Revised SARS-CoV-2 genomic surveillance sampling framework

Background

The national SARS-CoV-2 sequencing sampling framework has undergone revision. The new sampling framework (Tables 1 and 2) reflects: the changes in the requirements for SARS-CoV-2 sequencing at the regional, national and international level and the devolution of the National SARS-CoV-2 Whole Genome Sequencing (WGS) Surveillance Programme's work to 'business-as-usual'. International bodies now recommend the integration of surveillance activities for respiratory viruses and as such[1] the agreed new national SARS-CoV-2 sequencing sampling framework will be integrated into an overall Respiratory Virus Sequencing Sampling Framework document (under development). The WHO guidelines for integrated respiratory virus sentinel surveillance including suggested minimum target numbers for testing and sequencing for adequate coverage for countries to meet their primary surveillance objectives[1].

The previous SARS-CoV-2 sequencing sampling framework (version 2.0) which was last revised in January 2024 was based on the ECDC 2022 guidelines 'Operational considerations for respiratory virus surveillance in Europe'[2]. Note: a revision of these ECDC Guidelines is due in the latter half of 2025.

The revised framework outlined here is based on a streamlining of target groups and a reduction in the frequency and volume of SARS-CoV-2 sequencing. In the event of an emerging variant of concern, an increase in the frequency and volume of sequencing as outlined in this document may be required, at relevant time periods as dictated by the epidemiological situation and required dynamic risk assessments e.g. increased risk of transmissibility/disease severity/immune escape.

Objectives of SARS-CoV-2 sequencing in Ireland

1. Provide timely reporting on genomic epidemiology of SARS-CoV-2 viruses in Ireland to inform health service planning, public health policy and response and to inform local/regional/national outbreak and incident management
2. Monitor new variants/genetic changes (e.g. variants/mutations of concern) as they relate to transmissibility, severity, immune escape, and antiviral resistance
3. Provide up to date sequence information to inform vaccine composition, including vaccine match/mismatch and to monitor vaccine effectiveness against specific variants
4. To monitor the impact of new vaccines/immunisation programmes on the genomic epidemiology of SARS-CoV-2
5. To add to the global knowledge of SARS-CoV-2 biology and epidemiology, and timely sharing of genetic sequence data to international public repositories (e.g. GISAID)

[1] https://www.who.int/publications/i/item/9789240101432

[2] Operational considerations for respiratory virus surveillance in Europe - July 2022 (europa.eu)

Frequency and volume

A proposed minimum number of **12 SARS-CoV-2 specimens* sequenced per month per laboratory** (Table 1), with an overall total for Ireland of **96 specimens sequenced per month and approximately 1200 per year** (covering seven spoke laboratories and the National Virus Reference Laboratory (NVRL)) should be sufficient to meet the agreed surveillance objectives and for the timely detection of SARS-CoV-2 variants circulating in Ireland. Laboratories may increase the number of samples sequenced in certain scenarios, for example to maximise efficiencies or in response to a local emerging situation.

In the event of an **emerging variant of concern**, if needed and based on a dynamic risk assessment by HPSC/NHPO, this number may be **increased to a minimum of 12 specimens sequenced per fortnight** during the initial period of a COVID-19 wave where the risk of increased transmissibility/disease severity/immune escape has increased. This frequency is not prescriptive however and can be increased as needed. Also, surge capacity via the NVRL will be available should there be any resource or capacity issues. In their capacity and remit as the National Virus Reference Laboratory, the NVRL may carry out additional sequencing activities.

*note: specimens meeting the required Ct threshold for sequencing suitability

Table 1: Proposed SARS-CoV-2 sequencing sampling volume and frequency

Laboratory	Year-round sequencing (min no. sequenced *per month*)	Depending on situation if needed and based on dynamic risk assessment by HPSC/NHPO increase to (min no. sequenced *per fortnight*)
NVRL	12	12
UHG	12	12
SVUH	12	12
Beaumont	12	12
SJH	12	12
UHL	12	12
CUH	12	12
CHI Crumlin	12	12
Total per month	96	192
Annual Total	1152	~1300 (includes 11 months at 12 per lab per month and one month at 24 per lab per month)
Detection threshold per month*	min 10%	min 5%

*As per 'Operational considerations for respiratory virus surveillance in Europe', ECDC July 2022

Table 2: Proposed SARS-CoV-2 Genomic Surveillance Sampling Framework Update

Group to be sequenced	Considerations	Sequencing laboratory
Sentinel GP Surveillance	All Sentinel GP SARS-CoV-2 case positive specimens suitable for sequencing	NVRL
Sentinel Severe Acute Respiratory Infection (SARI) surveillance	All sentinel SARI SARS-CoV-2 positive case specimens suitable for sequencing	SARI site laboratories NVRL for surge capacity
Hospitalised Cases	A proportion of specimens from laboratory confirmed COVID-19 hospitalised cases, including cases in individuals identified at increased risk of disease. This proportion can be less during peak epidemic activity	NVRL/SARS-CoV-2 Programme Spoke Laboratories
ICU cases	All individuals positive for COVID-19 admitted to ICU due to COVID-19	NVRL/SARS-CoV-2 Programme Spoke Laboratories
Deaths	All/proportion of COVID-19 deaths (prioritising those where COVID-19 is the primary/contributing cause of death – if information is available)	NVRL/SARS-CoV-2 Programme Spoke Laboratories
Outbreaks in health and care settings following public health risk assessment[†]	Up to 3 positive symptomatic suitable case specimens from each outbreak to be sequenced	NVRL/SARS-CoV-2 Programme Spoke Laboratories
Outbreaks in other at-risk settings following public health risk assessment[†]	Up to 3 positive symptomatic suitable case specimens from each outbreak to be sequenced	NVRL/SARS-CoV-2 Programme Spoke Laboratories
New Variant of Concern[‡]	Surge capacity/escalation when new SARS-CoV-2 Variant of Concern (VOC) arises	NVRL/SARS-CoV-2 Programme Spoke Laboratories
Wastewater Surveillance Programme	SARS-CoV-2 sequencing included as part of National Wastewater Surveillance Programme	UCD/NVRL only

[†]Severe illness, high mortality, unexpectedly high attack rate

[‡]In addition, NVRL may decide to increase sequencing during the emergence of a new Variant Under Monitoring (VUM) or Variant Of Interest (VOI)