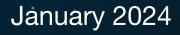


## UKHSA Pathogen Genomics Strategy



### Foreword



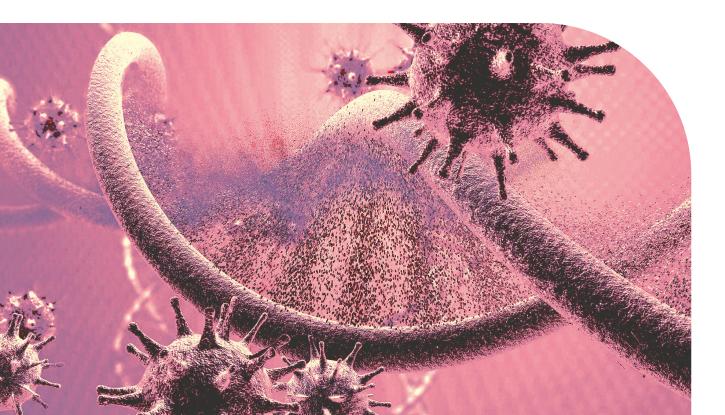
**Professor Susan Hopkins** Chief Medical Advisor, UKHSA

Pathogen genomics has demonstrated its impact on public health globally, through detecting and controlling outbreaks, and by allowing us to adapt the global pandemic response as SARS-CoV-2 evolved. Pathogen genomics has already been deployed across many areas of clinical and public health in the UK, keeping the food chain safe from outbreaks, allowing TB patients to receive appropriate treatment, and informing our choice of the most effective vaccines for influenza every winter.

Moving forward, our priority in UKHSA is to integrate genomics into every aspect of infectious disease control, prioritising the areas of vaccine-preventable disease, emerging infections, and antimicrobial resistance. These are areas in which pathogen genomics has the potential to yield substantial measurable benefits in health security.

Implementing our genomics strategy will require investment in our workforce, laboratories, data and analytics capabilities and collaboration with the NHS, academia and industry.

This Genomics Strategy sets out our 5-year ambition to deliver transformative improvements to public health genomics in England.



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### Introduction

#### The UK Health Security Agency

The UK Health Security Agency (UKHSA) prepares for and responds to infectious diseases, and environmental hazards, to keep all our communities safe, save lives and protect livelihoods. We provide scientific and operational leadership working with local, national and international partners to protect the public's health and build the nation's health security capability.

UKHSA has developed a 10 year <u>Science Strategy</u> and a 3-year organisational <u>strategic plan</u> setting out our goals and key priorities for 2023 to 2026.

#### Pathogen Genomics strategy: overview

The UKHSA Pathogen Genomics strategy sets the direction for how we will invest in pathogen genomics to mitigate public health threats from infectious diseases and to support delivery of our Science Strategy and organisational strategic plan.

Over the next decade we aim to maximise the benefit of pathogen genomics for public health and health security, through a single co-ordinated programme across the agency working with the NHS, academic partners, industry, other Government Departments and devolved administrations.

Our programme will improve our understanding of those pathogens that pose the greatest risks to the UK population, integrate genomics into every day public health decision making, and enhance the evidence-base for policy-making. We will improve health security, detecting and containing outbreaks, improving and protecting our vaccines and therapeutics, and building our capabilities to detect new pathogens and threats. We will demonstrate best practice in data sharing and transparency, making a valuable contribution to international genomic surveillance, supporting capacity building and ensuring that we work to strengthen the global pathogen genomics community.

Pathogen sequencing and genomic analysis are vital components of contemporary responses to infectious diseases. UKHSA and predecessor organisations have significant expertise in pathogen genomics, working at local, national, and global levels. Leveraging existing infrastructure, capacity, and scientific capabilities, we outline our vision for pathogen genomics over the next five years, through seven strategic cross-cutting aims and three priority public health areas.

## Strategic aims and objectives

#### Strategic aim 1:



Use genomic data to optimise clinical and public health decision-making, from local to global settings

- 1. **Integrate pathogen genomic data into public health systems**: We will ensure that pathogen genomic data is linked to epidemiological data and incorporated into clinical and public health systems to improve disease control and to quickly identify and respond to public health threats.
- 2. **Develop best practice guidelines for pathogen genomic data use**: We will work with partners to develop consensus on genomic data standards and develop guidelines for how, when and where pathogen genomic data should be used to inform clinical and public health decisions for all communities.
- 3. **Evaluate and implement metagenomic analysis**: We will work with NHS England to investigate the utility of metagenomic analysis to quickly and accurately identify pathogens causing disease, including pathogens present in the environment, and design novel surveillance systems to enhance biosecurity.



#### Strategic aim 2:



Use genomic data to drive improvements in diagnostics, vaccines, and therapeutics

We will achieve this aim through the following objectives:

- 1. Use pathogen genomic data to inform vaccine development: We will use genomic data to help ensure that existing vaccines continue to be effective against current and emerging strains of pathogens, whilst using genomic data to inform development of new vaccines.
- 2. Enhance therapeutic development and deployment using pathogen genomic data: We will use pathogen genomic data to understand the extent and evolution of antimicrobial resistance, enabling more effective treatments to be targeted to patients and informing future drug development.

#### **Strategic aim 3:**



Provide a nationally coordinated, high-throughput pathogen genomics sequencing and analysis service

- Ensure that infrastructure and partnerships are in place to sequence and analyse large volumes of pathogen genomic data at pace to inform clinical decision-making: We will work to deliver scalable, robust and standardised laboratory services, bioinformatic analysis pipelines and translational services for priority pathogens.
- 2. **Foster pathogen genomics system resilience and adaptability:** Working across UKHSA, we will build a system which is resilient, scalable, and rapidly adaptable to new public health challenges.
- 3. **Ensure equitable access nationally:** Working with stakeholders, including partners in the devolved nations, ensuring consistent, effective access to and use of pathogen genomics laboratory techniques, data, analysis and infrastructure across the UK.

#### Strategic aim 4:



Undertake a genomics workforce transformation within and beyond UKHSA

We will achieve this aim through the following objectives:

- 1. **Strengthen clinical and scientific genomics expertise and training:** We will ensure there are clear pathways for the development of specialists in all aspects of pathogen genomics, from sequencing through to policy applications.
- 2. **Improve genomic literacy across clinical and public health:** Working with stakeholders, we will develop training packages to improve the understanding and use of genomic data across all levels of the clinical, scientific, public health and policymaker workforce.

#### **Strategic aim 5:**



## Commit to pathogen genomic data sharing and global collaboration

- 1. **Enable rapid public data sharing:** We will support the development of national and global policies, systems and infrastructure to ensure that pathogen genomic data is quickly and fully shared with the global public health community and researchers.
- 2. **Foster collaborative networks:** Building on existing networks and working with key multilateral agencies, we will foster partnerships between organisations and countries to enhance the sharing of genomic data and scientific knowledge and improve global health security and response capabilities.

#### **Strategic aim 6:**



## Drive innovation in pathogen genomics

We will achieve this aim through the following objectives:

- 1. Set priorities for health protection and security research and development in pathogen genomics: We will work across government, develop priorities with academic funders, work with academic partners through NIHR HPRU, joint grants and academic partnerships, and promote collaboration and knowledge exchange with a focus on improving the evidence base for linking human and pathogen genomics, developing methodologies and cost-effectiveness estimates.
- 2. **Develop innovation hubs:** We will work to connect academic, NHS England Centres of Excellence and industry partners to find pragmatic solutions for priority public health challenges.
- 3. **Develop industry partnerships:** We will work with companies who develop sequencing technologies, bioinformatic tools, diagnostic platforms to leverage resources and support the UK ambition to enhance productivity across the economy, and in turn bring jobs, growth and prosperity to all parts of the UK.

#### Strategic aim 7:



Build high-impact services that are good value for money

- 1. **Develop and conduct rigorous health economic evaluation:** We will embed evaluation of public health impact and value for money into our services, and build the evidence base for the value of pathogen genomics for public health.
- 2. **Ensure long-term sustainability:** Through improvements in laboratory efficiency, we will work to ensure that our genomic services are sustainable and continue to deliver value over the long-term. We will also improve flexibility to keep pace with advances in technology and the expanding role of pathogen genomics.

## These strategic aims will be underpinned by actions to ensure that ethical, legal, and social considerations are addressed:



#### **Develop ethical guidelines**

We will create frameworks for the ethical use of pathogen genomic and metagenomic data.



#### Address data privacy concerns

We will implement measures to protect the privacy of individuals from whom genomic epidemiological data is derived.



#### Promote equitable access to pathogen genomic data

We will ensure that the benefits of pathogen genomics are shared broadly and help to reduce health inequalities.



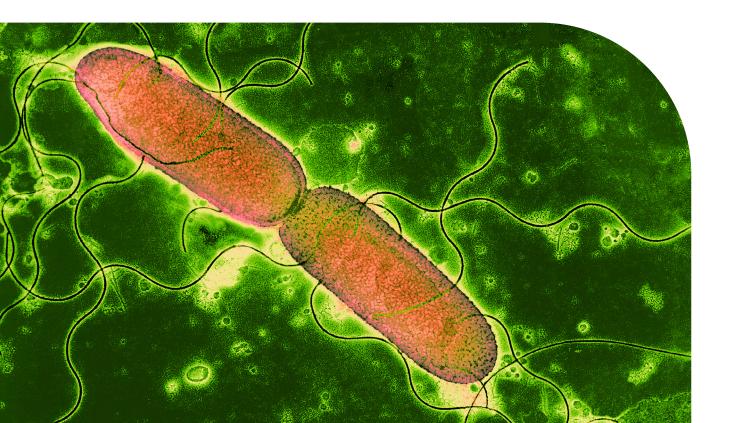
#### **Deliver public communication**

We will create educational resources and communication plans to explain the role and benefits of pathogen genomics to the public.

# Priority areas for implementation

Each of our strategic aims will cut across three areas that are directly aligned with UKHSA's strategic priorities. These have been selected for their population health impact and because investment in pathogen genomics and its application in these areas offers evidence-based public health benefits:

- 1. **Antimicrobial resistance (AMR)**: Pathogen genomics applied to AMR will provide detailed understanding of resistance mechanisms and t ransmission patterns, enabling healthcare practitioners and policymakers to implement targeted infection control interventions and antimicrobial stewardship programs, ultimately preserving the efficacy of antibiotics and protecting public health.
- 2. **Emerging infections and biosecurity:** Pathogen genomics will serve as an early-warning system for emerging infections, facilitating the detection, rapid and precise identification of new or variant pathogens. This capability will guide timely public health responses and strengthen biosecurity, and mitigate the impact of global health threats.
- 3. Vaccine-preventable diseases and elimination programmes: The application of pathogen genomics to vaccine-preventable diseases will inform vaccine development and deployment, support the identification and interruption of disease transmission chains, and play a role in achieving disease elimination targets, ultimately contributing to improved vaccine efficacy and enhanced population immunity.



## Delivering and achieving the strategy

Our programme will be enabled by:

**Our people**: we will value talent and resources, by recruiting, retaining, and upskilling the multidisciplinary expertise we require to run a forward-looking genomics service and encouraging career progression to develop national and international leaders in this field.

**Our facilities**: we will build capability across our state-of-the-art facilities, enabling laboratories and genomic sequencing capability, technologies, and bioinformatic infrastructure, including connected intelligence across digital, data and analytics.

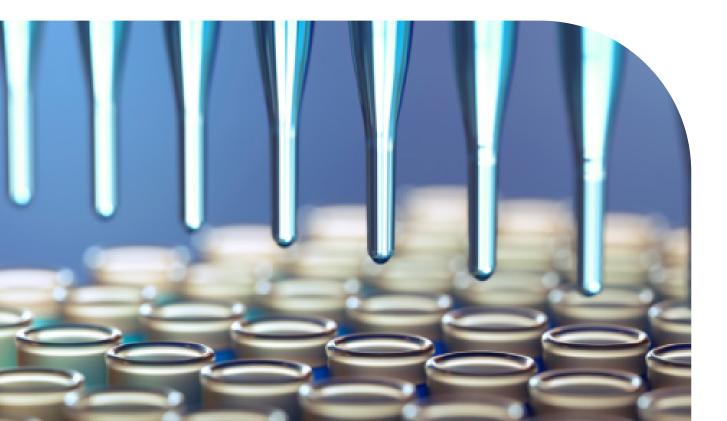
**Our partnerships**: we will work collaboratively internally to ensure cross-disciplinary input to link data and expertise for clinical and public health decision making, and externally to maximise benefits from local, national, and global partnerships with a wide range of stakeholders – including the NHS, academia and industry – to co-produce and deliver a global pathogen genomics ecosystem.

Our research, knowledge mobilisation and its translation into clinical and public health benefit: we will maximise the impact of pathogen genomics on public health by building on and expanding the existing strong academic links and research environments, which allows innovative technology and practice to directly inform clinical and public health actions.



#### Acronyms

AMR	Antimicrobial resistance
COVID-19	Coronavirus disease 2019
HPRU	Health Protection Research Units
HSST	Higher Specialist Scientist Training
ISO	International Organization for Standardization
KPI	Key performance indicator
NHS	National Health Service
NIHR	National Institute for Health and Care Research
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
UKHSA	UK Health Security Agency
WGS	Whole genome sequencing
WHO	World Health Organization



### About the UK Health Security Agency

UK Health Security Agency (UKHSA) prevents, prepares for and responds to infectious diseases and environmental, radiological and chemical hazards, to keep all our communities safe, save lives and protect livelihoods.

We provide scientific and operational leadership, working with local, national and international partners to protect the public's health and build the nation's health security capability.

UKHSA is an executive agency, sponsored by the Department of Health and Social Care.

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UKHSA supports the Sustainable Development Goals

