

# Genomics Artificial Intelligence Network (GAIN)

## NHSE Genomic Network of Excellence

Professor Tony Williams

Clinical Director, Central and South Genomic Medicine Service Alliance (GMSA)

Professor Sarah Ennis

Research Director, Central and South Genomic Medicine Service Alliance (GMSA)

UKRI AI in Health &  
Social Care Symposium

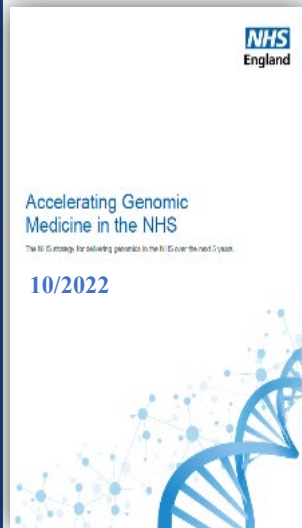
Thursday, 27 June 2024 1:00 pm - 5:00 pm

[Our Mission](#)

London, UK



# Overview of NHSE Genomics Strategy 2012-2032



Key themes include:

1. **Embedding genomics across the NHS**, through a world leading innovative service model from primary and community care through to specialist and tertiary care
2. **Delivering equitable genomic testing for improved outcomes in cancer, rare, inherited and common diseases** and enabling precision medicine and reducing adverse drug reactions
3. **Enabling genomics to be at the forefront of the data and digital revolution**, ensuring genomic data can be interpreted and informed by other diagnostic and clinical data; and
4. **Evolving the service driven by cutting-edge science, research and innovation** to ensure that patients can benefit from rapid implementation of advances



**UK Life Sciences Vision**  
sets 10-year strategy



**Genome UK; the future of healthcare**  
sets out a 10 year vision



**NHS Long Term Plan genomics commitments**

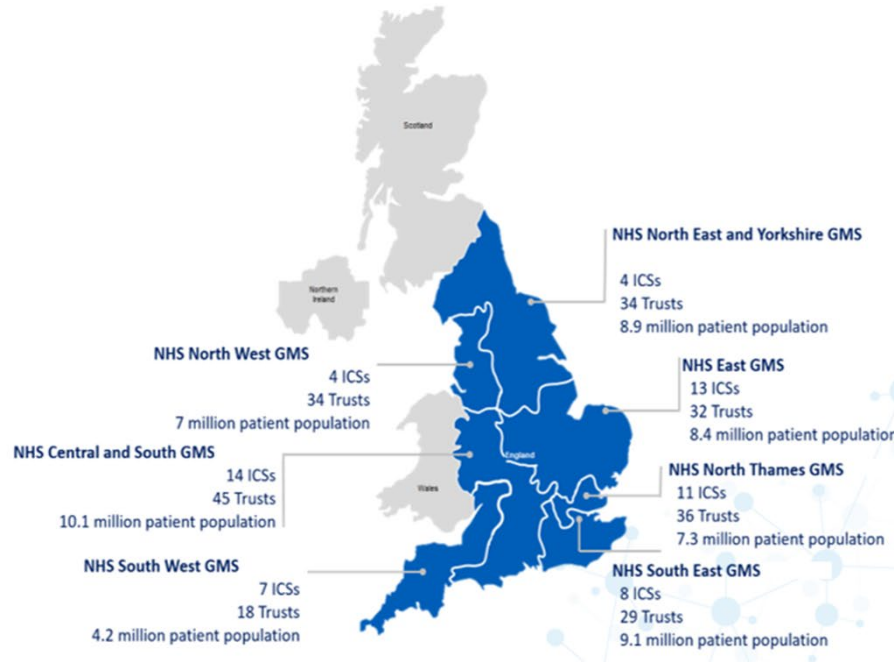
# Genomic Medicine Service Alliances (GMSA)



Central and South  
Genomic Medicine Service Alliance



South East  
Genomic Medicine Service



Geography	NHS GLHs	NHS GMS Alliances	Clinical genomics services
North East & Yorkshire	1 GLH 2 LGLs	4 GMS Alliance partners	3 clinical genomics services
North West	1 GLH 3 LGLs	9 GMS Alliance partners	2 clinical genomics services
Central & South	1 GLH 3 LGLs	4 GMS Alliance partners	3 clinical genomics services
East	1 GLH 2 LGLs	4 GMS Alliance partners	3 clinical genomics services
North Thames	1 GLH 3 LGLs	10 GMS Alliance partners	2 clinical genomics services
South East	1 GLH 3 LGLs	4 GMS Alliance partners	2 clinical genomics services
South West	1 GLH 1 LGL	3 GMS Alliance partners	2 clinical genomics services

- National Service delivering an equitable service for all patients and public in England
- Working with Genomics England (GEL) to support Clinical care, Research and Innovation adoption
- Working alongside Developed Nations to deliver UK wide implementation of Genomic Medicine

# Establishing NHS Genomic Networks of Excellence

DISCOVERY

TRANSLATION

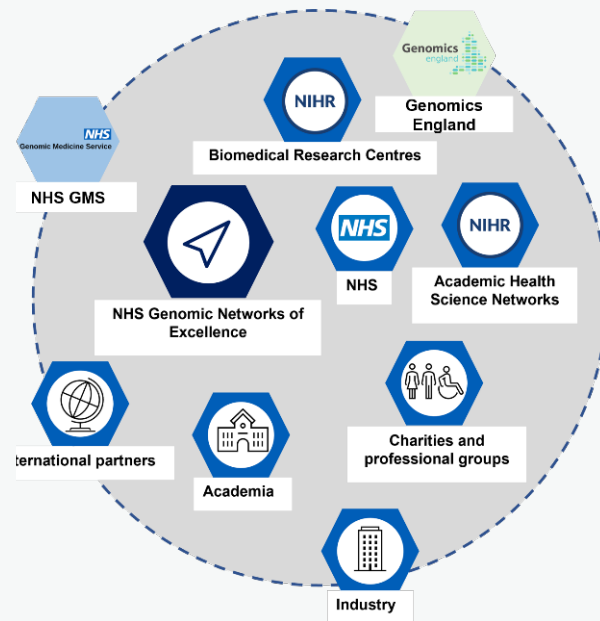
ADOPTION

DIFFUSION

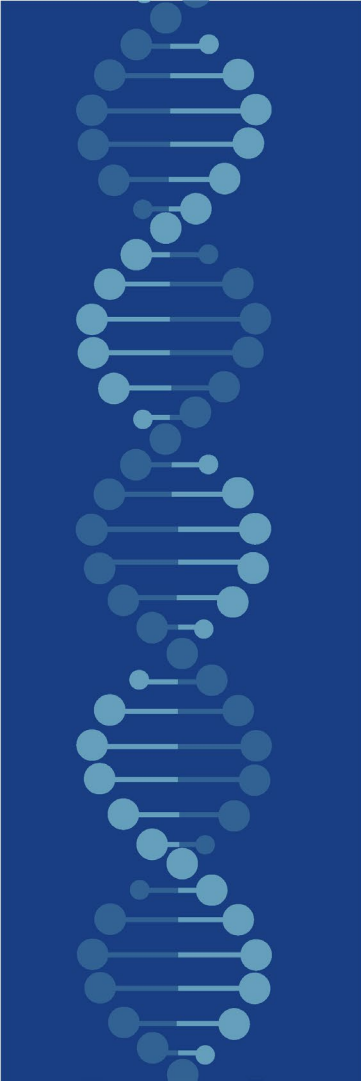
NHS Genomic Networks of Excellence will be partnerships between the NHS, academia, the third sector and industry to **generate evidence and models of adoption for new technology and testing** and, clinical and laboratory practice in defined topic areas of **strategic importance**.

NHS England has confirmed funding for:

- ▶ **Prenatal** Genomic Medicine Network of Excellence
- ▶ **Circulating Tumour Biomarker** testing for rapid diagnostics and monitoring for Cancer of Unknown Primary, advanced metastatic Breast Cancer, Paediatric Cancer, circulating miRNA test for Germ Cell Tumours and CSF testing for primary CNS lymphoma.
- ▶ **Haemato-Oncology** NHS Genomic Network of Excellence including rapid WGS
- ▶ **NHS Rare and Inherited Disease** Genomic Network of Excellence
- ▶ **Severe Presentation of Infectious Disease** Genomic Network of Excellence using long read sequencing in a partnership with Oxford Nanopore
- ▶ Improving the identification and outcomes for individuals with **inherited and acquired cardiovascular disease** NHS Genomic Network of Excellence
- ▶ **Pharmacogenomics** and Medicines Optimisation NHS Genomic Network of Excellence focusing on primary care, mental health, as well as specific drug/gene pairs
- ▶ **Genomics Artificial Intelligence (AI)** NHS Genomic Network of Excellence







## NHS Genomics AI Network of Excellence (GAIN)

The Genomics AI NoE has been established at the intersection of NHS genomic medicine and Artificial Intelligence (AI) development and translational research to support the implementation of AI technology solutions in genomic medicine pathways in the NHS.

The Network will:

- Build a national community in genomics and AI
- Create frameworks to support AI deployment in genomic medicine in the NHS
- Deliver exemplar accelerator programmes to develop the evidence required to adopt AI for the benefit of NHS patients, including improved and accelerated diagnosis and personalised medicine
- Building Patient and Public trust in Genomic-based AI clinical decision support systems

# GAIN Work Packages

## Work Package 1

### Building a Genomics AI Community

Collaborators:

- SE GMSA
- C&S GMSA
- Genomics England
- NHS England
- Academia
- NHS Partners
- Third sector

## Work Package 2

### Developing frameworks for the use of AI in genomics

Collaborators:

- SE GMSA Informatics
- C&S GMSA Informatics
- NHS England IWAG
- NHS England GU
- Genomics England
- NHS England AI/Digital Team
- Academia
- NHS Partners

## Work Package 3A

### AIDE Deployment Programme

Leads:

- GSTT Centre for Innovation and Improvement's (CITI) Clinical Scientific Computing team/The AI Centre for Value Based Healthcare

## Work Package 3B

### Accelerating patient diagnosis through NLP & Computational tools for pathogenic signal compression and genotype-phenotype diagnostics

Leads:

- Mendelian
- Eastern AHSN
- University of Southampton

## Work Package 3C

### Language AI for the identification of rare inherited cardiovascular disease and support genetic testing through automatic extraction of phenotypes

Leads:

- KCL Precision Health Informatics Data Lab
- King's College Technology Evaluation Centre
- Centre for Health Data Science ([UoB](#))

## Work Package 4

### Building Patient and Public trust in Genomic-based AI clinical decision support systems

Collaborators:

- CAS GMSA
- C&S GMSA PPV
- SE GMSA
- SE GMSA PPV
- Southampton BRC (Data, Health & Society theme)
- SLaM BRC
- King's College Hospital

# Work Packages Deliverables Summary

## Work Package

## Deliverables

### 01 Building a Genomics AI Community



- Create a Genomics AI hub
- Create network identity, comms & PPV approach
- Conduct network inter-working and market/ system appraisal
- Coordinate a programme of engagement events

### 02 Developing frameworks for the use of AI in genomics



- Define AI use cases in genomics
- Complete system technical engagement
- Creation and coordinate a Genomics AI Expert Delivery Group
- Publish a position statement that defines a framework and process for the adoption of AI genomics into the NHS

### 03 Exemplar Programmes

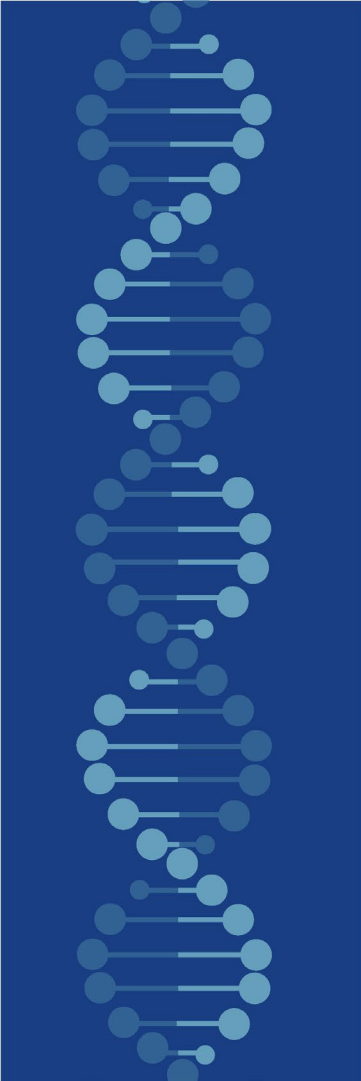


- Support ongoing delivery of exemplar programmes, including the development of proof of concepts tools, documentation of key findings and reviewing scalability of deliverables.

### 04 Building Patient and Public trust in Genomic-based AI clinical decision support systems



- Review of public trust in AI initiatives
- Creation of a forum with patient and public representatives to understand what specific issues related to AI in genomic medicine impact trust, and how we might address. These
- Conduct workshops
- Develop guidance documentation
- Develop a framework for patient and public involvement
- Creation of patient and public-facing AI toolkit
- Creation of a patient and public virtual panel



THANK YOU