

# **UKHSA Presents mSCAPE**

A part of UKHSA's Pathogen Genomics strategy

Chair: Lee Bailey, Director of Communications, UKHSA Wednesday 19 February 2025





#### **#UKHSAPresents**



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### **Aims of the Pathogen Genomic Strategy**

#### **SEVEN STRATEGIC AIMS**



Use genomics data to optimise decisionmaking from local to global



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

Provide a coordinated. highthroughput pathogen genomics service



Undertake a genomics workforce transformation within and beyond **UKHSA** 

Commit to pathogen genomics data sharing and global collaboration



Drive innovation in pathogen genomics



Build highimpact services that are good value for money



### **Priority areas**



### Antimicrobial resistance (AMR)

### Vaccine & elimination programmes





### Emerging infections & biosecurity



### **Priority areas**



#### **Clostridium difficile**

- Network analysis
- Sampling frame
- Pipeline
- Recruitment of sites

#### Carbapenamase producing Enterobales

- Back catalogue
- Strains and relatedness
- Geno-Pheno
- Plasmids

#### Nosocomial pathogens Candida auris

#### Mycobacteria

- 4 nation TB pipeline
- NTM
- Cloud and Containerise

#### Measles

 Evaluation of utility of WGS

#### HCV

 Support for elimination programme and drug resistance



#### Horizon scanning

- Global databases
- Mpox
- H5N1
- In house generic pipelines

#### Aircraft wastewater

- Sampling
- 7 organisms multiplex
- Metagenomics validation

#### mScape and MG service



## What is mSCAPE?



links clinical and research laboratories undertaking and developing pathogenagnostic metagenomic diagnostics in England, into a single platform to pilot and evaluate pathogen-agnostic surveillance



### **mSCAPE**



### mSCAPE: What can we gain?

## Emerging and imported infections

Detection of new pathogens not previously seen in humans or unexpected in the UK



### Characterisation

Generation of complete pathogen genomes, giving rapid pathogen characterisation, genetic features that may indicate harmfulness, infectiousness, susceptibility to vaccines or treatments

#### The ability to combine clinical and environmental data









### **mSCAPE:** progress

#### **Submitters / syndromes**

**Respiratory - NHS Genomics Network of** Excellence (30 Trusts) +/- Sanger RVI

Imported Fever service

Considering neurological (arbovirus risks)

**Biomedical research centres and HPRUs** 

Public domain datasets

4 weeks open: 358 clinical samples, 124 positive controls, 84 negative controls, 59 research samples, 3349 public domain

Platform deve			
Clinical pipeline facilitat			
Autom	nated analysis develop Pipeline		
	Initial classification Enhanced classification (be Metagenomic assembly (de HCID detection & verification Novel/altered virus detection Pathogen agnostic AMR de Pathogen specific pipelin Streptococcus pneumoniae Influenza – subtype M. tuberculosis – ID and lin SARS-CoV-2 - lineage MPXV		

#### **Environmental:** aircraft, (hospital)



#### elopment

#### tes upload to MRC CLIMB mSCAPE controlled area

#### oment (new progress marked \*)

	Development	Test and validation	In use
espoke database)			
le novo)			
ion			
on			
letection			
nes			
e – ID and serotype			
neage			





UK Health Security Agency

## <sup>h</sup> mSCAPE in the wider landscape: public health metagenomics in the UK

#### UKHSA led projects

**mSCAPE** UK clinical and environmental metagenomics surveillance pilot

**Targeted wastewater pilots** UKHSA Genomics Programme

Imported Fever Service Metagenomic diagnosis of unwell returning travellers

> UKHSA regional labs Diagnostic metagenomics

#### UKHSA partnership projects

#### Public Health Genomics HPRU NIHR

Primary research with public health applications Metagenomics method development and environmental sampling

mSCAPE-open [proposed]

Open access environment for public metagenomic data and processing tools / federated international mSCAPEs

#### **CLIMB-TRE**

Repository for UK academic analysis of data too sensitive for the public domain (with metadata) – metagenomics and WGS

Sampling frameworks Oxford and Imperial collaborations

#### Partners and associated projects

#### **ARTIC-2**

Wellcome Birmingham & Edinburgh Globally accessible metagenomics analysis tools

#### CLIMB

MRC Repository and infrastructure Birmingham

#### Cross government genomics consortia

Data generation and tools

NHS metagenomics roll out (Genomics Network Of Excellence) Diagnosis of severe respiratory infections

> Wellcome Sanger RVI High throughput community metagenomic surveillance



### Director of Communications Lee Bailey, UKHSA











# **Covid 19: the scale of the challenge**



Public health and NHS structures and functions were pivotal in responding to Covid-19.



Largest global scaling of pathogen genomics



UK delivered high throughput timely sequencing with rapid analysis and supported globally



### **Covid 19: the scale of the challenge**



- clinical studies
- products
- - Morbidity and mortality
- emergence.

2,820,245m SARS-COV-2 positive cases sequenced

Feedback loop through structural models, laboratory and

Data linkage and intergradation investment in analysis and

#### **Rapid sharing of data and analysis**

Validation of lab and point of care assays Emergence of new variants Vaccine effectiveness for each variant

Developed sample frames for longer term detection of

![](_page_13_Picture_0.jpeg)

### Strategic enablers

![](_page_13_Picture_2.jpeg)

![](_page_13_Picture_3.jpeg)

![](_page_13_Picture_4.jpeg)

### **Develop ethical guidelines**

#### Address data privacy

### Promote equitable access

#### **Public communication**

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### mSCAPE: Metagenomics Surveillance Collaboration and Analysis

### PRIORITIES

- Severe acute respiratory infections
- Fever in returning travellers
- Targeted environmental samples (borders)
- Undiagnosed
  meningoencephalitis

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#### AIMS

- Establish a data sharing
  platform: mSCAPE.CLIMB
- Develop a networked surveillance system and aggregate analysis capability
- Evaluate the performance characteristics
- Exercise the system using artificial constructs
- Design sampling frameworks for pathogenagnostic surveillance

### **DELIVERY PARTNERS**

- UKHSA genomics programme
- NHS genomics network
  of excellence
- UKHSA/NHS Imported Fever Service
- Universities: Birmingham, Edinburgh, Imperial

![](_page_14_Picture_19.jpeg)

![](_page_15_Picture_0.jpeg)

## **Commercial or legal**

- Time critical to share for global public health but requires a
- Should not be routinely released into the public domain (can be shared to a restricted Trusted Research Environment) Individual risk assessment to ensure both biosecurity and
- Routinely released to the public domain with a planned time frame. quality control and metadata checks

![](_page_16_Picture_0.jpeg)

# UKHSA Presents Thank you

### Find out more: <u>UKHSA Presents - GOV.UK</u>

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