**CVDR/S6/22/28/2**

# COVID-19 Recovery Committee

# 28th Meeting, 2022 (Session 6), Thursday, 15 December 2022

## COVID-19 surveillance

At this week's meeting Members will hear from two panels on COVID-19 surveillance. The first will focus on wastewater surveillance and the second on genome sequencing.

In February 2022 the Scottish Government published Scotland's Strategic Framework Update this stated:

> "We will continue to deliver the necessary testing capability to enable ongoing surveillance – including genomic sequencing to allow the early identification of new variants, and effective public health responses – including self-isolation where appropriate, treatment and outbreak management. We will continue to gather, publish and analyse data – both nationally and internationally – to support our management of the epidemic."

It also noted:

> "Monitoring disease prevalence through appropriate testing and wastewater sampling must continue, and we need to retain and enhance the capability to track new variants through PCR testing and genomic sequencing. We will continue to maintain and develop a proportionate testing capability, to support public health decision making, population health, and treatment of those who will benefit from it. Adequate surveillance, internationally and domestically, is critical."

It went on to say:

> "Adequate surveillance, both internationally and domestically, at borders and across the population is critical to provide advance warning of potentially dangerous variants. That is why the COVID-19 Outbreak Management Plan will be supported by the use of existing and new and emerging testing and

surveillance procedures to support early identification of future variants, including whole genome sequencing, wastewater surveillance, testing and contact tracing."

A Test and Protect Transition Plan was published in March 2022 this stated that "surveillance and contingency infrastructure for outbreak response will remain in place".

Public Health Scotland published Scotland's National Respiratory Surveillance Plan in September 2022, as the COVID-19 Outbreak Management Plan. This outlined five priorities to ensure a robust approach to respiratory surveillance.

1. Adapt and modernise its respiratory surveillance system to rapidly identify and characterise threats from novel respiratory viruses, including variants and mutations of SARS-CoV-2.

2. Through robust epidemiological analyses of routine surveillance data, gain deeper insights into opportunities to prevent and control respiratory infections.

3. Use intelligence and insights to inform the national, NHS Board and local authority response to respiratory health protection and for policy advice to the Scottish Government.

4. Support NHS and local health boards to evaluate and strengthen data systems and platforms to provide situational awareness of respiratory threats in their area.

5. Establish and continue to develop purposeful partnerships based on shared outcomes with local health protection teams, counterparts in the other three nations, international colleagues (e.g. WHO, ECDC, CDC) and academic partners. Harmonising surveillance activities across multiple known and novel respiratory pathogens will maximise financial and human resources, increase coordination and collaboration, and reduce duplication of effort

# Panel 1: Wastewater Surveillance

The first session will focus on wastewater surveillance and Members will hear from:

- Dr Rachel Helliwel, Director of Centre of Expertise for Waters (CREW) and the Hydro Nation International Centre
- George Ponton, Head of Research and Innovation, Scottish Water
- Peter Singleton, Research, Innovation and Evidence Manager, SEPA

## Background

In May 2020 the Scottish Environmental Protection Agency began exploratory work to pinpoint fragments of coronavirus ribonucleic acid (RNA) in local wastewater samples. Further information is available in the article SARS-CoV-2 RNA levels in Scotland's wastewater published in Scientific Data.

The World Health Organisation has published interim guidance on Environmental surveillance for SARS-COV-2 to complement public health surveillance. This states that the "objective of environmental surveillance is to provide early warning and additional evidence regarding the virus in circulation in the population, including its presence or absence, trends in concentrations, and variants of concern or interest. ES can help to inform decisions on, and help measure the effect of, interventions".

SEPA publishes the results on its RNA Monitoring dashboard. This notes that when normalised for environmental factors, such as flow through the sewage works which is affected by rainfall, the concentrations of virus in the wastewater tracks well with the number of cases reported across the country. It is possible to see site level analysis as well as national level results.

Testing is conducted on incoming wastewater samples collected by Scottish Water and its operators at 106 public wastewater treatment works across the country, covering all 14 NHS Scotland health board areas. Most locations are tested weekly, but this can be increased when local outbreaks are apparent.

In his submission George Ponton, Head of Research and Innovation, Scottish Water outlined:

> "Through the latter part of 2021 and early 2022 there have been discussions led by Scottish Government with health professionals as to the scale and extent of the monitoring programme and how this is built into the overall management of the pandemic. As a result, the sampling programme has been reduced to 200 samples per week which are taken only at wastewater treatment sites. This programme has been stable since May 2022."

In its submission SEPA stated that "the programme is funded by Scottish Government with the current programme's cost being in the region of £3m per year".

In relation to wastewater surveillance Scotland's National Respiratory Surveillance Plan states:

> "Historically, wastewater surveillance has been helpful in detecting viruses excreted through the gastro-intestinal system. Whilst wastewater surveillance is not yet able to reliably estimate the number of new infections, it has allowed the early detection of re-emergence of diseases, including COVID-19 in previously disease-free regions, and has been used to monitor changes in levels of COVID-19 infections over time, providing a reasonable understanding of the effectiveness of disease control and mitigations efforts.
>
> Wastewater surveillance can provide an insight into viruses circulating in Scottish communities or in particular geographic areas or settings without having to conduct more resource intensive and invasive testing programmes. Wastewater data have informed essential modelling work in Scotland, especially as population-wide access to testing has reduced. As part of its overall respiratory surveillance programme activities, PHS will undertake work to further validate the usefulness of wastewater as a surveillance programme and then work with partners to extend this as required."

The Scottish Government publishes a fortnightly briefing on modelling the epidemic in Scotland. Issue 113 reported:

- Nationwide, during the period 3rd – 16th November, wastewater Covid-19 levels were in the range of 21 to 32 million gene copies per person per day (Mgc/p/d). This continues the downward trend observed in the previous two-week period (22nd October – 4th November) when the levels were in the range of 34 to 62 Mgc/p/d.

**Members may wish to ask:**

**What role does wastewater surveillance play in understanding the prevalence and spread of COVID-19?**

**How can wastewater surveillance be used to identify new variants of COVID-19?**

**How is wastewater surveillance for COVID-19 best used – is it most useful at the start of an outbreak?**

**To what extent was information from the wastewater surveillance programme used to inform Scottish Government policy?**

**What level of wastewater surveillance for COVID-19 is currently taking place in Scotland?**

**Do witnesses consider it is important that wastewater surveillance for COVID-19 continues?**

# Future uses for wastewater surveillance

In its submission SEPA notes:

> "Wastewater can potentially be used to test for any disease that sheds fragments of its genetic material in human excreta. Samples collected though the programme are being used to:
>
> - Identify Covid variants of concern (and, potentially, the proportions of those variants).
> - Look for new Covid variants.
> - Investigate other diseases, including Adenovirus, Polio and Monkey Pox.
> - Test for antimicrobial resistance (AMR)
>
> Testing samples for influenza virus is being considered ahead of potentially the most significant flu season since before the pandemic.
>
> Elsewhere in the world, wastewater analysis has been used to detect medical and recreational drug residues."

This is also discussed in the article wastewater surveillance of pathogens can inform public health responses in Nature Medicine.

**Members may wish to ask:**

**What other diseases are currently being monitored using wastewater surveillance?**

**What are the other potential uses for wastewater surveillance? Are any other uses currently being considered?**

**Does the capacity still exist for scaling up monitoring if required for COVID-19 or another pandemic?**

# Research and innovation

The wastewater surveillance programme involved partnership working between SEPA, Scottish Water, CREW (Centre of Expertise for Waters) and academic partners from the University of Edinburgh's Roslin Institute and Heriot Watt University.

In its submission CREW discussed research carried out by Dr Isabel Fletcher and Professor Catherine Lyall, University of Edinburgh. They made six recommendations which focused on the ways in which the Scottish Government and its agencies could improve communication and co-ordination with each other and with the wider Scottish research community.

- A well-founded and responsive national research capacity requires an appropriate balance of public support for project and core funding to ensure the availability of key research infrastructure and capacity.

- The Scottish Government should consider adopting the good practice of the RESAS-funded knowledge brokerage units such as CREW and establish similar bodies for the Scottish public health community that bring researchers and stakeholders together to co-create research on policy-related topics.

- Ensure ongoing support to enable groups such as CAMERAS (Coordinated Agenda for Marine and Environmental Rural Affairs Science) to meet and maintain professional networks. These are a cost-effective way of future-proofing crisis responses and funding for such activities should be protected.

- Stronger cross-government and inter-agency links among those working in the environment and health sectors are needed to tackle future crises.

- The Scottish Government could make better use of its network of Chief Scientific Advisors as a conduit for information exchange among the research and policy communities.

- The Scottish Government should establish a new post of Chief Scientist for Public Health to better represent the Scottish Public Health community.

The Standing Committee on Pandemic Preparedness in its interim report made a number of recommendations including:

- To develop proposals for the creation of a Centre of Pandemic Preparedness in Scotland.

- To build on Scotland's existing data and analytics strengths to support proposals that advance the development of these as core infrastructure for future pandemics.

- To develop linkages to Scottish, UK, and international scientific advisory structures, networks, and agencies and strengthen information flows from

these in order to inform Scottish preparedness and response in the face of future pandemic threats.

- To support continued innovation in life sciences and public health research for the development of diagnostics, vaccines, and therapeutics to provide the capability to respond to novel threats when required.

**Members may wish to ask:**

**What lessons can be learned from the partnership working in the wastewater surveillance programme?**

**What level of financial support do witnesses consider is required to support research infrastructure and capacity around wastewater surveillance?**

**What are the potential benefits of creating the Chief Scientist for Public Health post? How would this role differ from that of the Chief Scientist (Health) and Chief Medical Officer?**

**What actions should be prioritised in the future to ensure sufficient wastewater surveillance capacity is maintained?**

**Whether the work being undertaken by the Standing Committee on Pandemic Preparedness and the Scottish Government is sufficient to ensure that surveillance capacity for COVID-19 and other potential diseases is maintained?**

# Panel 2: Genome sequencing

In the second panel Members will have an opportunity to discuss genome sequencing of COVID-19 with:

- Professor Sharon Peacock CBE, Executive Director and Chair, Covid-19 Genomics UK Consortium TBC
- Mike Gray, Service Manager for Laboratory Medicine, NHS Lothian
- Dr Kate Templeton, Head Molecular Diagnostics, (Microbiology, Virology and Molecular pathology), Director STI and viral genotyping reference laboratory, Royal Infirmary Edinburgh
- Professor Rory Gunson, Consultant Clinical Scientist and Virology Clinical Lead/Laboratory Director, West of Scotland Specialist Virology Centre, Glasgow Royal Infirmary
- Professor Matthew Holden, COG-UK Principal Investigator, Public Health Scotland

## Background

The SPICe blog on Variants of SARS-CoV-2: An exceptional virus, or one that is behaving normally? discusses variants of SARS-CoV-2. SARS-CoV-2 is the virus which causes the disease COVID-19.

Variants of SARS-CoV-2 are identified using whole genome sequencing. Genome sequencing of the COVID-19 virus SARS-CoV-2 has been useful in helping people understand how the disease moves through and between populations – if cases are linked and how the virus changes over time. It can be also used to help understand how effective interventions to reduce the spread of the virus have been.

Genome sequencing of a virus can also help to establish whether new variants of the virus are associated with particular patterns of symptoms or severity of disease. It can also be used to ensure vaccines are updates with the strains of virus that are currently circulating.

The COVID-19 Genomics UK consortium (COG-UK) was established in March 2020. It was funded by the UK Department of Health and Social Care, UK Research and Innovation and the Wellcome Sanger Institute. It was created to deliver large-scale and rapid whole-genome virus sequencing. It is a partnership of NHS organisations, the four Public Health Agencies of the UK, the Wellcome Sanger Institute and twelve academic partners providing sequencing and analysis capacity.

COG-UK provides datasets into public databases such as The Global Initiative on Sharing All Influenza Data (GISAID) database which is the standard database for

sharing of SARS-CoV-2 data internationally. The consortium is now moving towards closure on 31 March 2023.

Public Health Scotland (PHS) coordinates a whole-genome sequencing (WGS) service for COVID-19 viral genotyping in Scotland. This is provided by the Specialist Virology Centre at the Royal Infirmary of Edinburgh and the West of Scotland Specialist Virology Centre at the Glasgow Royal Infirmary. It aims to deliver rapid sequencing of SARS-CoV-2 samples and bioinformatic analysis of genome data to support the identification of variants and mutants of concern and the detection and investigation of COVID-19 outbreaks and incidents. The service was developed in partnership with COG-UK and its academic partners at the University of Edinburgh and the Medical Research Council, University of Glasgow Centre for Virus Research. PHS routinely sequences all suitable samples which test positive for SARS-CoV-2 in NHS Scotland.

The PHS submission noted that since March 2020, 357,981 SARS-CoV-2 genome sequences have been generated for Scottish COVID-19 cases (as of the 6th of December 2022). Fifteen percent from NHS Diagnostic and Hub laboratories (Pillar 1), with the remainder coming from Pillar 2 testing (UK Government testing laboratories).

The ONS Coronavirus (COVID-19) Infection Survey provides information on the percentage of people testing positive for coronavirus (COVID-19) in private residential households in England, Wales, Northern Ireland and Scotland. Whole genome sequencing (WGS) is undertaken on COVID-19 positive nose and throat swabs with sufficient virus.

Currently, the variants under surveillance in the UK are Omicron, including sub-lineages BA.1, BA.2, BA.4 and BA.5 and their sub-lineages.

**Members may wish to ask:**

**To what extent is whole genome sequencing of SARS-CoV-2 samples currently taking place in Scotland?**

**How has whole genome sequencing of SARS-CoV-2 been used during the pandemic?**

**What role is whole genome sequencing playing at this point in the pandemic?**

**How can genomic sequencing playing be used to monitor vaccine effectiveness and re-infections?**

**Are witnesses confident that the level of genome sequencing that is currently taking place in Scotland is sufficient to identify and track different variants of SARS-CoV-2?**

# Funding and infrastructure

In March 2021 the Public Health Minister announced a £13 million investment in 2021/22 to establish Scotland's own genomic sequencing service to track new coronavirus (COVID-19) variants, and manage future outbreaks. It was anticipated that the service would be capable of identifying the genetic origins of up 1000 cases a day and that the service would support Scotland's preparedness for any future pandemics, as well as other threats such as antibiotic resistance.

Public Health Scotland (PHS) coordinates a whole-genome sequencing (WGS) service for COVID-19 viral genotyping in Scotland. This is provided by the Specialist Virology Centre at the Royal Infirmary of Edinburgh and the West of Scotland Specialist Virology Centre at the Glasgow Royal Infirmary.

The PHS submission noted that in December NHS Greater Glasgow and Clyde announced the step down of SARS-CoV-2 sequencing capacity from Jan 2023 due to staff departure. It went on to comment:

> "Due to current uncertainty about the future funding of SARS-CoV-2 sequencing service beyond March 2023 and the impact that this is having on staff retention, the ability to support SARS-CoV-2 sequencing in the new year is now at risk, as is the legacy of the Scottish Government investment to support the wider application and benefits of WGS for other pathogens".

In her submission Professor Peacock commented that the legacy of COG-UK's legacy will depend on decision makers abilities to:

1. Deliver public health genomics capacity guided by a clear, prioritised, long-term strategic plan.

2. Maintain momentum, motivation and goodwill to support a network that can bring together diverse organisations across the four nations without over-reliance on goodwill alone.

3. Ensure the involvement of all relevant actors.

4. Stabilise and ensure adequately funded governance, management and administrative arrangements to support networked pathogen genomics capacity in the UK.

5. Advance data linkage in the public health landscape.

6. Ensure a sustainable division of labour between diverse stakeholders in the public health genomics landscape

7. Revisit the UK's role in the global pathogen genomics landscape.

**Members may wish to ask:**

**How is the whole-genome sequencing (WGS) service for COVID-19 viral genotyping in Scotland organised? How does it work with other services in the UK and globally?**

**Does the capacity still exist to scale up whole genome sequencing if required?**

**Is Scotland well placed to respond to any future pandemics, as well as other threats such as antibiotic resistance?**

**What lessons have been learned from the rapid scale up of whole genome sequencing capacity in Scotland?**

**What funding is currently available for the genome sequencing service? Is sufficient long-term funding in place?**

**What are the risks resulting from "current uncertainty about the future funding of SARS-CoV-2 sequencing service"?**

**Are there any issues with recruitment or retention of trained staff in the area of genome sequencing? If so, has this had any implication on service delivery?**

**Is a workforce development strategy in place and what are the benefits of such a strategy?**

# Global surveillance

The Scottish Government's Strategic Framework Update states:

> "In the longer term, the UK aims to enhance global surveillance capabilities to maximise detection of variants. This includes working with the WHO and other public health bodies on the International Pathogen Surveillance Network (IPSN), supporting a small number of regional hubs and countries bilaterally to build genomic sequencing capability and capacity (New Variant Assessment Platform, NVAP) and continuing to offer rapid sequencing capability where needed. Scottish Government Ministers are committed to working with the UK Government, other Devolved Administrations, and delivery partners in developing robust surveillance architecture."

The Genome UK: shared commitments for UK-wide implementation 2022 to 2025 report noted:

> "Since 2021, delivery of a national SARS-Cov-2 genomics service has been led by the 4 national public health agencies working with partners including the Wellcome Sanger Institute and CLIMB-COVID. Coordination across the

UK was overseen by the UK Strategic Public Health COVID-19 Genomics Advisory Board. At its final meeting the board endorsed the transition to a wider UK Pathogen Genomics Board. Work to take this forward will commence in financial year 2022 to 2023. To date, the UK has shared over 2.25 million genomes on public databases with the international community."

**Members may wish to ask:**

**What work is happening internationally on global surveillance of COVID-19 variants?**

**How well placed is Scotland to be contribute to the continuing global surveillance of COVID-19?**

**How is genomic sequencing used to inform future vaccine development?**

**For an update on the work of the UK Pathogen Genomics Board.**

# Future developments

The Public Health Scotland submission notes that prior to the COVID-19 pandemic in Scotland, whole genome sequencing (WGS) had been rolled out for four groups of bacterial pathogens in the Scottish Microbiology Reference Laboratories:

- Salmonella/Shigella species
- Neisseria meningitides
- Streptococcus pneumoniae
- Shiga toxin-producing Escherichia coli

The policy paper Genome UK: shared commitments for UK-wide implementation 2022 to 2025 was published in March 2022. This outlines the shared commitments on a UK wide basis to "help to ensure better coordination of our joint ambitions for genomics research and healthcare so that these can flourish in each of our nations and across the UK". It outlines a range of commitments under three pillars:

1. diagnosis and personalised medicine
2. prevention and early detection
3. research

The Scottish Government has stated it intends to publish a Genomics Healthcare Strategy in 2023. This is a separate specialty looking at human genomics. As part of the Genome UK: 2021 to 2022 implementation plan the summary for Scotland noted:

"In Scotland, we continue to invest in the development of genomic medicine and research and see these emerging medical advances as important parts of our future healthcare strategies […] Genomics pathogen sequencing has been a key component of our response to COVID-19 and we will continue to use and expand our pathogen sequencing service to better understand the current pandemic and any future infectious disease outbreaks."

**Members may wish to ask:**

**What work is taking place to plan for future pandemics and/ or antibiotic resistance?**

**How could / should the wider application of Whole Genome Sequencing for other pathogens be supported in Scotland?**

**What work is taking place on a UK-wide basis around pathogen sequencing? In particular around the development of the public health pathogen genomics service.**

**Lizzy Burgess, Senior Researcher – Health and Social Care, SPICe Research**
**12 December 2022**