

# How can Precision Prevention Reduce the Demand on Health Systems?



Parliamentary and Scientific Committee, 14 January 2025

# Welcome and Opening Remarks

*George Freeman MP*



# Physiology Passport: Putting Personalised Prevention at the Heart of Resilient Health Systems

*Professor Dame Melanie Welham, Former Executive  
Chair, BBSRC UKRI*



# Physiology passport: putting personalised prevention at the heart of resilient health systems

Professor Dame Melanie Welham, DBE,  
FRSB

Former Executive Chair, Biotechnology & Biological Sciences  
Research Council, UKRI

Independent Trustee, Royal Society of Biology

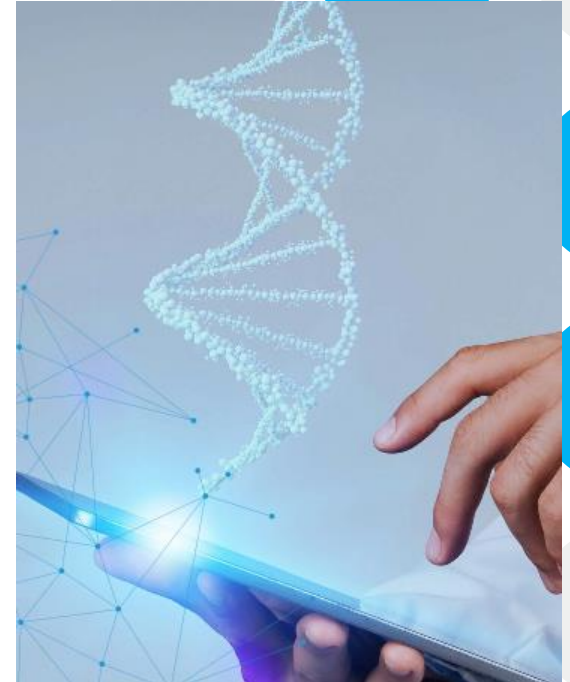
Independent Trustee, University of Bristol

Independent Trustee, John Innes Foundation

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# Integrative physiology: supporting a shift towards personalised prevention

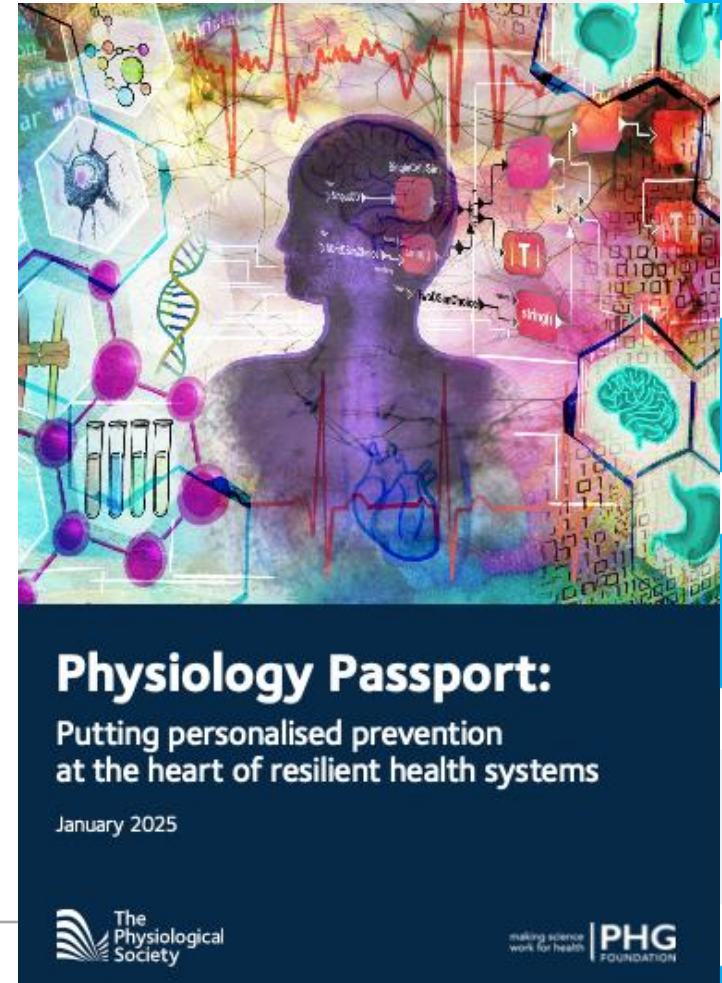
- Personalised health / prevention identified as a key emerging research area over a decade ago
  - Recent advances in physiology research and technology development mean real opportunities to shift towards prevention – at an individual level
  - Understanding root causes of poor health critical for prevention
  - Innovative approaches needed to relieve unsustainable burden on existing healthcare systems
  - Steering group of experts to discuss and guide
- 



# Physiology Passport

## A dynamic, long-term and integrated personal physiology health profile

- Curation of a person's multimodal physiological health information in existing electronic health record to establish the parameters defining good health for each individual
- Can be used by individual and healthcare teams in an integrated and holistic way – early intervention if parameters shift away from health
- Raises a series of research, policy, ethical and practical questions requiring detailed consideration



# What might the report achieve?



Highlight the opportunity and multiple benefits that can be realised by personalised prevention



Spark a national debate about preventive health; raise awareness; influence policy



Recognition that Physiology Passport can support shift towards prevention



Stimulate new strategic physiological & collaborative research and innovation to accelerate progress

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# Recommendations for funders

## 1. Incentivise multimodal translational research:

To advance interdisciplinary approaches that combine physiology, genomics, technology, and behavioural science for personalised prevention, with a goal of supporting clinical translation. UKRI (MRC, EPSRC, BBSRC, iUK); NIHR; Charities; Wellcome

## 2. Support pilot studies and longitudinal research:

To test the feasibility, cost-effectiveness and impact of physiology-led interventions such as the Physiology Passport and to gather data over time for predictive models. UKRI (MRC, ESRC); NIHR

## 3. Promote health equity in research:

To ensure funding is allocated to address health disparities and include underrepresented populations in research. UKRI (ESRC; MRC); Charities; Wellcome

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# Personalised Prevention – Opportunities and Challenges for Governments



*Professor Catherine Ross, Chief Scientific Officer,  
Scottish Government*

# Personalised Prevention – Opportunities and Challenges for Governments

Professor Catherine Ross

January 2025



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# Population Demographics



## 2022 census data

Scotland's population has risen to

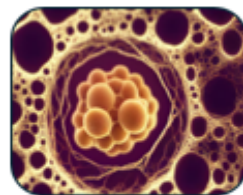
**5,436,600**

Healthy life expectancy by deprivation decile



## Healthy Life Expectancy

In the most deprived areas, people spend more than **1/3** of life in poor health



## Cancer

Remains the highest disease burden and is forecast to see an increase of **24%**



## Cardiovascular disease/ neurological disorders

Forecast to increase by **34%**



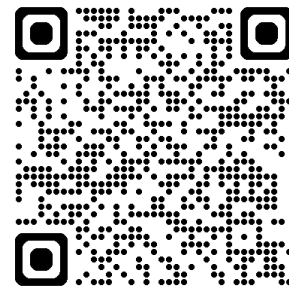
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# Importance of Prevention – Supporting Better Choices

	Deaths wholly attributable to alcohol consumption	Hospitalisations wholly attributable to alcohol consumption
<b>Sex</b>		
Males	-14.8% (-18.7 to -10.7)	6.2% (-10.0 to -2.3)
Females	-12.0% (-20.5 to -2.6)	3.1% (-2.8 to 9.3)
<b>Age group</b>		
16-34 years	Not estimated	3.0% (-6.2 to 13.3)
35-64 years	-10.0% (-14.7 to -5.0)	-4.8% (-9.4 to 0.2)
≥65 years	-26.7% (-35.6 to -16.5)	-2.8% (-9.2 to 3.9)
<b>Deprivation decile</b>		
1 (Most deprived)	-21.6% (-31.8 to -10.0)	-6.8% (-11.9 to -1.3)
2	-17.5% (-27.5 to -5.9)	-4.5% (-10.8 to 2.3)
3	-33.6% (-43.4 to -22.1)	-6.3% (-11.3 to -1.0)
4	-19.3% (-29.4 to -7.7)	-6.9% (-11.4 to -2.3)
5	-9.7% (-27.2 to 12.2)	11.9% (-0.5 to 25.7)
6	-6.3% (-28.7 to 23.1)	-0.7% (-9.8 to 9.2)
7	-2.8% (-23.2 to 23.2)	0.7% (-7.6 to 9.7)
8	-9.2% (-28.3 to 14.8)	-1.2% (-8.1 to 6.4)
9	-2.9% (-23.5 to 23.2)	0.3% (-8.3 to 9.7)
10 (Least deprived)	-8.2% (-22.1 to 8.1)	-2.0% (-16.8 to 15.5)

Data are effect estimates, % (95% CI).

**Table 2: Change in outcomes from controlled models associated with the implementation of alcohol minimum unit pricing legislation, by subgroup**



# New and Emerging Technologies



**AI OPPORTUNITIES  
ACTION PLAN**

Ramping up AI adoption  
across the UK  
to boost economic growth,  
provide jobs for the future and  
improve people's everyday lives

The graphic features a dark background with glowing green and blue abstract patterns. A horizontal green bar is positioned above the title. The text is in a clean, sans-serif font.

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# Building Personalised Prevention into Long-term Strategic Thinking

National deployment of genetic tests to place Scotland at the vanguard in adopting precision and preventative medicine:

**Lab-based Stroke Clopidogrel Genetic Test** for newly presenting ischaemic stroke and TIA patients to guide clopidogrel use, preventing c.30,000 patients being prescribed a medication that won't work for them (over 5 years)



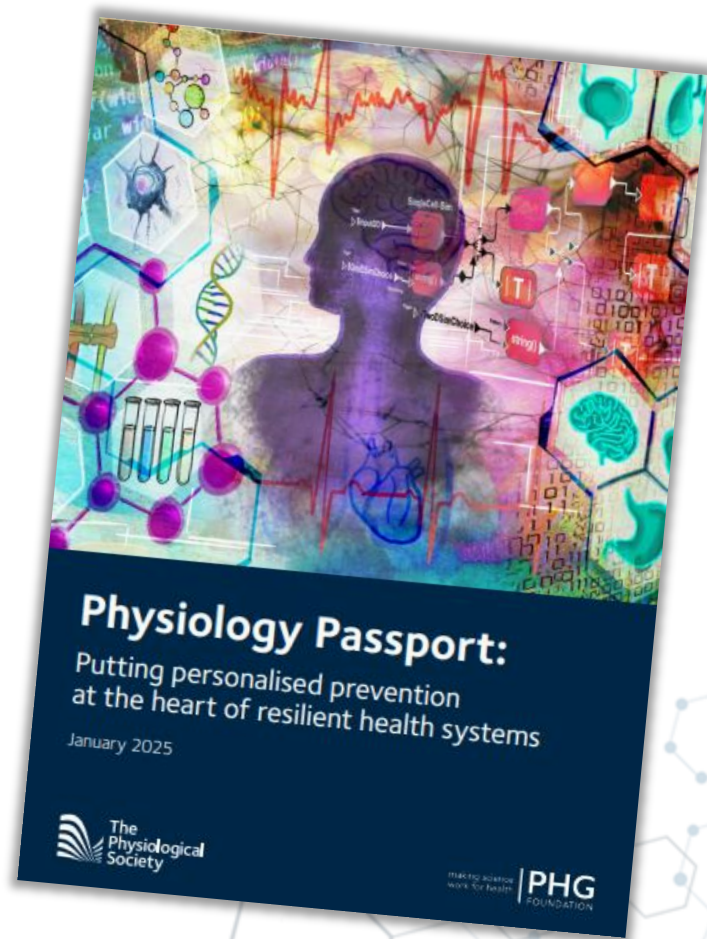
## Benefits:

- **Prevent 943 strokes in Scotland**
- Deliver a **net cost avoidance of £17.9 million** to NHS
- **21 fewer hospital beds** required per day by year 5
- Improve health outcomes



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# Next Steps



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making science  
work for health  
**PHG**  
FOUNDATION

# How is Research Advancing Precision Medicine and Personalised Prevention?

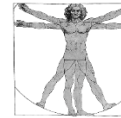


*Professor Heidi de Wet, The Physiological Society  
and University of Oxford*



# About me

- Trustee of The Physiological Society and a member of the Policy Committee.
- Associate Professor of Physiology. Research in human metabolism, with a focus on obesity, diabetes and the gut-brain connection.
- Tutorial Fellow for Medicine at St Catherine's college.



Department of  
**PHYSIOLOGY, ANATOMY & GENETICS**  
Defining Excellence  
Oxford Anatomy and Physiology ranked #1 in the QS World University Rankings by subject 2017, 2018  
Medical Sciences Division



**St Catherine's  
College Oxford**

# About The Society

- Founded in 1876, we are Europe's largest network of physiologists counting 60 Nobel prize winners among our global membership.
- Physiology is the science of life. It is the branch of biology that aims to understand the mechanisms of living things. The emphasis on integrating molecular, cellular, systems and whole body function is what distinguishes physiology from the other life sciences.
- *The Journal of Precision Medicine: Health and Disease.*

# Why is Physiological Research Important to Personalised Prevention?

- Research in physiology helps us to understand how the body works in health and how it responds and adapts to the challenges of everyday life and helps us to determine what goes wrong in disease.
- Facilitates the development of new treatments and guidelines for maintaining human health, with a unique opportunity to focus on personalised prevention of disease.
- Physiological research integrates molecular, cellular, systems and whole-body function.

# Why do we need a Physiology-led approach to Personalised Prevention developed through the *Physiology Passport* concept?

- A physiology-led approach combines information from a variety of sources to build a global view of a person's health over their life span through the development of a richer data set of 'normal' range for the individual.
- This will improve patient health by leading to early diagnosis, intervention, care and treatment
- Physiology research and scientists to become the convening umbrella under which an interdisciplinary, cross-cutting approach to health, research, integrated and collaborative approaches between specific specialisms of organ or body systems and between physiological and genomic data sets.



## **Physiology Passport:**

Putting personalised prevention  
at the heart of resilient health systems

# How does Physiology support a 'Four P' approach to Personalised Prevention and Treatment?

## What are the Four Ps of medicine?

### Box 2. Four Ps of medicine

**Predictive:** Identifies an individual's risks of developing diseases based on key biomarker profiles

**Preventive:** Disease prevention measures are delivered throughout the life course at different stages of the healthcare pathway: primary (reduction of the risk of developing certain diseases), secondary (early diagnosis) or tertiary (improvement of patient quality of life)

**Personalised:** Considers the biomarker characteristics of each person, as well as their medical, environmental, social and cultural context

**Participatory:** Individuals are empowered to take part in managing their own health


# How does Physiology support a 4-P approach to Personalised Prevention and Treatment?

## Case study – Weight Management and Bbesity

Four Ps	Physiology's role
<b>Predictive</b>	Being overweight is strongly correlated to socio-economic background, access to green and blue spaces as well as a family history of obesity and type 2 diabetes
<b>Preventative</b>	Gaining weight over a lifetime is a complex process, and individuals pick up weight for different reasons. There should be multiple opportunities to intervene and stop a steady increase in BMI before it become problematic. Currently, NHS weight management is focussed on treating obesity, not prevention
<b>Personalised</b>	Many well know studies showing effective weight loss on calorie restricted liquid diets, exercise and the use of GLP-1R antagonists or a combination of all 3.
<b>Participatory</b>	Lost weight is often regained after the cessation of dietary intervention GLP-1R agonists are a powerful tool to fight obesity in diabetic patients, but not all patients are willing to take the drugs due to side effects or social implications

# How can Research Address Gaps in Understanding and Implementation?

As researchers we must:

- 1. Foster interdisciplinary research collaboration.**
  - 2. Expand biomarker research.**
  - 3. Develop more comprehensive longitudinal data sets.**
  - 4. Embed patient and public involvement and engagement (PPIE) in research.**
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# How will the 10 Year Plan look to Harness the Opportunities of Personalised Prevention Now and in the Future?

*Dr Alistair Connell, Director of Digital Health, Our  
Future Health*



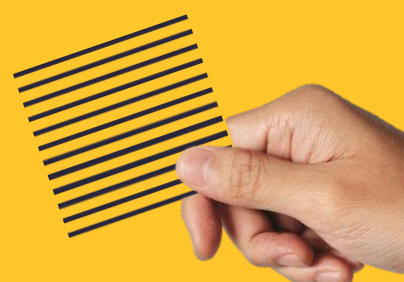
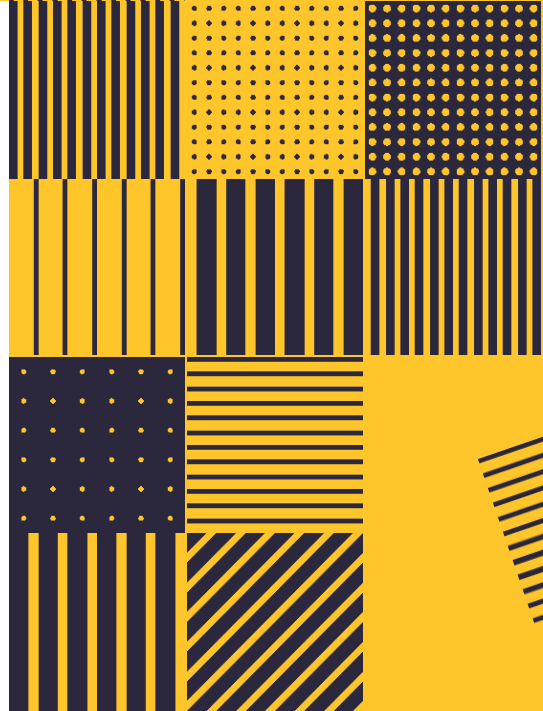




# Our Future Health

A world-leading platform for early  
detection and prevention research

January 2025



# Our Future Health

A world-leading resource for early detection and prevention research

In partnership with



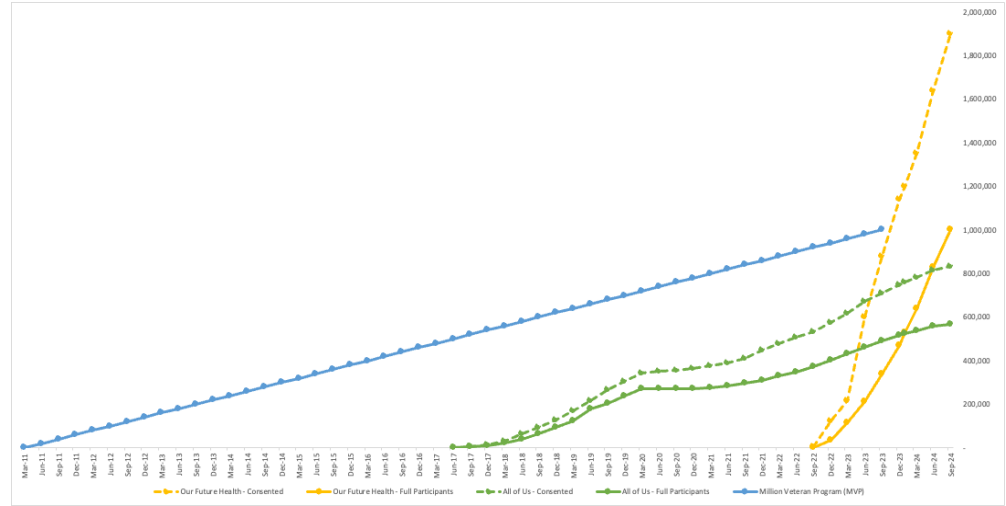
- The UK's largest ever health research programme, designed to enable the discovery and testing of more effective approaches to prevention, earlier detection and treatment of diseases
- It will collect and link multiple sources of health and health-relevant information, including genetic data, across a cohort of 5 million people that truly reflects the UK population
- A resource for researchers to undertake discovery research on early indicators of disease, plus the opportunity to re-contact participants on a risk-stratified basis for further research

## At enrolment:

- Self-report health and lifestyle questionnaire
- Physical measures
- Blood sample

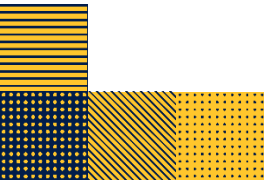
- Consent to link with NHS records and additional data sources
- Consent for re-contact to offer feedback to participants, including genetic risk
- Consent to re-contact for invite to provide additional data collection, samples, or to take part in new clinical studies

# Recruitment



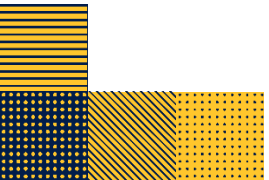


# Delivering value for participants



# Challenges for preventive health research

- Political & social context
- Funding & resource allocation
- Access & uptake
- Service delivery & coordination
- **Demonstrating impact**



# Personalized prevention

## The purpose of the Physiology Passport is to:



- **detect health changes** early by identifying deviations from an individual's normal baseline collected through clinically validated existing systems;



- **empower individuals** to manage their own health through personalised insights and preventive strategies;



- **support healthcare providers** in making informed, tailored decisions for treatment and prevention;



- **enable proactive care** by focusing on preventing illness rather than just treating diseases;



- **reduce healthcare disparities** by improving equity of access to, and collection of, physiological data.

