

# Genomics strategic workforce plan 2024/25-2027/28



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## Foreword

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We are pleased to present the Strategic Workforce Plan for Genomics, the product of a strong partnership approach between Health Education Improvement Wales (HEIW) and Genomics Partnership Wales.

Genomics is revolutionising the way in which we think about healthcare. It has significant potential to disrupt how we diagnose, treat and manage rare, common and infectious diseases. The pace of technological and scientific advance is rapid; tests that were unthinkable 20 years ago are now routine and genomics is already improving outcomes for people in Wales.

As the strategic workforce organisation in NHS Wales, HEIW's role is to develop comprehensive plans for our current and future workforce through collaboration with our partners in NHS Wales.

Genomics Partnership Wales brings together a range of individuals from across NHS Wales, Welsh Government, higher education, research organisations, strategic partners, patients and the public to deliver the ambitions set out in the Genomics Delivery Plan for Wales.

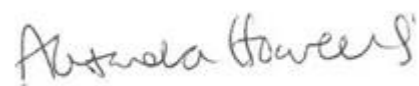
Together, we have developed this plan to respond to one of the key aims of the [Genomics Delivery Plan for Wales](#) which is to ensure that we focus on people.

As we embrace the world of genomics, we need a strong and capable workforce. Behind every genomic test, we have a skilled and dedicated workforce drawn from a wide range of backgrounds spanning science, medicine, research, education and an array of support roles. To keep pace with the advances in genomics, we will need to continue to grow our specialist workforce and focus on the education of the non-specialist workforce.

Genomics cuts across many different clinical and public health services and requires a whole system approach to delivering better outcomes for patients. Our challenge now is to educate, train and inspire the wider NHS workforce to become active partners in the delivery of genomic healthcare to people in Wales to realise its full potential.

This plan identifies a set of actions for us to take forward in partnership over the next three years.

We look forward to working with you on this exciting journey.



**Alex Howells,**  
Chief Executive for Health Education  
Improvement Wales



**Suzanne Rankin,**  
Chief Executive and Senior Responsible  
Officer for Genomics Partnership Wales

## Executive Summary

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[A Healthier Wales](#)<sup>1</sup>, the long-term plan for health and care, clearly maps out the system transformation journey for the next ten years to meet the needs of the people of Wales. This includes developments in healthcare, such as genomics.

Genomics is one of the fastest growing areas of medicine in the UK. Genomic testing is increasingly being integrated into patient and public health pathways and this is likely to continue. The pace of change is significant, with new technologies, digital transformation and scientific advance acting synergistically. This is likely to grow further over the next decade and to offer increasing benefits for patients, for the wider healthcare system in the management of a wide range of conditions, and for population health.

This plan has been developed jointly with Genomics Partnership Wales to assess the impact of genomic medicine on the future workforce needed within NHS Wales.

The plan has been developed using a consistent workforce methodology that included engagement with specialist genomics services and the wider workforce.

It is important to consider the wider landscape and the close cooperation with other UK nations to deliver the [Genome UK: the future of healthcare strategy](#)<sup>2</sup>. This provides opportunities to work collaboratively in key areas which are particularly important given the specialist nature of genomics services. We want to continue to grow our partnership with other UK nations and to deliver on UK shared commitments.

The plan considers a number of drivers for change:

- ❏ the continued development of genomic medicine within areas including cancer and rare disease
- ❏ the development of pharmacogenomics as a distinct element of human genomics to support the delivery of personalised healthcare
- ❏ the use of pathogen genomics to manage the transmission of infectious disease
- ❏ the use of genomic testing within a broader range of health conditions, moving increasingly into all areas of healthcare
- ❏ the application of genomic testing to improve health at a population level
- ❏ the adoption of technology that could free up the administrative, laboratory and clinical teams, facilitating an expansion in testing.

The plan sets out a roadmap for the next three years with **33 actions** identified to support the workforce in harnessing genomic medicine for the benefit of patients and the population.

The plan includes actions to:

- ☒ attract and retain the workforce needed, including developing structured career pathways for people working within specialist genomics services
- ☒ accelerate education and training pipelines and support professional registration where possible to facilitate an expansion in services
- ☒ extend multi-professional workforce models as appropriate to support the delivery of prudent healthcare
- ☒ improve genomic literacy across the wider workforce through targeted education and support so that the significant benefits of genomic healthcare and public health genomics can be realised.

We need a workforce that have the right skills, training and resources to be able to make use of genomics within their everyday roles across the NHS.

Success will look like:

- ☒ High quality patient care, delivered by fully regulated multi-professional teams working in partnership with citizens and communities to delivery safe, timely, effective, efficient, equitable and patient-centred care
- ☒ Improvements in the health of the population, informed by public health genomics
- ☒ High levels of staff engagement, motivation, wellbeing and satisfaction
- ☒ Improved recruitment and retention of specialist genomics staff through attractive and flexible working arrangements and career opportunities
- ☒ An infrastructure that supports education and training, helping to inspire future generations of people to work in genomic healthcare
- ☒ Flexible education opportunities and career development across the multi-professional workforce
- ☒ Intelligence-led workforce planning to ensure that we have sufficient number and skills in the specialist genomics workforce
- ☒ A compassionate culture, role modelled by excellent leaders and managers.

This plan will be implemented through continued partnership between HEIW and Genomics Partnership Wales, working across NHS Wales.

It will be reviewed periodically to ensure that it remains relevant within the broader landscape and in relation to other anticipated publications related to genomics including rare disease, pharmacogenomics, pathogen genomics, digital and research strategies for Wales.

## Section 1: Overview

### 1.1 Health Education and Improvement Wales (HEIW)

HEIW is the strategic workforce and education body for NHS Wales. HEIW's unique contribution or 'added value' is to:

- ☒ address strategic workforce issues that require solutions across Wales, both demand and supply
- ☒ make Wales a great place for our health and care staff to be educated, trained and employed
- ☒ maximise the contribution of all professions and occupations.

Our strategic objectives are set out below:



## 1.2 Genomics Partnership Wales

Genomics Partnership Wales is a key strategic Welsh Government programme, set up to drive forward the [Genomics for Precision Medicine Strategy](#)<sup>3</sup> and the subsequent [Genomics Delivery Plan for Wales 2022-25](#)<sup>4</sup>, to utilise genomic technologies to improve the health and prosperity of the population.

### Our Key Partners

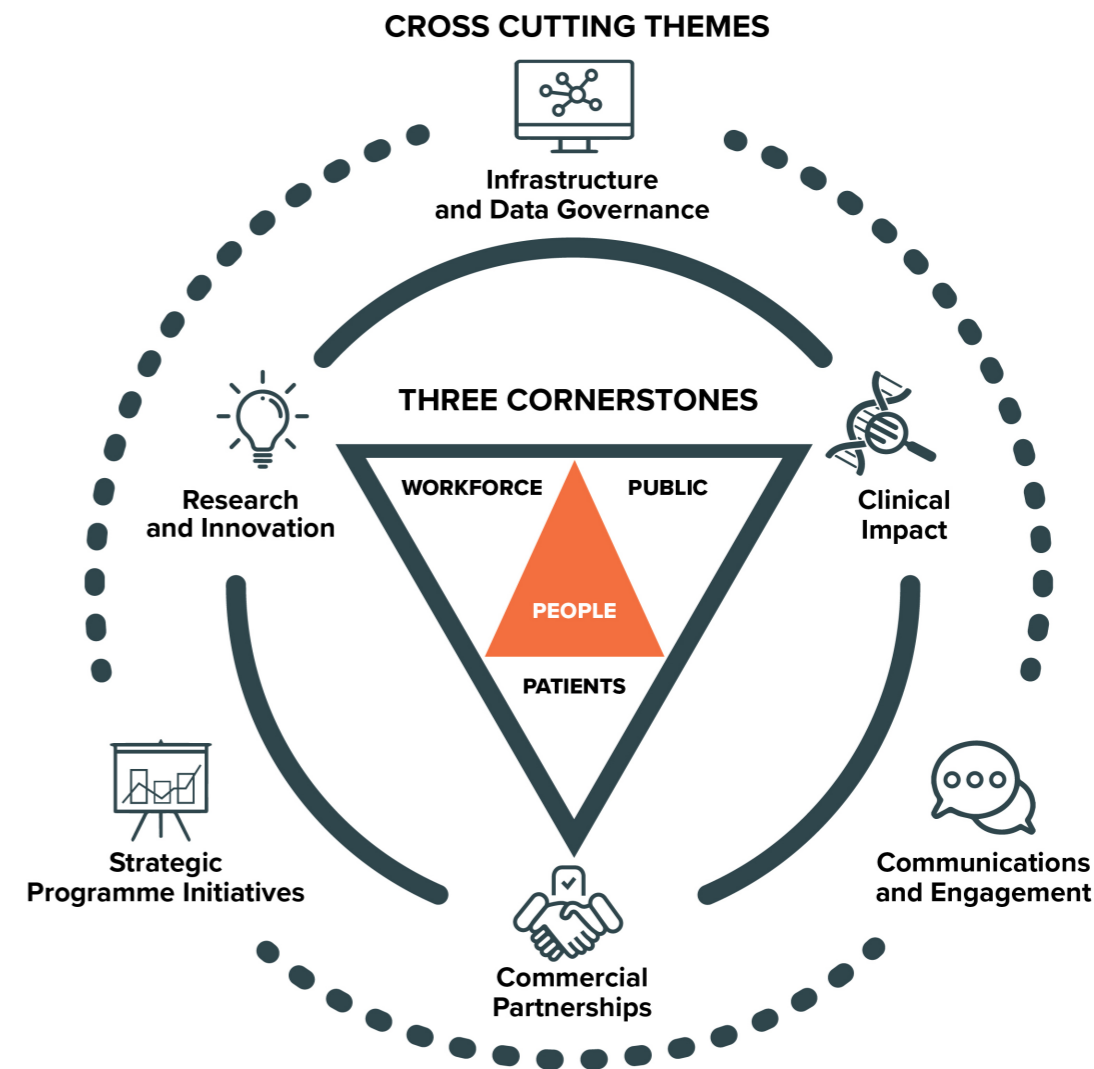


Genomics Partnership Wales brings together a wide range of partners, and focusses strongly on co-production with patients and the wider public to deliver genomic healthcare in Wales. A Patient and Public [Sounding Board](#) has been established to enable patients to be involved with the work of Genomics Partnership Wales, contributing through regular consultations; two representatives sit as members of the Genomics Partnership Wales Board.

Our key partners are:

- ▣ All Wales Medical Genomics Service (AWMGS) (NHS): the laboratory and clinical staff providing human genomic health services
- ▣ Public Health Genomics programme within Public Health Wales (NHS): comprising pathogen genomics services, the Genomic Epidemiology Unit and the staff who use genomic data to respond to outbreaks, undertake surveillance and inform public health strategies
- ▣ Wales Gene Park (Cardiff University): provide genomics expertise to researchers and industry partners, as well as education and engagement about genomics with the public and healthcare professionals.

## Our Genomics Ecosystem in Wales



## 1.3 Plan Scope

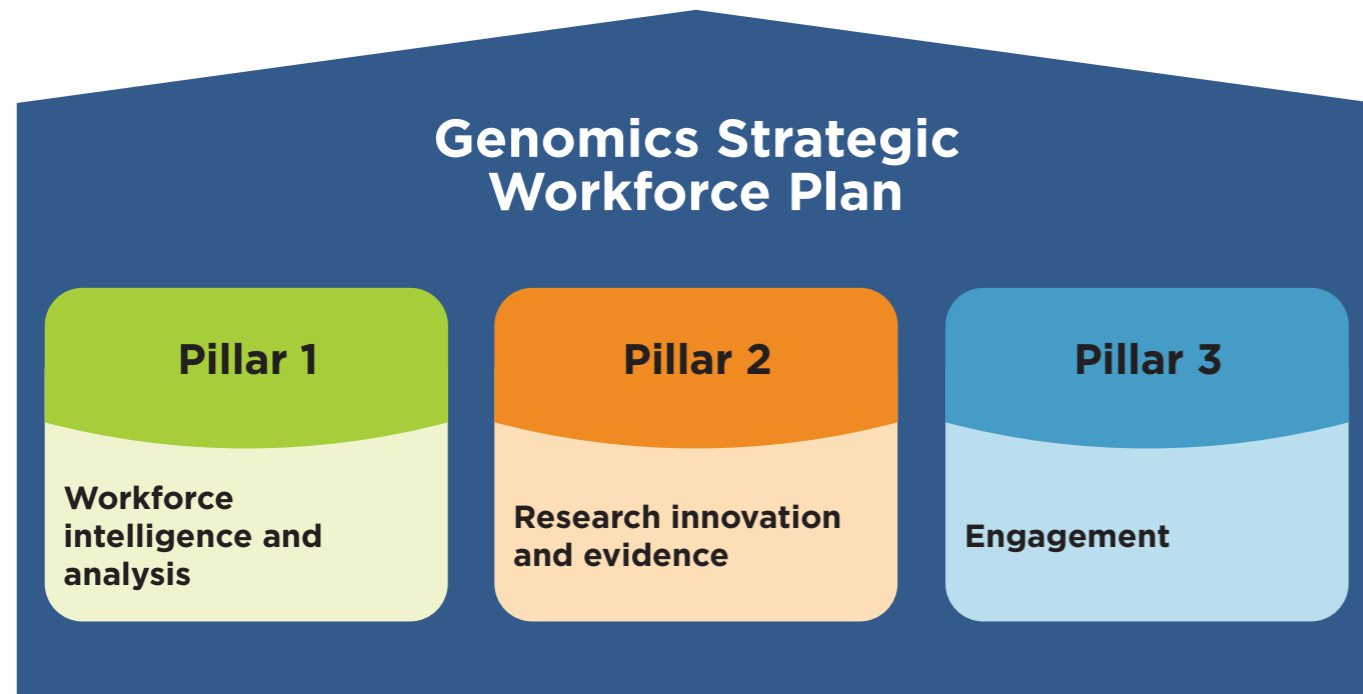
The scope of the plan was agreed between HEIW and Genomics Partnership Wales. It was agreed that the plan would focus on two key areas:

- ▣ assessing the needs of the specialist workforce across both human and pathogen genomics
- ▣ considering the implications of an expansion in genomic healthcare across the wider workforce.

It was agreed that the plan would review the specific workforce ambitions set out in the [Genomics Delivery Plan for Wales 2022-25](#)<sup>4</sup> and consider next steps.

## 1.4 Developing the Plan

This plan has been developed following a consistent methodology for workforce planning adopted by HEIW.



The methodology includes:

- ❏ A review of available workforce data and intelligence to help identify workforce trends and issues
- ❏ A review of relevant strategies together with published research
- ❏ Engagement with key stakeholders.

This methodology helps to ensure that our workforce planning is high quality, consistent and evidence based.

In line with the Duty of Quality, we have completed an assessment of the process against the six core quality standards for NHS Wales.

We completed an equality impact assessment as part of the process and our publications comply with the Welsh Language Act.

You can access more information on the methodology in our supporting documents which are available [here](#).

## 1.5 Strategic and Policy Context

In 2016, Welsh Government issued a [Statement of Intent](#)<sup>5</sup> for genomics and precision medicine in Wales which led to the development of the [Genomics for Precision Medicine Strategy](#)<sup>3</sup>, launched in 2017, and the creation of Genomics Partnership Wales in 2018.

In 2020, the UK Government published [Genome UK - The Future of Healthcare](#)<sup>2</sup>, a ten year strategy which set out a vision of how genomic healthcare should be transformed over the next decade. This strategy included a cross-cutting theme of “workforce development and engagement with genomics through training, education and new standards of care”.

In 2022, the UK Government, working with the devolved administrations, published a [policy paper](#) which set out a series of [Shared Commitments for UK-wide Implementation 2022-25](#)<sup>6</sup>. This paper also included a cross-cutting theme of ‘workforce development’ to support and enable healthcare staff to deliver the benefits of genomics by training and supporting them to acquire the relevant knowledge and skills, and by developing clinical pathways and standards of care. It paved the way for close collaboration between the UK home nations and remains a central driving force in the approach to developing our genomics workforce.

In December 2022, Welsh Government published the [Genomics Delivery Plan for Wales 2022-25](#)<sup>4</sup>, which included an action for HEIW to work with Genomics Partnership Wales to develop a Strategic Genomics Workforce Plan for Wales.

The plan’s ambition is to increase access to genomic testing across healthcare and public health; to sequence up to 3,000 whole genomes annually by 2025 and offer 5,000 genomic tests per annum to improve diagnosis of a range of conditions and treatment of cancer.

With rapid advances in genomics, the plan considers both the current implementation of genomics across healthcare and looks to the future. Genomic analysis technologies will continue to develop at significant pace and the use of generative Artificial Intelligence (AI) will routinely support joint decision making, so NHS Wales needs to prepare to respond to the rapid pace of development.

The plan recognised that attracting, developing and retaining a highly skilled, motivated and dedicated genomics workforce is a high priority, and contains actions that span the specialist genomics workforce, wider healthcare workforce and academic workforce.

It set out **four** key workforce deliverables for the Strategic Genomics Workforce Plan:

- ❏ Support for the specialist genomics workforce to grow and develop to meet increased demand for genomics
- ❏ Development of tools to upskill the wider workforce in genomics
- ❏ Development of clinical research in genomics through increasing the research and development workforce
- ❏ Links to UK-wide workforce and education initiatives as part of the [UK Shared Commitments](#)<sup>6</sup> with collaboration through the Genomics Training Academy.

## Section 2: Case for Change

This section sets out the case for change and why we have developed this plan.

### 2.1 Introduction

Genomics plays a pivotal role in transforming healthcare by enabling personalised and targeted approaches to disease diagnosis, treatment, prevention and surveillance across a wide range of medical conditions and infectious diseases, leading to improved patient outcomes and quality of life.

**Human genomics:** is the study of a person's DNA (the genome), and of how genes work together and with the person's environment. It includes:

- ❏ **Cancer Genomics:** the study of genetic variants that increase the risk of a person developing cancer and the study of the genetic information within cancer tumours to inform treatment choices and enable the practice of precision oncology.
- ❏ **Pharmacogenomics:** the study of how a person's genetic makeup predicts how they are likely to respond to medicines. Pharmacogenomic testing has the potential to reduce the occurrence of adverse drug reactions and improve the effectiveness of medicines use in clinical practice.
- ❏ **Rare disease genomics:** although rare diseases are individually rare, they are collectively common, affecting 1:17 people in Wales. Rare diseases can affect any organ system and occur at any age from conception through to the end of life. Around 80% of rare diseases are genetic in origin and genomics plays a major role in the diagnosis of rare diseases to facilitate targeted treatment, screening and advice on family planning.
- ❏ **Pathogen genomics:** is the study of the genetic makeup of micro-organisms that cause diseases. It involves analysing the entire genome of these pathogens to identify emerging pathogens, target treatments, manage patients, develop vaccines and control outbreaks. Pathogen genomics played a key role in the Covid-19 pandemic.

Genomics is already playing an important role in the delivery of healthcare in Wales. Genomic data can be used at a range of scales, from patient to population, and the [Genomics Delivery Plan for Wales<sup>4</sup>](#) sets out examples of innovative and, in some cases, world-leading services across both human and pathogen genomics in Wales.

### 2.2 Benefits of genomics in healthcare

Genomics improves patient management and outcomes for patients as well as offering benefits across the healthcare system:

- ❏ improving diagnostic effectiveness, reducing the time spent awaiting diagnosis by shortening the diagnostic odyssey for families affected by rare disease, and enabling more treatment possibilities at an earlier stage
- ❏ more precise diagnostics providing clear identification of the underlying cause of disease to improve treatment outcomes and pathway management
- ❏ facilitating precision medicine, by targeting optimised treatments leading to better patient outcomes
- ❏ fewer adverse drug reactions to medications by using pharmacogenomic testing to identify risk of side effects
- ❏ developing prognostic/ preventative approaches through better characterisation of conditions and identification of risk at both an individual and population level
- ❏ supporting family planning decisions based upon an understanding of the cause of rare diseases
- ❏ improved public health through surveillance of pathogens and the ability to inform targeted public health approaches.

To achieve these benefits, it is essential that genomic testing is offered by healthcare professionals outside of the specialist genomics service, known as 'mainstreaming', both to meet demand and to ensure that all eligible patients are offered testing at the appropriate point in the care pathway.

Healthcare professionals will need to feel confident to obtain informed consent from patients for genomic testing and to interpret the results. They will need an appropriate understanding of the ethical implications and the time to discuss this with patients before testing.

## 2.3 The future of genomics

To underpin the development of this plan, we have assessed where genomic healthcare is likely to be heading and to consider what will drive the demand for genomics.

Genomics is rapidly evolving and the pace of change is dependent on a range of factors, so it is difficult to be precise about the future. However, we have identified several areas where genomics is likely to impact the delivery of healthcare over the next ten years and a further set of enablers that are likely to impact the pace at which genomics could be expanded.

### Mainstreaming genomics

Genomic testing and analysis are increasingly being integrated into routine clinical practice. As technologies become more accessible and affordable, genomic testing is likely to become a standard component of patient care across a much wider range of specialties, informing diagnosis, treatment decisions and disease prevention strategies.

### Population genomics and public health

Population-wide genomic studies provide insights into genetic diversity and susceptibility to diseases within different populations. This could increasingly be used to inform public health policies and disease prevention strategies, including screening programmes, helping to improve population health.

In pathogen genomics, genomic data can be used to track the evolution and transmission of pathogens. This allows better identification and management of outbreaks, as well as providing a toolset that enables the identification of the emergence of wholly new pathogens or new 'variants' of a known pathogen.

This data can be used simultaneously to better manage patients and inform treatment, and to drive public health intervention and guide regional prescribing guidelines for antimicrobial drugs. By sharing this data, it is also possible to support a research response, which can lead to vaccine and treatment development.

### Newborn screening

The current [Generation Study](#)<sup>7</sup> in England aims to look at the utility and acceptability of population-level whole genome sequencing carried out at birth. If this were widely adopted, it has the potential to transform healthcare, but would create significant extra demand for the laboratory and the clinical practice of genomics.



### Advancements in precision medicine

Further accumulation of genomic datasets will refine our understanding of the genetics of cancer, rare, common and infectious diseases. This would support more precise and targeted approaches to treatment and management, as is already progressing within cancer care.

Miniaturisation of diagnostic technologies and the use of AI will enable rapid shared decision making for treatment pathways in real time, closer to patients and families. This migration of rapid diagnostic technologies into primary and community settings will require a robust governance framework aligned to the national [NHS Wales Point of Care Testing framework](#)<sup>8</sup> where some pharmacogenomic devices in primary and community care settings are already being considered.

Pharmacogenomics is likely to play a significant role in the delivery of healthcare, facilitating more precise treatment that is tailored to individuals helping to improve patient outcomes, minimising the risk of adverse drug reactions and improving safety.

### Therapeutic innovations

Genomic research is driving the development of novel therapeutics, including gene and cell therapy, RNA based therapies and gene editing technologies, broadly known as '[advanced therapies](#)'. Many advanced treatments will depend on genomic testing as part of the pathway of care. The number of new advanced therapies approved by regulators and evaluated by the National Institute for Health and Care Excellence (NICE) is likely to accelerate over the next few years, impacting on the number of genomic tests required.

### Genomics as a monitoring tool

There is an emerging body of evidence that some genomic assays could be a useful biomarker to monitor the progression and treatment response to a wide variety of conditions, from heart attacks through to Alzheimer's disease which could increase the volume of genomic testing required.

## Enablers

### Artificial Intelligence and data science

The average person's genome differs from the human reference genome at 4.1-5.0 million sites, with some variants common and others rare. Working out which of these variants is disease causing, which are contributing towards a person's risk of common diseases, and which are harmless genomic variation is a major challenge.

Artificial intelligence and machine learning are highly likely to facilitate an improvement in the speed in which genomic datasets can be analysed and reduce the work per genome for clinical scientists, facilitating further expansion of genetic testing through the release of time.

### Emerging laboratory techniques

Research is already demonstrating new approaches to increase the diagnostic yield of genomic investigations, such as long-read sequencing, and novel approaches to interrogating the genome and its effects on cellular function, which are likely to further change the practice of genomics. This could increase the yield from genomic testing, with the potential to improve the diagnostic and treatment pathway for patients.

## 2.4 The impact on the workforce

### Human Genomics

As human genomics develops and more testing is required, this will significantly increase demand on the AWMGS laboratory and clinical staff. Capacity within AWMGS is a key constraint for implementing the changes outlined below.

#### Mainstreaming

The NHS England [National Genomic Test Directory](#) (which is mirrored in Wales) outlines which patients are eligible for genomic testing and which specialties can request particular tests in England.

The directory is updated annually. The demand for genomic testing is increasing and, as more tests are added to the Directory, this will continue. In Wales, testing can be rolled out to other specialties, with the pace of mainstreaming influenced by:

- the ability, capacity and willingness of clinical staff working across NHS Wales to develop the appropriate skillsets and take on this work
- the capacity of the specialist genomics laboratory to provide increased genomic testing (as more eligible patients are identified and more tests added)
- the capacity of the specialist clinical genomics workforce (clinical geneticists and genetic counsellors) to train and support clinical staff in the wider NHS
- government policy
- the evidence base informed by research and development
- regulatory and approval mechanisms for new treatments and approaches.

#### Pharmacogenomics

Pharmacogenomics is already being used in Wales as part of medicines optimisation, by increasing efficacy and reducing adverse drug reactions. The evaluation and assessment of pharmacogenomic testing within clinical practice is ongoing and implementation is likely to grow across the whole healthcare system.

The speed of adoption will be driven by cost effectiveness and availability of gene panel tests but also by access to different testing methods, such as point of care testing when a result is needed rapidly to enable clinical decision-making.

Wales is developing a pharmacogenomics delivery plan in 2024-25.

The implementation of pharmacogenomics will impact on the NHS workforce across primary, acute and specialist care settings, with a particular impact on anyone who prescribes medication. There will be a need for access to specialist pharmacy professionals to support patient management.

#### Rare diseases

The increasing use of wider-scale testing techniques, such as gene panel testing, whole exome sequencing (WES) and whole genome sequencing (WGS), has increased the diagnostic rate.

Synthesis of these large datasets with phenotype information collated by clinical geneticists has led to a diagnostic yield of 30-40% in rare disease. However, it has led to increased complexity at all stages of the process, including ensuring informed consent, analysis and variant interpretation, and returning results to patients.

Alongside the increasing use of these tests, Wales wants to develop long read sequencing capacity to further increase the number of patients identified with a rare disease and reduce the diagnostic odyssey. [The Wales Rare Diseases Action Plan 2022-26](#)<sup>9</sup> signals a clear intent to further embed genomics in the diagnosis of rare diseases.

#### Cancer and genomics

Cancer can be thought of as an acquired genetic disease. Our genomes are subject to constant assault from the environment, which can result in a variety of novel mutations accumulating in our cells throughout life.

Identification of the specific mutations responsible for driving a patient's cancer is increasingly used to guide specific treatments. This precision medicine approach is already being used to improve treatment outcomes for patients across the NHS and is likely to continue to expand.

Cancer clinicians are already well engaged in the delivery of genomic testing and the implications for their patients but there will need to be a continued programme of education and support.

#### Liquid biopsy

For many diseases and conditions (most notably, cancers and specific infections), the removal (biopsy) of a small piece of tissue is one of the first steps in disease diagnosis. However, detecting DNA fragments in biological fluids (liquid biopsies) enables the early detection and monitoring of disease, without the need for invasive biopsies. Projects are underway to test liquid biopsy as an adjunct or alternative to traditional investigative options and this field is likely to expand as more evidence becomes available.

This will impact clinicians across NHS Wales offering liquid biopsy, who will need education, support and time.

#### Common diseases

Many genetic variants contribute to someone's susceptibility to or protection from common diseases, including diabetes, schizophrenia, heart disease and various cancers. Therefore, genomic testing can be used to identify those at higher risk, which can be used to inform surveillance and management.

At present, this mainly focuses on single gene variants with a large impact on risk. Research is already underway to generate polygenic risk scores, looking at the combined impact of many gene variants.

These are likely to be incorporated into certain areas of healthcare over the next decade, enabling the use of preventative measures and surveillance for those at high risk. In the future, a person's entire genome could be used to identify susceptibility to disease and guide care plans to reduce their risk.

The NHS Wales workforce would need to become familiar with offering such testing and using the results to offer personalised care.

## Whole Genome Sequencing - newborn screening

The current newborn screening programme in the UK uses a limited suite of metabolic and biochemical tests on dried blood spots to identify signatures of a handful of treatable diseases. Many of these require genetic confirmation before a diagnosis is reached.

England is developing an ambitious screening pilot, using whole genome sequencing in newborns to look for genetic diagnoses of a wide range of diseases before symptoms become apparent. There are significant ethical issues to be resolved before wide adoption. If the project demonstrates a significant benefit and is adopted in Wales, there may be future generations of patients where 70% or more have whole genome sequencing datasets acquired at birth, which could be used to guide long term health care decisions. This would impact on the workforce across NHS Wales.

## Pathogen genomics

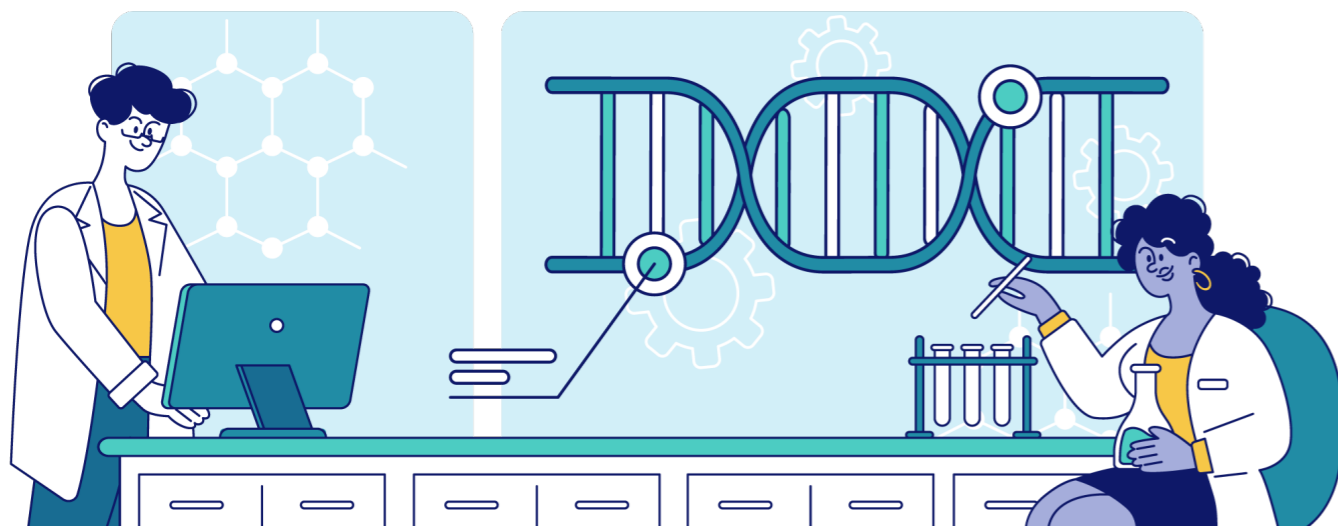
Pathogen genomics plays an increasing role in public health, informing policy and interventions to mitigate the threat of infectious disease. It has significant potential, with thousands of potential pathogens that could be sequenced.

Pathogen genomic data could increasingly be linked into public health systems at different levels:

- ❏ **Patient level**, to support patient management in specific areas such as human immunodeficiency virus (HIV) and tuberculosis (TB)
- ❏ **System level**, for example in the management of infectious diseases within a hospital environment
- ❏ **National level**, for example in developing surveillance programmes, or the design of new vaccines.

Wales has world-leading capability in the field of pathogen genomics. A separate pathogen genomics delivery plan will be released in 2024-25 which will set out the future direction.

Integrating pathogen genomics into clinical practice means that individuals within the wider workforce (for example, those working in infection prevention and control) will need to understand genomic data alongside other molecular data. Increasing pathogen testing will have a significant impact on the Public Health Wales Pathogen Genomics Unit.



## 2.5 Workforce Drivers: Specialist Genomics Workforce

Section 2.2 set out the likely 'demand side' drivers over the medium-long term. Technological advances are likely to be both a demand and a supply-side driver; changing the nature of how we deliver genomics and impacting on workforce requirements into the future, although the precise impact is difficult to assess.

AWMGS and Public Health Wales (the Pathogen Genomics Unit and Public Health Genomics Programme) have a range of specialist staff. AWMGS has around 300 full-time equivalent (FTE) staff with around 50 (FTE) staff working across the Public Health Genomics Programme. All services are currently in a position where demand for testing is outstripping supply, creating a significant backlog of testing that cannot be delivered through current capacity. This also limits the ability of the genomics teams to develop new, transformational, services.

There are many roles within the specialist workforce across human and pathogen genomics. These include:

- ❏ technical laboratory staff who carry out the preparation of samples and run sequencing technology
- ❏ bioinformaticians who develop and implement algorithms to identify variants that may be clinically relevant
- ❏ clinical scientists who support the analysis, interpretation and reporting of results
- ❏ family history coordinators who collect family and medical information from patients and their records
- ❏ genetic counsellors who counsel patients and provide specialist advice and support for families, both before and after genomic testing
- ❏ clinical geneticists who manage patients in conjunction with other multi-professional teams
- ❏ genomic epidemiologists and public health consultants who interpret and utilise genomic data at a population-level for public health purposes
- ❏ microbiology consultants and consultants of communicable disease who use genomics to manage patients and outbreaks
- ❏ a wide range of administrative, quality management, training and digital staff who support the system to function effectively.

In common with other parts of the NHS, specialist genomic services are impacted by a range of workforce supply issues:

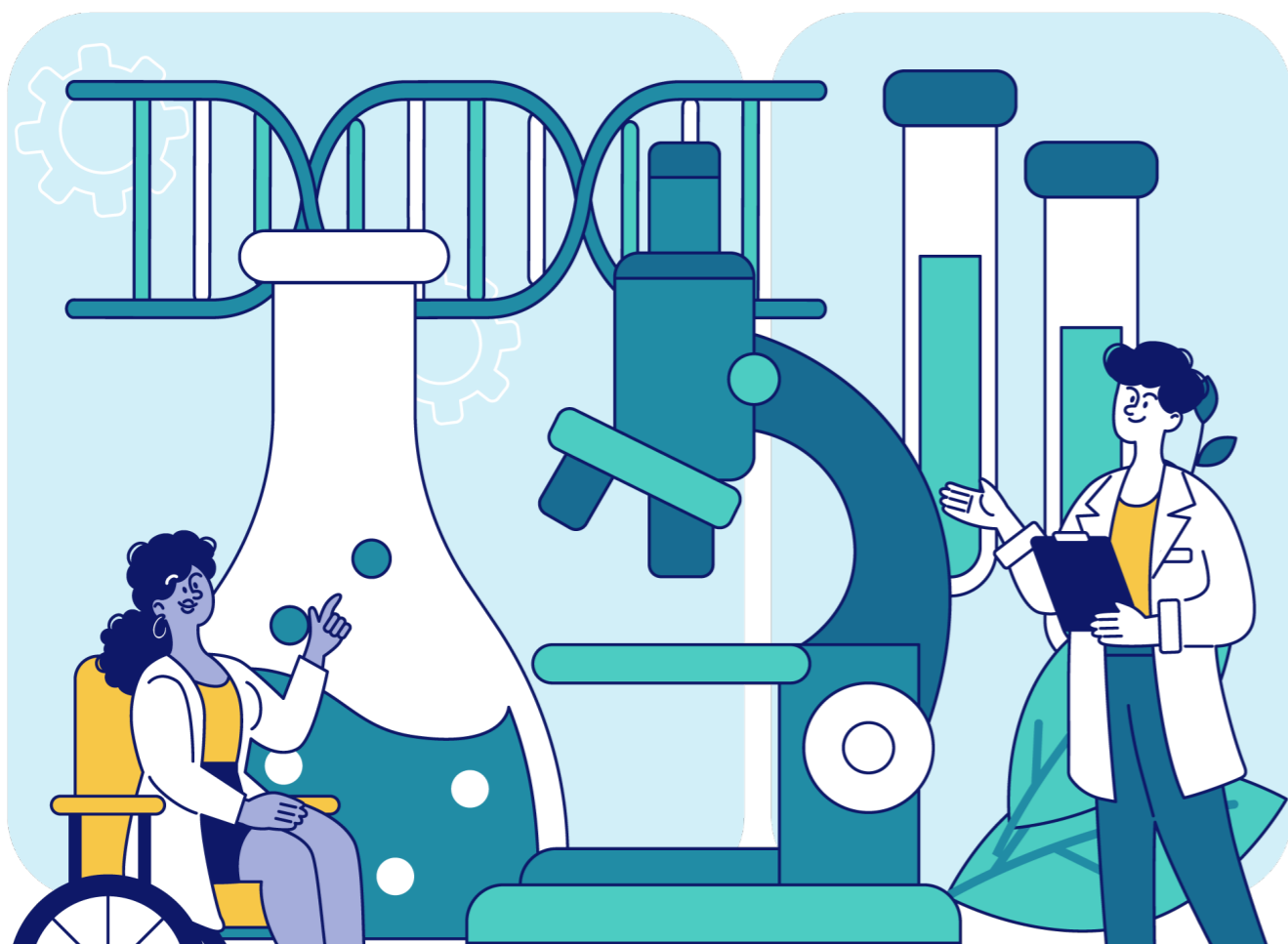
- ❏ lengthy training pipelines ranging from 3 years up to 15 years for medical and non-medical roles
- ❏ recent increases in students and trainees requiring in-service training are impacting on the availability of supervisory capacity particularly in laboratory settings, placing further demands on the existing workforce
- ❏ labour market shortages across the UK driving demand for key skills, with competition within the NHS and from industry, academia and research environments

- generational changes have increased demand for flexible working and for roles that offer rewarding careers with opportunities for progression, impacting on retention
- workforce morale and wellbeing due to workload pressure, impacting on retention
- genomics is data intensive and requires new skills and expertise in mathematics and computer science which are poorly covered at every level from school through to more advanced training.

## Summary

Human and pathogen genomics are likely to drive significant changes to the delivery of healthcare. However, the benefits will not be realised without an increase in the specialist genomics clinical and laboratory workforce, and an investment in workforce development for both specialist genomics services and the wider NHS workforce.

Given these challenges, it was agreed that the plan would align with the current UK shared commitments and provide a roadmap for workforce development over the next three years, and will then be reviewed.



## Section 3: Key Findings: Specialist Genomics Workforce in Wales

This section summarises some of the key findings from our engagement with staff working in specialist genomics services in Wales.

### 3.1 Introduction

This plan is intended to address how we scale up the specialist genomics workforce across human and pathogen genomics to respond to future demand. The services are already reporting a significant increase in the complexity of testing and reporting over the last five years. Headline testing numbers mask the growth in complexity and there is a significant backlog of cases within the system awaiting testing, analysis and reporting.

Given the pace of technological change, it is difficult to accurately assess future workforce requirements. For example, increased automation could help to reduce the workload and artificial intelligence assisted tools could speed up variant interpretation, phenotyping and letter writing, reducing the workload for clinical scientists and clinicians. On the demand side, predicting the uptake and success of mainstreaming is challenging given the number of variables involved, whilst changes in policy and scientific research could rapidly alter the demand curve.

If we overestimate the pace of change and the degree of technological advancement, there is a risk that we make decisions to train fewer people and the pipeline is insufficient to cope with the growth in demand, resulting in increasing turnaround times for test results and sub-optimal patient outcomes.

The counter-risk is that we underestimate the benefits of technological advance and train too many people for fewer jobs, resulting in a loss of value to the system and the potential need to re-train individuals in other roles including research development and innovation, commercial partnership and technology governance. These factors need to be carefully assessed through the development of this plan.

There may be a need to consider alternative models, such as contracting in specialist skills from other sectors where there is a need to scale up services and where market conditions and elongated training pipelines have created workforce shortages.

### 3.2 Key themes from engagement with specialist workforce

A specialist workshop took place in autumn 2023 to explore the current challenges in more detail. The engagement exercise was supplemented by a questionnaire, meetings with members of the specialist workforce and a consultation held in May 2024 to garner views on the actions proposed. More detail can be found [here](#). The discussions were supplemented by a round table event held with leading academics across Wales which helped to identify the key challenges and opportunities within the current landscape.

The engagement used the [Workforce Strategy for Health and Care](#)<sup>10</sup> to explore the issues raised as this provides a consistent framework across Wales.

## Theme 1: A Healthy, Engaged and Motivated Workforce

Respondents working within specialist genomics services identified unmanageable and overwhelming workload as a key theme, impacting on performance, increasing stress and sickness, and limiting time to undertake training and development, resulting in staff feeling undervalued.

This is compounded by:

- ❏ high vacancies - a recent healthcare science vacancy audit found that genomics has a significant proportion with 20% of funded posts being vacant. The vacancy rates for clinical scientists who are able to report cases in some specialist laboratory sections has ranges between 40% and 60% which is unsustainable
- ❏ high turnover of staff in some areas due to limited career progression opportunities or lack of flexible working. The high turnover of staff is not only a sustainability issue for the specialist services but also a significant cost to NHS Wales' training budgets
- ❏ a significant number of staff who are in training posts within the service needing supervision and support, increasing the pressure on experienced staff
- ❏ high burden on clinical staff to train and support other healthcare professionals to offer genomic healthcare (mainstreaming)
- ❏ high administrative burden, especially due to estates and digital infrastructure - this may improve with the planned move of all specialist genomic laboratory workforce to the new state of the art facility in Cardiff at Canolfan Iechyd Genomig Cymru (CIGC), though digital challenges remain.

The ability to work flexibly and/or remotely has become a key factor in the labour market post-pandemic, which has not been possible for AWMGS laboratory staff due to digital constraints. The vacancy audit reported a significant loss of bioinformaticians and clinical scientists to other roles within the NHS in England due to improved remote access and home working. The adoption of the new Genomic Laboratory Information Management System software later in 2024 should improve the ability to work remotely and provide more flexibility, improving the attractiveness of the roles.

Fixed-term contracts and the lack of job security were also reported as a demotivating factor for some roles across the genomics programme team and within the Wales Gene Park.

All organisations involved need to continually focus on staff health and wellbeing as the evidence highlights that this is a key factor in employees' engagement levels.

Actions that we will take forward as a result of this plan are:

1. Facilitate flexible and remote working opportunities for specialist staff as a result of investment in an upgraded laboratory management system (Lead: AWMGS)

## Theme 2: Attraction and Recruitment

There is a need to attract, develop and retain a highly skilled specialist genomics workforce to meet the increasing demand for genomic healthcare. There is a risk that there will be insufficient specialist genomics workforce to deliver genomic healthcare without improvements in attraction, training and retention.

Respondents highlighted the need to promote the benefits of [Train, Work, Live](#) and the unique selling points of Wales for those wishing to work within genomics, i) cost of living compared to England, ii) size, iii) ability to influence service delivery and policy, and iv) increased research opportunities.

Many of the professions within this workforce require a niche interdisciplinary skillset. The lack of visibility means that the future workforce is unaware of the career options available and therefore do not train with this in mind. Raising awareness of genomics and highlighting the role of genomic careers in healthcare, especially amongst young people, can inspire and foster interest to attract the future workforce.

The lack of awareness of genomics amongst those considering scientific careers within healthcare is particularly true of pathogen genomics, which is not addressed in many curricula. Therefore, it will be important to work with higher education institutions to ensure that this is covered within relevant programmes.

Widening access would also create a broader pipeline for recruitment, for example introducing an apprenticeship level entry route as an alternative to the traditional university model.

Staff reported that current Agenda for Change agreements can inhibit career progression where there are very limited opportunities for staff to progress to senior roles without taking on management responsibilities. AWMGS has recently taken steps to create new roles at a consultant level for bioinformaticians to reflect the need to create an attractive career structure.

However, there is a lack of opportunity to retain clinical input for those looking to progress their careers, which is an issue across the NHS. This creates difficulties retaining staff who want to progress without moving into management or to have more varied roles, though this could be possible if staff were able to continue working within the NHS, whilst also working in academia and/or industry.

Relatedly, data scientists who wish to move from a research environment into clinical bioinformatics are unable to as they are expected to have previous NHS experience. There is a need to work with service, industry, and academia to develop new career frameworks and pathways to support those who wish to change or diversify careers.

The use of recruitment and retention premiums being offered in other parts of the UK was also noted as an issue, as these are not available in Wales. This is an area that needs further exploration and consideration, at both a local and national level, of the benefits and risks of such an approach.

The actions that we are proposing to take forward are:

2. Promote the availability of careers within genomics services:
  - a. Actively promote the availability of genomics careers using available platforms; develop dedicated approach to the promotion of genomics and inclusion within Careersville (Lead: HEIW)
  - b. Target outreach work to 6th Form careers fairs across Welsh schools and colleges to promote the awareness of careers within genomics services (Lead: Wales Gene Park)
  - c. Target outreach work to science, genomics and biomedical science courses at Welsh universities including careers fairs and science societies (Lead: Wales Gene Park)
3. Develop pathfinder model to enable partnership arrangements with academic institutes and/or industry that allow staff within the specialist genomic workforce to span NHS service delivery and research scholarships to support the attraction and retention of skilled staff (Lead: GPW)
4. Consider 'Return to Genomics' initiative for those who may have left the workforce or wishing to transition to a new career (Lead: HEIW)
5. Work with higher education institutions to include pathogen genomics in the delivery of the Healthcare Science Life Sciences Practitioner Training Programme curriculum to increase knowledge of pathogen genomics within the specialist workforce (Lead: HEIW)

### Theme 3: Excellent Education and Training

Statutory registration of staff within the specialist workforce is important to ensure quality and safety for patients. However, statutory registration has not been available for all staff members, and respondents reported that regulation requirements for clinical scientists, bioinformaticians, genetic counsellors and genetic technologists are a barrier, impacting on recruitment and retention.

Currently, there are complex education and training pathways, with multiple routes through formal and equivalence education pathways. Respondents noted that a mapping exercise of equivalence routes for some roles within the workforce should be undertaken, to clarify what training was available to pursue development opportunities.

Within human genomics, obtaining statutory registration for clinical scientists and bioinformaticians is resulting in a significant training burden on the service and taking longer than necessary due to workload pressures. Alternative approaches to tackling the regulation backlog need to be considered.

The majority of genetic counsellors have voluntary registration, though statutory registration has recently become available. Again, workload pressure is a barrier to working towards this, and represents a significant training burden to the service.

Genetic technologists are not able to obtain statutory registration, however the landscape is changing and the technical laboratory workforce could now become registered as biomedical scientists. This would also enable career progression opportunities, promoting retention of staff.

For pathogen genomics, current biomedical scientist training is not always appropriate and there are issues with top-up modules. The Institute of Biomedical Science has recognised some of these constraints and has indicated that they are willing to work with NHS Wales on this.

With a need to promote statutory registration for all eligible staff groups, respondents suggested that a mechanism be considered to support the financial burden this presents.

Allocation of time to attend further education opportunities was also reported to be limited due to demands of the day-to-day role. Unfortunately, due to continued system pressures, many staff across the NHS are experiencing similar challenges. Continued professional development is not a 'one-time thing', especially as scope of practice may change over time. A recommendation of [Genome UK: the future of healthcare strategy](#)<sup>2</sup> is that continuing professional development programmes are established to ensure all relevant staff maintain an up-to-date and role appropriate understanding of genomics. HEIW has recently developed a [CPD Strategy](#)<sup>11</sup> to support the adoption of a structured, nation-wide approach to the provision of continuing professional development.

These training pathways place significant demands on the core specialist services to educate and train these individuals. However, our engagement also highlighted opportunities to accelerate training programmes through the provision of structured in-house and external education. As part of the [Genome UK shared commitments policy paper](#)<sup>6</sup>, the [Genomics Training Academy](#) (GTAC) has been established by NHS England. This will provide training and education for the specialist workforce (for example using virtual reality/simulation) to help reduce the training burden on specialist services. However, there may be a need to develop additional resources as identified to support the workforce in Wales.

There also needs to be a recognition of the impact on the relatively small, experienced specialist workforce of the requirement for them to upskill the wider workforce to provide genomic healthcare. Respondents noted that protected time is required to allow the capacity to deliver education and training without having to 'catch-up' on the workload missed, and should be factored into job planning. Staff could also consider producing some learning resources (such as recorded lectures) to be re-used. Quality assurance processes should be put in place for existing and future training programmes, to ensure appropriate supervision and assurance of assessors.

The actions that we will take forward are:

6. Strengthen specialist genomics workforce expertise and training by supporting staff to obtain statutory registration or (if this is not available) voluntary registration:
  - a. Map equivalence routes with Institute of Biomedical Science (Certificate of Competence by Equivalence) and/or Academy of Healthcare Science (Science Training Programme Equivalence) for laboratory technical staff and genetic counsellors to assess opportunities to develop career pathways and new education and training required (Lead: HEIW)
  - b. Ensure access to education and training support to enable all genetic counsellors, bioinformaticians, laboratory technical staff, biomedical scientists and clinical scientists to achieve appropriate professional registration to improve patient safety (Lead: HEIW)

7. Undertake a detailed review of the education framework for healthcare science to support the development of pathogen genomics services as part of phase 2 of Strategic Review of Education Programmes (SREP2) including:
  - a. Working with UK partners to ensure the appropriate education and training in pathogen genomics for clinical scientists and bioinformatics including appropriate routes to registration (Lead: HEIW)
  - b. Working with the Academy of Healthcare Science to agree and publish an appropriate equivalence pathway to clinical scientist registration in pathogen bioinformatics (Lead: HEIW)
8. Expand the opportunity for people working within specialist services who are supported into employment through healthcare science education and learning pathways (including apprenticeships):
  - a. Implement the learning pathways for healthcare science and ensure that they remain fit for purpose (Lead: HEIW)
  - b. Use the learning pathway to develop the role of assistant practitioners across specialist services (Lead: GPW\*)
9. Strengthen education and training infrastructure to accelerate training pipelines and reduce training burden on specialist staff:
  - a. Identify how to accelerate training and reduce training time for healthcare science roles within specialist genomics services (Lead: GPW)
  - b. Ensure that NHS Wales contributes to the NHS England Genomics Training Academy (GTAC) and identify how GTAC resources can be utilised to support accelerated training pathways for key roles (Lead: HEIW)
  - c. Develop an educator development plan that increases the quality of education and training within specialist services (Lead: HEIW)
10. Promote mechanisms of funding support for applying for registration for identified specialist genomics workforce (Lead: HEIW)

#### Theme 4: Seamless Workforce Models

Another main theme from the engagement was a lack of understanding of roles and responsibilities across the specialist workforce due to 'compartmentalisation' of workflows within teams and limited crossover; this results in the inability to support each other effectively. There is also a limited understanding and appreciation of the skills and experience that non-scientific staff can bring to the service.

Following the principles of prudent healthcare, there are opportunities to introduce other roles to support specialist staff. The role of genomic associate/ practitioner is becoming commonplace in England and could be a valuable role in clinical genetics enabling senior clinicians to maximise the use of their skills and enable prudent use of their time.

The move towards a fully registered workforce will also enable the service to adapt its skill mix. If the technical workforce become registered as biomedical scientists, some of the reporting work undertaken currently by registered clinical scientists could be delegated within an appropriate competence framework and scheme of delegation, so that clinical scientists' skills can focus on the areas that only they can undertake.

There is a need for all staff to understand the process and work undertaken by each role within the service, to create mutual respect. Respondents noted that clear lines of leadership, clarity of roles and responsibilities, and effective communication are all essential for a multi-professional team to work. This becomes even more crucial where the team straddles organisations as is the case with the specialist genomics workforce in Wales.

The concept of 'T-shaped skills' is relevant in the development of seamless workforce models. The vertical bar on the T represents the depth of skills and expertise in a particular field, whereas the horizontal bar is the ability for individuals to work across disciplines with experts in other areas from across the multi-professional team. Given the number of disciplines with genomics and its broad applicability across medicine, we will need people with T-shaped skills in the workforce in the future.

The actions that we are proposing to focus on are:

11. Extend multi-professional workforce models within genomics services and work with UK partners to implement a framework for genomic associate/practitioner support roles within the specialist genomic service to support the delivery of prudent healthcare (Lead: HEIW)
12. Identify how the enhanced, advanced and consultant framework can be utilised within specialist services to provide structured career pathways within the multi-professional workforce (Lead: GPW\*)
13. Map current career pathways for all areas of healthcare science, towards creating a career framework/s for all areas of the profession that considers future service need in all regions of Wales and that will improve attraction and retention (Lead: HEIW)
14. Increase the number of genomic biomedical scientists working within specialist genomic services to optimise skills as part of the transition to a fully registered workforce (Lead: GPW\*)

#### Theme 5: Workforce Supply and Shape

The current backlog in the genomics laboratory and clinical service within Wales means that there is a need to consider the broad demand and capacity requirements (both current and future) to right size the workforce.

An increased demand for genomic testing across all specialties and the likely acceleration of pharmacogenomics demonstrates the need for a larger specialist genomics workforce. However, uncertainty about the rate of increase and about technological advance makes future workforce planning difficult.

Demand for genomic testing is likely to be driven by several factors including:

- ▣ the uptake of mainstreaming
- ▣ the speed of translation of research and development into evidence and through regulatory processes
- ▣ policy decisions
- ▣ financial context.

Some of the need for significant increases in the workforce could, in theory, be mitigated by technological advances, such as automation and artificial intelligence, speeding up the processing of laboratory results and analysing results. This may also provide opportunities for new or changing roles.

Therefore, there is a balance between training enough people so that the workforce is not a brake on the ability to derive benefits, whilst not training too many, which would result in an over-supply. Aligning future supply pipelines with demand at a time when there is considerable uncertainty about the extent of technological advances is inherently difficult.

In addition to the extra laboratory workload and the need for the clinical workforce to support mainstream colleagues to provide genomic healthcare, an increase in genomic testing will result in increased numbers of relatives needing genomic information and therefore additional demand for genetic counsellors.

Wales Gene Park currently provides research infrastructure to academia and industry partners, which support the advancement of genomic research. As their funding from Health and Care Research Wales is coming to an end, it will be important to establish a sustainable infrastructure to ensure that this research is still supported, and these partnerships can continue and develop.

The actions that we will take forward are:

15. Review the output from workforce modelling exercise being undertaken in NHS England and consider the future size and shape of the workforce for Wales needed to meet the increased demands for genomic testing and for public health genomics, identifying increases needed through the annual Education and Training Commissioning Plan (Lead: HEIW)
16. Working with Public Health Wales including the Pathogen Genomics Unit, consider the future size and shape of the workforce needed to meet the increased demands for public health genomics, identifying increases needed through the annual Education and Training Commissioning Plan (Lead: HEIW)
17. Establish the sustainable workforce infrastructure needed to facilitate the interface between the clinical and research environments, to realise both the research ambitions of genomics in Wales and the opportunity to attract strategic partnerships and industry investment (Lead: GPW)

## Theme 6: Leadership and Succession

Although a leadership structure is in place within the specialist workforce, respondents noted that an increase in management roles has meant that a large number of experienced staff are no longer practicing science and lack a range of management skills, for example, senior leadership roles are often recruited from within the service which can be a barrier to introducing innovative and transformative ways of working.

18. Promote leadership programmes for current and future leaders to specialist genomics services (Lead: HEIW)
19. Embed leadership development within specialist genomics services for current and future leaders (Lead: GPW\*)

## Theme 7: Building a Digitally Ready Workforce

Genomic data is of high quality and reliability and can add real value to patient care. With the increasing use of precision medicine, including genomics, the workforce will need to develop new skills in all aspects of information governance, consent, and data law which are fundamental to the delivery of patient-centred care across the spectrum of the specialist genomics workforce activities. An agile specialist workforce who are able to embrace and embed future innovation, will be important to maximise the benefits of genomics.

Data sharing initiatives such as the Secure Anonymised Information Linkage (SAIL) databank enables genomic data to be combined with wider healthcare information for analysis. Respondents noted that there will be a workforce training need in accurate coding and recording of data to adopt a common language to grow data stores for analysis.

Digital tools are already important for aspects of genomic healthcare, such as bioinformatics. Currently, bioinformaticians in AWMGS and the pathogen genomics unit spend time working on the digital architecture required to facilitate their work, which does not require specialised bioinformatics knowledge. Increasingly, in order to utilise data at a population level, there will be a need for bioinformaticians to pass data to other data professionals (e.g. genomic epidemiologists or genomic data scientists). Provision of system engineering expertise is critical to allow bioinformaticians to dedicate more time to specialised bioinformatic tasks, and to enable digital systems to communicate.

An increased demand for genomic data will require additional capacity to provide data analysis. Limited clinical scientist and bioinformatician capacity makes this difficult; data interpretation is rate-limiting. Automated data analysis and artificial intelligence/machine learning is required to increase capacity, but we need to ensure efficacy. Regulations are needed around the clinical application of artificial intelligence.

The actions that we will take forward are:

20. Work with DHCW & individual programmes on the digital roadmap for genomics to monitor impact on the workforce to identify opportunities for role design, new roles and education and training requirements (Lead: HEIW)
21. Scope the requirements for system engineer support to release bioinformaticians' time, and assess how best this can be implemented across specialist services (Lead: GPW\*)
22. Implement a national approach to horizon scanning for innovations and improvement in technology and diagnostic equipment that would provide opportunities for workforce transformation including specific actions arising from the AI Commission for Health and Social Care (Lead: GPW)

### 3.3 Research and specialist workforce

One of the key issues highlighted in the [Genomics Delivery Plan for Wales<sup>4</sup>](#) is the need to ensure that Wales continues to develop its genomics research activities. Genomics Partnership Wales are developing a genomics research strategy for Wales. A review carried out on behalf of Welsh Government by IQVIA provides an analysis of the landscape and highlights Wales' strengths in genomic research; key areas include mental health, dementia, cancer, rare disease and pathogen genomics. Health and Care Research Wales has facilitated genomics research activity through its investment in the Wales Gene Park.

The landscape assessment indicates the pivotal role that the specialist genomics workforce plays and articulates the risk that workforce shortages may affect the pace and quality of genomics research. For example, clinical scientists play an important role in research and development, but at present have limited capacity to do so due to workload pressures. Through a SWOT analysis, it identifies the threat that the skilled workforce will migrate to industry roles due to limited career opportunities, slow development pathways and lower pay.

Wales Gene Park also play a valuable role in educating the wider public on genomics and in supporting continuing professional development activities for healthcare professionals. This has been a core aspect of their work programme since inception. From April 2025, Wales Gene Park will no longer be funded by Health and Care Research Wales. This represents a risk to the system and discussions are taking place to identify alternative options.

HEIW also plays a key role in research in two ways. They develop the academic workforce through the [Welsh Clinical Academic Track \(WCAT\)](#) training programme, and they provide continuing professional development in research skills.

WCAT provides clinical medical training with research and a research qualification (MD or PhD) and is designed to support the supply of clinical academic doctors to the workforce. There are around 30 doctors in the programme currently. Nursing, AHP and science areas are considering similar programmes including offering the Masters in Research (MRes).

All medical postgraduate curricula include research competencies, and these are monitored at the Annual Review of Competency Progression (ARCP).

The importance of enabling the workforce to undertake research and development is recognised. HEIW's approach to growing the clinical academic workforce is being considered alongside our role in undertaking research activities, and this may be relevant for genomics.

### 3.4 Summary and implications for workforce planning

The key messages from the engagement, review of workforce intelligence and horizon scanning are that there is a requirement to significantly expand the specialist genomics workforce over the short, medium and long term. There are current vacancies in the workforce, with competition across the UK and from industry, and we will need to consider how best to secure our future supply.

Our workforce supply typically comes through four routes:

<p><b>Attraction and recruitment</b> Attracting people to work within genomics through recruitment</p>	<p><b>Education and training</b> Providing excellent education and learning pathways, experiences at undergraduate and post graduate levels, and work-based learning</p>
<p><b>Retention</b> Creating new or extended roles for current and new workforce</p>	<p><b>Redesign</b> Retaining people in roles through career development, improved workplace wellbeing, flexible working and retirement options</p>

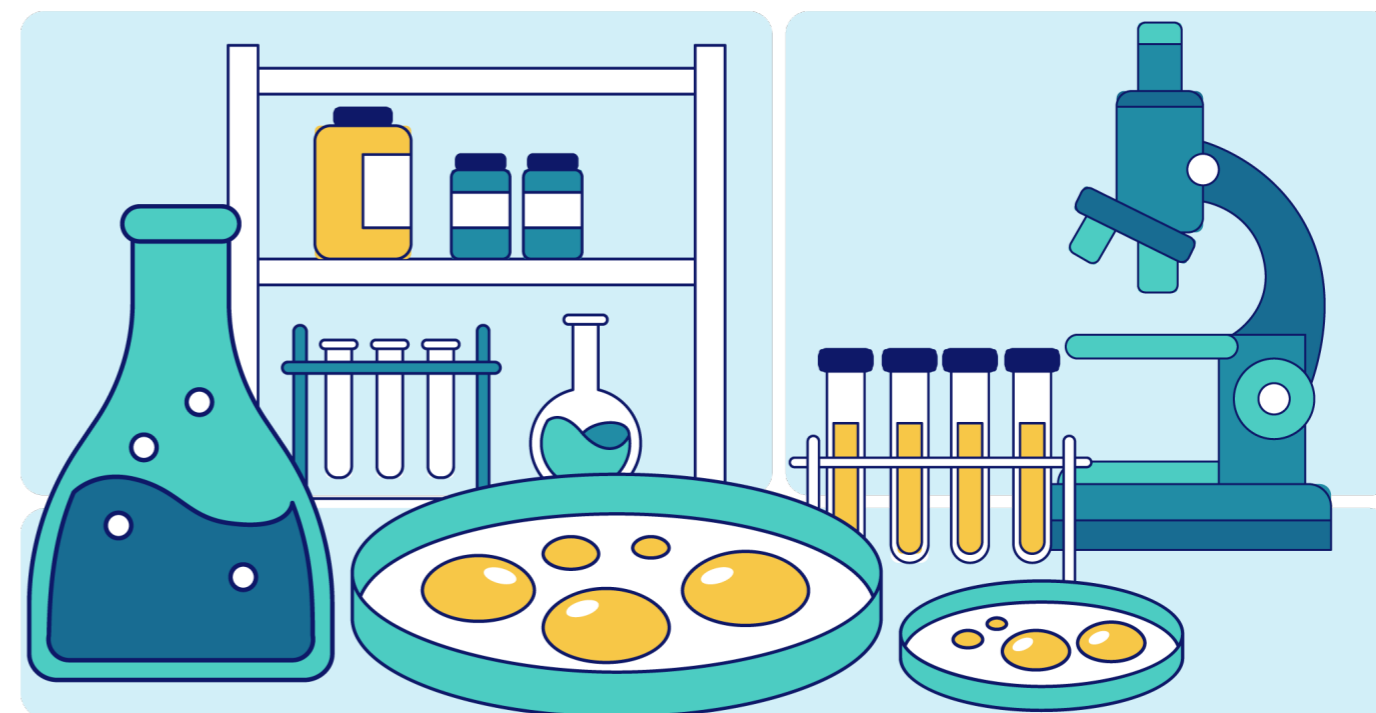
As AWMGS is commissioned centrally in Wales through the Joint Commissioning Committee, future workforce implications will need to be assessed and a case developed to support service expansion. HEIW will continue to work closely with Joint Commissioning Committee and Genomics Partnership Wales to consider the implications of an increase in genomic testing and what this means for both specialist services and the wider workforce.

HEIW will use the annual Education and Training Commissioning Plan to flag increases needed in the training pipelines for relevant groups of staff including:

- ▣ healthcare scientists (technical laboratory workforce, clinical scientists, bioinformaticians, genetic counsellors)
- ▣ doctors.

Through the [Healthcare Science programme](#), HEIW will review its approach to education and training and consider opportunities to create new pathways, strengthen equivalence routes and identify funding to support in-service training opportunities.

We will also continue to work closely with Health Boards to focus on retention through our work in the [National Retention programme](#).



## Section 4: Supporting the ambition to mainstream genomics

This section sets out our approach to the development of the wider workforce to support the mainstreaming of genomics.

Genomic medicine is the most rapidly developing field in medicine. To get the maximum patient benefit, genomic testing will need to be incorporated into many patient pathways, and therefore offered by specialties outside of specialist genomics services. As technology continues to develop, it is likely that the cost of genomic testing and interpretation of results will become more affordable creating the opportunity to undertake more testing.

The wider NHS workforce lacks adequate training in genomics. Although genomic literacy is included within some undergraduate programmes for healthcare professionals, this is a relatively new development and many of our current workforce have limited knowledge and awareness.

There is a need for specialised education and training programmes to equip healthcare professionals and NHS leaders to effectively incorporate genomic information into patient care, pathway development and public health initiatives.

As genomics is a rapidly evolving field, with new discoveries and technologies emerging regularly, healthcare professionals will need opportunities for continual professional development to stay abreast of changes.

The education and training of the wider workforce is a key part of this strategic genomics workforce plan. However, successful mainstreaming of genomic healthcare also requires additional considerations which are outside the scope of this plan.

Firstly, it requires the involvement of and collaboration among different professional groups. Development of roles with specialist knowledge of genomics within the healthcare professions could bridge the gap between the specialist and wider NHS workforce. This includes specialist pharmacist roles, which will be required for the implementation of pharmacogenomics and advanced therapies. The increased demand for such roles will need to be considered through HEIW's annual Education and Training Commissioning Plan.

Building effective interdisciplinary teams and fostering good communication amongst different healthcare professionals are essential for delivering integrated genomic health care.

The other important consideration for healthcare leads is that incorporating genomic testing into routine clinical practice will increase workload, which needs to be appropriately resourced. Discussing genomics with patients, taking consent, interpreting results and counselling patients will increase the demands on healthcare professionals and this will need to be considered in the design of new pathways and as part of resource allocation.

Provision of more genomic testing is also dependent on other aspects of the wider workforce to obtain samples, such as phlebotomists and pathologists, which again is essential but outside this workforce plan.

Our education & training framework is described in the table below:

<b>Specialist knowledge</b>	<ul style="list-style-type: none"><li>• Access to Scientist Training programmes</li><li>• GTAC Academy</li></ul>
<b>In-depth knowledge on key topics</b>	<ul style="list-style-type: none"><li>• Master's modules commissioned from Cardiff and Bangor universities</li></ul>
<b>Demand-led education including access to in-clinic resources and CPD</b>	<ul style="list-style-type: none"><li>• GeNotes</li><li>• Access to specialist advice from AWMGS/ PenGU</li></ul>
<b>Genomic Literacy (all staff)</b>	<ul style="list-style-type: none"><li>• E-learning resources available to the whole workforce via Y Ty Dysgu</li></ul>

The actions that HEIW will take forward to support mainstreaming through the provision of high quality education and training are:

**23.** Evaluate the impact of current education programmes and consider further development to ensure they remain relevant, including the need for any additional e-learning and Masters' modules (Lead: HEIW)

**24.** Work with Public Health Wales Genomics Programme to:

- a. develop specific education packages that will improve genomic literacy across clinical and public health specifically focusing on pathogen genomics (Lead: HEIW)
- b. identify the education needs relating to public health genomics workforce utilising human genomic data (e.g. screening and disease epidemiology) (Lead: HEIW)

**25.** Develop additional resources via Y Ty Dysgu to promote mainstreaming including:

- a. Digital resources that help mainstream genomics and support clinical decision making e.g. ethics of genomic testing (including equality, diversity and inclusion issues), assessing test eligibility, taking consent, ordering genomic tests, interpreting and delivering results, and using genomic data (Lead: HEIW)
- b. Branded patient resources that clinicians can signpost to patients, reducing time spent answering questions in person (Lead: GPW)
- c. A toolkit for planning the implementation of genomic testing (diagnostic and pharmacogenomic testing) in a particular service, to identify which healthcare professionals are involved at which stages and signpost to relevant education and training resource for each stage (Lead: HEIW)

**26. Promote genomic education for future workforce by:**

- a. Ensuring genomic education is embedded in all undergraduate and/or foundation phase curricula relevant for each professional group (Lead: HEIW)
- b. Work with HEIs to provide appropriate genomic education within post-registration training as a contractual requirement, in the same way that has been achieved with pre-registration training contracts (Lead: HEIW)

**27. Establish a long-term resource to**

- a. oversee genomics education and training within HEIW and act as a critical link with other UK nations to maximise the benefits of UK shared workforce commitments (Lead: HEIW)
- b. continue and develop the outreach engagement and required education on genomics with the wider workforce, reducing the burden on clinical and laboratory staff in the specialist services (Lead: GPW)

**28. Work with:**

- a. Multi-professional Primary and Community Care Academy and CPD leads to promote availability of education resources to support staff working in GP practices and community pharmacies (Lead: HEIW)
- b. Postgraduate centres and training departments to promote availability of education resources to support staff working in secondary care (Lead: HEIW)

**29. Work with each Health Board, NHS Trust and Public Health Wales to identify a senior/executive lead who will lead on the workforce implications of the mainstreaming of genomics and establish local networks (Lead: GPW)**

**30. Explore an Out of Programme fellowship in Clinical Genetics for Specialty Trainees/SpRs from other specialties (Lead: HEIW)**

**31. Identify education, training and competency requirements arising from new genomic testing and pharmacogenomic clinical pathways to support effective mainstreaming (Lead: HEIW)**

**32. Work with the National Pharmacogenomic Group to identify the implications of mainstreaming pharmacogenomics and in particular:**

- a. The need for additional education and training to support multi-professional teams who will need to be competent to deliver pharmacogenomics as part of service delivery (Lead: HEIW)
- b. The requirement for extended, advanced and consultant roles to support pharmacogenomics (Lead: HEIW)
- c. The size and shape of the workforce needed to meet the increased demand for pharmacogenomics (over the medium to long term) and the increased education and training needs for certain professionals (i.e. pharmacy professional) which need to be reflected within the annual Education and Training Commissioning Plan (Lead: HEIW)

**33. Scope our approach to the expansion of the current prescriber competency framework for the UK, to include pharmacogenomic competencies for prescribers (Lead: NPGG)**

## Section 5: Implementation

This section sets out how we aim to deliver the benefits achievable through the comprehensive approach set out in this plan.

An implementation plan will be developed in autumn 2024 setting out how prioritised actions will be taken forward. Alongside this, a benefit framework will be developed collaboratively with Genomics Partnership Wales to identify the measures that will be tracked throughout the lifespan of this plan.

Some of the 33 actions within the plan can be taken forward within existing resources or with minimal investment, others will require additional investment which will be subject to discussion through individual cases and plans.



## Glossary

AI	Artificial Intelligence
AWMGS	All Wales Medical Genomics Service
CIGC	Canolfan Iechyd Genomig Cymru
CPD	Continuing Professional Development
DNA	Deoxyribonucleic Acid
DHCW	Digital Health Care Wales
FTE	Full Time Equivalent
GPW	Genomics Partnership Wales
GTAC	Genomics Training Academy
HCRW	Health and Care Research Wales
HEIW	Health Education and Improvement Wales
RNA	Ribonucleic acid
SAIL	Secure Anonymised Information Linkage
SREP2	Strategic Review of Education Programmes
TB	Tuberculosis
WCAT	Welsh Clinical Academic Track
WES	Whole Exome Sequencing
WGS	Whole Genome Sequencing

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