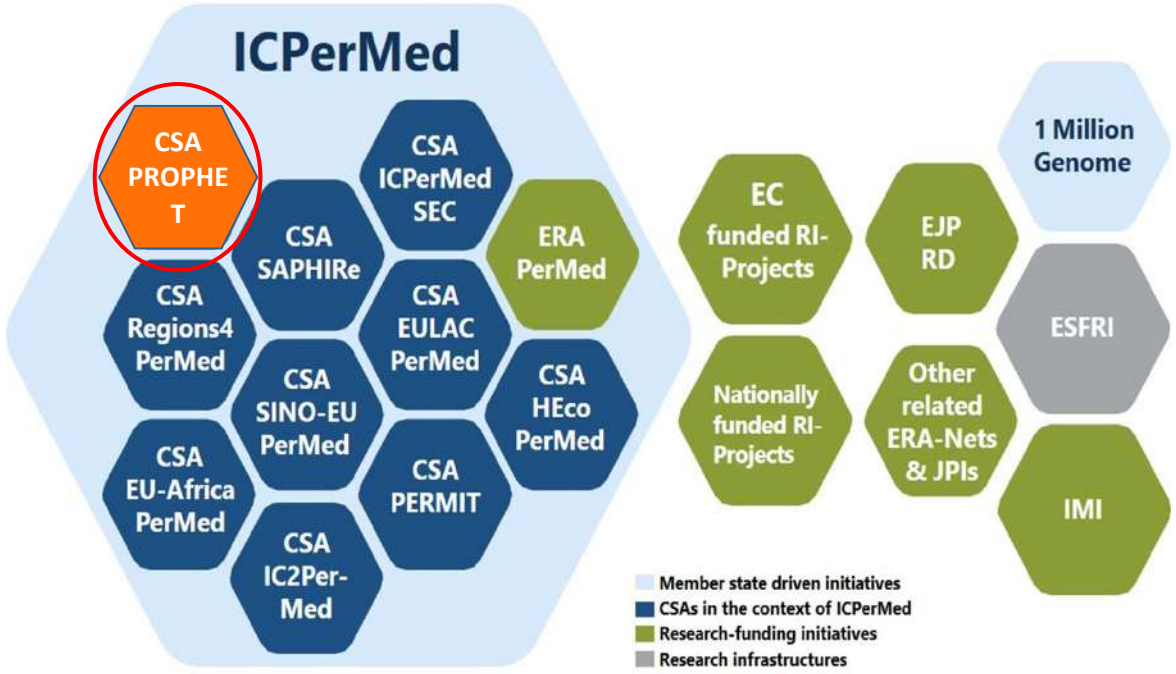
Rome, kick-off meeting, 21-23 September, 2022

The overall objective of PROPHET is co-create with stakeholders a **Personalized Prevention Roadmap** for the future healthcare, in order to support the definition and implementation of innovative, sustainable and high-quality personalized strategies that are effective in preventing chronic diseases.



- **European Union: Horizon - CSA Staying Healthy (2021) (HORIZON-HLTH-2021-STAYHLTH01)**
- **Consortium: 18 partners**
- **Starting Date : September 1st, 2022**
- **Duration : 48 months- Budget: €3,000,000**

PROPHET
a PeRsOnalized Prevention roadmap for the future HEalThcare

EUROPE'S BEATING CANCER PLAN: IMPLEMENTATION ROADMAP

	ACTION	2021	2022	2023	2024	2025
30.4	SAMIRA: Equal access to modern technology and interventions	EU support for implementation of *Council Directive 2013/59* Euratom's requirements for medical equipment			Publication of study results and guidance document (Q2-Q3 2024)	
			Cover radiation technology in cancer plans			
				Evidence for clinical efficacy of novel cancer interventions involving ionising radiation improved		
30.5	SAMIRA: EU research and innovation support	Research roadmap development (Ongoing *EURAMED Rocc-n-roll* project)		Research roadmap delivered	Roadmap implementation	
31.1	Set up Horizon Europe Partnership on Personalised Medicine	Preparatory actions	Call launched under Horizon Europe	*Partnership on Personalised Medicine* launched	Yearly calls launch, projects	
					Launch of first call for multinational research projects (Q1)	
31.2	Roadmap to personalised prevention	Call launched	Start of development, first project launched under Horizon Europe		First version of Strategic Research and Innovation Agenda (Q3)	
32.1	Launch 'Genomic for Public Health' project	Call launched	Preparatory work on EU Cancer and Public Health Genomics platform Project (*CAN.HEAL*) launched in November	Pr		
32.2	*1+ Million Genomes Initiative*	Technical proof-of-concept, call publication for data infrastructure deployment	*Genomic Data Infrastructure (GDI)* deployment project launched under Digital Europe, catalogue of genomic datasets legal/ethical analysis	Data integration and quality g development towards sustaina a group of		

CONSORTIUM

ROPHET

a PeRsOnalized Prevention roadmap for the future HEalThcare

ROPHET

a PeRsOnalized Prevention roadmap for the future HEalThcare

Concept paper on Strategic Research and Innovation Agenda (SRIA)

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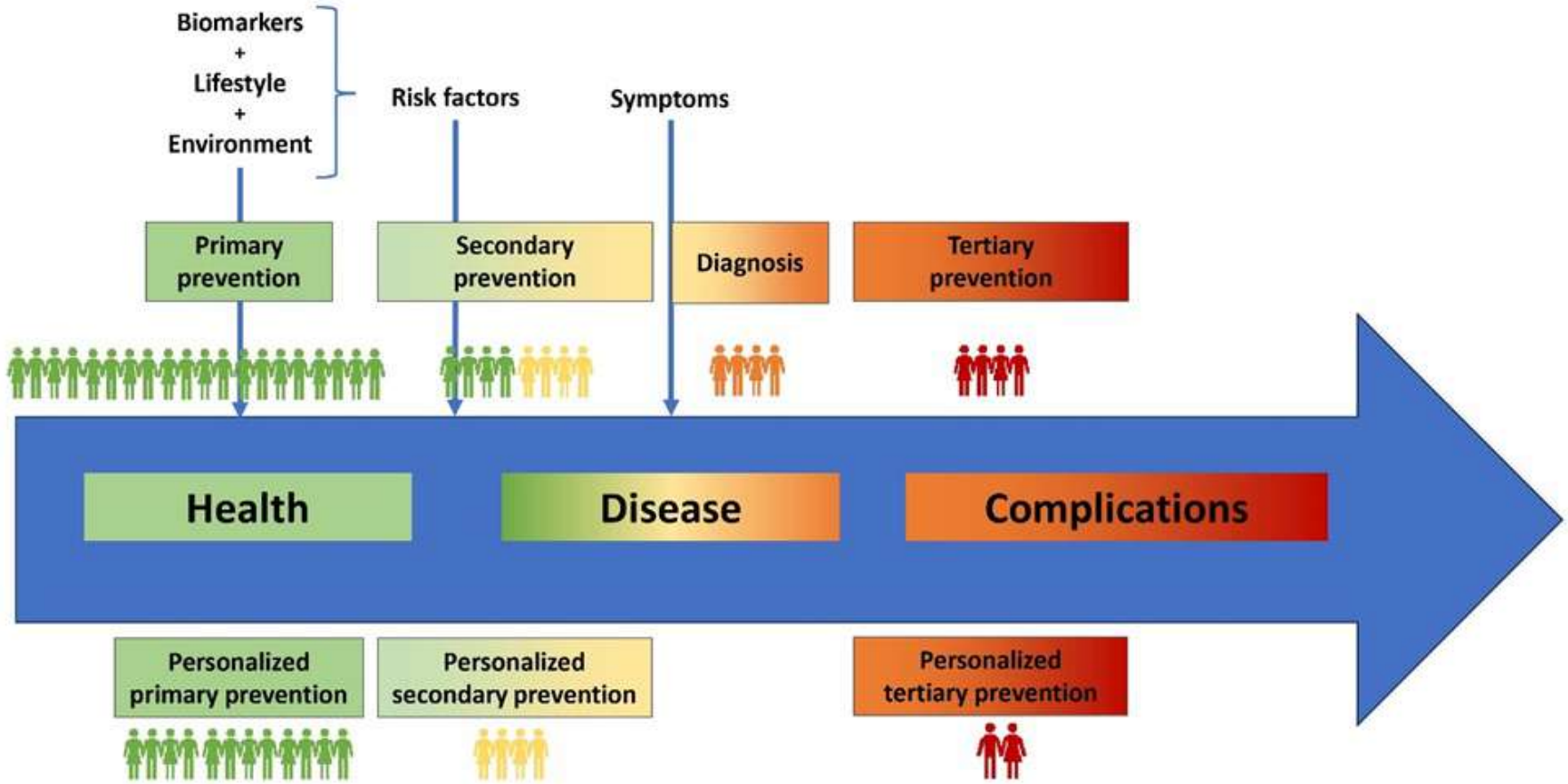
Karolinska Institutet (KI) Leader, All Partners Contributors



"Personalised prevention aims to prevent onset, progression and recurrence of diseases through the adoption of targeted interventions that consider the biological information, environmental and behavioural characteristics, 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"*

* e.g. genetic and other biomarkers, demographics, health conditions

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PRECeDI
Personalized PREvention of Chronic DIseases

The “Personalized Prevention of Chronic Diseases (PRECeDI)” project has received funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 823995

Funded by the European Union

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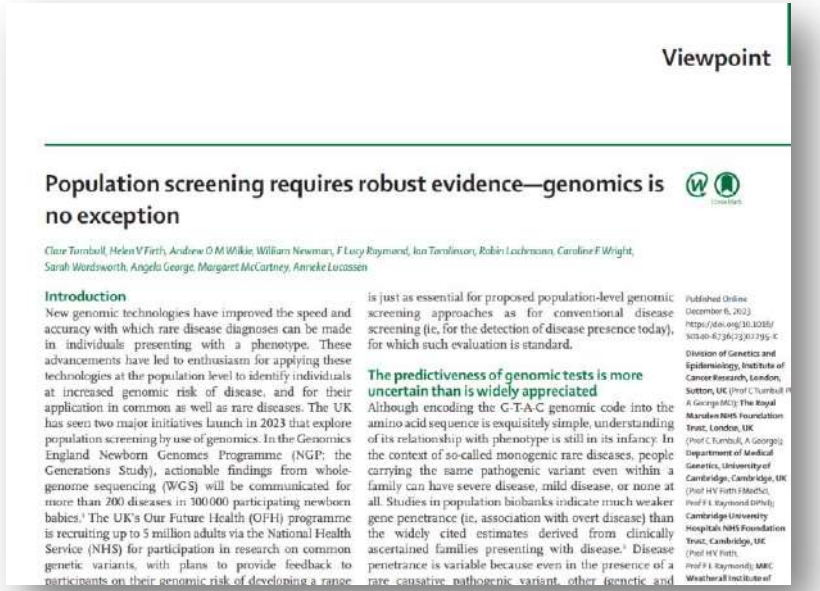

Viewpoint

Population screening requires robust evidence—genomics is no exception

Clare Turnbull, Helen V Firth, Andrew O M Wilkie, William Newman, F Lucy Raymond, Ian Tomlinson, Robin Lachmann, Caroline F Wright, Sarah Wordsworth, Angela George, Margaret McCartney, Anneke Lucassen

Introduction

New genomic technologies have improved the speed and accuracy with which rare disease diagnoses can be made in individuals presenting with a phenotype. These advancements have led to enthusiasm for applying these technologies at the population level to identify individuals at increased genomic risk of disease, and for their application in common as well as rare diseases. The UK has seen two major initiatives launch in 2023 that explore population screening by use of genomics. In the Genomics England Newborn Genomes Programme (NGP; the Generations Study), actionable findings from whole-genome sequencing (WGS) will be communicated for more than 200 diseases in 100 000 participating newborn babies.[1] The UK's Our Future Health (OFH) programme is recruiting up to 5 million adults via the National Health Service (NHS) for participation in research on common genetic variants, with plans to provide feedback to participants on their genomic risk of developing a range is just as essential for proposed population-level genomic screening approaches as for conventional disease screening (ie, for the detection of disease presence today), for which such evaluation is standard.

The predictiveness of genomic tests is more uncertain than is widely appreciated

Although encoding the G-T-A-C genomic code into the amino acid sequence is exquisitely simple, understanding of its relationship with phenotype is still in its infancy. In the context of so-called monogenic rare diseases, people carrying the same pathogenic variant even within a family can have severe disease, mild disease, or none at all. Studies in population biobanks indicate much weaker gene penetrance (ie, association with overt disease) than the widely cited estimates derived from clinically ascertained families presenting with disease.[2] Disease penetrance is variable because even in the presence of a rare causative pathogenic variant, other (genetic and

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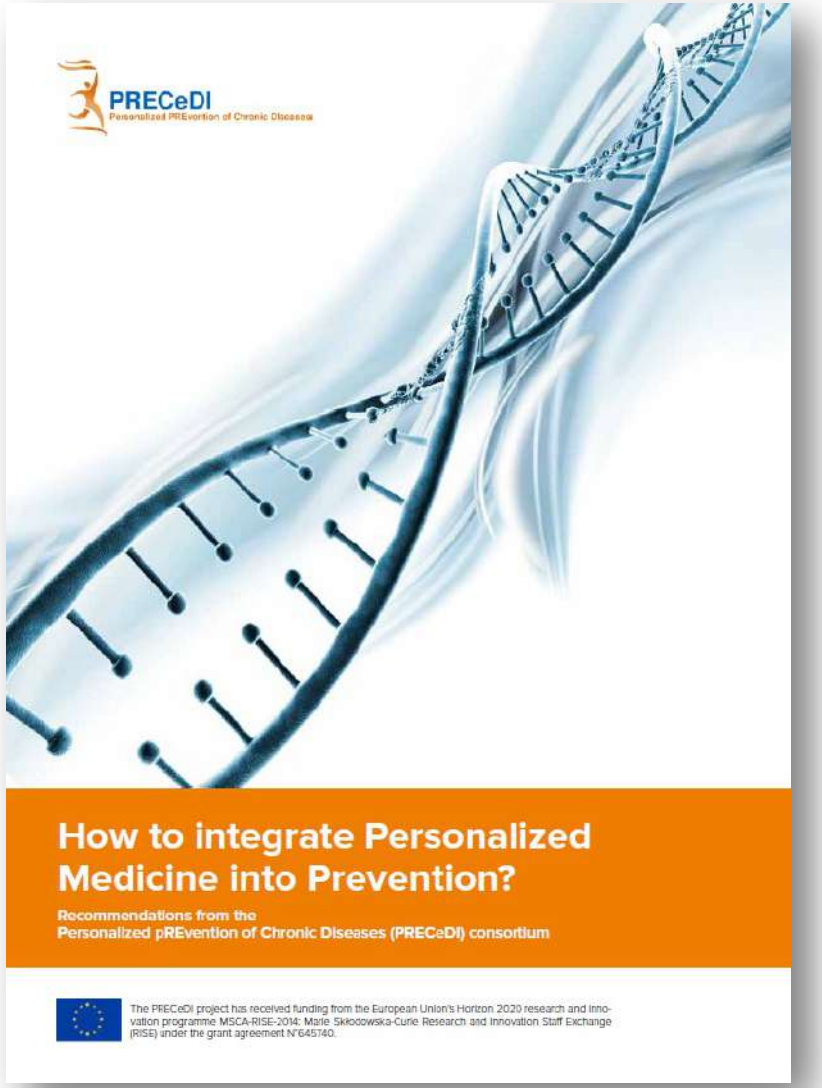
THE LANCET

December 06, 2023Prof Clare Turnbull, PhD
Prof Helen V Firth, FMedSci
Prof Andrew O M Wilkie, FRS
Prof William Newman, PhD
Prof F Lucy Raymond, DPhil
Prof Ian Tomlinson, FRS



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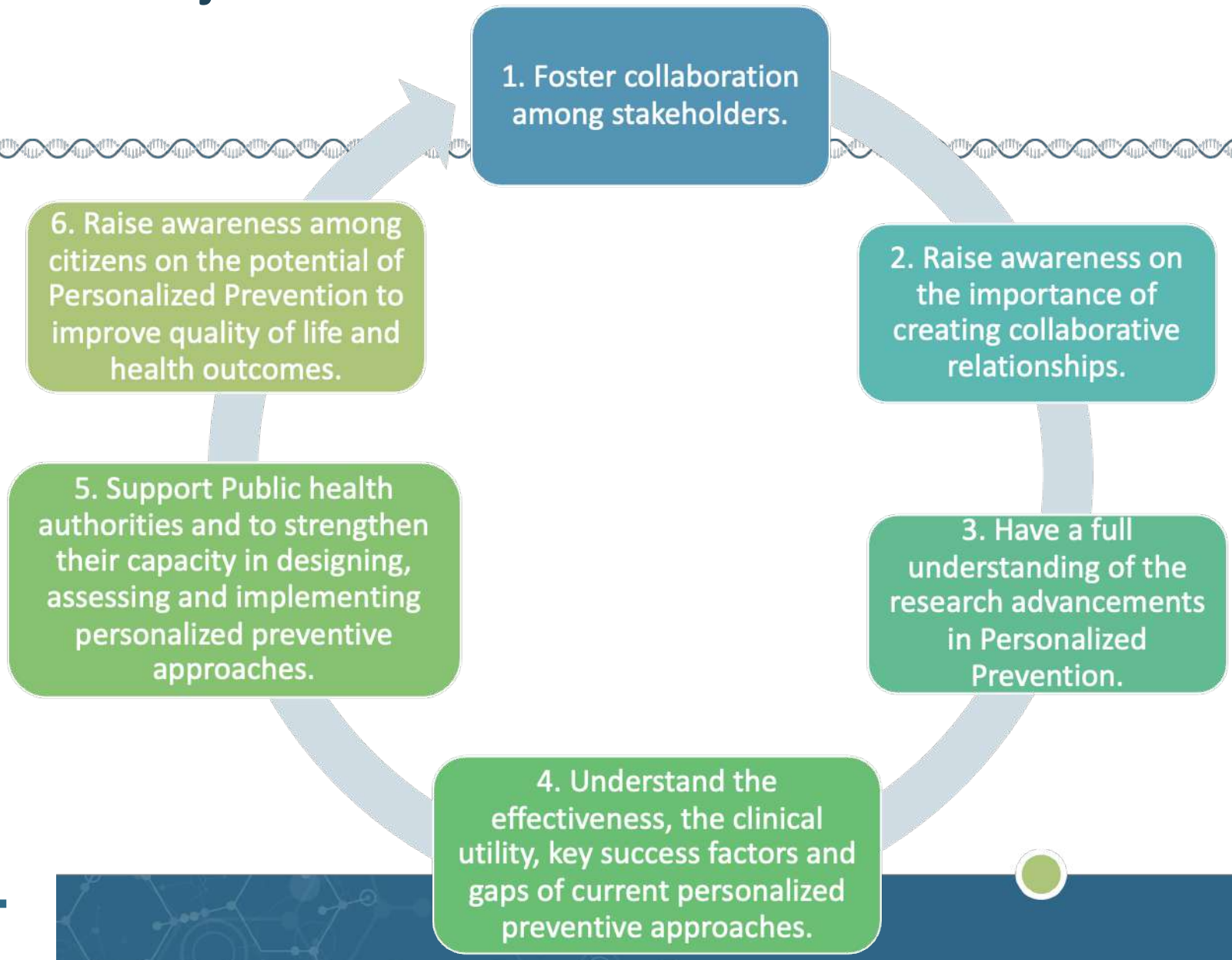
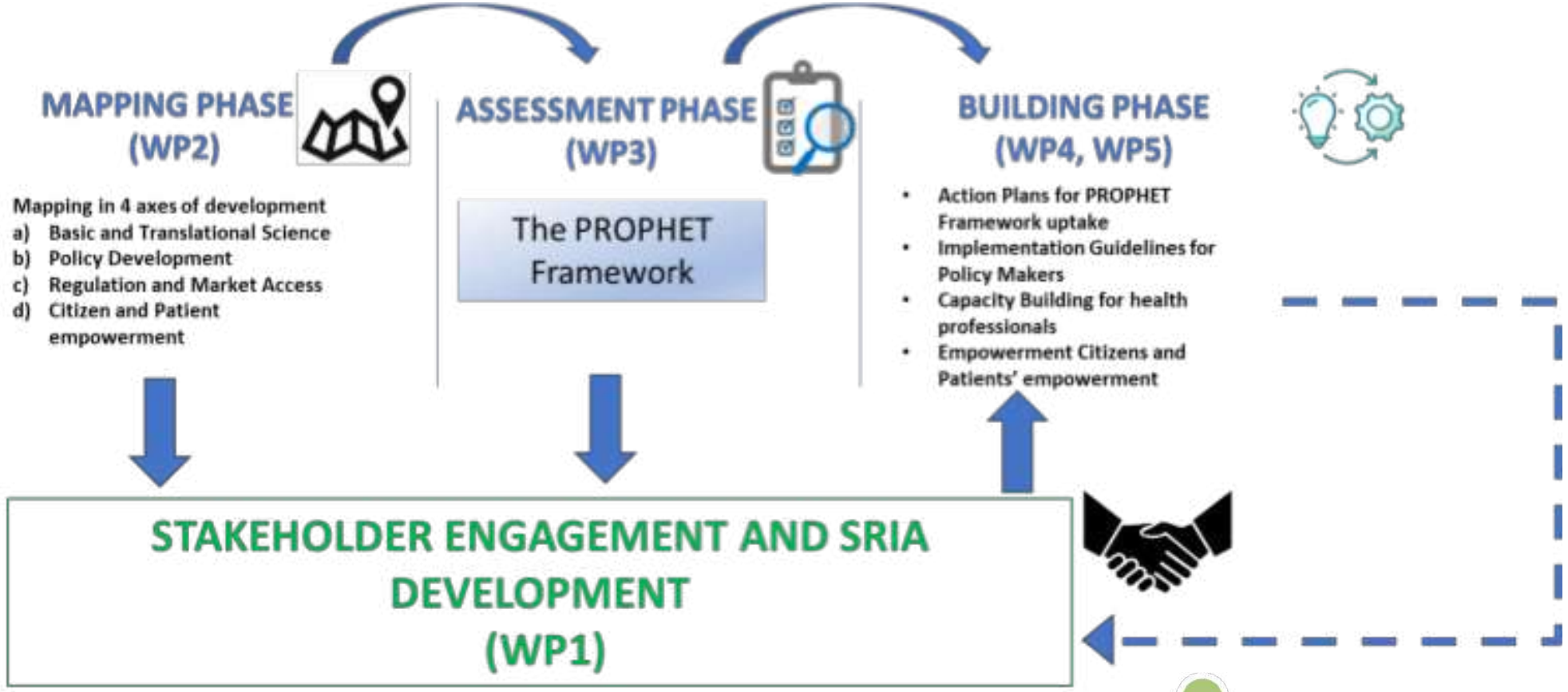
PROPHET Specific objectives



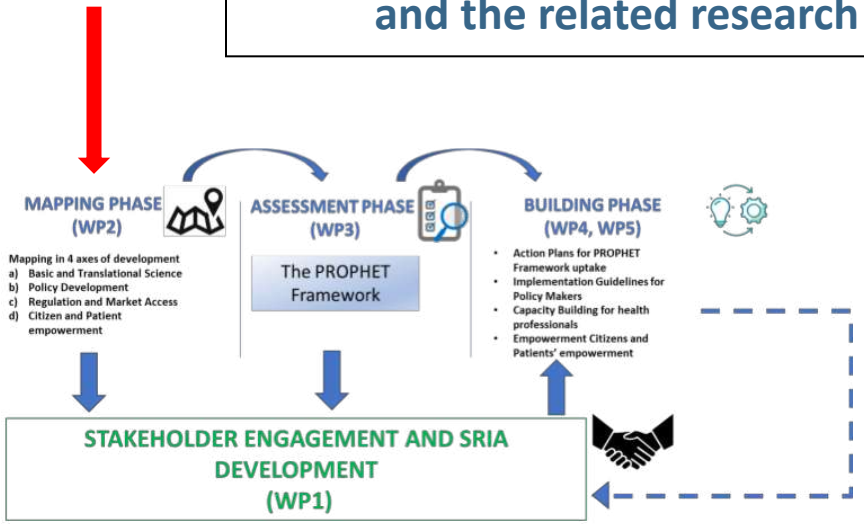
PROPHET Methodology

In order to reach all these objectives, PROPHET is revolving around the **Stakeholder engagement** and the **Strategic Research and Innovation Agenda (SRIA) development,** processes that is in close relationship with three main strands of activities: **Mapping, Assessment,** and **Building**



PROPHET Mapping

We carried out **literature reviews, scoping reviews and surveys** of current practices and programmes in the field of Personalized Prevention across the three different levels of prevention (primary, secondary and tertiary). Mapping phase aims at identifying current research advances, practices and programmes across **4 axes of development and the related research and innovation areas**



Policy Development

Regulation and Market Access

Educational and Literacy

Basic and Translational Science

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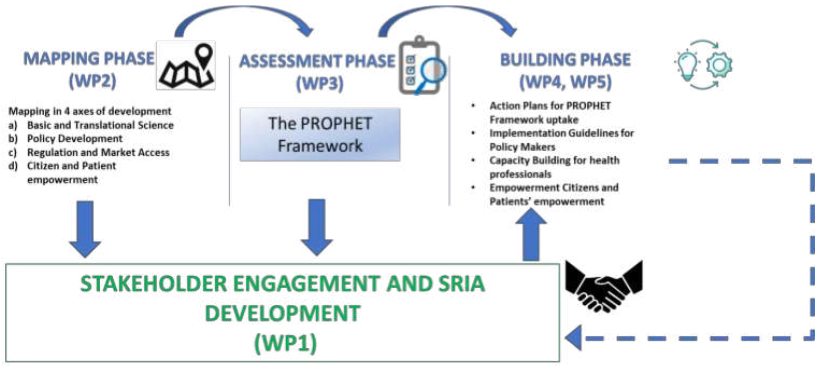
PROPHET Assessment

Based on the results of Mapping Phase, the Consortium will identify the **process and outcome indicators for the evaluation of personalized preventive approaches**, and will design an holistic framework (the **PROPHET Framework**) to **appraise personalized preventive approaches** using s value-based perspective



The Framework will become a core part of the SRIA as it will be the basis to ensure **evidence based policy uptake**

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DEVELOPMENT OF THE PROPHET FRAMEWORK

EVALUATION OF THE CLINICAL UTILITY OF THE TECHNOLOGY ACCORDING TO EU NEW REGULATION

PROSPECTIVE ASSESSMENT OF THE POTENTIAL IMPACT ON POPULATION HEALTH OF THE POLICY

IMPLEMENTATION

POLICY MONITORING

GOALS NOT REACHED

GOALS REACHED

POLICY CALIBRATION

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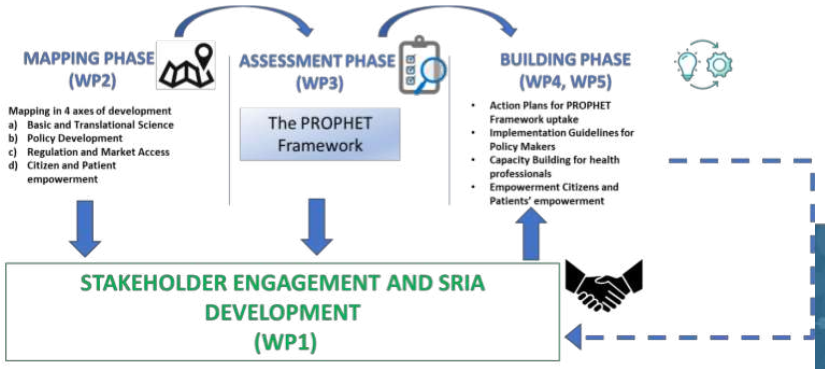
PROPHET Building

Different implementation scenarios of Personalized Prevention approaches in the health system.

Raising awareness Campaigns targeted to Citizen/Patient as well as Capacity Building activities/tools towards Public Authorities.

Results from the Mapping activity and the Assessment will converge into the SRIA. All these information will then provide inputs to support the implementation of the **Building strand activities**.

Action plans in different settings across 4 Countries (Finland, Estonia, the Netherlands and Italy)

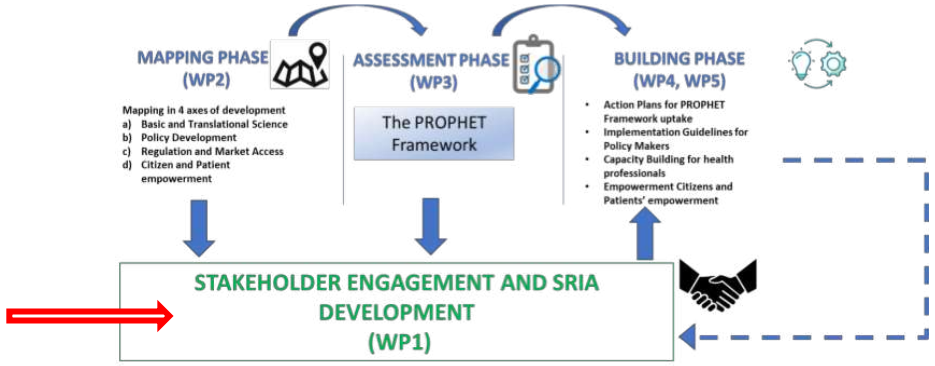


The PROPHET Strategic Research and Innovation Agenda (SRIA)

The Strategic Research and Innovation Agenda is the strategic document with the primary objective of **advancing the development of innovative, sustainable and highly effective personalized programs aimed at preventing chronic diseases**.

It aims at translating the vision of the consortium in a **long-term systemic approach**.

It is based on an **open, inclusive and transparent approach**.



It is **strategic and impact-oriented**, contributing to **European policy** objectives and expectations.

PROPHET – stakeholder engagement – a co-creation process

Want to get involved?

Whether you are a health professional, a citizen, a patient or any other person involved in Personalized Prevention, come and participate in the co-creation activities of the PROPHET SRIA

Become a PROPHET stakeholder:

Become part of the PROPHET Forum of experts (expert community)

+

Benefit from knowledge exchange through the PROPHET Platform (digital platform)

Stakeholders are involved in all phases of the SRIA development:

- ✓ Phase 1: **SRIA Concept paper**
- Phase 2: **first draft of the SRIA** (by sept 2024)
- Phase 3: **public consultation** on the first draft version of SRIA (second half of 2024).
- Phase 4: **final version of the SRIA** based on the inputs from the public consultation (expected September 2025)

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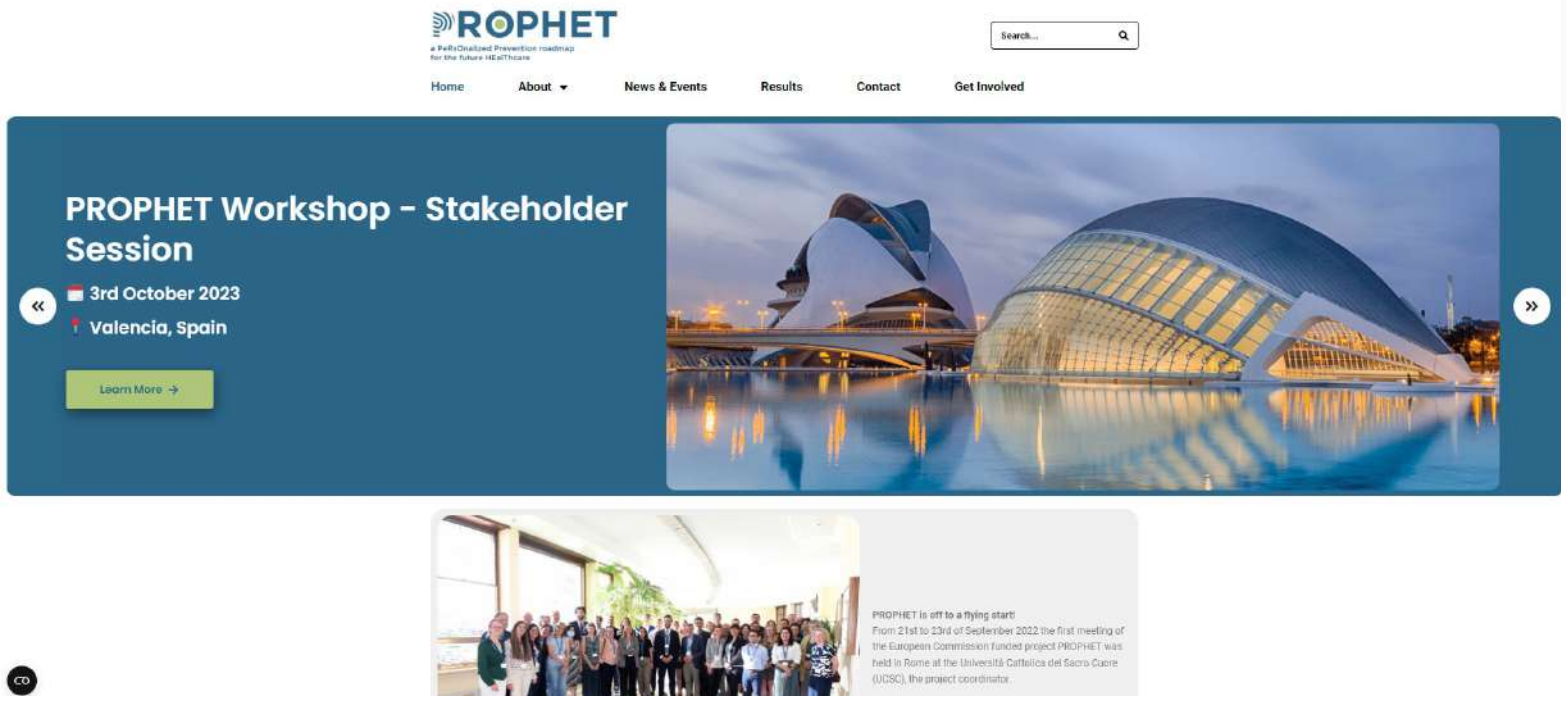
PROPHET Workshop on first draft of SRIA presentation to stakeholders

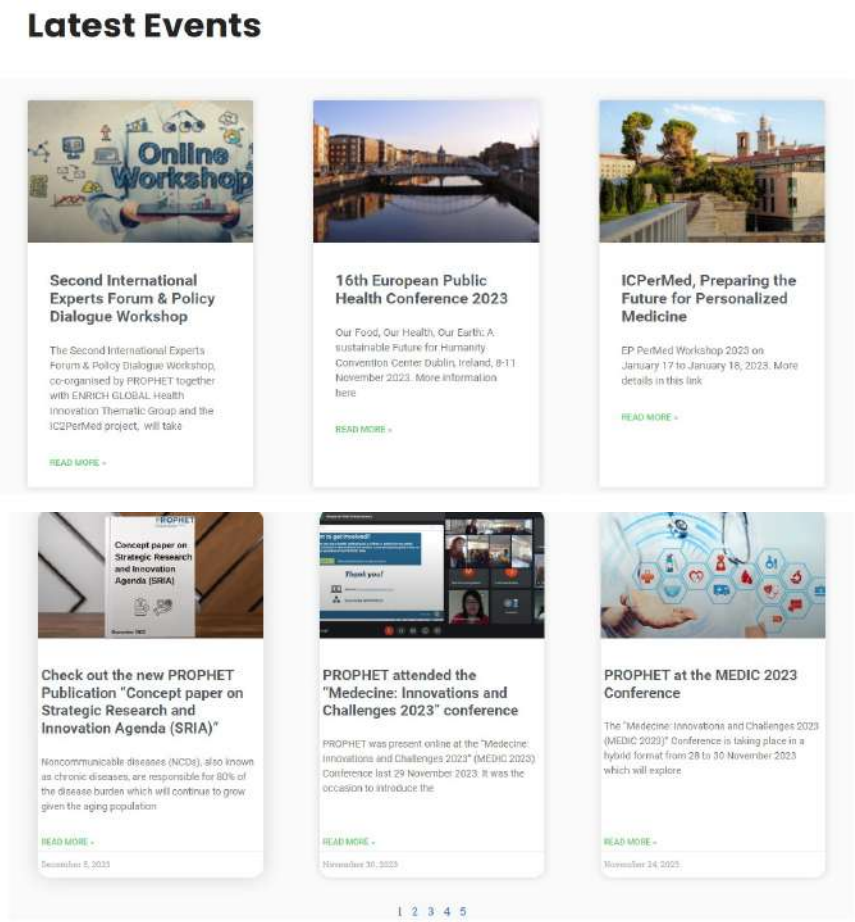
The PROPHET Workshop on SRIA will take place in attendance and remotely on:

Wednesday 2 October 2024
SAVE THE DATE!

If you are interested in participating please send an email to:
mario.masiello@unicatt.it

PROPHET website

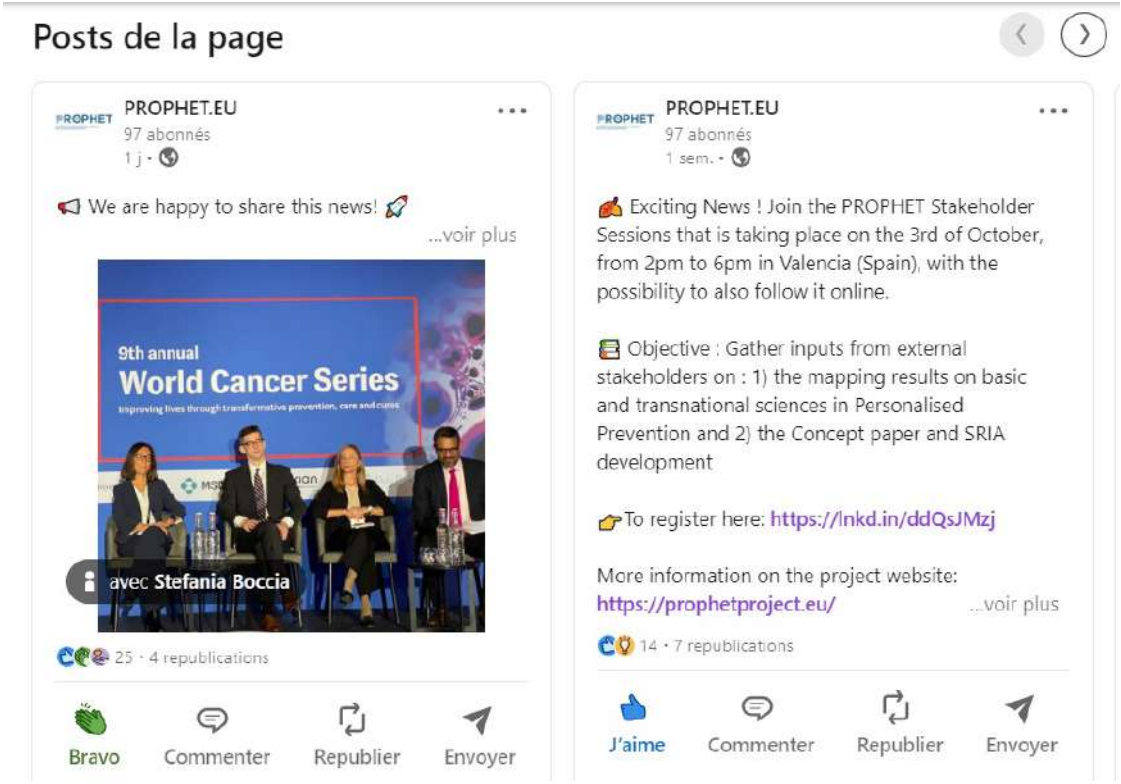




https://prophetproject.eu/

PROPHET on social media

LinkedIn



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Report on research on novel biomarkers for personalized primary and secondary prevention in chronic diseases

Three rapid **scoping reviews** to map available or under development **biomarkers** for primary or secondary **personalised prevention** in **cancer**, **cardiovascular** and **neurodegenerative diseases**

Beatriz Pérez-Gómez (bperez@isciii.es)

Plans-Beriso E., Babb-de-Villiers C., Barahona-López C., Diez-Echave P., Turner H., Hernández OR., Erady C., Fernández de Larrea N., Wilson, H., Petrova D., Fernández-Martínez N., García-Ovejero E., Craciun O., Arruabarrena-Blanco E., Granero B., Fernández-Navarro P., García-Esquinas E., Kuhn I., Jiménez-Planet V., Moreno V., Rodríguez-Artalejo F., Sanchez MJ., Pollan M., Blackburn L., Kroese M., Perez-Gomez B.

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721
UK participant in Horizon Europe Project PROPHET is supported by UKRI grant number 10040946 (Foundation for Genomics & Population Health)

Scoping review

- Question: What biomarkers are available or under development for personalized primary and secondary prevention of **cancer**, **cardiovascular diseases**, and **neurodegenerative diseases** in the adult general population, in clinical or public health settings?
- Way: 3 Rapid scoping reviews conducted in parallel **2020-2023**
- Aim: Mapping available biomarkers

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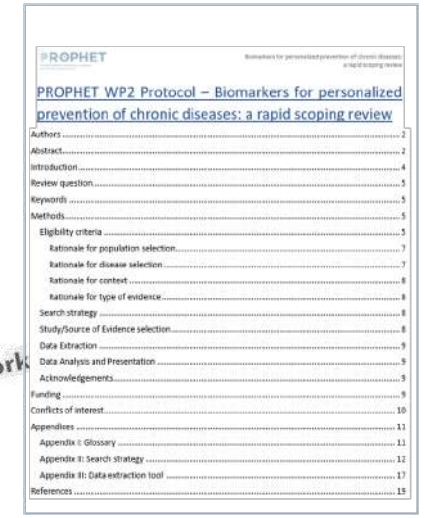
METHODOLOGY

→ Main diseases in each group

→ Reports with original data or systematic reviews

SCOPING REVIEW PROTOCOL

Open Science Framework


PROPHET

PROPHET WP2 Protocol – Biomarkers for personalized prevention of chronic diseases: a rapid scoping review

Authors 2
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Review question 5
Keywords 5
Methods 5
Eligibility criteria 5
Rationale for population selection 7
Rationale for disease selection 7
Rationale for context 8
Rationale for type of evidence 8
Search strategy 8
Study/Source of Evidence selection 8
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Data Analysis and Presentation 9
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Appendix III: Data extraction tool 17
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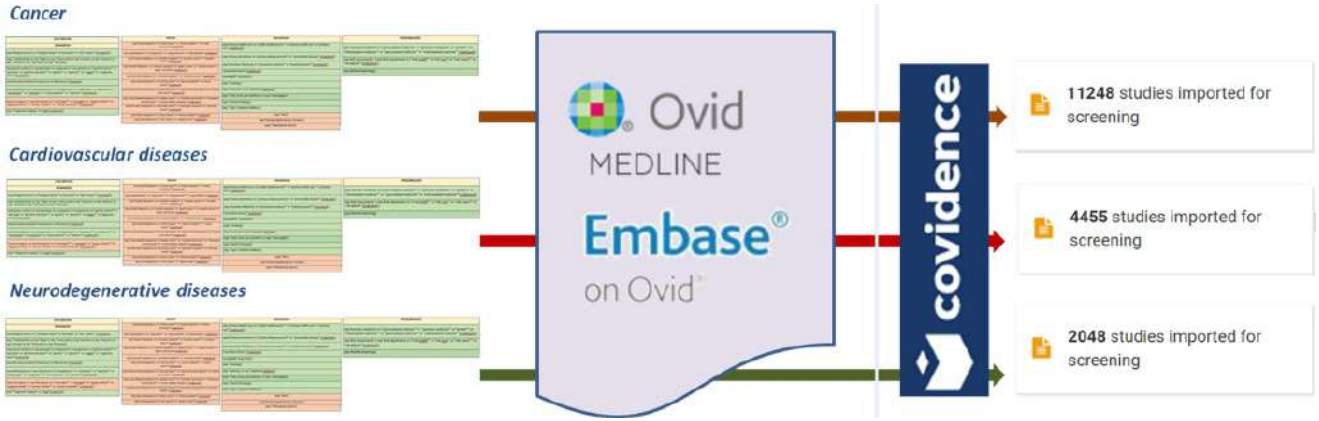
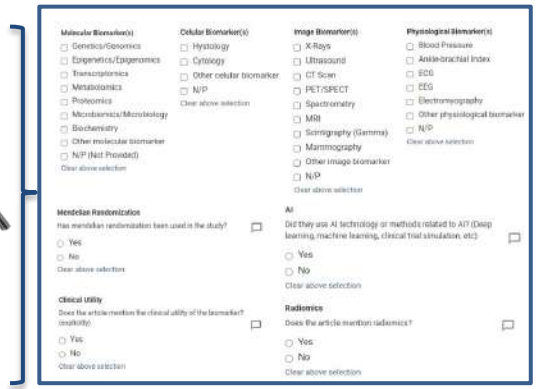
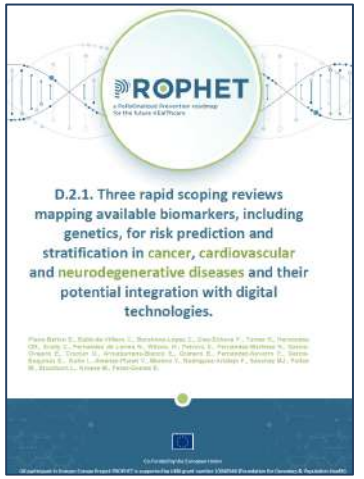
Cancer	CVD	Neurodegenerative diseases
▪ Breast ▪ Prostate ▪ Lung ▪ Colorectum ▪ Stomach ▪ Liver ▪ Pancreas ▪ Cervix ▪ Corpus uteri ▪ Bladder ▪ Kidney	▪ Ischemic heart disease ▪ Stroke ▪ Cardiomyopathy & miocarditis ▪ Atrial fibrilation & atrial flutter ▪ Aortic aneurism ▪ Nonrheumatic valvular heart disease ▪ Peripheral artery disease **Major adverse cardiac events (MACE)**	Dementias: ▪ Alzheimer´s disease ▪ Vascular dementia ▪ Lewy body dementia ▪ Frontotemporal dementia Demyelinizing disorders: ▪ Amyotrophic lateral sclerosis ▪ Multiple sclerosis Synucleopathies: ▪ Parkinson

STRATEGY — SEARCH — TITLE/ABSTRACT SCREENING — FULL TEXT — DATA EXTRACTION — REPORT







DATA EXTRACTION SHEET

Molecular Biomarker(s)

- [ ] Genetics/Genomics
- [ ] Epigenetics/Epigenomics
- [ ] Transcriptomics
- [ ] Metabolomics
- [ ] Proteomics
- [ ] Microbiomics/Microbiology
- [ ] Biochemistry
- [ ] Other molecular biomarker
- [ ] N/P (Not Provided)

Clear above selection

Celular Biomarker(s)

- [ ] Hystology
- [ ] Cytology
- [ ] Other celular biomarker
- [ ] N/P

Clear above selection

Image Biomarker(s)

- [ ] X-Rays
- [ ] Ultrasound
- [ ] CT Scan
- [ ] PET/SPECT
- [ ] Spectrometry
- [ ] MRI
- [ ] Scintigraphy (Gamma)
- [ ] Mammography
- [ ] Other image biomarker
- [ ] N/P

Clear above selection

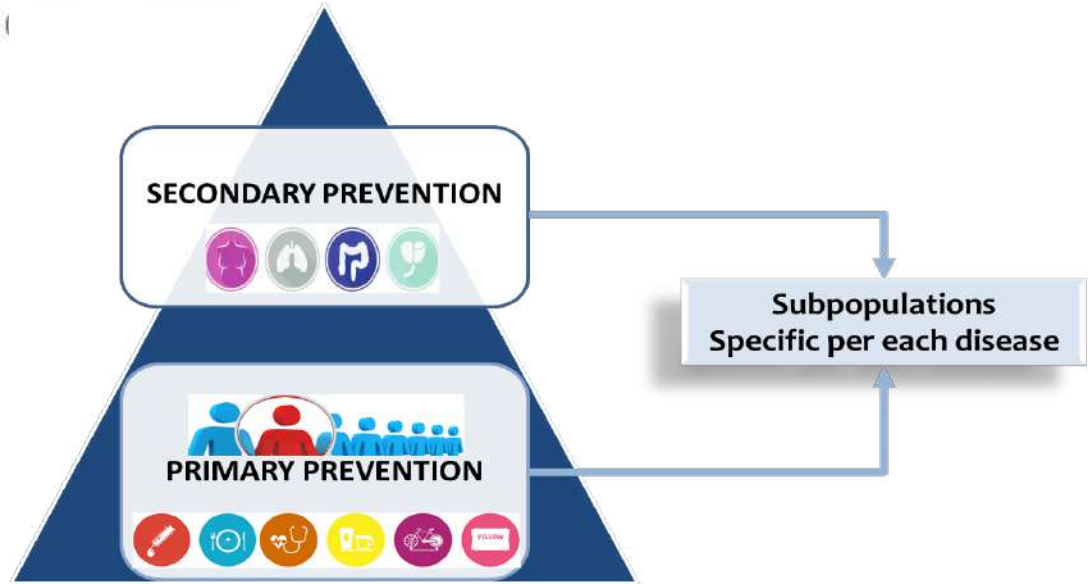
Physiological Biomarker(s)

- [ ] Blood Pressure
- [ ] Ankle-brachial Index
- [ ] ECG
- [ ] EEG
- [ ] Electromyography
- [ ] Other physiological biomarker
- [ ] N/P

Anthropometric Biomarker(s)

- [ ] BMI
- [ ] Body perimeters
- [ ] Other anthropometric biomarker
- [ ] N/P

Clear above selection



Summary: PRISMA flowcharts

CANCER

11,376 references retrieved

Included

843 Studies extracted

439 Primary prevention
296 Secondary prevention
108 Primary & secondary

CVD

5,321 references retrieved

775 Studies extracted

376 Primary prevention
353 Secondary prevention
46 Primary & secondary

NEURODEGENERATIVE DISEASES

2,066 references retrieved

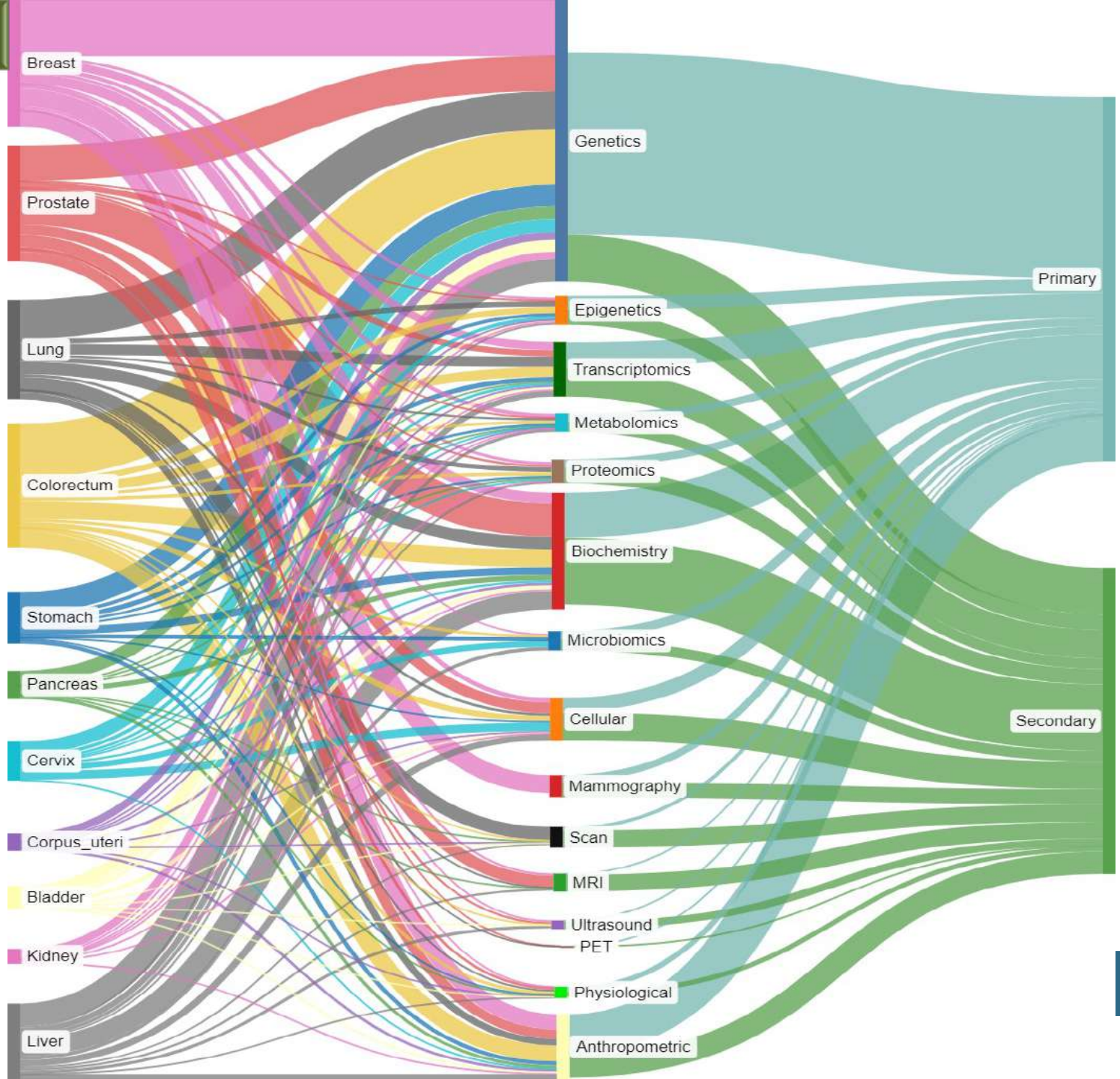
286 Studies extracted

120 Primary prevention
149 Secondary prevention
17 Primary & secondary

CANCER

Biomarkers

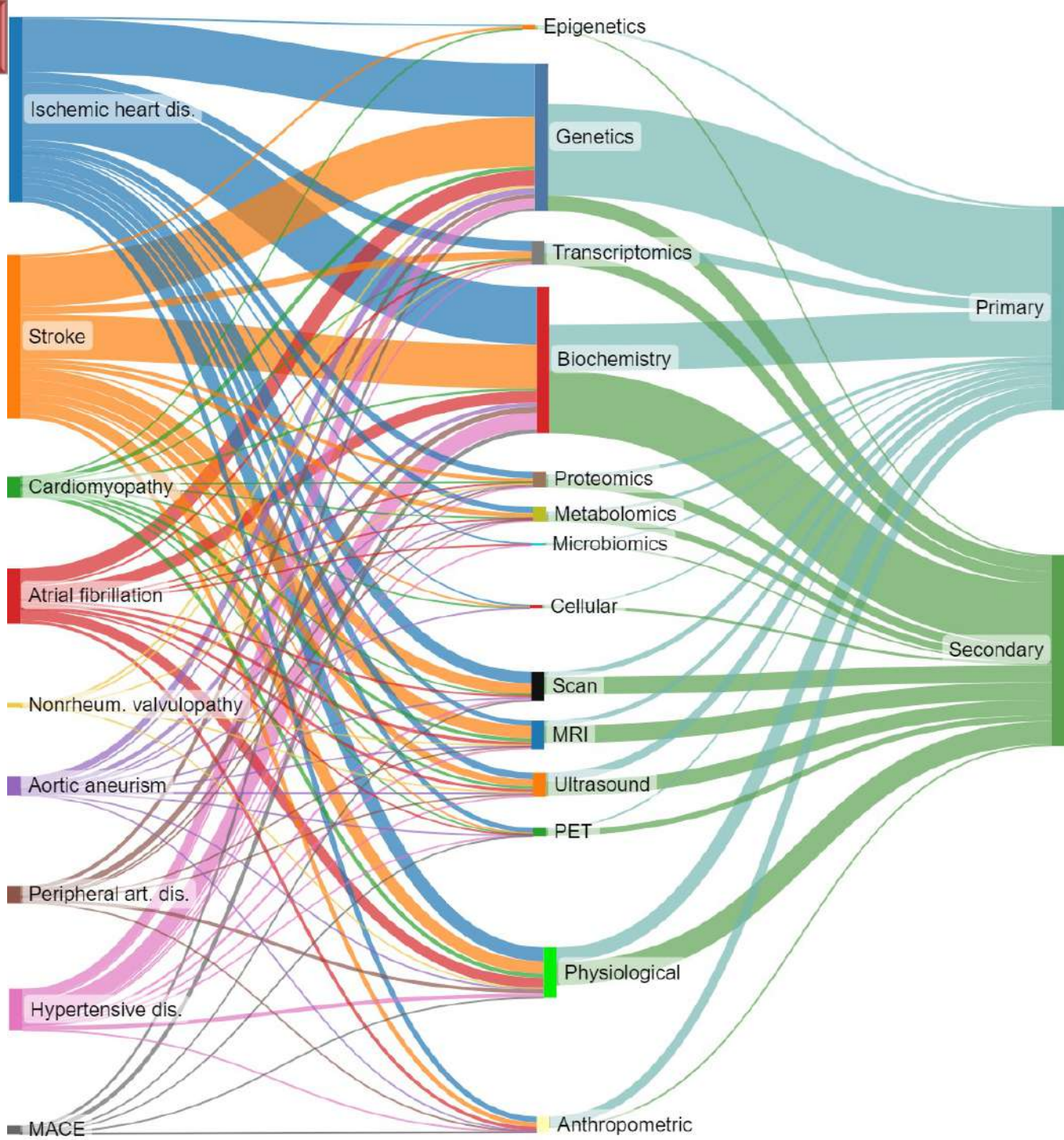
- Molecular biomarkers (mostly genetic)
- Use of other ‘omics, including epigenomics, transcriptomics, metabolomics, and proteomics, limited results
- Use of imaging, multi-omics technologies and AI in secondary prevention.



CARDIOVASCULAR DISEASES

Biomarkers

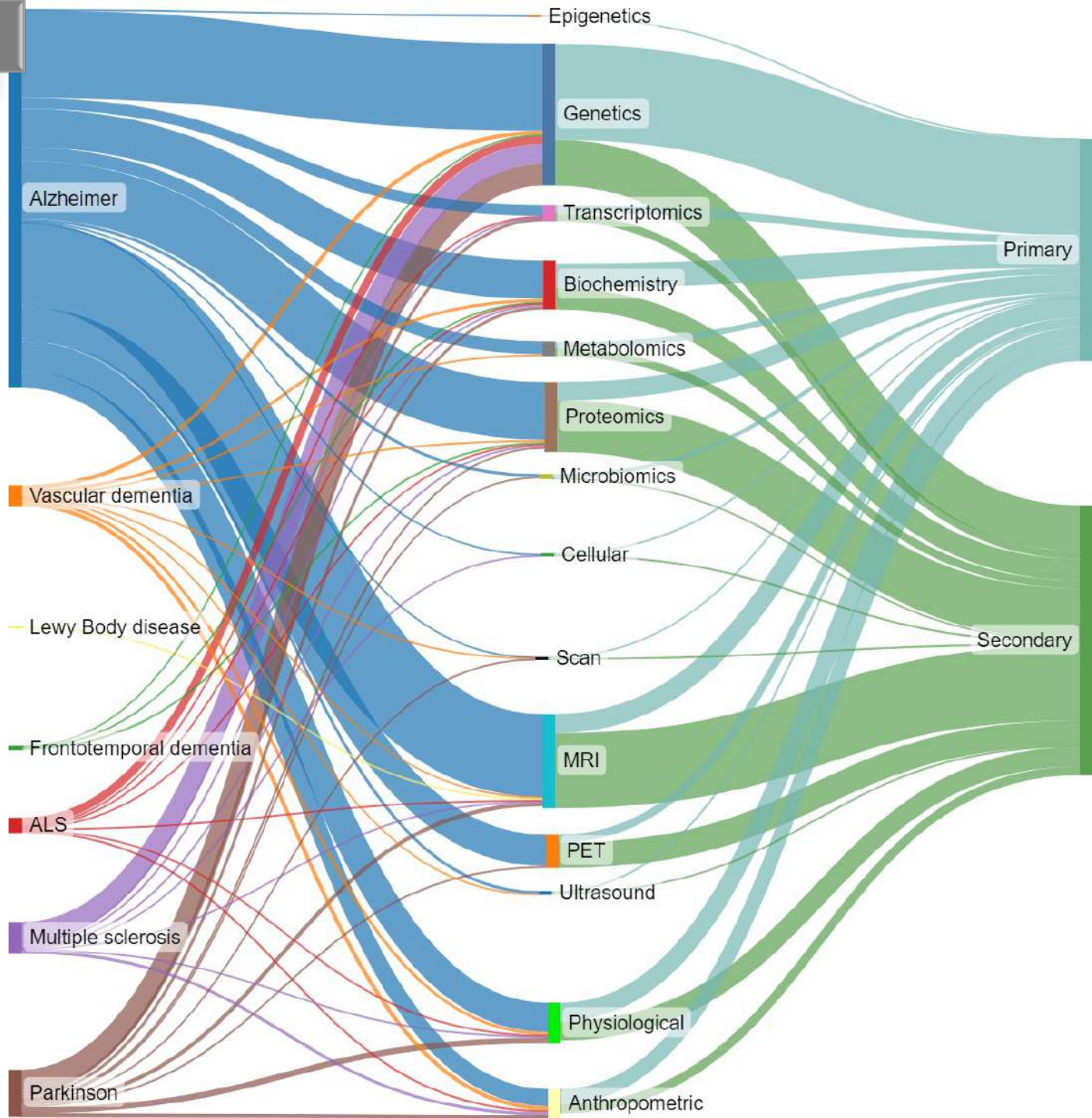
- Again, molecular biomarkers (mostly genetic)
- Biochemical biomarkers also relevant
- Physiological biomarkers
- Use of imaging, multi-omics technologies and AI in secondary prevention.



NEURODEGENERATIVE DISEASES

Biomarkers

- Alzheimer is the only disease with results for all biomarkers.
- Protein-based biomarkers fairly well represented:
  Multiple studies using amyloid types and fractions in blood samples (surrogate for more expensive or invasive tests)
- Imaging (specially MRI & PET/SPECT).



General comments

→**Cancer** is the area with more research, followed by **CVD**. Scarce investigation in **neurodegeneratives**

- ❖**AI** most frequently used with image BM or large amounts of data → **predictive** models/ **early** detection
- ❖Low integration of wearables or other technologies

→ Biomarkers should add to what we already know in prevention, and **we know a lot**….

Genomic/genetic biomarkers:

- The **biomarker category most** researched in **primary** prevention
- The **second category** (after Image biomarkers) most reasearched in **secondary**

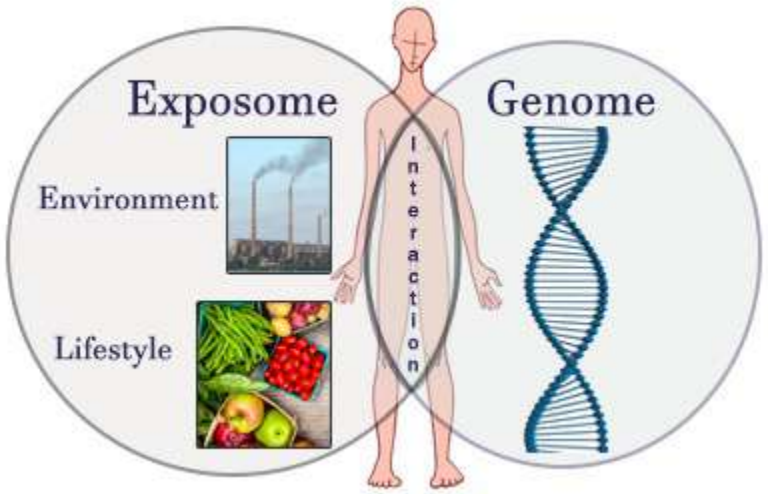
Allows to identify a low number of persons with high risk

↓

In most cases, primary prevention is

- ➢ General healthy lifestyle recommendations
- ➢ Controlling known risk factors

Potentiality of population-based personalization



https://blogs.cdc.gov/genomics/2022/09/06/from-the-genome-to-the-exposome/

→ Some good examples of **gene-environment interactions**, but, in general, relatively scarce literature.

→ **Epigenetic biomarkers** currently under researched
(crucial role in understanding environmental/lifestyle factors)

→ Other –omics (i.e. microbiota)

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OSFHOME

Biomarkers for personalized prevention of chronic diseases /

Interactive gap maps on available biomarkers for risk prediction and stratification in cancer, cardiovascular and neurodegenerative diseases

	Primary prevention		Secondary prevention
	Lifestyle-related factors/family risk	Study population	Study population
Cancer	✓	✓	✓
CVD	✓	✓	✓
Neurodegenerative diseases	✓	✓	✓

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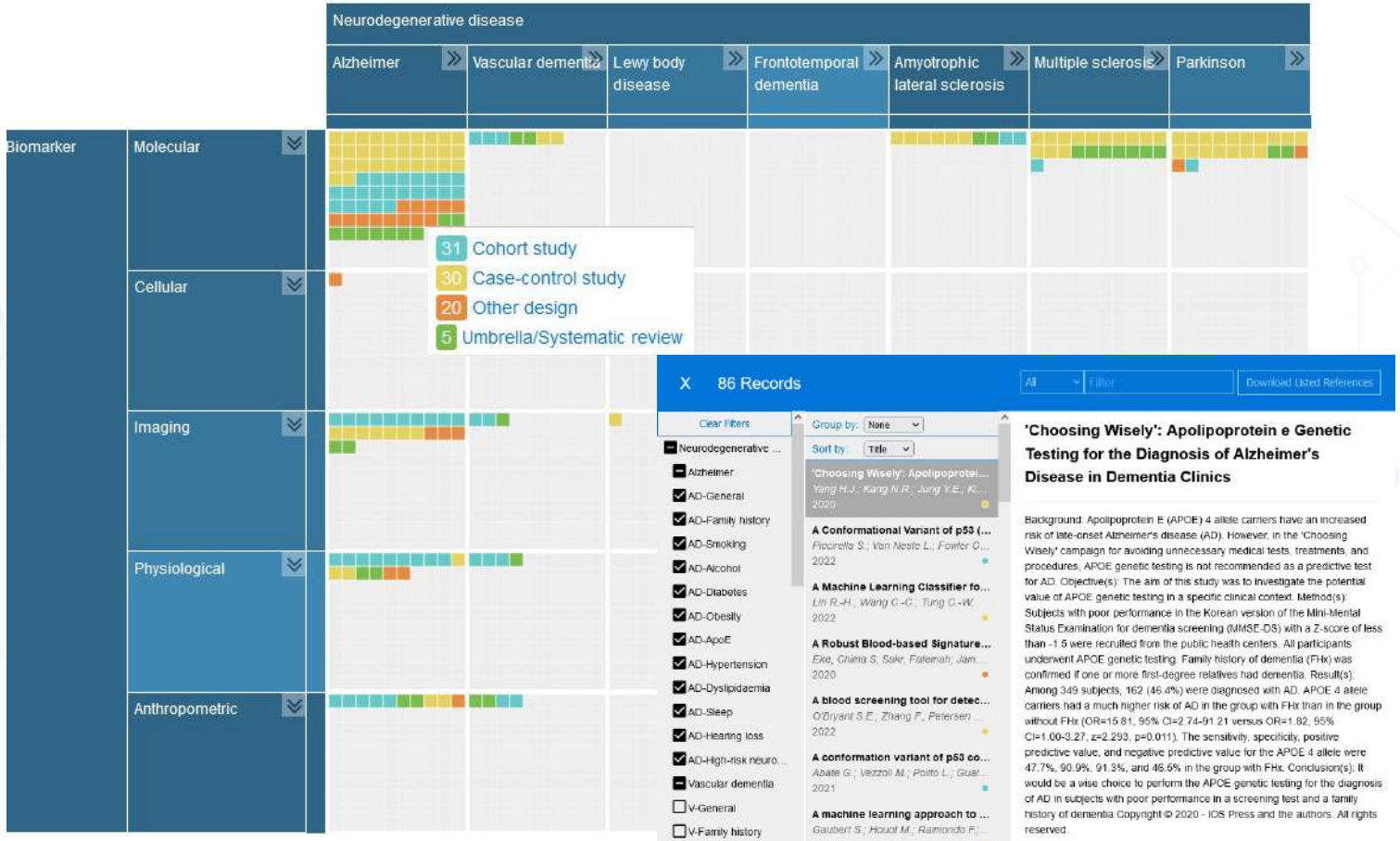
Biomarkers in personalised primary prevention of neurodegenerative diseases by study population

Co-funded by the European Union

UK participant in Horizon Europe Project PROPHET is supported by UKRI grant number 10040948 (Foundation for Genomic & Population Health).



https://biodama.isciii.es/prophet/

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Mapping the state-of-the-art and bottlenecks for the adoption of personalized preventive approaches in Europe and beyond

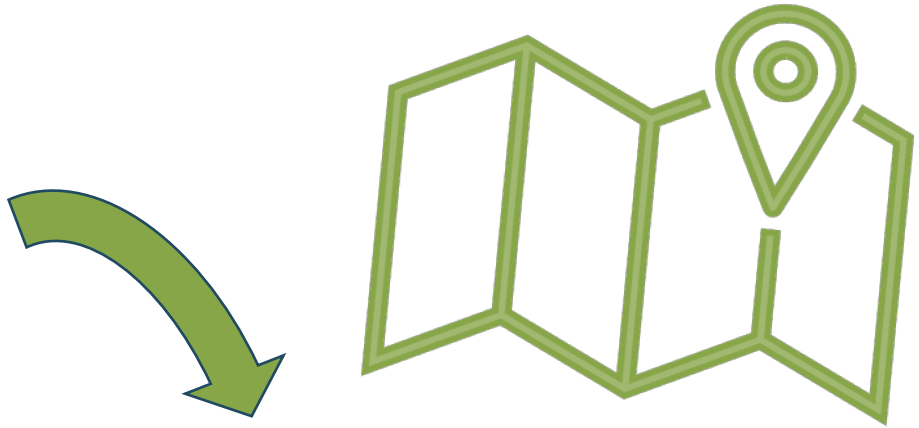
Partners: Sara Farina (UCSC) and **Maria Luis Cardoso (INSA)**

Team: KI, CIBER, VUMC, THL

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

Aims and outputs

- Mapping the state-of-the-art of personalised preventive approaches in Europe and beyond
- Collect critical factors, bottlenecks and gaps that preclude their effective implementation
- Provide a set of examples of preventive approaches according to all three levels of prevention, including useful information for the structuring of the PROPHET Framework



D2.4 - Report on critical factors for the successful adoption of Personalised Prevention approaches by healthcare systems (**UCSC**)

Submitted

Methodology

Literature review

Scoping review of scientific and grey literature on personalized approaches on primary, secondary and tertiary prevention and bottlenecks for the implementation across health systems in Europe and beyond.

Task 2.2.1

Survey

Target end-users across Europe:

- patients
- health professionals
- insurers
- policy makers

Collect their perspectives regarding implementation, usability, functionality, limitations and possible improvements of personalized prevention programs currently in place.

Definitions

Personalized Preventive Approach

an action, or a set of actions, in which the information provided by **genetic and/or other omic biomarkers testing**, combined with demographic, environmental and behavioral characteristics, socio-economic and cultural context of individuals, **guides the decision-making** process regarding one or more interventions aimed at **preventing** the onset, progression and recurrence of diseases

Bottlenecks for implementation

any **barriers, limitations or obstacles** to the implementation of personalized medicine approaches in health systems, concerning **laboratory and clinical research**, health professionals' and citizens' **knowledge**, **ethical, legal and social** issues and **operational** aspects

Scoping review methodology

- Inclusion criteria:
  1. prospective primary studies, guidelines and recommendations on **personalized preventive approaches** for **common chronic diseases**
  2. reviews about **bottlenecks** for their implementation
  3. English language
  4. from 2017 to 2023

- Arksey - O'Malley and ScPRISMA Checklist
- Pubmed, Scopus, WebofScience, Google Scholar and grey literature

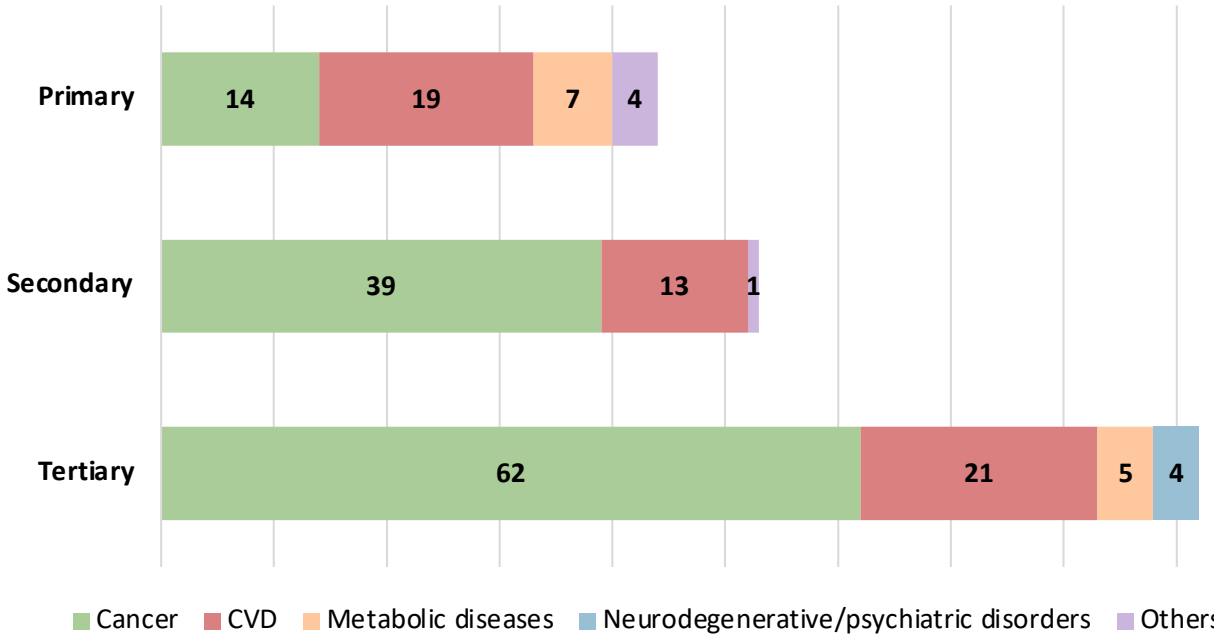
Key words:

- *personalized prevention, precision medicine*
- *approach, program, intervention, strategy, pathway,*
- *genetic, omic*

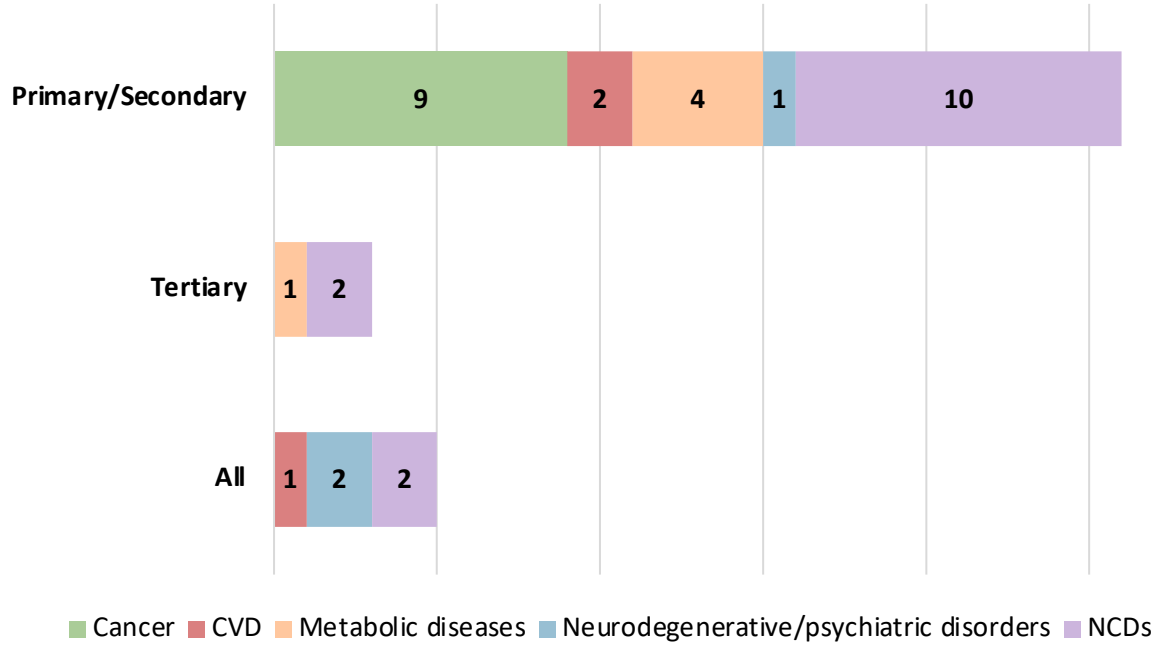
Protocol registration DOI on OSF:
https://doi.org/10.17605/OSF.IO/M4SZ3

Results: 134 records included

100 studies on 189 personalized preventive approaches



34 reviews on bottlenecks for implementation



Personalized primary prevention: examples

Preventing **disease onset** strategies:

1. Communicating genetic risk, changing **behavior/lifestyle**
2. **Preventive therapies/interventions**, based on genetic risk

BMJ Nutr Prev Health. 2020 May 21;3(1):49-59. doi: 10.1136/bmjnph-2020-000073. eCollection 2020.

Enhanced long-term dietary change and adherence in a nutrigenomics-guided lifestyle intervention compared to a population-based (GLB/DPP) lifestyle intervention for weight management: results from the NOW randomised controlled trial

Justine Horne [1 2], Jason Gilliland [3 4 5 6 7 8], Colleen O'Connor [7 9], Jamie Seabrook [3 6 7 8 9], Janet Madill [7 9]

JOURNAL ARTICLE

Effectiveness and feasibility of cardiovascular disease personalized prevention on high polygenic risk score subjects: a randomized controlled pilot study

Margus Viigimaa ✉, Mikk Jürisson, Heti Pisarev, Ruth Kalda, Helene Alavere, Alar Irs, Aet Saar, Krista Fischer, Kristi Läll, Krista Kruuv-Käo ... Show more

Author Notes

European Heart Journal Open, Volume 2, Issue 6, November 2022, oeac079, https://doi.org/10.1093/ehjopen/oeac079

Published: 15 December 2022 **Article history** ▾

Personalized secondary prevention: examples

Early detection strategies:

1. **Screening programs** through population stratification
2. Communicating genetic risk, increasing **screening adherence**

SPECIAL ARTICLE | VOLUME 34, ISSUE 1, P33-47, JANUARY 2023 Download Full Issue

Risk reduction and screening of cancer in hereditary breast-ovarian cancer syndromes: ESMO Clinical Practice Guideline☆

C. Sessa • J. Balmaña • S.L. Bober • ... K.-A. Phillips • S. Paluch-Shimon • on behalf of the ESMO Guidelines Committee ✉* • Show all authors • Show footnotes

Open Archive • Published: October 25, 2022 • DOI: https://doi.org/10.1016/j.annonc.2022.10.004 •

Randomized Controlled Trial > Genet Med. 2021 Dec;23(12):2394-2403.

doi: 10.1038/s41436-021-01292-w. Epub 2021 Aug 12.

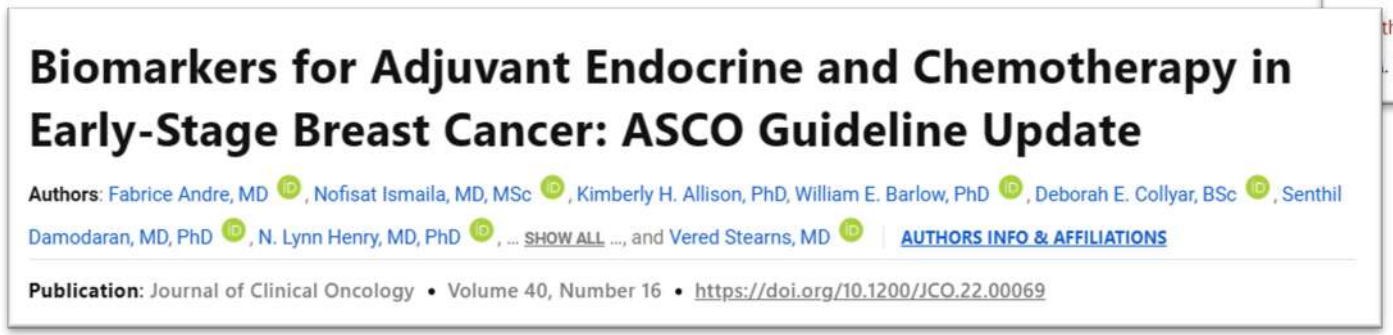
Impact of personal genomic risk information on melanoma prevention behaviors and psychological outcomes: a randomized controlled trial

Amelia K Smit [1 2], Martin Allen [3], Brooke Beswick [1], Phyllis Butow [4], Hugh Dawkins [5 6], Suzanne J Dobbinson [7], Kate L Dunlop [1], David Espinoza [8], Georgina Fenton [1], Peter A Kanetsky [9], Louise Keogh [10], Michael G Kimlin [11], Judy Kirk [12], Matthew H Law [13 14], Serigne Lo [2], Cynthia Low [15], Graham J Mann [2 16], Gillian Reyes-Marcelino [1], Rachael L Morton [2 8], Ainsley J Newson [17], Jacqueline Savard [18], Lyndal Trevena [19], Sarah Wordsworth [20], Anne E Cust [21 22]

Personalized tertiary prevention: examples

Preventing **complications/recurrence** strategies:

1. **Target therapies**
2. **Pharmacogenomics**



Biomarkers for Adjuvant Endocrine and Chemotherapy in Early-Stage Breast Cancer: ASCO Guideline Update

Authors: Fabrice Andre, MD, Nofisat Ismaila, MD, MSc, Kimberly H. Allison, PhD, William E. Barlow, PhD, Deborah E. Collyar, BSc, Senthil Damodaran, MD, PhD, N. Lynn Henry, MD, PhD, ... SHOW ALL ..., and Vered Stearns, MD | AUTHORS INFO & AFFILIATIONS

Publication: Journal of Clinical Oncology • Volume 40, Number 16 • https://doi.org/10.1200/JCO.22.00069

July 12, 2022

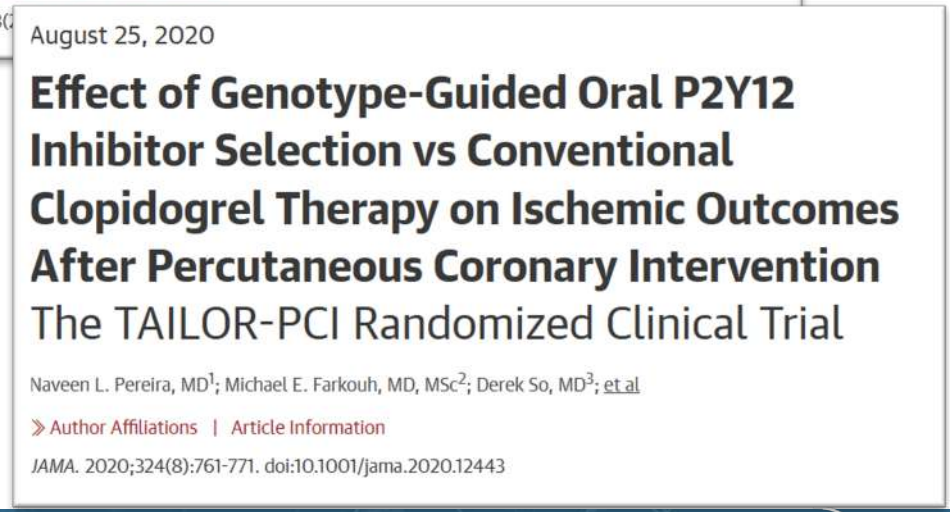
Effect of Pharmacogenomic Testing for Drug-Gene Interactions on Medication Selection and Remission of Symptoms in Major Depressive Disorder

The PRIME Care Randomized Clinical Trial

David W. Oslin, MD[1,2]; Kevin G. Lynch, PhD[1,2]; Mei-Chiung Shih, PhD[3,4]; et al

thor Affiliations | Article Information

. 2022;328(



August 25, 2020

Effect of Genotype-Guided Oral P2Y12 Inhibitor Selection vs Conventional Clopidogrel Therapy on Ischemic Outcomes After Percutaneous Coronary Intervention

The TAILOR-PCI Randomized Clinical Trial

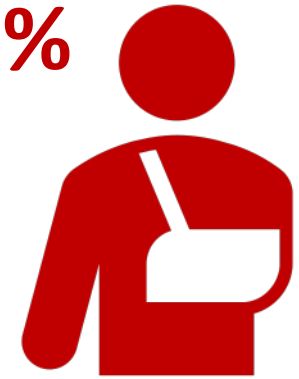
Naveen L. Pereira, MD[1]; Michael E. Farkouh, MD, MSc[2]; Derek So, MD[3]; et al

» Author Affiliations | Article Information

JAMA. 2020;324(8):761-771. doi:10.1001/jama.2020.12443

Bottlenecks and barriers from literature

62%



Citizens and patients

Poor knowledge
Public trust

47%

Equity

Applicability across populations

44%

Regulation

Lack of standards, regulations, and guidelines

41%

Research

Lack of clinical evidence

38%

Health Care Workers

Poor knowledge on PP

Final remarks

- Personalized prevention has **great potential**, especially for reducing the burden of **chronic diseases**.
- Extensive research has led to advanced personalized, especially in **personalized treatments** and **pharmacogenomics**.
- Despite advancements, the **overall implementation** of personalized prevention remains **unsatisfactory**.
- Challenges include the **need** for robust **clinical evidence**, **healthcare professionals' knowledge**, **healthcare inequalities**, and managing **psychological impacts** when delivering risk information.
- **Ongoing efforts** in personalized prevention hold **promise** for tailoring prevention strategies, emphasizing the need for further research and integration.

PROPHET
a PeRsOnalized Prevention roadmap for the future HEalThcare

Task N° 2.2.1. Mapping the state-of-the-art and bottlenecks for the adoption of personalized preventive approaches in Health Systems in Europe and beyond

Maria Luis Cardoso

Instituto Nacional de Saúde Doutor Ricardo Jorge, Lisbon, Portugal

PROPHET Workshop on Mapping Results | 14th March 2024

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Experts' interviews

Online survey

Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Experts' interviews development

- Semi-structured interviews
- Four groups of stakeholders:
  - *health professionals*
  - *citizens and patients' representatives*
  - *researchers*
  - *policy makers*
- Carried out online, using the Teams platform
- Interviews took place between April and July 2023

Online survey development

- Cross-sectional web-based survey administered via REDCap platform
- Targeting the 4 groups of stakeholders
- Content was developed based on barriers and enablers raised by experts
- Data collection: June to August 2023 (reassessed in February 2024)
- Status: Still open

Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Experts' interviews analysis

- Qualitative analysis of transcriptions using the **thematic analysis** method.
- Thematic analysis is a qualitative research method that entails searching across a data set to identify, analyse, and report repeated patterns (Braun & Clarke, 2006).

Survey instrument and data analysis

- A total of **112 items** representing **potential barriers and enablers** to the adoption of personalised prevention strategies, scored on a **6-point Likert scale**.
- Descriptive statistics were used (frequencies and percentages).

Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Interviews results | Sample

Experts' interviews results

26 experts

5

Policy makers

11

Health professionals

6

Researchers

4

Citizens/Patients

- From different European organisations and multiple countries.
- Provided their individual opinions and were not representing a country or organisation.

Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Interviews results | Barriers

Experts' interviews results

LEVEL(S)	THEME(S)	REPRESENTATIVE QUOTE
(I) HEALTHCARE SYSTEM	HEALTH STRATEGY INEQUITIES IN ACCESS CLINICAL PRACTICE	"I think most of the healthcare systems are simply not oriented at prevention. They are oriented at curing or first diagnosing and then curing disease. (...) the education of people is pointed at diagnosing and curing. The reimbursement system is pointed at diagnosing."
(II) RESEARCH	SCIENTIFIC STRATEGY SCIENTIFIC FUNDING	"The lack of robust evidence supporting personalised prevention strategies (...) that can demonstrate efficacy and safety, reduces the credibility of these interventions and can impact the uptake of these strategies. (…) Without solid evidence, there may be concerns about the efficacy, potential harms, or cost-effectiveness of these strategies."
(III) IMPLEMENTATION	TRANSLATIONAL GAPS SYNERGIES BETWEEN HEALTHCARE, RESEARCH AND INDUSTRY ELSI	"Despite efforts (…) personalised medicine is not perceived as the medicine of the moment but rather as an emerging research field with potential benefits in the future (…)."
(IV) AWARENESS, EDUCATION AND LITERACY	POLICY MAKERS HEALTH PROFESSIONALS CITIZENS AND PATIENTS	" (…) many individuals may not be aware of the availability, benefits, and importance of participating in screening programs or other personalised prevention initiatives (…) lack of trust and perceived benefits in healthcare systems, concerns about privacy, and perceived low personal relevance of personalised prevention strategies."
(V) PERSONAL ATTITUDES	HEALTH PROFESSIONALS CITIZENS AND PATIENTS	"I believe that there is resistance from various sectors to these [preventive] programs. there can be competition for the same resources, at the limit. There may also be issues related to the resistance of professionals themselves to developing these programs."

Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Survey results | Sample

Survey results

259 complete answers

24 (10%)

Policy makers

57 (22%)

Health professionals

81 (31%)

Researchers

97 (37%)

Citizens/Patients

Females: 172 (66%)

50 - 59 yrs: 72 (28%)

Doctoral studies: 129 (50%)

78 (30%)

23 (9%)

20 (%)

Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Survey results | Perceived barriers

Survey results

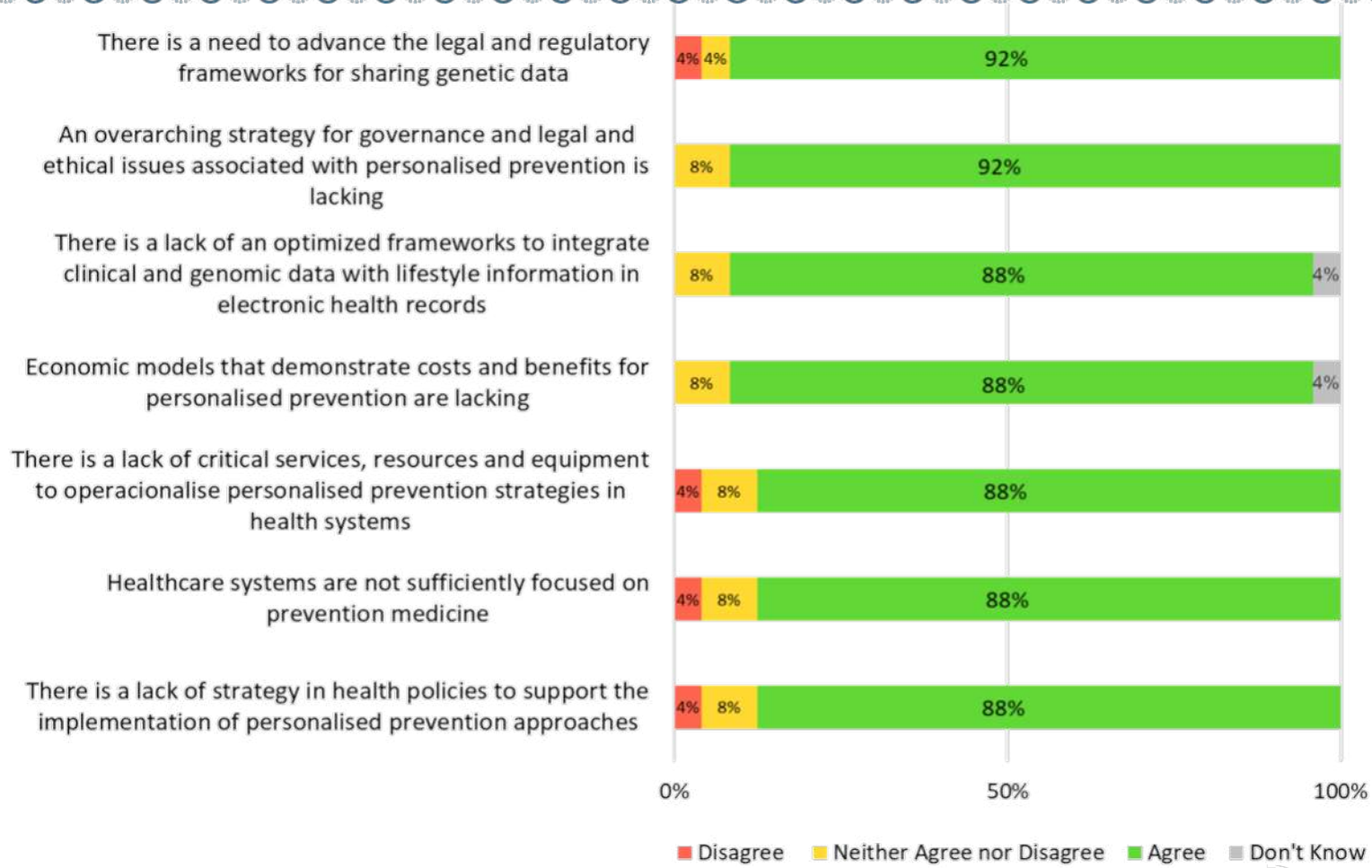
24

(10%)

Policy makers

Ethical, legal, and social implications (ELSI)

Health strategy



Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Survey results | Perceived barriers

Survey results

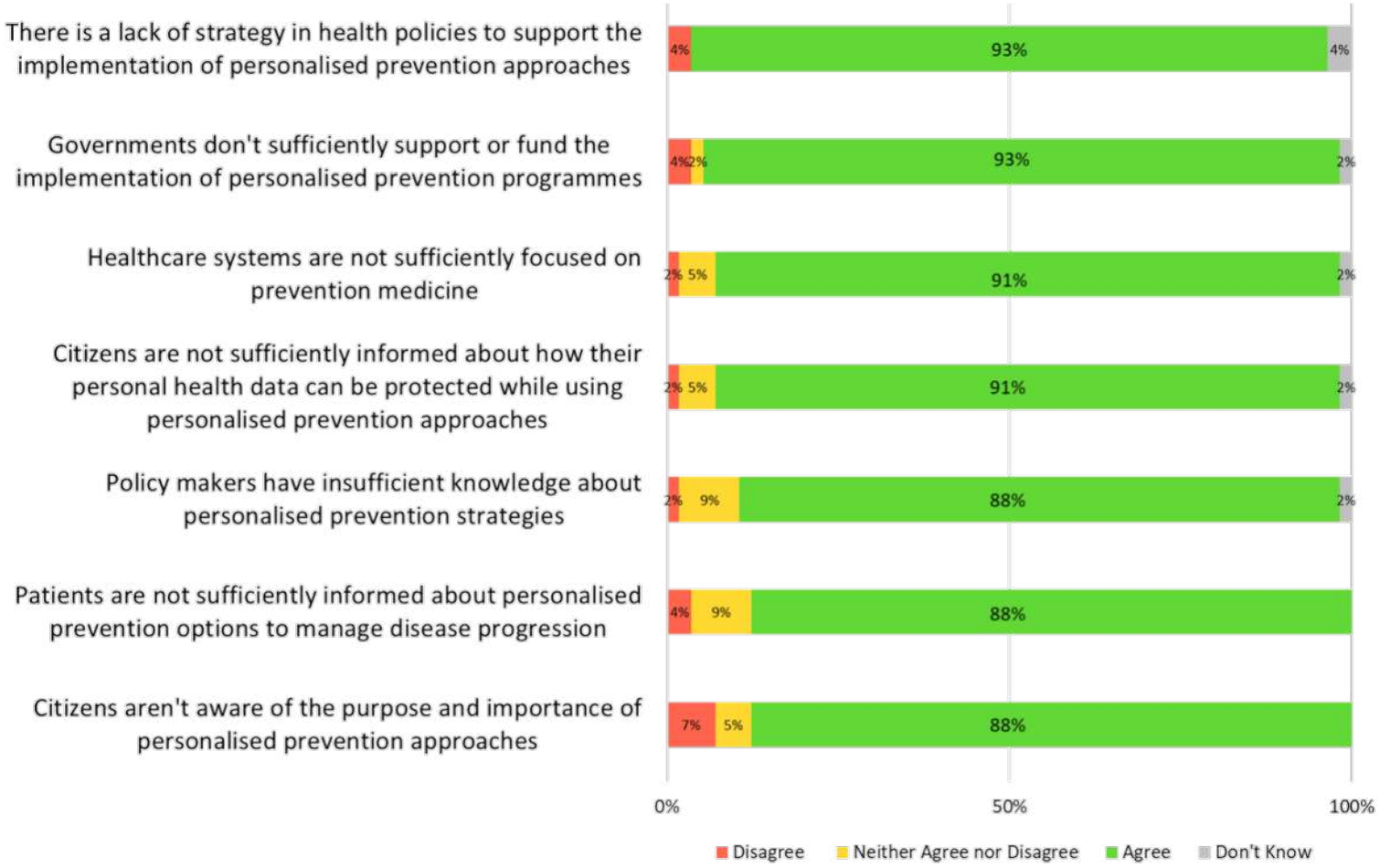
57

(22%)

Health professionals

Health strategy

Awareness, education and literacy of citizens/patients, health professionals and policy makers



Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Survey results | Perceived barriers

Survey results

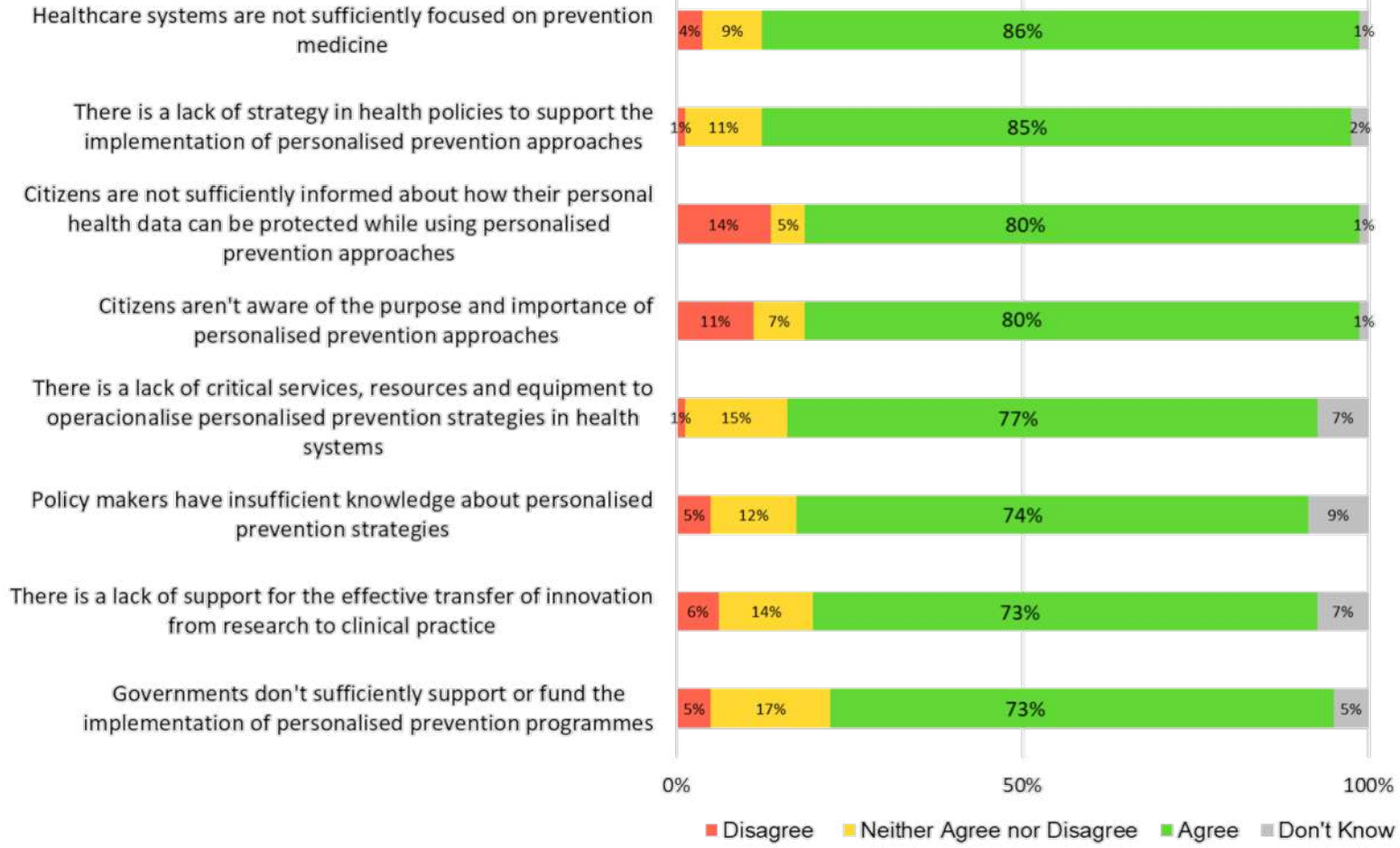
81

(31%)

Researchers

Health strategy

Awareness, education and literacy of citizens/patients and policy makers



Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Survey results | Perceived barriers

Survey results

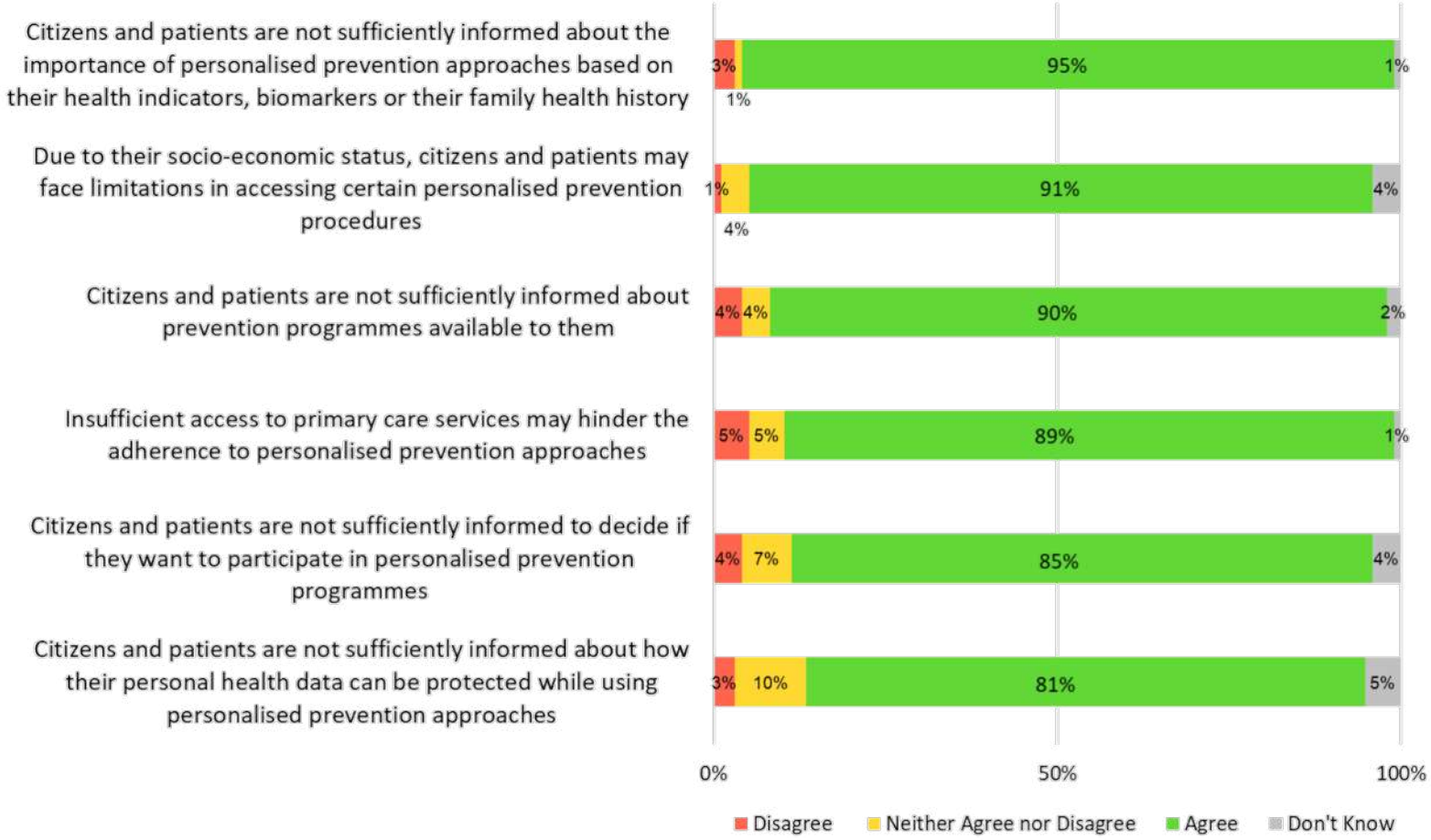
97

(37%)

Citizens/Patients

Awareness, education and literacy of citizens/patients

Inequities in accessing the healthcare system



Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Results| Summary

Stakeholder consultation

Four barriers highlighted by all stakeholder groups:

1. Health systems are geared towards care and not towards prevention;
2. Awareness and understanding of the PP concept is low, particularly for citizens/patients, policy-makers and health professionals;
3. Lack of basic and life-long training for health professionals, insufficient evidence to raise the interest of policy makers and a true interest in improving literacy of citizens and patients are challenges;
4. Insufficient research, evidence of cost-efficiency and regulation for translation were also highlighted as main issues to be addressed.

Perceived barriers, challenges, and enablers for the adoption of personalised prevention strategies in EU and beyond - Stakeholders consultation

Your collaboration is important!

Take our survey!

Thank you!

PROPHET

a PeRsOnalized Prevention roadmap for the future HEalThcare

Report on existing Research Programmes and Projects in the field of Personalised Prevention

Dr. Alessandra Maio - UCSC

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

Aims and expected outputs of Mapping

- To map **research programmes** funded by the European Commission in which Personalised Prevention is included.

- To conduct a detailed analysis of the actual allocation of these funds identified for **research projects** related to Personalised Prevention, analysing which diseases are most represented.

Methodology

First Phase:

Desk research

- **Scoping review**:
  - Arksey and O'Malley (1).
  - PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) checklist (2).
- **Institutional online archives**.
- To retrieve **publicly available information** and **documentation**.

Second Phase:

Expert consultation

- Experts in the field of **Personalised Prevention or Medicine**, identified among the consortium and Advisory Board members.
- Created a **form** to enrich the document search phase.

Inclusion criteria:

- **Research funding programmes** in the field of Personalised Prevention in the European context;
- **Funded research projects** in the field of Personalized Prevention in the European context;
- **Ongoing** research programmes and projects;
- Documents in **English language**.

ROPHET
a PeRsOnalized Prevention roadmap for the future HEalThcare

1. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol. 2005 Feb;8(1):19–32.
2. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018 Oct 2;169(7):467–73

Results

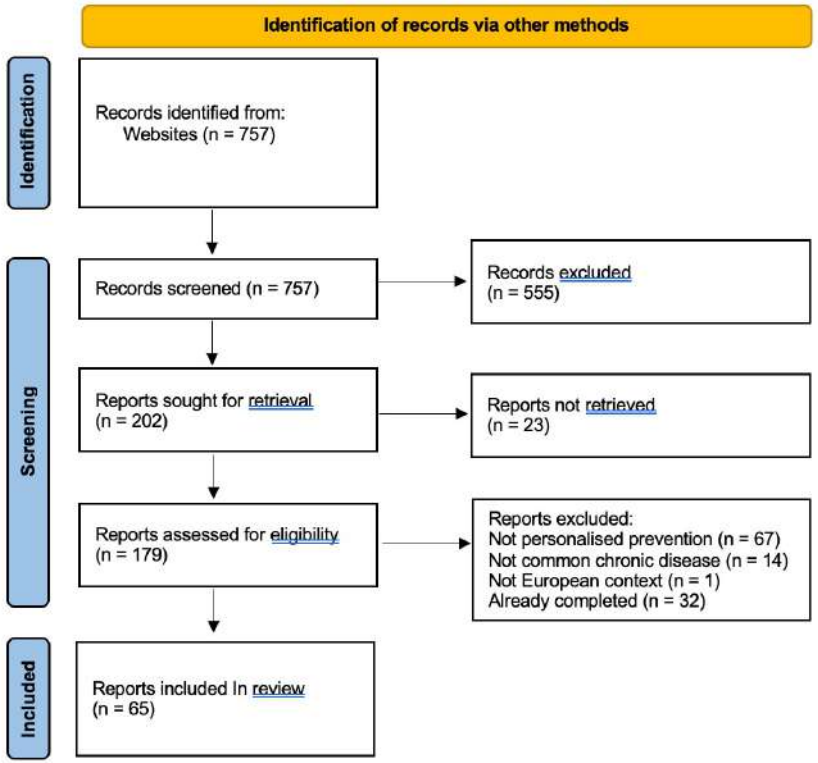


Figure. Prisma 2020 flow diagram for the Scoping review

Through the **Scoping review** and the **Expert consultation**

we identified:

- **2 main Research Funding Programmes**
- **45 Research Funded Projects**

Key features of Research Funding Programmes

General Funding Programme	Horizon Europe THE NEXT EU RESEARCH & INNOVATION PROGRAMME (2021 – 2027) European Commission		EU4Health programme for a healthier and safer Union #EUBudget #EU4Health
Total Budget	€95.5 billion		€ 5.3 billion
Specific Funding Programme	*HORIZON.1.1 - European Research Council (ERC)*	*HORIZON.2.1 - Health*	*HORIZON.4.1.1 - Widening participation and spreading excellence*	*HEALTH PROMOTION AND DISEASE PREVENTION (DP)*	*CANCER (CR)*
Specific Budget	€16 billion	€8.246 billion	€198 million	€ 70.9 million	€ 117.6 million
N. Funding schemes	1	3	1	N.R.	1
N. Calls	1	18	1	N.R.	3
N. Projects funded	1	24	1	N.R.	3

Key features of Research Funding Programmes

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N. Funding schemes	1	3	1	N.R.	1
N. Calls	1	18	1	N.R.	3
N. Projects funded	1	24	1	N.R.	3

Only 29... but we mapped 45 Research Funded Projects!

Research Funding Programme: HORIZON 2020 (H2020)

Duration: 2014-2020
Budget: € 80 billion

It was not included because it has **already finished**.
However, it has funded **16 ongoing projects**, that we included in our mapping.
The programme has been succeeded by **Horizon Europe**.

Research Funding Programme: HORIZON 2020 (H2020)

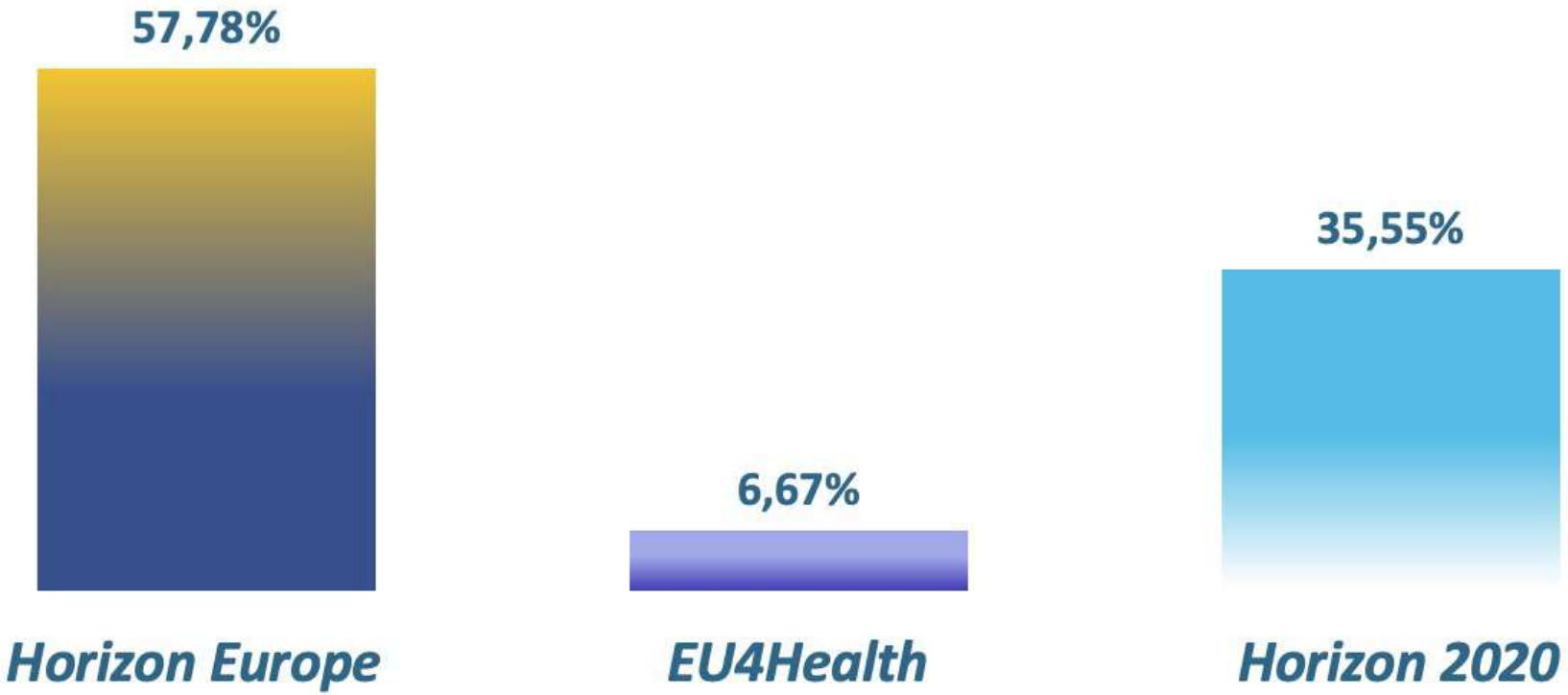
Duration: 2014-2020
Budget: € 80 billion

It was not included because it has **already finished**.
However, it has funded **16 ongoing projects**, that we included in our mapping.
The programme has been succeeded by **Horizon Europe**.

New main element of Horizon Europe compared to H2020

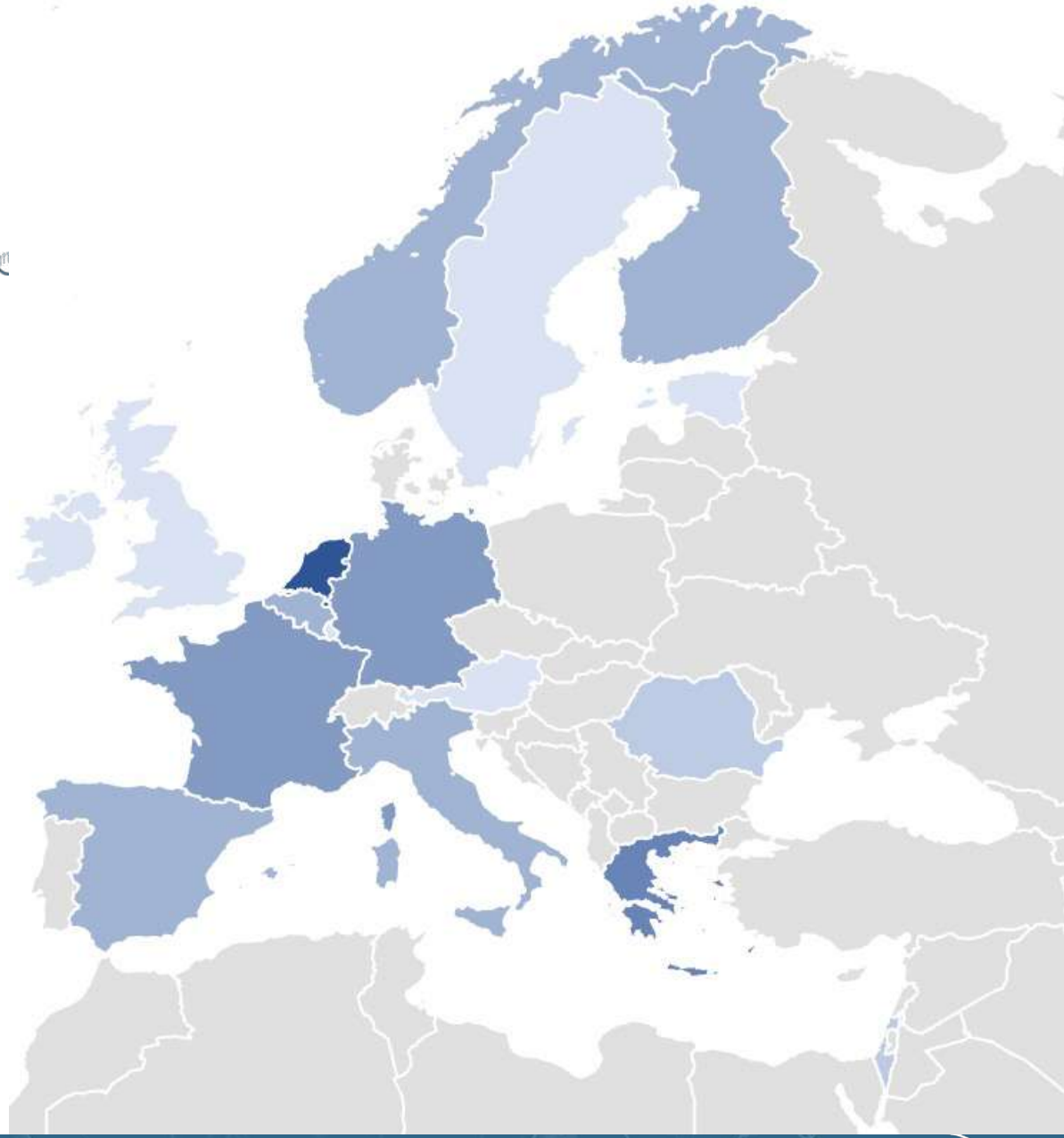
Five missions (set of measures to achieve bold, challenging and measurable goals within a given timeframe)

45 Research Funded Projects: distribution across funding programs



45 Research Funded Projects: Coordinator countries

Netherlands	15.56 %
Greece	11.11 %
France, Germany	8.89 %
Belgium, Finland, Italy, Norway, Spain	6.67 %
Israel, Romania	4.44 %
Austria, Estonia, Ireland, Luxembourg, Sweden, United Kingdom	2.22 %



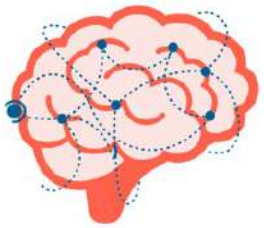
45 Research Funded Projects: distribution of type of disease

cancer

40 %

cardiovascular diseases

20 %

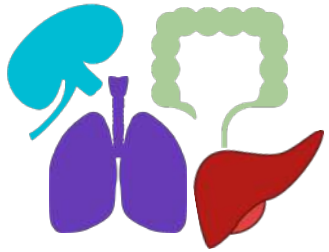


neuropsychiatric disorders

20 %

metabolic diseases

6,67 %



other type of chronic diseases

4,44 %

unspecified chronic diseases

8,89%

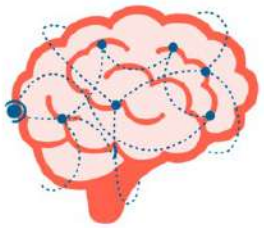
45 Research Funded Projects: distribution of funding programme across type of disease

cancer

HE 66.67%
EU4H 5.56 %
H2020 27.76 %

cardiovascular diseases

HE 55.55 %
EU4H 11.11 %
H2020 33.33 %

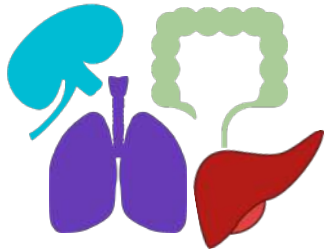


neuropsychiatric disorders

HE 44.44 %
H2020 55.55 %

metabolic diseases

HE 100 %



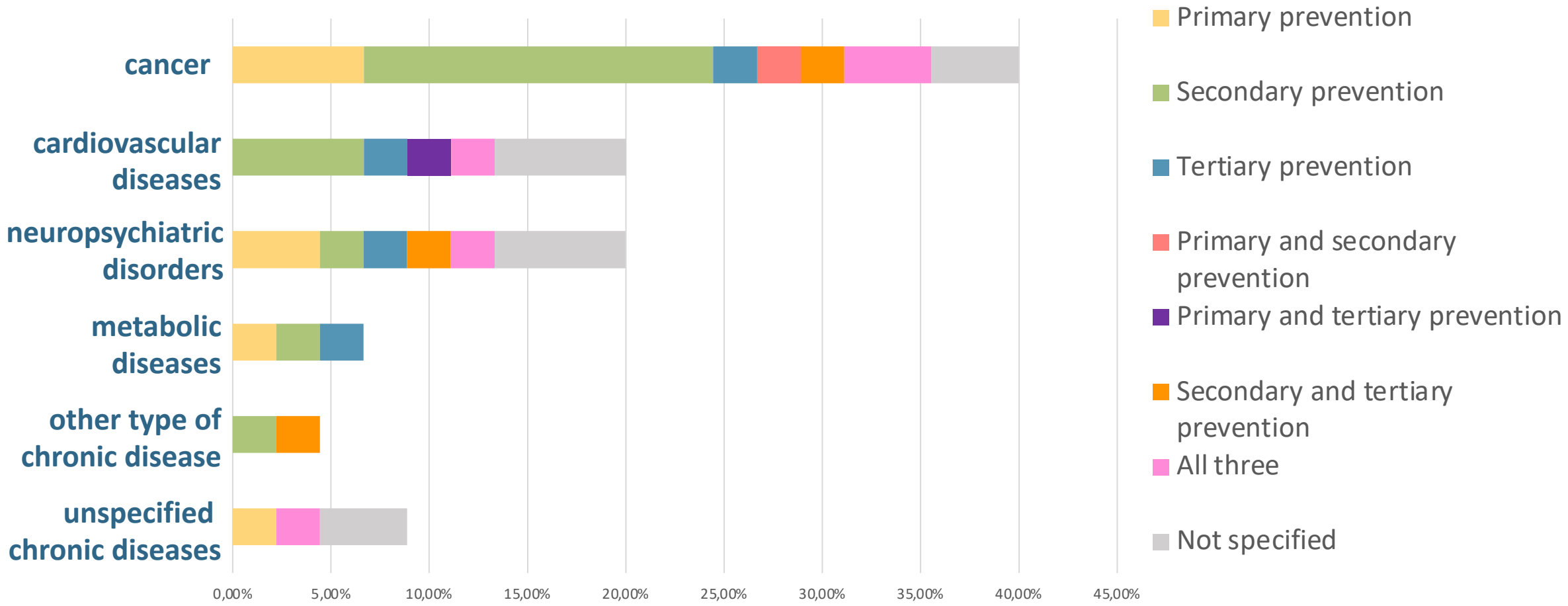
other type of chronic diseases

HE 50 %
H2020 50 %

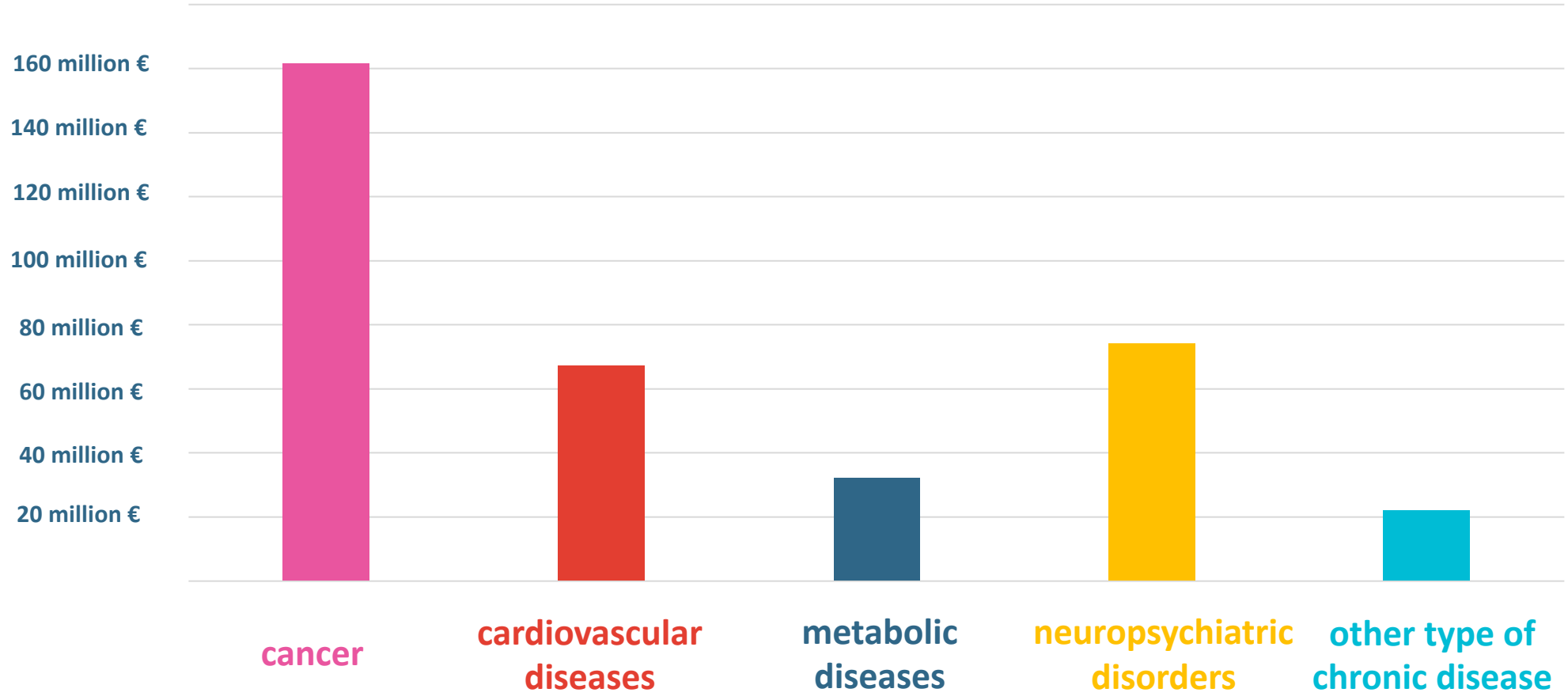
unspecified chronic diseases

HE 25 %
EU4H 25 %
H2020 50 %

45 Research Funded Projects: distribution of prevention level according to disease



45 Research Funded Projects: distribution of EU contribution (€) across type of disease



Conclusions

- The **research programmes** funded by the European Commission are characterised by large budgets and diversified funding schemes that promote research and innovation in the field of **personalised prevention**.

- Priority research efforts focus on **cancer**, followed by **cardiovascular** and **neuropsychiatric diseases**, reflecting their pervasive impact on global populations.

- However, this concentration of resources on high-burden diseases also highlights **potential disparities** in research focus between different health conditions.

PROPHET
a PeRsOnalized Prevention roadmap for the future HEalThcare

How do researchers and institutions measure clinical utility in personalised prevention? Results from a scoping review

Presenter: Angelo Maria Pezzullo (UCSC)
Team: **UCSC**, **UTARTU**, DEBRECEN, THL, INSA

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

Definition shapes the understanding

Understanding makes the difference

Simple questions

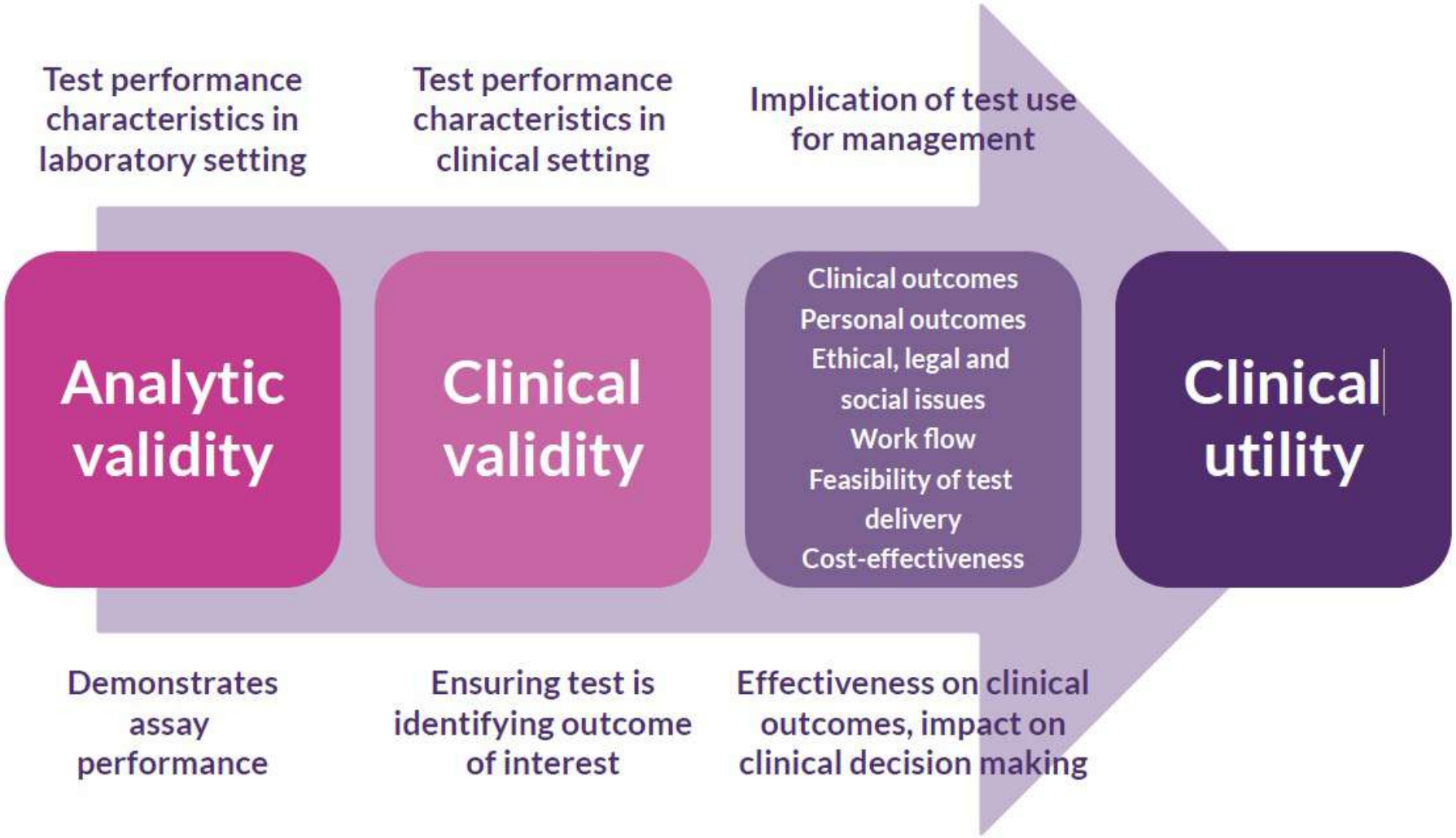
Is it true?	analytical validity
Is it meaningful?	clinical validity
Can we change the health outcome?	clinical actionability
Do we have means to bring it to everyday practice?	public availability

Prevention is all about timing:

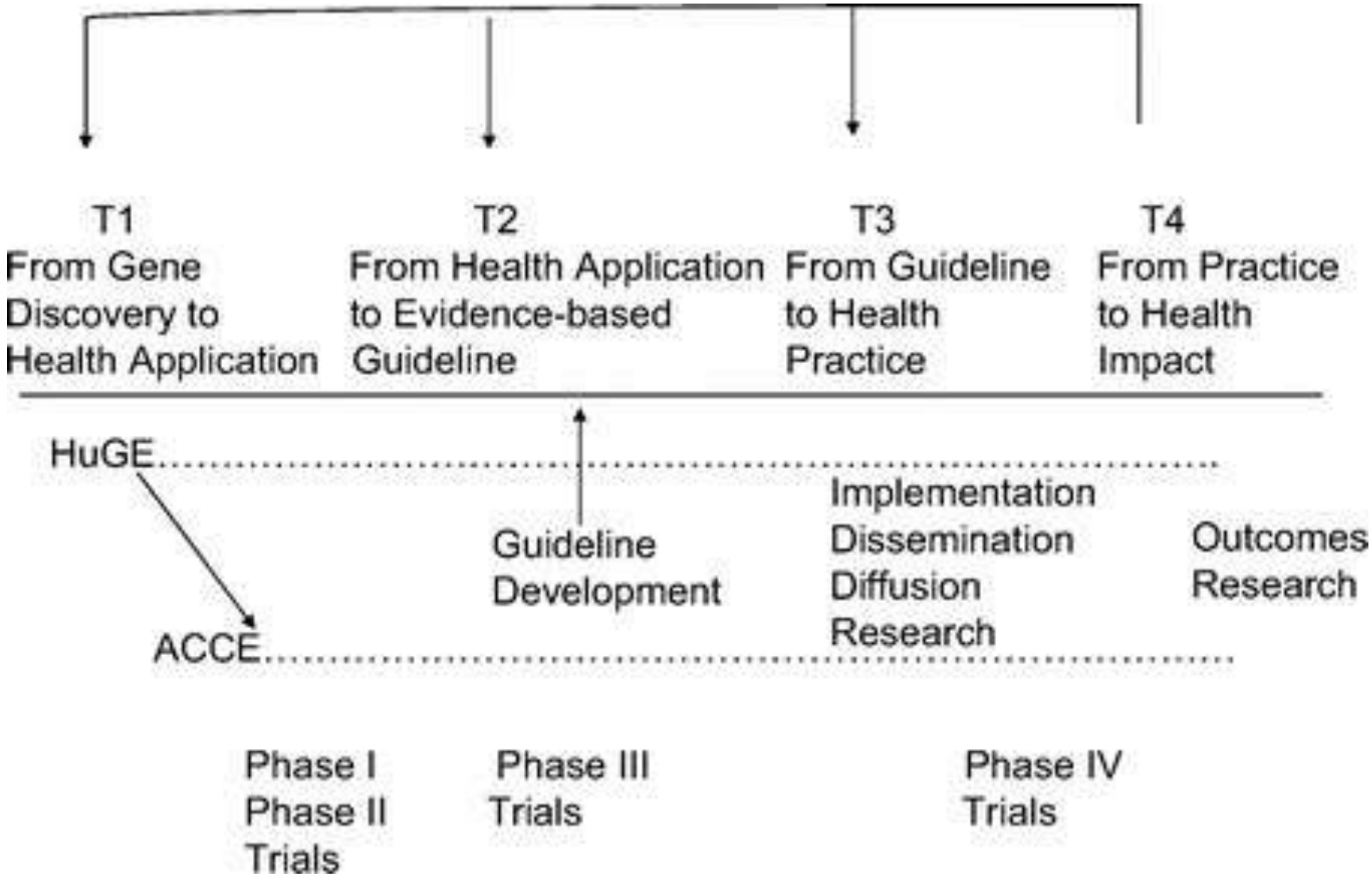
Will we start **timely** enough?

What would be the **cost of not acting** now?

Figure 2: Overview of the processes that can ultimately lead to demonstration of clinical utility



Ref: PHG Foundation, 2021



Ref: Khoury MJ et al., Genet Med. 2007t;9(10):665-74.

Review Article | Open access | Published: 08 February 2018

How is genetic testing evaluated? A systematic review of the literature

Erica Pitini ✉, Corrado De Vito, Carolina Marzuillo, Elvira D'Andrea, Annalisa Rosso, Antonio Federici, Emilio Di Maria & Paolo Villari

European Journal of Human Genetics **26**, 605–615 (2018) | Cite this article

8726 Accesses | **45** Citations | **34** Altmetric | Metrics

Abstract

Given the rapid development of genetic tests, an assessment of their benefits, risks, and limitations is crucial for public health practice. We performed a systematic review aimed at identifying and comparing the existing evaluation frameworks for genetic tests. We searched PUBMED, SCOPUS, ISI Web of Knowledge, Google Scholar, Google, and gray literature sources for any documents describing such frameworks. We identified 29 evaluation frameworks published between 2000 and 2017, mostly based on the ACCE Framework ($n=13$ models), or on the HTA process ($n=6$), or both ($n=2$). Others refer to the Wilson and Jungner screening criteria ($n=3$) or to a mixture of different criteria ($n=5$). Due to the widespread use

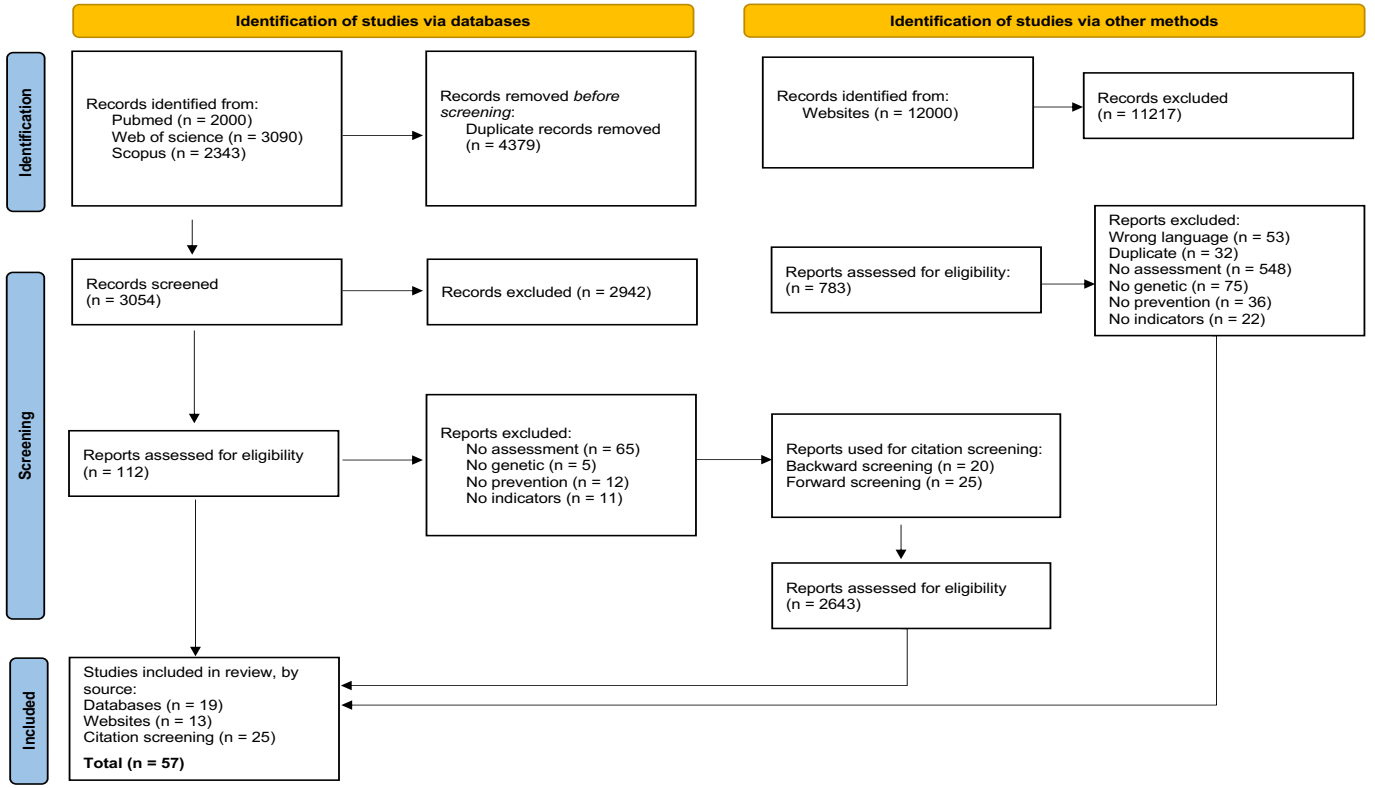
DIMENSIONS OF CLINICAL UTILITY

- Analytical validity
- Clinical validity
- Health outcome
- Economic impact
- Context
- Equity
- Legitimacy
- Feasibility
- Acceptability
- Personal value

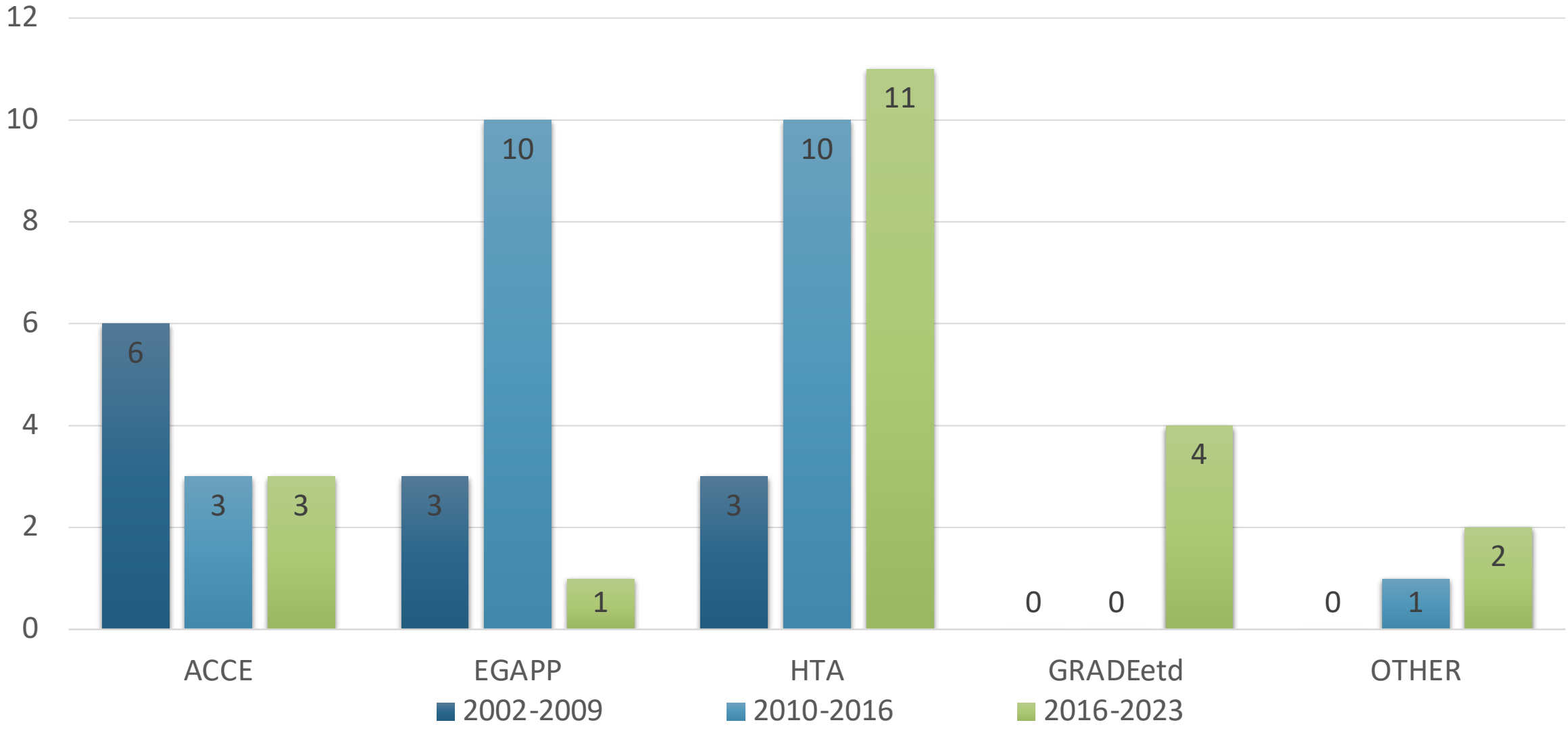
List of process and outcome indicators for the evaluation of the clinical utility of personalized preventive approaches

We conducted a **scoping review** that aimed to identify the general dimensions and specific process and outcome indicators that encompass clinical utility while assessing personalized prevention approaches

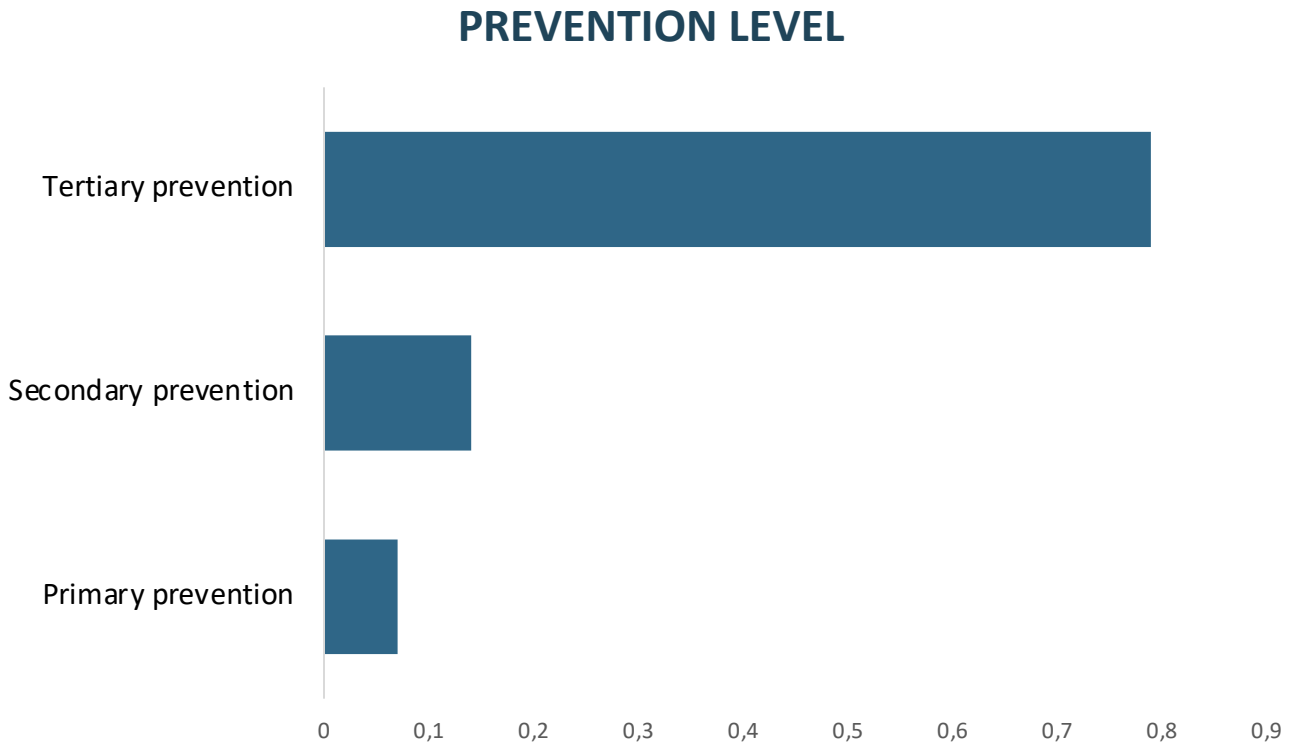
We collected 57 formal assessments of **genetic**, **genomics** or other **omics tests**



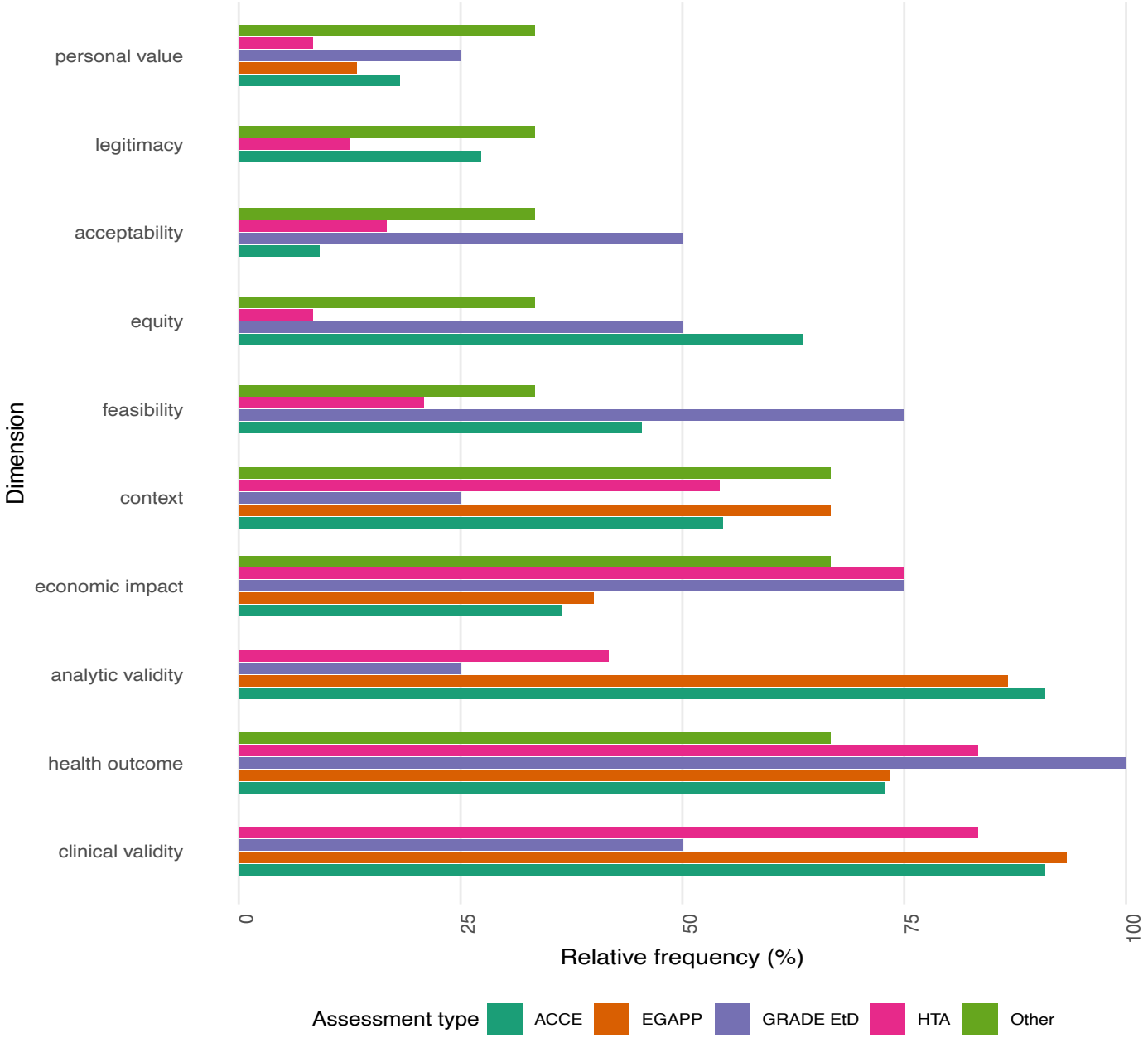
REFERENCE FRAMEWORKS



LEVELS OF PREVENTION AND DISEASE



Disease	Frequencies
Breast cancer	18 (32%)
Colorectal cancer	6 (11%)
Other types of cancer	7 (12%)
Cardiovascular diseases	19 (18%)
Hereditary disorders	7 (12%)
Other	9 (16%)

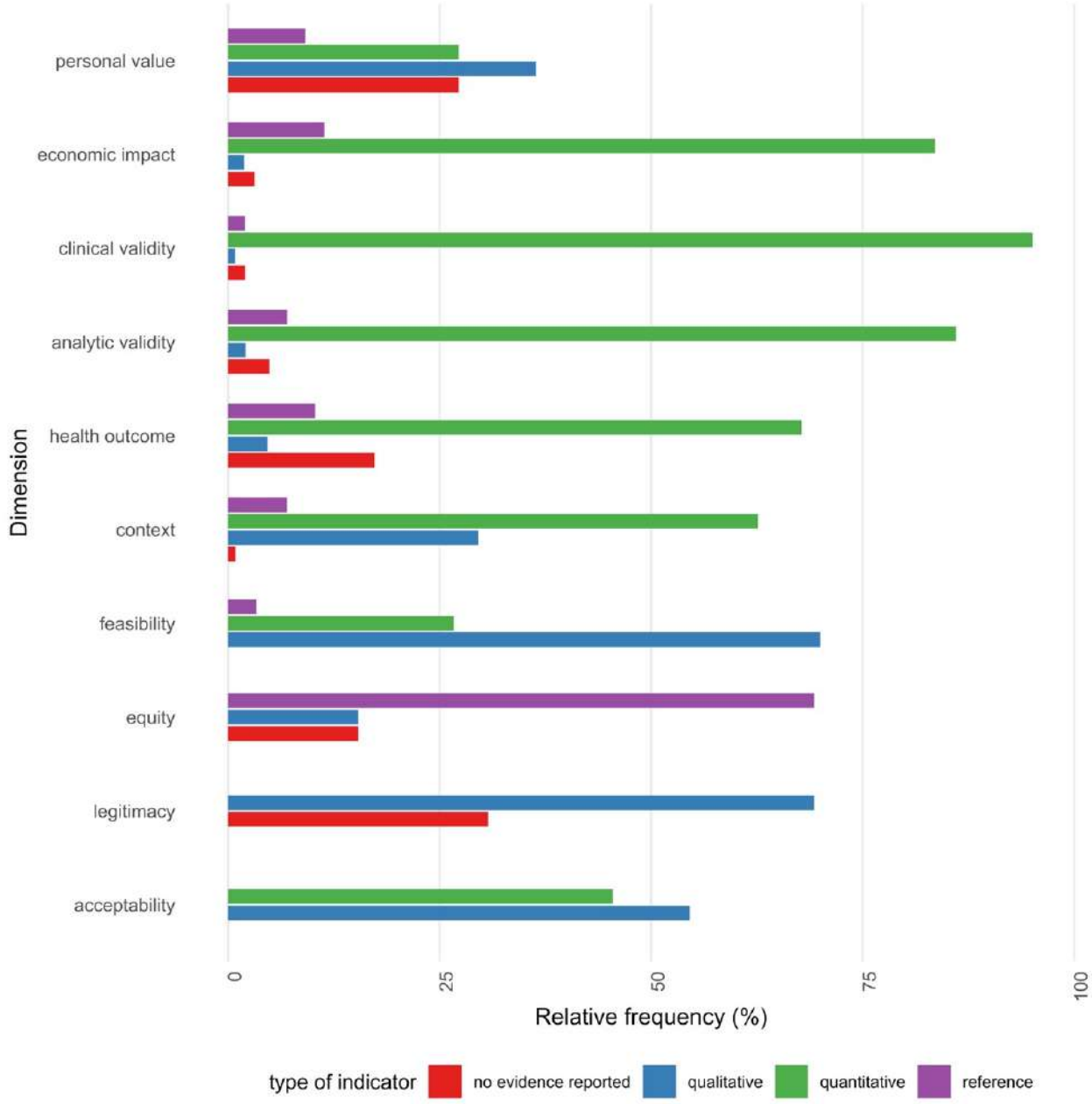


Analysis of 57 reports

Proportion of the documents that considered the dimension, stratified by assessment methodology

Analysis of 951 extracted indicators

Proportion of indicators within each dimension, classified by calculation methods



We distilled a total of 156 unique indicators

#	Dimension	Indicator name	Calculation methods	Numerator	Denominator	Assessment methods
1	acceptability	personal attitude toward genomic testing	proportion	number of patients having a positive feeling about genetic testing	total number of patients interviewed	GRADE EtD, Other
2	acceptability	proportion of adequately informed patients who refuse to undergo genetic testing	proportion	number of patients that refuse to do the test	total number of patients invited to do the test	ACCE, HTA, Other
3	acceptability	patient satisfaction with the information provided by the genetic test	proportion	number of patients that stated that they were satisfied with the information they had received before the test	number of patients who could recall having the genetic test	HTA
…	…	…	…	…	…	…

IMPLICATIONS (1/2)

- While many frameworks (29) have been developed, publicly available assessment reports are scarce
- While personalised technologies for primary and secondary prevention are attractive, the reports were predominantly on tertiary prevention (including therapy)

IMPLICATIONS (2/2)

- Analytical validity, clinical validity, health outcome and economic impact are emphasised
- However, scarcity of direct health outcome evidence means that few trials are conducted
- Personal value, acceptability, legitimacy, equity, and feasibility are rarely measured

PROPHET

a PeRsOnalized Prevention roadmap for the future HEalThcare

Clinical utility of prevention biomarkers - where are we?
T2.1.2

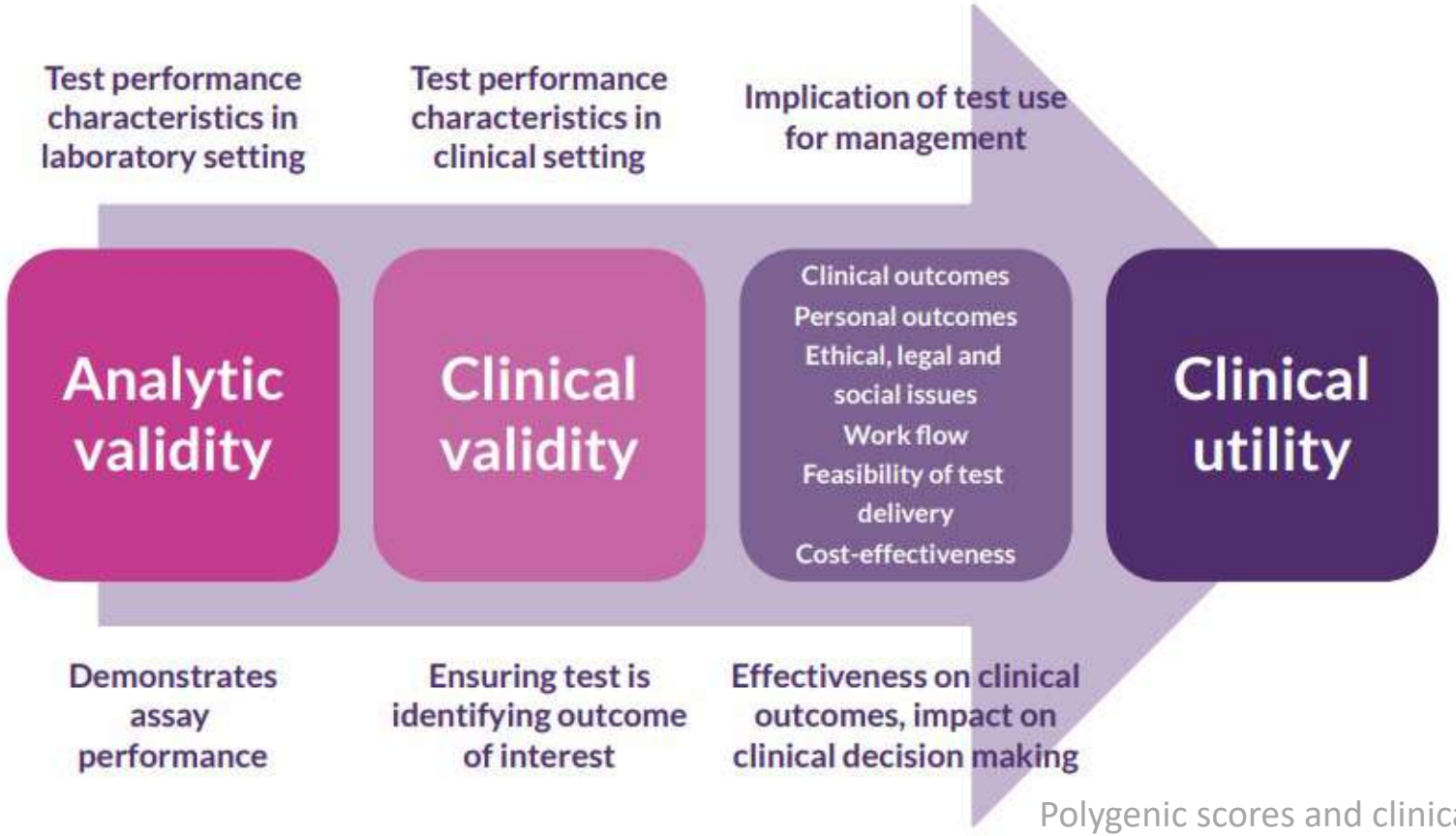
PHGF, CIBER, DEB, ALLELICA

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721
UK participant in Horizon Europe Project PROPHET is supported by UKRI grant number 10040946 (Foundation for Genomics & Population Health)

Task 2.1 Mapping on Basic and Translational Science, including aspects related to Clinical and Biomedical research and Data Analytics

- T2.1.1 Mapping available (and under development) biomarkers including genetics, for risk prediction and stratification (typology, current use, pros and cons aspects), and their potential integration with digital technologies (CIBER, PHGF, VUMC)
- **T2.1.2 Mapping scientific evidences reporting on the predictive power and clinical utility of biomarkers (PHGF, CIBER, DEB, ALLELICA)**
- T2.1.3 Mapping of existing Research Programmes in the field of Personalized Prevention in Europe and beyond as well as analysis of gaps and bottleneck in carrying out research in this field (UCSC, DEB)

Overview of the process to demonstrate clinical utility



Polygenic scores and clinical utility, 2021, PHG Foundation

PROPHET definition

Clinical utility of a test refers to the likelihood that it provides information that is of value to the person being tested to identify if an effective intervention or preventive strategy is required

Methodology

Prioritisation

Prioritise the biomarkers from the scoping reviews to further assess clinical utility

STUDY DESIGN: Meta-analysis with a systematic review, review and RCT papers

Cancer 843 → 77 CVD 775 → 47 Neurodegenerative diseases 286 → 17

Test definition

The **test** is described as the use of a biomarker assay within a specific **disease context**, in a particular **population** for a **particular purpose**

Clinical utility evidence searches

Evidence of clinical utility in personalised prevention is demonstrated by published

- Guidelines
- Health Technology Assessments
- Cost effectiveness studies

GuidelineCentral

INTERNATIONAL HTA DATABASE

Trip Pro

CRD Database

CEA REGISTRY

Results

	Searches		
	Cancer	**CVD**	**Neuro**
Test definitions	113	59	32
Biomarkers	82	33	25

	Searches with evidence		
	Cancer	**CVD**	**Neuro**
Test definitions	22	8	1
Biomarkers	22	5	1

Neurodegenerative diseases

- Cortical and hippocampal atrophy measurement using structural sMRI in a population with subjective cognitive decline (SCD) to predict clinical progression to mild cognitive impairment (MCI) or **Alzheimer's disease**

Results: CVD tests with evidence

- Use of a doppler ultrasound to detect atheroma or atherosclerosis and identify people at increased risk of **CVD**
- Apolipoprotein A1 (APOA1) blood test for early-stage screening in suspected patients of **ischaemic stroke**
- CAC scores to identify people at risk of **CVD** in a *general population* or in *type 2 Diabetes Mellitus patients*
- Cohorts for Heart and Aging Research in Genomic Epidemiology model for AF (CHARGE-AF) prediction model for primary screening of **atrial fibrillation** in *adults* or those *above the age of 65 years old*
- Risk Equations for Complications of Type 2 Diabetes (RECODe) score used identify *T2DM patients* at risk of **myocardial infarction** or **stroke** later in life

Results: Cancer

- Tyrer-Cuzick model to estimate risk of having high risk breast cancer mutations, and therefore risk of developing **breast cancer** in women
- GALAD score to predict risk of **liver cancer** among chronic liver disease patients
- Stockholm3 test to predict risk of **prostate cancer** in men aged 45 to 74 years with PSA of at least 1.5 ng/ml and no previous prostate cancer diagnosis
- Combination of digital breast tomosynthesis (DBT) & two-dimensional mammography (2DM) with VOLPARA software to automatically assess breast density for the screening of **breast cancer** in women (HTA + CEA)
- The ExoDx Prostate IntelliScore (EPI) for improved screening of **prostate cancer** (CEA)

Use not recommended *

- PanCan prediction model to estimate the probability of **lung cancer** for screen-detected solidary pulmonary nodules in adult patients
- Lung Cancer Death Risk Assessment Tool (LCDRAT) prediction model to identify patients at high risk of **lung cancer** death in adults
- PLCOm2012 model to identify patients at high risk of **lung cancer** in ever-smoker adults
- Prostate Health Index for the improved screening of **prostate cancer**
- Michigan prostate score (MiPS) to estimate an individual's risk of developing **prostate cancer**
- SelectMDX urine test to evaluate the risk of developing clinically significant **prostate cancer**

Genetic tests to identify variants in

- BRCA1 / BRCA2 genes for risk of **prostate cancer**
- CHEK2 / HOXB13 / MLH1 / MSH2 / MSH6 / PALB2 / PMS2 gene indicating risk of fatal **prostate cancer**
  - multi-panel gene test
- MLH3 / GREM1 gene indicating risk of **colorectal cancer (CRC)** in the general population

Additional searches for clinical genetic tests and polygenic scores

	Searches (Genetic)		
	Cancer	CVD	Neuro
Test definitions	113 (61)	59 (25)	32 (5)
Biomarkers	82 (33)	33 (13)	25 (5)

	Searches with evidence (Genetic)		
	Cancer	CVD	Neuro
Test definitions	22 (11)	8 (0)	1 (0)
Biomarkers	22 (11)	5 (0)	1 (0)

- Clinical genetic testing
  - Clinical utility in specific use cases
    - mainly high-risk individuals
- Polygenic scores
  - Highly active area of research in common diseases, many different use cases
  - Overall current guidelines / statements from professional organisations recommend they do not be used as more evidence of use is needed
    - One guideline supports use of PGS testing in CVD risk prediction under specific circumstances and requirements
  - Cost effectiveness studies starting to appear but early days

Discussion

- Challenges and limitations
- Clinical utility was demonstrated for some tests
- Most searches did not identify any evidence to assess of clinical utility of the tests
  - Not completely unexpected as many are novel biomarkers in early stages of R&D

Conclusion

- Our results demonstrate significant evidence gaps and lack of translation of promising biomarkers for prevention

- This requires urgent attention in order to accelerate the development of improved prevention interventions and programmes for the European population

Recommendations for the research agenda for prevention

1. Research funders should continue to fund high quality biomarker research and the necessary **translation and implementation studies** for biomarkers and the tests in which they are used
2. Research funders should encourage the **evaluation and validation** of biomarkers and the tests in different subpopulations (i.e., age groups; gender; population group) to improve information for personalised prevention approaches
3. Research funders should consider developing and implementing a **prioritisation approach** to support the necessary implementation and translation research for biomarkers/tests for prevention purposes
4. Research funders should promote the **consideration of other domains** (e.g. social, behavioural, environmental) to allow a more complete perspective of the usefulness of any proposed test or biomarker in terms of personalised prevention from the public health perspective
5. Researchers in the field of biomarkers should ensure that their research **clearly contributes to a test definition** for further translational research and prevention purposes
6. Research activity should continue to identify biomarkers in areas such as genomics, epigenomics, proteomics, metabolomics, microbiomics and exposomics, and to enhance their usefulness for personalised prevention **integrating this information with the development of risk prediction models**
7. Research in the use of machine learning algorithms should be supported as this can improve biomarker **validation efforts and the development of risk prediction models**. However, **standardisation in research methods and reporting**, is needed to translate these results into clinical practice
8. Greater efforts and resources are needed to **integrate data** from electronic health records (EHRs) into research, for example risk modelling using large-scale omics datasets linked with EHRs and other sources of data including socio-demographic and environmental exposures. **Appropriate research study designs** incorporating these elements will be needed to improve preventive strategies

PROPHET

a PeRsOnalized Prevention roadmap for the future HEalThcare

D2.6. (A) - Mapping of current practices of citizens', patients', healthcare professionals, policy makers engagement in Personalized Prevention (VUMC, EPF, ACN) (M1-M18).

Loes Lindiwe Kreeftenberg, PhD candidate & Carla van El PhD

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Amsterdam UMC, Location: VUMC

Amsterdam UMC
University Medical Centers

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

Why is stakeholder engagement important?

A personalised approach to healthcare envisions and requires the public and patients to be:

✓ educated and empowered to control their own health and influence healthcare and research

Aim:
To map the current practices of public and patient engagement in personalized prevention in Europe

Method:

Systematic Scoping review

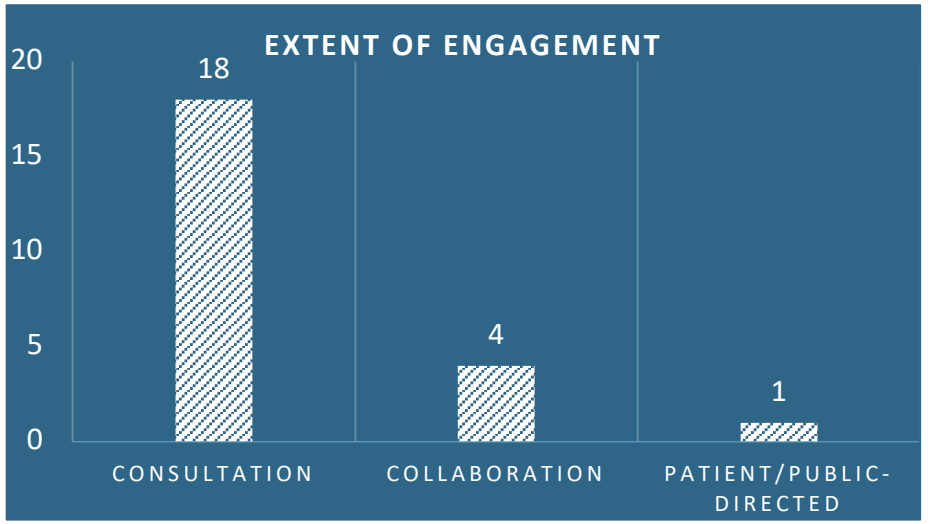
2015 - 2023

Disease focus: common chronic disease

Cardio-vascular diseases

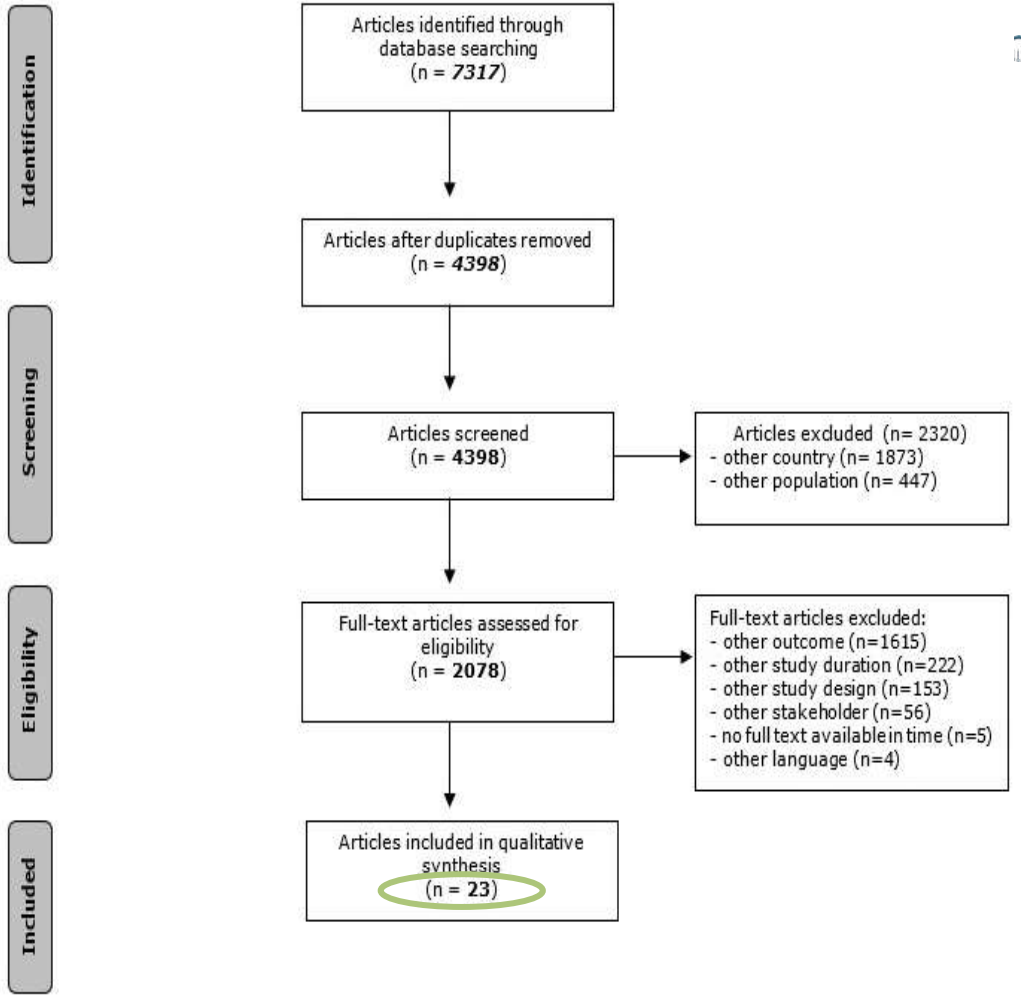
Cancers

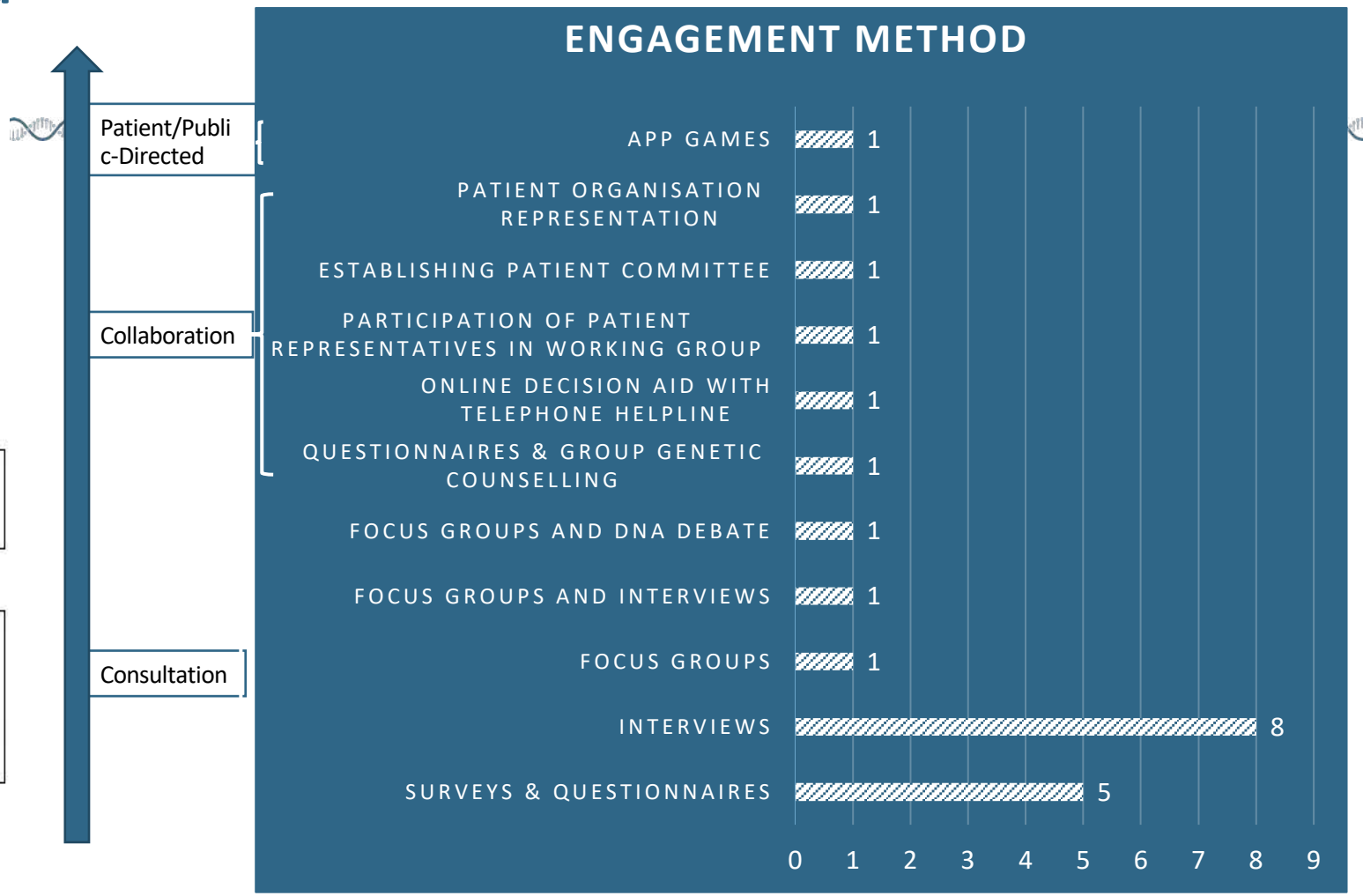
Neurodegenerative disorders



ROPHET
a PeRsOnalized Prevention roadmap for the future HEalThcare

Methods: Flowchart &
Results: Engagement Method





> Sociol Health Illn. 2017 Jan;39(1):143-158. doi: 10.1111/1467-9566.12457. Epub 2016 Jul 27.

Stratified, precision or personalised medicine? Cancer services in the 'real world' of a London hospital

Sophie Day [1 2], R Charles Coombes [3], Louise McGrath-Lone [1], Claudia Schoenborn [1], Helen Ward [1]

Affiliations + expand

PMID: 27460935 DOI: 10.1111/1467-9566.12457

Research & Care

Consultation

> J Transl Med. 2015 Nov 14:13:360. doi: 10.1186/s12967-015-0711-x.

Alliance Against Cancer, the network of Italian cancer centers bridging research and care

Paolo De Paoli [1], Gennaro Ciliberto [2], Manlio Ferrarini [3], PierGiuseppe Pelicci [4], Paolo Dellabona [5], Francesco De Lorenzo [6], Alberto Mantovani [7], Pellegrino Musto [8], Giuseppe Opocher [9], Piero Picci [10], Walter Ricciardi [11], Ruggero De Maria [12]

Governance & Education

Affiliations + expand

PMID: 26578263 PMCID: PMC4650281 DOI: 10.1186/s12967-015-0711-x

Collaboration

Editorial > FEBS Lett. 2022 Apr;596(7):845-848. doi: 10.1002/1873-3468.14331. Epub 2022 Mar 29.

GENIGMA: an app to map the 3D genome of cancer cell lines through extreme citizen science

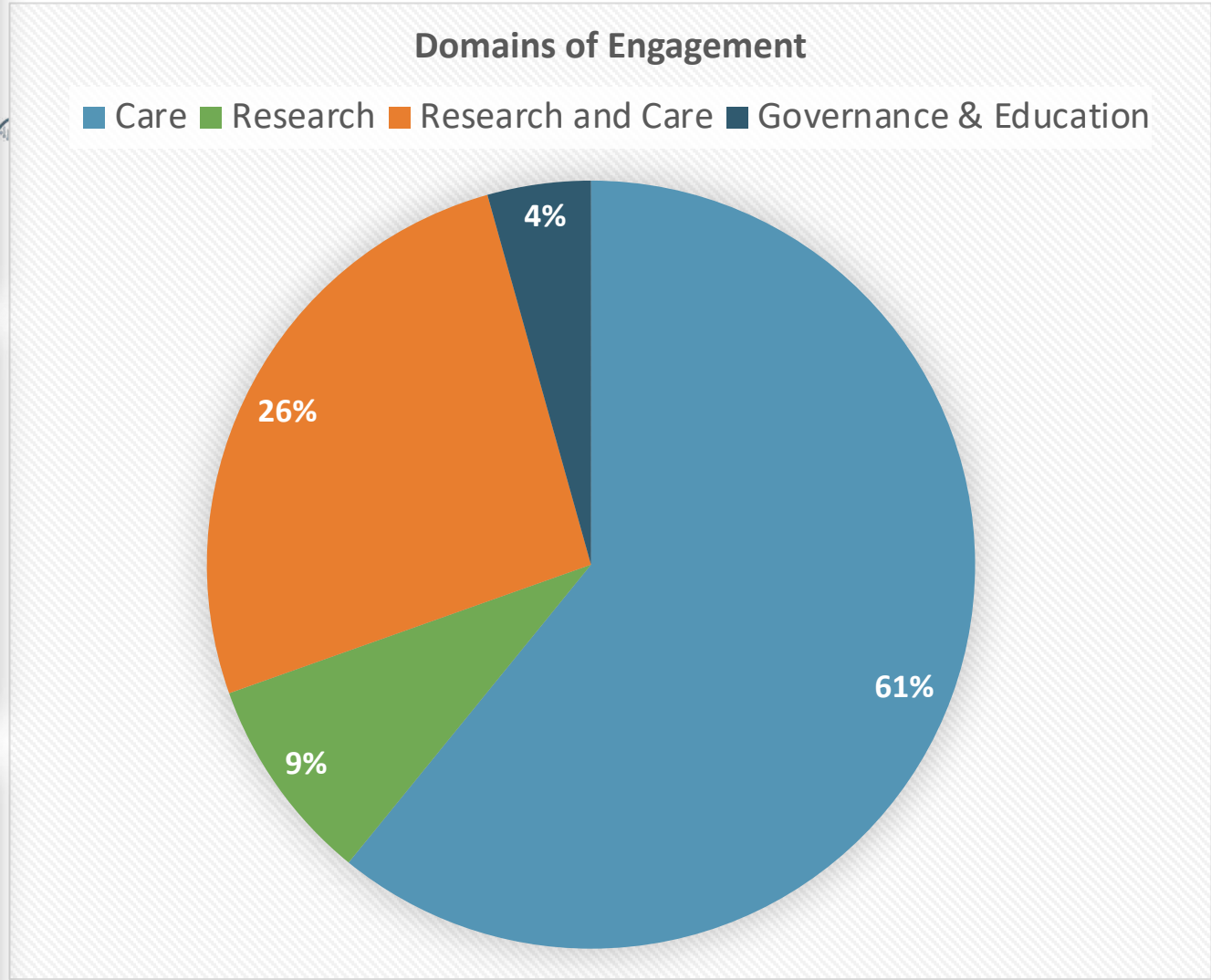
Daniela Ruffell [1]

Research

Public-directed

Affiliations + expand

PMID: 35349172 DOI: 10.1002/1873-3468.14331



Conclusion

- The findings demonstrate the wide range of approaches and methods that can be utilised to engage patients and the general public at various levels of the empowerment and engagement spectrum
- There is a need to elaborate practices that engage public and patients in all the levels
- Most engagement activities in our review were related to (personalised prevention of) cancer, and none to neurodegenerative diseases.
- Gap: Lack of Evaluation
  - It is still unknown, how these practices impact patients and the public and whether improvements result in higher-quality care
  - Creates a huge gap in the implementation of these practices, making it difficult to measure their success and make necessary modifications.
- Future Plan:
  - Best model citizens' and patients' engagement (Interviews & Focus groups)

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D2.6. (B) - Mapping of current practices of citizens', patients', healthcare professionals, policy makers engagement in Personalized Prevention (VUMC, EPF, ACN) (M1-M18).

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PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

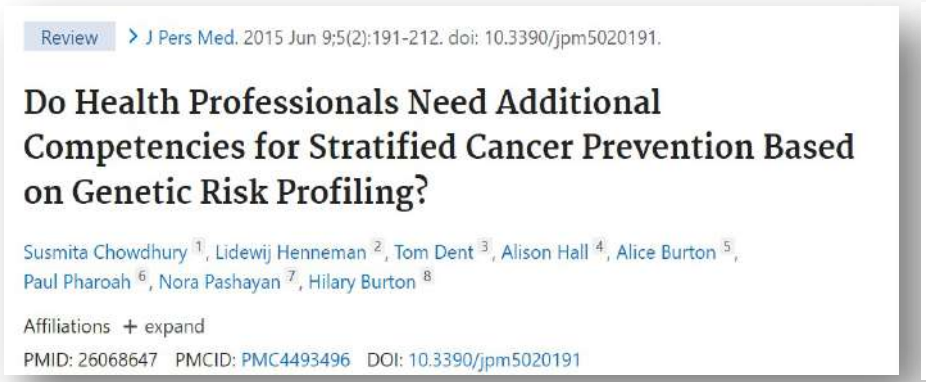
D2.6. (B) Mapping educational needs on personalised prevention for health care professionals: a narrative review

- Aim:
  To provide an overview of healthcare professionals' needs and knowledge gaps to facilitate optimal implementation of personalised prevention.

- Method:

Narrative review

- Knowledge, skills & competencies
- Modes of training



Review J Pers Med. 2015 Jun 9;5(2):191-212. doi: 10.3390/jpm5020191.

Do Health Professionals Need Additional Competencies for Stratified Cancer Prevention Based on Genetic Risk Profiling?

Susmita Chowdhury [1], Lidewij Henneman [2], Tom Dent [3], Alison Hall [4], Alice Burton [5], Paul Pharoah [6], Nora Pashayan [7], Hilary Burton [8]

Affiliations + expand

PMID: 26068647 PMCID: PMC4493496 DOI: 10.3390/jpm5020191

Front Genet. 2021 Mar 15:12:626685. doi: 10.3389/fgene.2021.626685. eCollection 2021.

Capacity Building of Health Professionals on Genetics and Genomics Practice: Evaluation of the Effectiveness of a Distance Learning Training Course for Italian Physicians

Giovanna Elisa Calabrò [1], Alessia Tognetto [1], Alfonso Mazzaccara [2], Donatella Barbina [2], Pietro Carbone [2], Debora Guerrera [2], Alessandra Di Pucchio [2], Antonio Federici [3], Walter Ricciardi [1], Stefania Boccia [1,4]

Affiliations + expand

PMID: 33790945 PMCID: PMC8005606 DOI: 10.3389/fgene.2021.626685

Knowledge and competencies

Primary Prevention

- E.g. Ethical competencies on informing healthy family members

Secondary Prevention

- E.g. Knowledge on risk assessment and stratified screening for general population

Tertiary Prevention

- E.g. Training oncologists and oncology nurses in counseling and genomic (tumour) testing

- How to assess elements of training (knowledge, competencies)?

Gaps identified

- In assessing the evolving landscape of educational initiatives for non-genetic medical professionals relevant for PP in healthcare, several gaps have surfaced.
- In relation to earlier initiatives the following aspects need more attention:

- Appropriate training is required for efficient stratification in public health screening.
- There is a need for training in new categories such as somatic genomics related to the tumour.
- Introduction of new methods of assessment of competences such as Entrustrable Professional Activities (EPAs).
- Incorporation of public and patient involvement.

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a PeRsOnalized Prevention roadmap for the future HEalThcare

WP 2.6. (C) - Mapping of current practices of citizens', patients', healthcare professionals, policy makers engagement in Personalized Prevention (VUMC, EPF, ACN) (M1-M18).

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Amsterdam UMC, Location: VUMC

Amsterdam UMC
University Medical Centers

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

Report: What policymakers, their role and capacity building needs

- **What policymakers**:

  Broad scope: institutional, national and international scale
  dedicated policymakers (e.g. governing bodies) versus representatives from stakeholders

- **Role in stakeholder engagement**:

  -Collaboration among stakeholders to address regulatory, ethical, resource, technological, organizational etc. challenges.
  -Policymakers should facilitate and use stakeholder input and research to guide their decisions.

- **Need for education & capacity building:**

  Well-informed policy makers are better equipped to draft and discuss policies regarding PP with relevant stakeholders and sustain further responsible implementation across disciplines, domains and national borders.

Policymakers' engagement in different settings

Three examples

- Stratifying breast cancer screening
- Pharmacogenomics
- Hereditary cancer care/screening

What kind of policymakers should be engaged?		
Disease	**Actors**	**Activities**
All examples discussed	Funders of research Researchers Professional organisations Health Technology Agencies Reimbursement experts	Set agenda Make innovation possible Develop innovative idea Agenda setting Assessment Evaluate insurance economic aspects
Stratify breast cancer risk in population screening	Public health screening decision makers Governments/Ministries of Health Screening Committees	Decide on implementation
Pharmacogenetics	Medical specialists Pharmacists Hospital leadership	Develop guidelines Decide on implementation in practice
Integrating hereditary cancers in public health screening	Public health organisations Health care providers Payers	Recommendations Implementation Funding

Conclusion

For the integration of genomic testing in personalised prevention strategies not only **dedicated policymakers** (e.g. governing bodies), but representatives of also a **wide range of stakeholders**,
(including health care professionals and their organisations, IT specialists, patient organisations, funders and insurers, etc),
will need to collaborate to establish viable new routines and shared visions to reduce barriers to responsible implementation.

Inevitably this will entail addressing varying and at times diverging (professional) interests and viewpoints.
Stakeholder engagement and dialogue is key to adequate policymaking and help sustain public trust in data sharing and foster responsible implementation of personalised prevention.

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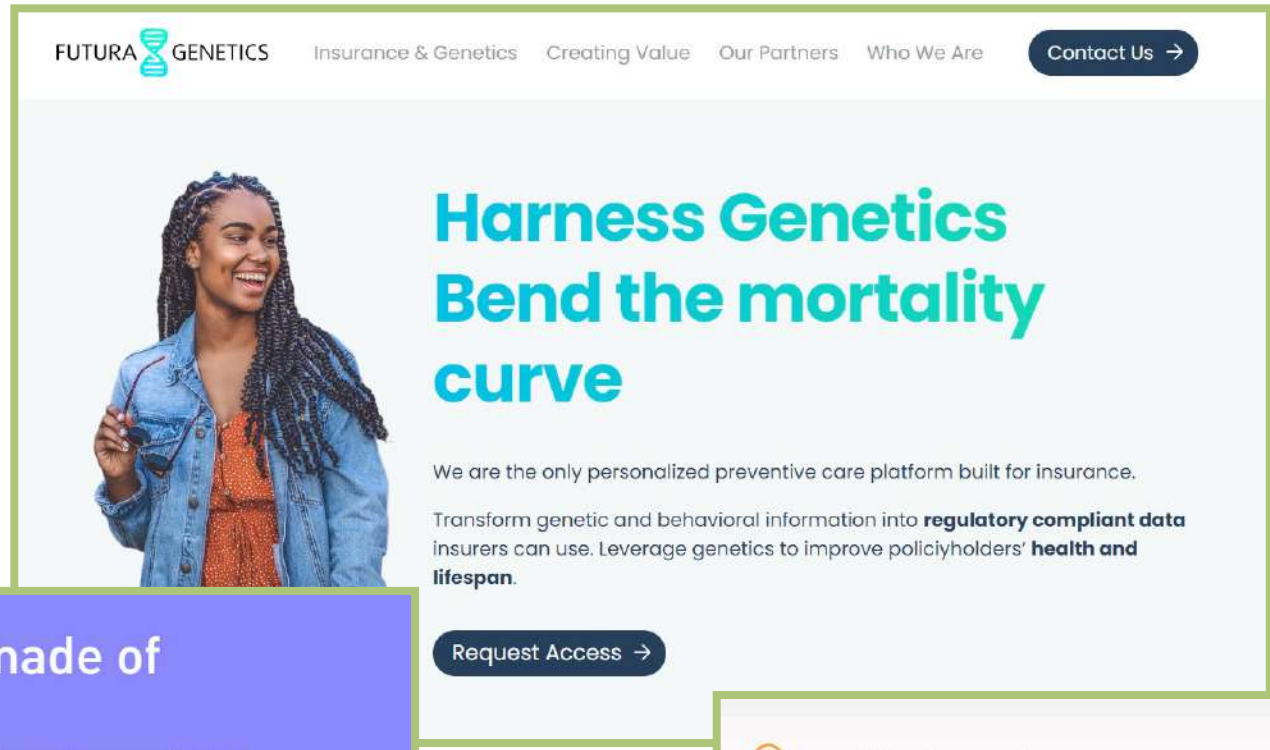
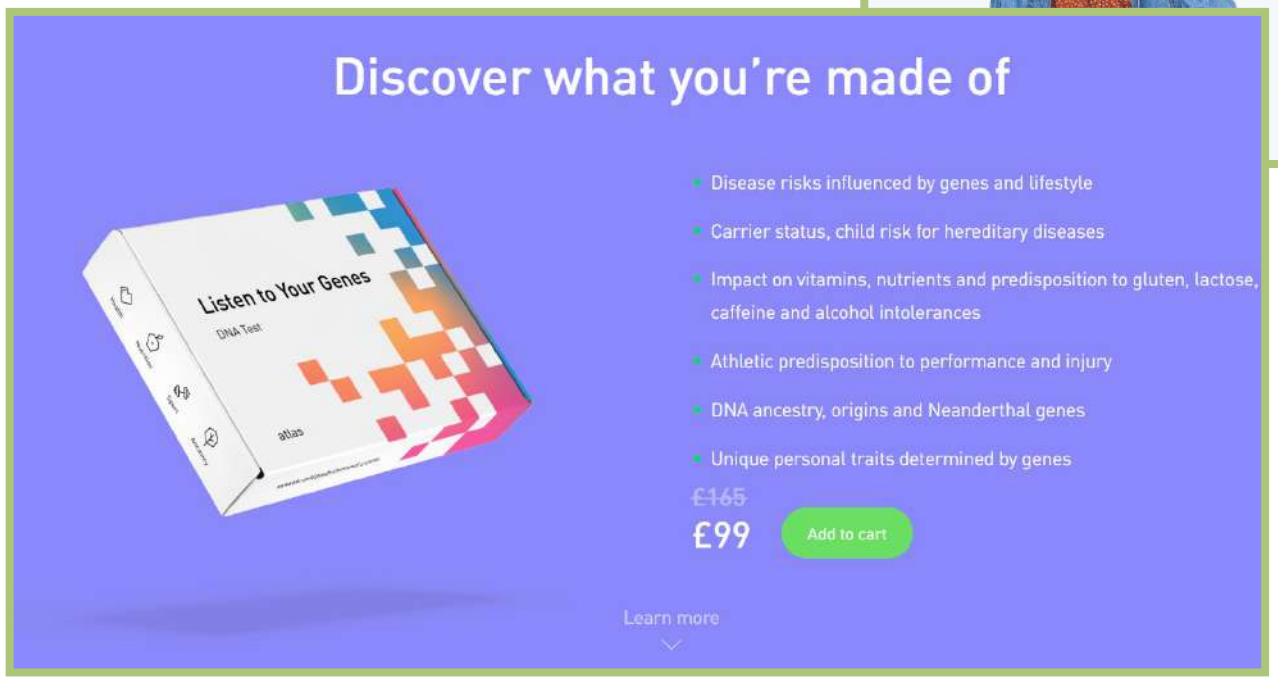
The use of direct-to-consumer genetic testing in personalized prevention: public health impact & current policy approaches.

14/03/2024 – Dr. Eva Van Steijvoort (KU Leuven)

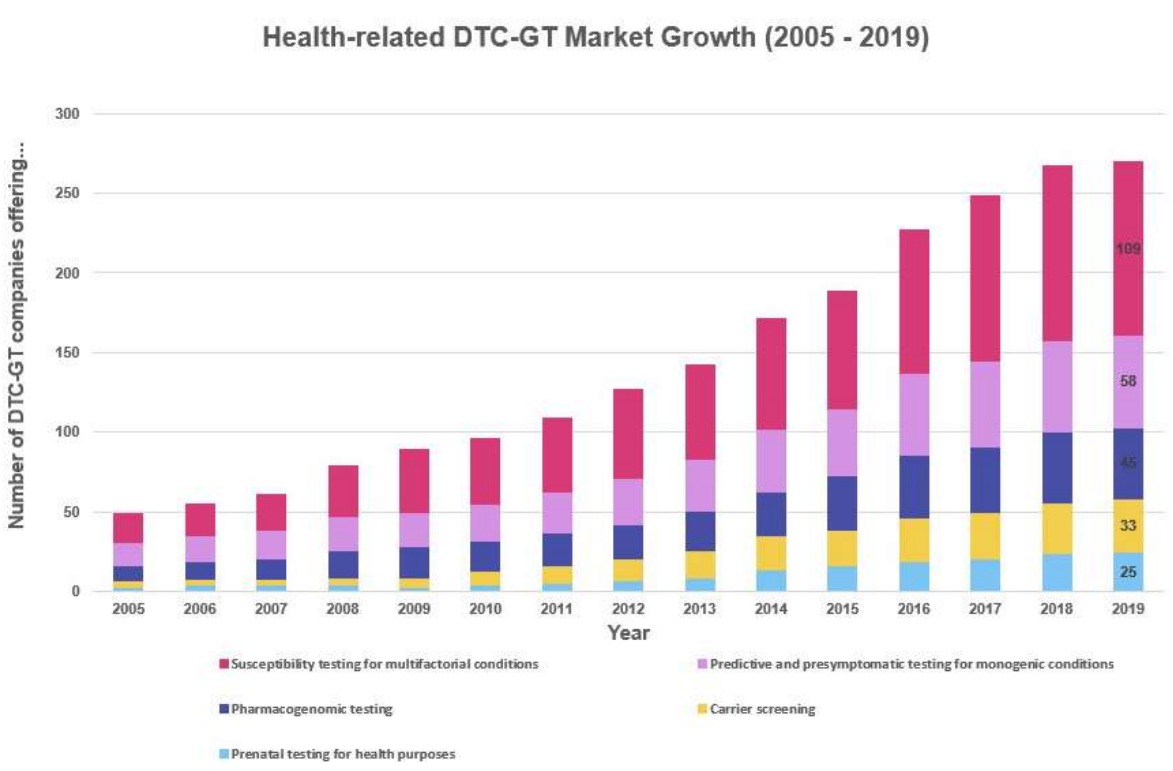
PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

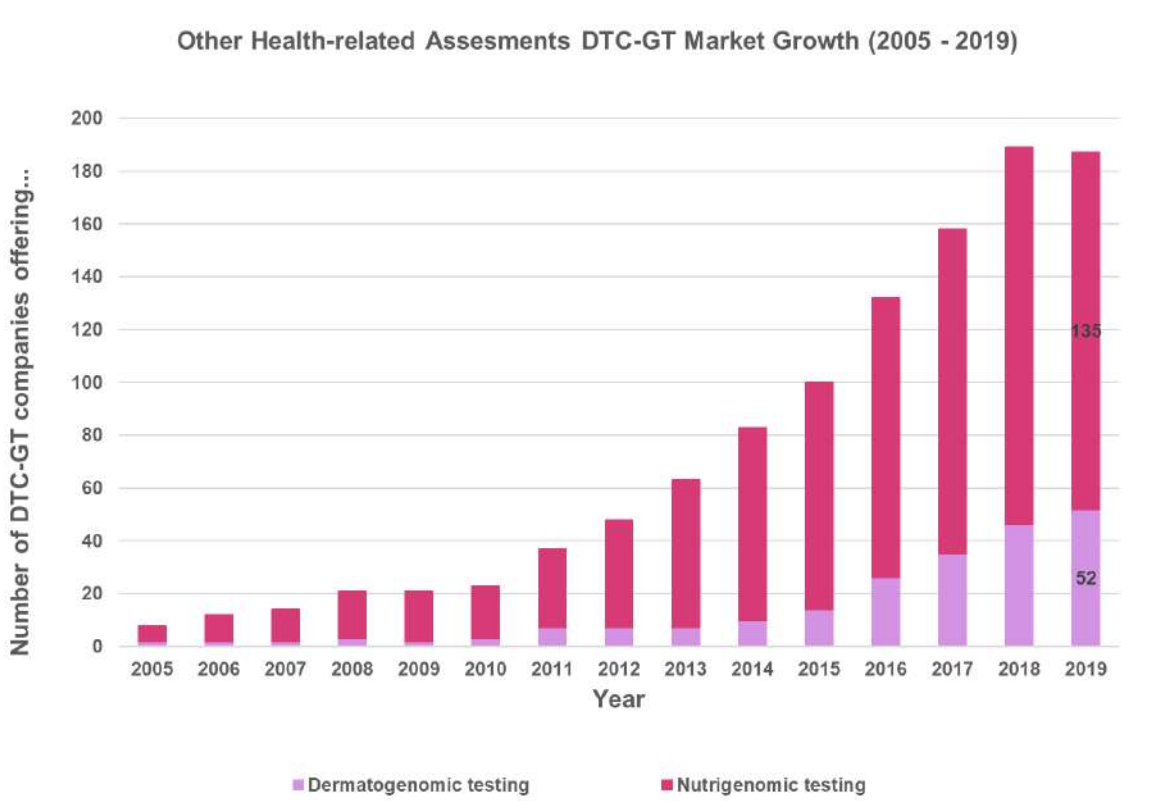
THE RISE OF DTC-GT





THE RISE OF DTC-GT





THE IMPACT ON PUBLIC HEALTH

Unnecessary follow-ups and visits of (potential) consumers to healthcare professionals?

Extra burden/costs on the public health care system

IS THERE ANY EVIDENCE ???

POLICY APPROACHES

Self regulation of DTC-GT industry

Educational initiatives (general public and/or health care professionals)

Legislation regulating the market introduction of DTC-GT

- EU

e.g. 'Regulation (EU) 2017/746' (in vitro diagnostic medical devices)

Legislation regulating the delivery or canalization of genetic testing

- EU

e.g. 'Oviedo Convention' & ' Additional protocol on genetic testing for health purposes'

- National member states

(Partial) Ban of DTC-GT
Focus on canalization of genetic tests through medical intermediaries
Regulating genetic counseling
Regulating informed consent procedures
Penalization of users or non-consensual testing
Permit system
Regulation of laboratories

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Data management & infrastructure, outlining challenges and best practices

Arshiya Merchant

March 14th, 2024

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

Background


Data Management
Healthcare system
Infrastructure
Research Genomic & Health Data

Data

Data Management

Research Genomic & Health Data

Challenges

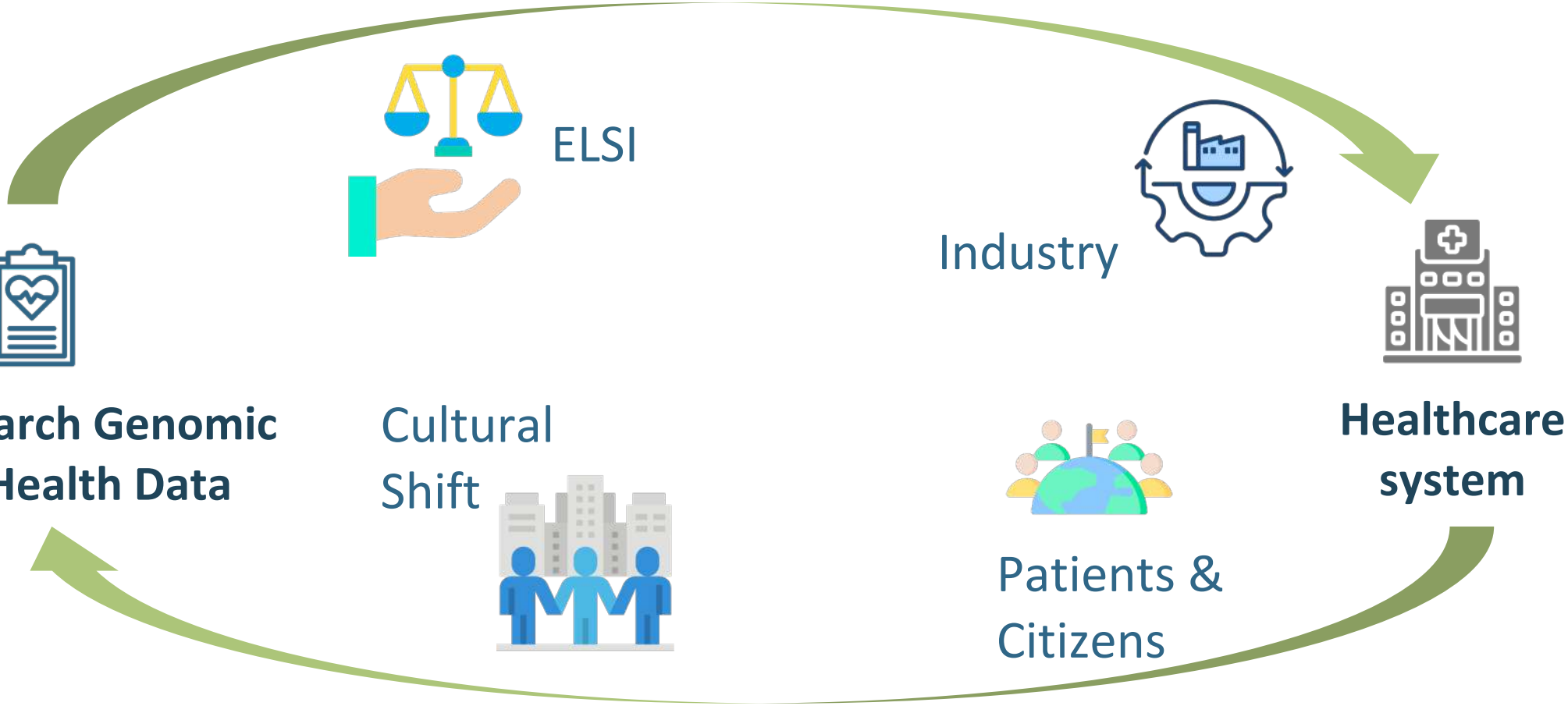
- Discoverability
- Accessibility
- Standardisation
- Reproducibility
- Data Sharing
- Security, Storage & Processing

Infrastructure

Challenges

- Implementation of research advances:
  - Technical Infrastructure
  - Workforce
- Regulatory Framework
- Tools
- Sustainability

Broader Ecosystem



Alignment with other projects

Outcomes from following relevant projects were reviewed to consider relevance and use for personalised prevention approaches:

Learnings pertaining to best practices for data management and infrastructure requirements such as **interoperability** and **sustainability** were included in a separate section as background knowledge within the deliverable.

Key Challenges

Adopting **personalised prevention** ≈ Adopting **personalised medicine**

Challenges and barriers on **data management** align with learnings from other initiatives including:

- Discoverability
- Accessibility
- Standardisation
- Reproducibility

Integration of **sustainable technical infrastructure**

Cultural shift on attitudes towards data sharing, **ethical and regulatory** considerations, inclusion of **patients, citizens,** and collaboration with **industry**.

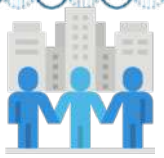
Recommendations & Best Practices

- Application of **FAIR principles** to sensitive data to improve data management

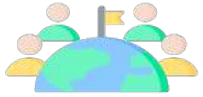
  Resource: FAIR Cookbook

- Integrate a **sustainable** technical **infrastructure** by building upon current infrastructure & outcomes from **GDI** & **EHDS.**
- **Shared ownership** between researchers and healthcare professionals to integrate technical infrastructure into clinical settings.
- Develop **regulatory models** for assessing the efficacy and safety of innovative diagnostics and treatments

Recommendations & Best Practices



Encourage a **cultural shift** toward data sharing and the adoption of data-driven solutions in healthcare.



Patient and citizen engagement: adopt a **co-creation** mindset to **engage patients** and **citizens** from the initial set-up of initiatives and projects.

Advocate for **standardised legislative approaches** to facilitate data sharing, and ensure that legislative frameworks address the **nuanced** considerations between treatment and prevention

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WP 2.2.3. Fair access to data-driven tools in personalized prevention: exploring the regulatory challenges and solutions

Patricia Cervera de la Cruz, PhD Candidate & Mahsa Shabani, Associate Professor Health Privacy Law

Ghent University, Faculty of Law and Criminology

14th March 2024

GHENT UNIVERSITY

PROPHET is funded by the European Commission under the Horizon Europe research and innovation programme under Grant Agreement N°101057721

T.2.2.3. Mapping the ELSI challenges and bottlenecks in PP in Europe and beyond, including data protection (GDPR) issues in processing and linking genomic data, health/clinical data and other diverse data sources for PP

- **Aim:**
  To provide a legal analysis of the existing and emerging data protection regulatory framework and relevant policies in the EU applicable to processing health and genomic data.
- **Expected result:** A report on the results of legal analysis of the relevant provisions for processing health data for personalized prevention purposes.

- **Method:**

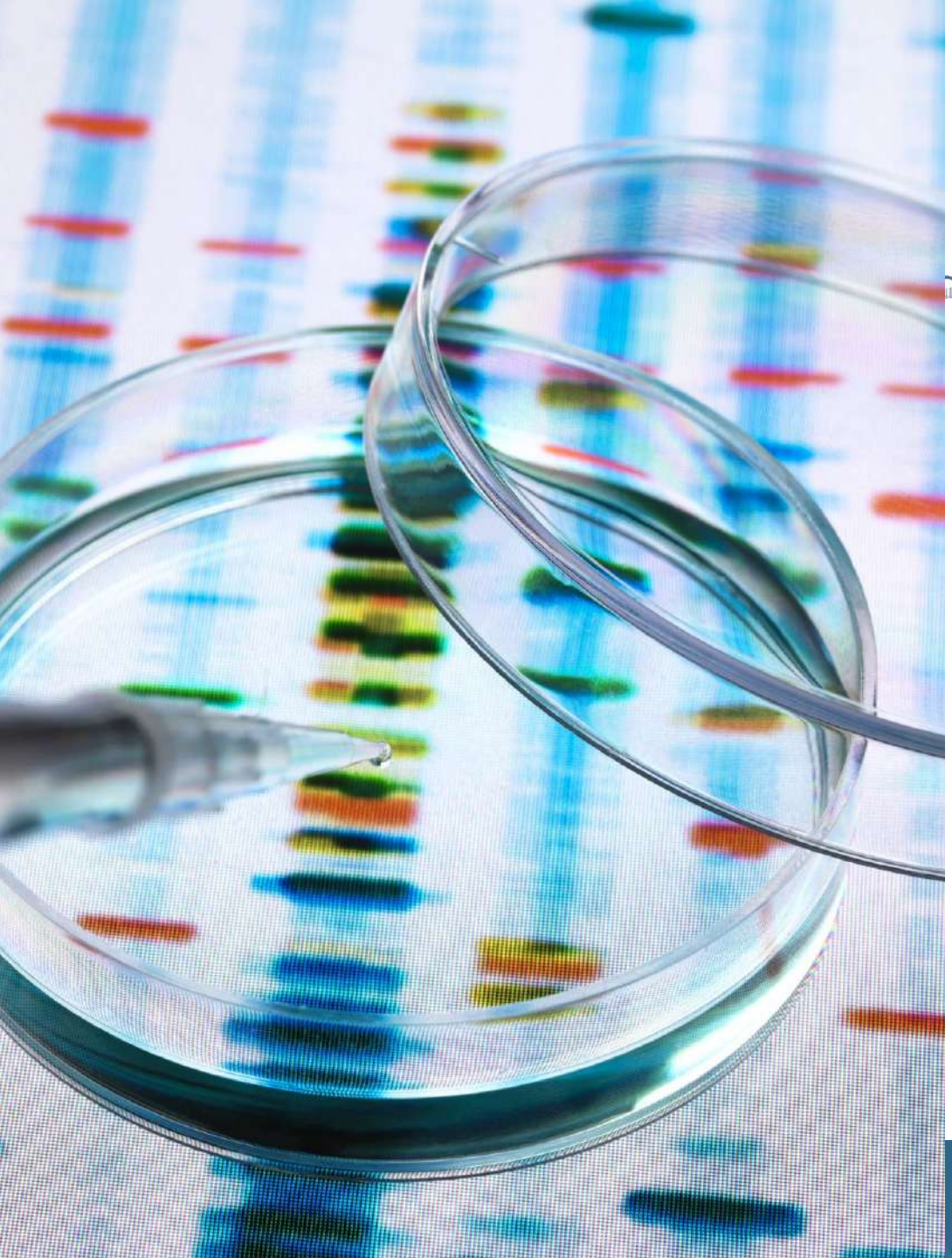
  Literature review

Fair-access to data-driven tools in personalized prevention

Q: What are the legal protections available to ensure fair access to data-driven tools in personalized prevention?

The main concerns:

1. Need for collection of sensitive attributes (socio-economic status, ancestry related attributes, …which fall under strict protection under the GDPR)
2. Secondary uses of health data (GDPR/ EHDS/DGA and issues related to legal bases, purpose limitation, individual control,…)
3. Use of non-traditional health data (wearables, mobile apps, social media…) (access to wearables, commercial interests,…)



1. Processing of health data including sensitive attributes such as genetic data

- The development of data-driven tools in healthcare requires collecting large volumes of health data, including sensitive attributes like genetic information.
- While leveraging sensitive attributes can enhance predictive accuracy, it also raises concerns about privacy, discrimination, and data accuracy.
- Inclusion of sensitive attributes may help prevent discrimination and lead to fairer outcomes, but strict data protection regulations pose challenges.
- Proposed solutions include allowing the use of sensitive data with appropriate safeguards in PP to mitigate concerns for bias while balancing privacy and security concerns.

Healthcare organizations play a crucial role in determining which data-driven tools enhance equitable outcomes in processing sensitive attributes and which perpetuate discrimination.

2. Secondary use of health data

- Secondary use of health data for the development of data-driven tools in personalized medicine (PP) involves repurposing existing data from sources like electronic health records and biobanks.
- **Challenges:** interoperability issues (heterogeneous data systems) and fragmented regulatory environments across Member States.
- The European Commission's proposal for a European Health Data Space (EHDS) aims to harmonize rules and facilitate data use but raises concerns about **individual control and benefit sharing**.
- Secondary use under EHDS may conflict with existing GDPR rules principles, such as purpose limitation and the right not to be subject to automated decision making.
- The EHDS proposal and emerging regulations like the Data Governance Act (DGA) offer promising avenues for facilitating data sharing, yet raise concerns regarding fair access to data driven tools in the context of PP.

Achieving fair access to data-driven tools for PP necessitates a nuanced approach that not only ensures regulatory compliance but also prioritizes individual autonomy, equitable representation, and meaningful benefit sharing.

3. Use of non-traditional health data (wearables, mobile apps, social media,…)

- Wearable devices offer continuous, real-time health data, capturing behavioral nuances often overlooked in traditional medical records.
- Utilizing non-traditional health data from wearables and mobile apps can refine risk assessments, engage underrepresented communities, and empower individuals in their healthcare journey.
- **But** concerns exist…
  - **Data Validity:** Concerns exist regarding the validity and quality of wearable data, impacting the accuracy of data-driven tools in personalized prevention.
  - **Accessibility Disparities:** Privately acquired wearables may widen existing health disparities, particularly affecting underrepresented groups and those in lower socioeconomic conditions.
  - **Data Protection:** The commercial nature of wearable development introduces data protection concerns, including risks of data breaches and unequal treatment for individuals.

Wearable data holds promise for personalized prevention but requires careful consideration of validity, accessibility, and regulatory oversight to ensure fairness and equity in healthcare access.

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