GIG CYMRU NHS WALES | Iechyd Cyhoeddus Cymru Public Health Wales	**Name of Meeting** Knowledge, Research and Information Committee **Date of Meeting:** 06 June 2024 **Agenda item:** 3.4

Public Health Genomics Programme – Delivery of research and analysis agenda	
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Approval/Scrutiny route:	Update on work presented at the Knowledge, Research, and Information Committee in March 2024 Scrutiny for this document was provided by the Public Health Genomics Programme Leadership Team, with the document being provided as information to the HPSS Programme Oversight Team.

Purpose
Here we present an update on the delivery of the research and analysis agenda as part of the Public Health Genomics Programme. The paper is presented to inform the Knowledge, Research, and Information Committee (KRIC) and to stimulate discussion to support the continued development of Genomics Programme activities.

Recommendation:				
APPROVE ☐	CONSIDER ☐	RECOMMEND ☐	ADOPT ☐	ASSURANCE ☒

The Committee is asked to:

- **Note** our view that analysis and research are central to the business-as-usual activity in Genomics.
- **Note** and take **assurance** on the progress being made against our IMTP objectives, and their direct relevance to the research and analysis agenda.

- **Note** and take **assurance** on the range of other activities being undertaken, in particular our external engagement and successes in grant funding capture.
- **Endorse** our aim to collaboratively develop key plans for analysis, data and research aspects of our activity in a cross-organisational way.

Link to Public Health Wales Strategic Plan Public Health Wales has an agreed strategic plan, which has identified seven strategic priorities and well-being objectives. This report contributes to the following:	
Strategic Priority/Well-being Objective	5 - Protecting the public from infection and environmental threats to health
Strategic Priority/Well-being Objective	7 - Building and mobilising knowledge and skills to improve health and well-being across Wales
Strategic Priority/Well-being Objective	All Strategic Priorities/Well-being Objectives

Summary impact analysis	
Equality and Health Impact Assessment	Not Required
Risk and Assurance	Not Required
Health and Social Care (Quality and Engagement) (Wales) Act	Not Required
Financial implications	None
People implications	None

Contents

1. Purpose / situation

In March we provided a detailed overview of our activities in the last year and challenges for the next year. Here we present an update on the delivery of the research and analysis agenda as part of the Public Health Genomics Programme. The paper is presented to inform KRIC and to stimulate discussion to support the continued development of Genomics Programme activities.

2. Background

Pathogen Genomics was established as a capability within PHW in 2016, and, following the 2017 Welsh Government Genomics for Precision Medicine strategy, the Pathogen Genomics Unit (PenGU) was formally created within PHW in 2018. PenGU joined Genomics Partnership Wales – the body setup by Welsh Government to oversee the delivery of the 2017 strategy as one of its key partners. The successor to the 2017 Genomics for Precision Medicine Strategy is the Genomics Delivery Plan for Wales 2022-2025 (December 2022), which follows on from the UK-wide Genome UK strategy launched in 2020.

The Public Health Genomics Programme comes out of this activity and brings together genomics activity from across Public Health Wales, including the Pathogen Genomics Unit in Infection Division and the Genomic Epidemiology team in Health Protection. As a Programme, we aim to drive the development of genomics services from patient to population, to protect and improve health and well-being and reduce health inequalities for the people of Wales. Our role is very much as a systems leader, and our work is founded upon research and analysis.

The raw material of our work is genome sequence data – we currently host a set of sequencing instruments that can generate terabytes of data per week. Unlike other diagnostic or laboratory sciences, in genomics the analysis elements are critical, as that is where our diagnostic and public health 'tests' take place. In essence, in genomics analysis is essential to turn raw sequence data into actionable information and insight.

Genomics currently relies upon devices called 'high throughput sequencers' or 'next generation sequencing'. The first generation of these instruments only came into existence in 2005, and we are still at a relatively early stage in terms of translating what remains a research tool into clinical and public health services.

Therefore, research sits at the heart of what we do. That can be research to develop new/better ways of doing things, research translation to move methods from the academic into our clinical lab, research to apply analytical approaches into our

services or research to develop evidence to guide, inform and advise. In many areas, international best practice for genomics doesn't exist yet, and so we also have a role to play in developing best practice.

Our research and analysis activities are also central to our responsibilities under the duty of quality. Research and data analysis are the engines by which we can assess, improve and innovate our services.

3. Analysis

Our challenges

In our previous paper to KRIC (March 2024) we identified a set of key challenges, that relate to our Programme as a whole, but which are also firmly planted in the digital and research spaces, specifically:

- The deployment/deployment of new assays and analysis pipelines for use in the wet lab and in the bioinformatics/digital arena.
- The challenge of genomics translation from academia into service
- The challenge of fully using the data that we do generate
- The challenge of analysing data in a timely way
- The challenge of analysing and storing our genomic data
- The challenge of developing a digitally and genomics-aware workforce
- The challenge of needing to develop best practice from the ground up

As we develop the Programme, we need to address these challenges, and as we continue to build the Programme, we are putting in place activities to move forward the research and analysis agenda within PHW. As part of this we have put in place a workplan for this financial year which will collectively help us to address the key challenges and extend our world class public health genomics capability to benefit the patients and public of Wales.

What we are trying to do

PHW already possesses a mature genomics capability and a set of world-class genomics services, including those for HIV, TB, *C. difficile,* Influenza, and SARS-CoV-2. As a cutting-edge area of both research and service, which is also data intensive, genomics provides an opportunity to both deliver transformational new services and embody the change that we want to see more widely within PHW, both in terms of our engagement with research and the creation of a more data-aware workforce, in an organisation that makes better routine use of the data it generates. This is in line both with the Welsh Government Genomics Delivery plan and with the PHW Digital and Data strategy.

The changes we need to usher in require a collaborative approach and will depend on engagement with stakeholders within and outside of PHW. We have identified a set of activities that collectively provide the basis for addressing the key challenges that we face, which are now in train. In these activities, we also acknowledge that genomics exists within a special space in PHW – representing a data-intensive area of activity that carries with it significant digital and data requirements. As we develop our new services and capabilities, we aim to build on the PHW Digital and Data strategy, to improve and extend the use of our data and digital assets to improve the health and well-being of people in Wales and to reduce health inequalities.

Current activities

We have six IMTP objectives for the coming period, along with a set of wider activities that we are undertaking to develop the Public Health Genomics Programme, and which are directly relevant to supporting the research and analysis agenda within PHW. All of these areas have seen progress since the last presentation of the Programme at KRIC in March.

Progress against IMTP objectives and relevance to research/analysis

In the 2024 IMTP, the Programme has six objectives:

1. Development of a Digital Blueprint for Public Health Genomics *[Digital/data relevance]*

    a. This is a digital-focused activity, which is seeking to develop a more strategic plan for our digital development, as well as defining core principles to support future digital planning for genomics. This work seeks to build on the principles outlined in PHW Digital and Data strategy to develop alignment within PHW and with stakeholders elsewhere in Wales. Following engagement at KRIC in March, this activity was initiated in April 2024, and is in the process of bringing together key stakeholders in PHW to begin mapping out a digital blueprint. This work has a dependency on strategic work within the wider Genomics Partnership Wales. The GPW digital strategy is currently being developed, and the Programme has engaged in an active way as part of this work, developing an initial user needs document that outlines the service requirements for the development of genomics services on the cloud. This is an active piece of work that is at its start, and its success will depend on the involvement and engagement of staff within PHW across both Genomics and Digital/IT areas. At the present time, this work is **on track**.

2. Development of a training plan for enhancing genomics skills across the PHW workforce *[Digital/data relevance]* *[Research relevance]*

    a. Staff within genomics have engaged extensively with HEIW, which has seen the development of a workforce plan for genomics, which is undergoing consultation. As part of this work, we have highlighted the importance of digital roles within genomics, including bioinformatics, data science and systems engineering. Further, this work will need to consider the development pipeline for staff, which will also need to consider research and enabling a research-active workforce in genomics. We have prepared feedback to HEIW (which has been circulated to the exec team) which is included as an annexe to this document. The engagement with HEIW will provide us with a baseline to develop specific training plans within PHW to develop our workforce; with the digital elements being critical areas of need. This work aligns directly with the Genomics Delivery Plan for Wales, as well as being consistent with the empowering people aims within the PHW Data and Digital strategy. This work is being progressed and is currently **on track**.

3. Development of a new service covering RSV to support vaccine roll-out *[Research relevance]*

    a. The introduction of a new vaccine will necessitate the development of a supporting genomics service. Currently we are an active participant in a UK-wide collaborative activity to develop a set of sequencing and analysis protocols for RSV, which could then form the basis of an agreed RSV protocol for the UK. The work therefore falls under the research heading and should result in the production of research publications. We also recognise that this work provides us with an opportunity to undertake service development activities in a different way, integrating digital and data planning into the very first stages of development. This work is **on track**.

4. Working with partners across the UK to develop evidence for the introduction of a metagenomics service *[Research relevance]*

    a. Metagenomics is a new capability that offers opportunities ranging from improved patient management (e.g., in sepsis cases) through to the ability to detect a pathogen in a sample without knowing what you are looking

for (playing a key role in future pandemic planning). However, the potential use of metagenomics in service requires the generation of evidence, and the entry into service of metagenomics requires analysis software/pipelines and sequencing protocols. We are collaborating on a UK-wide basis to develop evidence and to build new software to enable this type of analysis. In this area, we have been awarded funding from the MOD (potentially worth up to £130k over 2 years) to support one activity – the UK Microbial Forensics Consortium – which will involve us developing software to enable the analysis of metagenomics samples. This work is therefore **on track.**

5. Work to identify synergies and resilience challenges arising from the PenGU move to Cardiff Edge to improve the efficiency of current service delivery *[Digital/data relevance]* *[Research relevance]*

    a. The move to the Canolfan Iechyd Genomig Cymru (CIGC) offers a set of opportunities in terms of delivering better value for money through sharing equipment and analysis approaches, and through opportunities to develop staff and undertake collaborative research. Genomics services generate large amounts of data, and with current systems used by PHW and Cardiff and Vale having an end of life within the next 3 years, there are opportunities to work together to deliver shared systems that will provide better value for money. Further, collaborative working with AWMGS provides opportunities in the research space, particularly with respect to new potential areas of activity where evidence generation is badly needed – such as Liquid Biopsy. The move to CIGC therefore offers digital opportunities to undertake work that is 'once for Wales' and research activities that are interdisciplinary and on an 'All-Wales' scale. This work is consistent with the aims articulated in the PHW Digital and Data strategy – it provides us with an opportunity to review and better document our systems, an opportunity to develop collaborative relationships between HPSS and Data and Digital staff, and to develop plans that will help us achieve outcomes that align with the objectives of the data and digital strategy. These activities are at an early stage but have already led to the procurement of an archive storage platform that is intended to be made available to PHW to support future genomic work. This work is therefore, **on track**.

6. Development of a roadmap for the evolution of genomics epidemiology capacity within PHW to deliver new genomics services *[Digital/data relevance]* *[Research relevance]*

    a. The value of genomic epidemiology was demonstrated during the pandemic, where the combination of genomic data and epidemiological/data intensive analysis saw the examination of genomic data to identify and quantify the evolution and rise of variants. Genomic epidemiology exists as a field that has a growing status, but it remains tightly tied to research activity – as there is still much to do in terms of developing methodologies and determining best practice. While we already make use of genomic epidemiology in routine service, to build our services and capabilities, we need to ensure that we have the right pathways in place to undertake the research that is required to develop staff and move the field forward. We also must acknowledge that the analysis of large, complex datasets requires high performance computing resource – which also has digital implications. Developing these new, cutting edge, capabilities is very well aligned with the idea of using our data better, and building to make a difference. We also acknowledge that there is also significant read across into data science and data engineering within this work, creating opportunities for collaborative, cross-organisational activity that can potentially lead to transformative services. Recognising the need to build this capability in a strategic way, we have begun work on developing a roadmap for our genomic epidemiology capability, which is due to complete its work in October. The initial discussions for this activity have been held, and work is progressing – and so is **on track**.

Progress against other key activities relevant to research/analysis

In addition to our IMTP objectives, we previously identified a set of key activities to support us in realising our vision for Public Health Genomics in Public Health Wales.

1. Develop an agreed plan for Public Health Genomics research in PHW.

    a. We are in the process of instigating a dedicated group within the Programme to advance the plan for the development of genomics research within PHW. This work also overlaps with our work to develop the genomic epidemiology roadmap, which will be a key component of our research plan for Public Health Genomics within PHW. This work is **on track**.

2. Develop a plan for a Genomic Data Unit

    a. We have identified a need to develop plans for a Genomic Data Unit to support digital and data aspects of genomics activity. The development of the Genomic Data Unit aligns with the objectives of the Digital and Data strategy and will provide a key mechanism by which data and digital activities will be bought together and planned as part of the Programme. This work is currently planned, awaiting staff availability to move forward. This work is therefore **paused**.

3. Genomics Partnership Wales Cloud procurement

    a. We have been engaging with the GPW team, our GPW partners, DHCW and Shared Services (from a procurement perspective) with an aim to develop a Framework Agreement for genomics cloud services that could be used to purchase cloud services for genomics by any NHS trust or University in Wales. This work is progressing well and has seen engagement with cloud providers and Welsh Government, as well as the production of a set of user requirements encapsulating the functional and nonfunctional requirements associated with current genomics services. Further engagement is planned within PHW, as we develop a project team across GPW to deliver a framework that will support the procurement of cloud services for genomics work. This activity aligns with the PHW Digital and Data strategy, as it will enable the continued evolution of analytical environments within genomics to make better use of APIs and event-driven systems to enable faster analysis of data, and the generation of closer-to-real-time insight. This work also creates opportunities to access genomics data generated elsewhere in the NHS, which in turn will enable PHW to innovate and improve existing services that we provide. This work is **on track**.

4. Engage internationally, develop research collaborations and publish research. This work has several areas of activity and engagement, with recent activities covering:

    a. External engagement

        - We have engaged with the UKHSA HPRU in Genomics and Enabling Data, with members of the Programme attending their recent conference at UKHSA. PHW staff presented posters and

the Head of Programme presented a talk to introduce the Programme to the audience.

- We have continued to engage with GPW, Welsh Government and Illumina with the aim of completing an MOU, which is planned to provide a platform for further collaborative engagement.
- We are supporting the GPW and Welsh Government Genomics Research review and will be actively participating in this activity.
- We are actively contributing our expertise to the international Public Health Alliance for Genomic Epidemiology. This work has seen engagement with multiple working groups that are seeking to develop best practice for pathogen genomics.
- We have indicated that we would like to be part of the WHO International Pathogen Surveillance Network – an international network focused on using genomics and bioinformatics for pathogen surveillance.

b. Grant capture and involvement

i. We have secured funding from the Ministry of Defence / DSTL to participate in the UK Microbial Forensics Consortium. This will see PHW being part of a UK-wide network of pathogen genomics/bioinformatics laboratories to support the UK National Biosecurity Strategy.
ii. We are a partner in a successful Wellcome grant application to support the development of tools and resources to aid laboratories in LMICs to achieve ISO 15189 accreditation for genomics and bioinformatics processes.
iii. We are collaborating with colleagues in Northern Ireland around a ONE-ZOO PhD studentship focused on *Mycobacterium bovis* infections.

c. R&D projects/collaborations

i. Metagenomics – We are involved in the mScape project at UKHSA to develop clinical metagenomics pipelines and protocols.
ii. RSV – We are working on a 4-Nations basis to collaboratively develop sequencing approaches for RSV.

iii. We have provided support for a fellowship application to HCRW focused on Cryptosporidium genomics.
iv. We have provided support for a research application to HCRW focused on *Mycoplasma pneumoniae* genomics.

d. Publications

i. Since the last KRIC we have published a paper in Nature Communications focused on E. coli bacteraemia (Genomic epidemiology reveals geographical clustering of multidrug-resistant Escherichia coli ST131 associated with bacteraemia in Wales | Nature Communications).
ii. We have multiple genomic epidemiology and Pathogen Genomics papers that are currently in preparation

Collectively, therefore, Public Health Genomics represents a vibrant area of activity within PHW, with an extensive range of activities currently ongoing to support the development of the research and analysis agenda within PHW. Although only a relatively small number of staff (approx. 30 staff in total employed focused on genomics across PHW, and only 1.8 FTEs in the Programme team itself), the Programme is delivering significant outputs across several areas of activity.

4. Conclusion

Public Health Wales already possesses a vibrant community of innovative genomics staff who are engaged, collaborative and have enormous potential. We are working to direct this energy, and collaboratively develop a set of more strategic frameworks for the sustainable development of our Public Health Genomics capacity and capabilities, across the organisation. Research and Analysis sits at the heart of our business-as-usual activity, and so ensuring that we are making progress to advance the research and analysis agenda in PHW is central to realising our vision as a Programme, in support of the PHW strategic objectives.

5. Recommendation

This report is presented to provide assurance and outline current key activities and their relevance to the research and analysis agenda. It provides an overview of our current activities in this space and plans for the year ahead.

As such, the Committee is asked to:

- **Note** our view that analysis and research are central to the business-as-usual activity in Genomics.
- **Note** the progress being made against our IMTP objectives, and their direct relevance to the research and analysis agenda.
- **Note** the range of other activities being undertaken, in particular our external engagement and successes in grant funding capture.
- **Endorse** our aim to collaboratively develop key plans for analysis, data and research aspects of our activity in a cross-organisational way.

- Annex – HEIW consultation (Strategic Workforce Plan for Genomics - HEIW (nhs.wales)) feedback text

PHW consultation response

PHW welcomes the genomics workforce plan, and is delighted to see the engagement that has taken place with PHW staff to develop the workforce plan to date.

PHW strongly supports the actions that have been outlined within the plan. To support the development of the plan, we have a small number of specific comments/additional areas for consideration.

- Page 1 Suggestion: We would note that there are members of the genomics workforce in Public Health Wales beyond PenGU. Within PHW this combined activity is bought together under the Public Health Genomics Programme, and so it might be more inclusive to refer to the Public Health Genomics Programme, including the Pathogen Genomics Unit and other specialist genomics staff, rather than PenGU alone.
- Page 1 Suggestion: At present, staff within PHW's wider Infection Division, Health Protection and Screening all have direct roles in providing genomics services, in partnership with both PenGU (Infection division, Health Protection) and AWMGS (Screening). Amongst these staff, there are some groups (such as the Genomic Epidemiologists) whose role is focused on genomics, and so these roles should probably be reflected in the wider grouping of 'specialist genomics workforce'. Further, while allied with bioinformatics, genomic epidemiology is a distinct area of activity, and should have separate consideration as distinct roles within the healthcare system moving forwards. It is also important to note that within care settings, roles such as the Welsh Healthcare Epidemiologists will also increasingly rely upon genomics as a key tool for their roles, so it would be useful to understand where the line is drawn between specialist genomics services and staff for whom genomics is a significant part of their jobs.
- Page 2 #1 Suggestion: include bioinformatics, public health and epidemiology degrees in list of targets
- Page 2 #2 Query: Would the pathfinder model be time limited or more like a clinical academic role?
- Page 2 #4 Suggestion: Include public health genomics and epidemiology within this item
- Page 3 #5 Suggestion: Include work around mapping to the UKPHR, and possibly work with the Faculty of Public Health with respect to the specialist workforce.

- Page 3 #6 Suggestion: Include engagement with UKPHR and the Faculty of Public Health, as well as engagement with the UK Field Epidemiology Training Programme.
- Page 3 #7 Suggestion: The development of a bioinformatics apprenticeship route
- Page 4 #12: Suggestion: make clear that healthcare science covers epidemiology/public health and screening services, in addition to the laboratory focussed activities
- Page 4 #13: Query: this seems like a specific example/focus – will similar actions be committed to for other groups of workers
- Page 5 #15: Suggestion: add " and the wider Health Protection and Screening Services directorate" after PenGU.
- Page 5 #16: Suggestion: Include development of expectations for professional registration for senior leaders – at the present it isn't clear what the most appropriate professional registration/career path may be for senior staff.
- Page 5 #18: Suggestion: Include the wider digital teams within NHS organisations (e.g., PHW Knowledge, Research, and Information directorate).
- Page 5 #18: Suggestion: currently the role of data scientists and data engineers is not clear within the document (or the activities within genomics in Wales) – is there a piece of work to be done to map out their roles and potential involvement in this work, and provide suitable training for those staff?
- Page 5 #19: Query: is the commission mentioned the AI Commission for Health and Social Care?
- Page 6 #20: Suggestion: consider the development of short courses/workshops that can be delivered in person (based on the carpentries approach)
- Page 6 #21: Suggestion: Expand to 'work with the Public Health Genomics Programme (including PenGU and the Genomic Epidemiology unit)'.
- Page 6 #21: Query: the focus is on pathogen genomics, which makes sense as we currently do that and are expanding. We are also beginning to expand activity in areas related to human health. Can you consider an action to scope out the needs for the development of the wider public health genomics-aware workforce, and what will be needed to train public health specialist staff to handle human genomic data for public health uses (e.g., noncommunicable disease epidemiology and screening).
- Page 6 #22: Query: This also has resonance for the development of genomics uses in screening ; can the use of genomics for screening be part of the toolkit that is planned to be developed?
- Page 6-7 #24: Query: Can you also consider how support may be provided to staff working in health protection/public health, and also if consideration is

needed for staff working in other environments/settings (e.g., prisons, care homes)

- Additional query: Could an additional item be considered relating to the education, training and competency requirements arising from the increasing development of population-wide genomic activities, covering both screening and health intelligence/monitoring.
- Additional query: Bioinformatics is mentioned once specifically under an action (action 6) – given its criticality, would it worth be considering specific actions relating to bioinformatics (or, more generally, data focused staff), in terms of attraction, developing career models for those staff, and under the digitally ready workforce element.
- Additional query: The actions mention consent, but despite the considerable ethical issues that genomics potentially raises, there isn't any specific consideration of training around ethics and work to develop a workforce that has a deep understanding of the ethics (both medical and public health) that relate to the data that we generate and use. Please could you consider if this is something that could/should be included.
- Additional query: Under the Digitally Ready Workforce element, have you considered the wider training needs in relation to cybersecurity and GDPR, given the risks around genomics data? Is this something that should be looked at, and considered as an area of action?

Collectively, the action plan is extremely welcome, and fills a really important gap. We are in strong agreement with its focus, and would be happy to facilitate meetings with other key teams within PHW if that is helpful. The Genomic Epidemiology team and representatives from the Screening division could be two groups who could be really useful to engage with, in addition to the extensive engagement that has already taken place with PenGU.