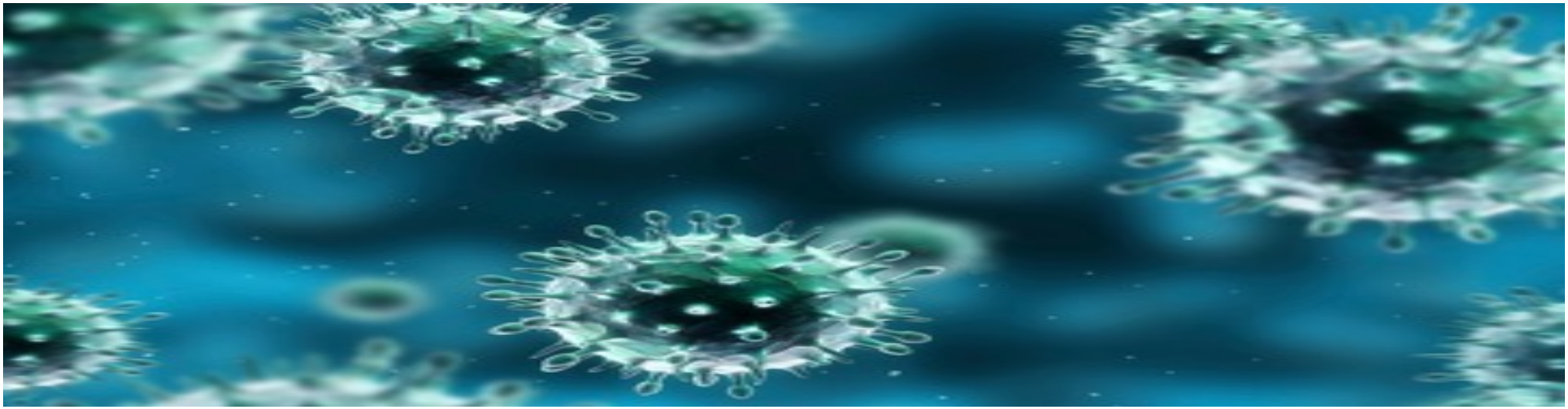

High level guidance document on sewage surveillance of SARS-CoV-2 in wastewater.

SIWW Presentation – Tuesday 19 April 2022

Stéphanie Rinck-Pfeiffer Managing Director (GWRC)
Bernd Manfred Gawlik (European Commission Joint Research Centre (JRC))
Dan Deere (reporting to WaterRA ColoSSoS, GWRC and JRC)

Global Water Research Coalition

Examples of sewage surveillance in disease mitigation - Polio

Background

Environmental surveillance (ES) for poliovirus is the routine collection and testing of environmental (sewage) samples from designated locations draining large target populations. ES supplements AFP surveillance by providing information on the presence and spatial scale of poliovirus transmission.

As a surveillance system, it has been in use for more than 70 years.[2] In the pre-vaccine era in the United States, ES was used to monitor virus circulation in major cities. In the past 30 years, ES has detected and monitored the re-introduction of WPV in polio-free countries such as Finland, the Netherlands, and Israel, and in some cases ES has detected the presence of the virus without a single confirmed WPV case. ES has also led to early detection of the new emergence of VDPVs. Because of its utility in providing confidence for the interruption of circulation, ES has been used to document the elimination of WPV in Egypt and India. In recent years, ES has been particularly useful in improving the overall sensitivity of the polio surveillance system in countries where an extensive network of ES has been established (see Annex 10, Environmental Surveillance). While countries endemic for WPV have been at the forefront of the use of ES, in the context of the evolving global risk for circulating VDPV type 2 (cVDPV2) following the cessation of trivalent oral poliovirus vaccine (tOPV), ES could potentially become even more valuable beyond endemic countries.

[2] For a historical survey on environmental surveillance and its achievements within the programme, see GPEI, Guidelines on Environmental Surveillance for Detection of Poliovirus. Working Draft March 2015. http://polioeradication.org/wp-content/uploads/2016/07/GPLN_GuidelinesES_April2015.pdf. Accessed on 15 June 2018

Examples of sewage surveillance in disease mitigation - Typhoid

TRACING TYPHOID CARRIERS BY MEANS OF SEWAGE *

By Arnold E. Greenberg, Robert W. Wickenden, and Theodore W. Lee

Respectively, Chief, Sanitation Laboratory, Senior Sanitary Engineer, and Associate Sanitary Microbiologist, Divisions of Laboratories and Environmental Sanitation, California Department of Public Health, Berkeley, Calif.

The classical method of detecting and tracing typhoid carriers is by investigation of probable cases followed by analysis of individual fecal or rectal swab specimens. These procedures are complicated, time consuming and, more important, they require extensive contact with large numbers of people. A simplified, impersonal screening procedure for narrowing down the suspected area in which the carrier will probably be found would, therefore, be desirable.

Moore (1), in 1948, developed such a procedure based on the analysis of flowing sewage at various points in a sewer system. Although Moore's method has often been used successfully in locating carriers of enteric diseases in English communities, its use in the United States has been limited. It is the purpose of this paper to describe a field study in which Moore's method was used to locate a typhoid carrier and to make some general remarks on the utility of the procedure.

Experimental Method

Site Selection

There are many communities in which cases of typhoid fever occur sporadically. Unfortunately, it is frequently impossible to locate the source of the infection with the usually available information, techniques, and personnel. Portola, Calif., a town of about 2,200 people in the Sierra Nevada Mountains, is such a community. Over the past 20 years more than a dozen isolated cases of typhoid have been reported, the most recent having occurred in the summer of 1955. Preliminary discussions with city and county public health officials indicated an interest and enthusiasm for a detailed study of the carrier problem. Local assistance was generously provided throughout the planning and execution of the investigation.

Portola is situated near the head of a narrow mountain valley on the Middle Fork of the Feather River. The older portion of town lies on the south bank, whereas the more recently developed section is on the north side of the river. Topographically, both sides are hilly with well-defined drainage toward the river.

In the older part of town, public sewers were first provided about 1900. In 1949 a new system, including sewers, an underwater river crossing, a pumping station, and a primary treatment plant, was installed. At the same time, sewers were extended to serve the entire community. Connections between the old and new systems were made in certain places.

Planning with respect to the site required an engineering analysis of the sewer system. After inspection of the available maps, a field party examined the system in order to verify the location of sewers and the accessibility of manholes that were to be used as sampling points. Buried manhole covers were located with the aid of a mine detector and were dug up. Dye studies

* Presented at the 1957 Annual Meeting, California Sewage and Industrial Wastes Assn.; San Diego, Calif.; May 1–4, 1957.

https://www.jstor.org/stable/25033471?seq=1

Together We Can

Take on Typhoid

HOME | WHY TYPHOID? | THE ISSUES | RESOURCES & TOOLS | BLOG & NEWS | CONFERENCES

Tackling typhoid with environmental surveillance

Posted on ***September 16, 2020*** *by* ***Jason R. Andrews and Alexander Yu, Division of Infectious Diseases and Geographic Medicine, Stanford University School of Medicine***

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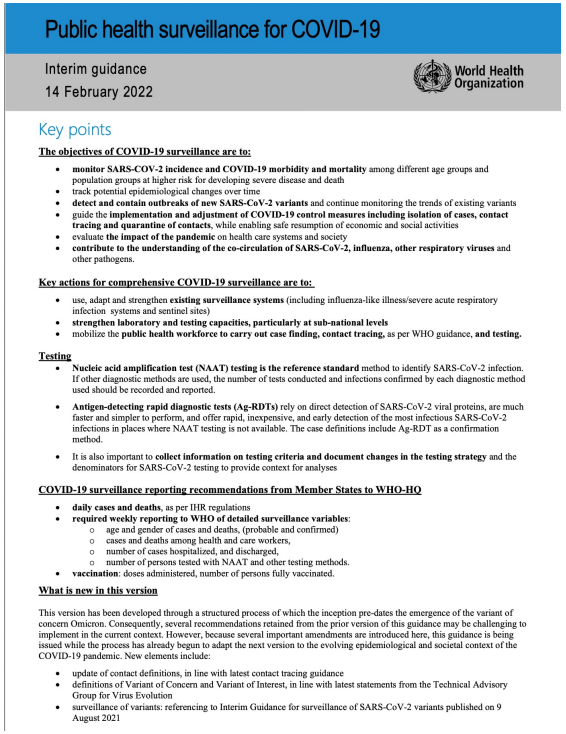
Typhoid and paratyphoid continue to be important causes of preventable morbidity and mortality—estimated to impact 12-16 million people and result in 77,000-219,000 deaths—that disproportionately affect children. While we know these diseases are overwhelmingly concentrated in low- and middle-income countries (LMICs), the lack of burden data threatens to hinder introduction of typhoid conjugate vaccines (TCV) and monitoring efforts to combat these diseases. Even highly endemic countries face challenges due to variable quality and geographic or temporal distribution of the data. The historical reason for this has been the complexity and cost of disease surveillance programs needed to fill these data gaps. Environmental sampling can be an effective tool in this effort and potential serve as a predictor of typhoid risk through surveillance of water and sewage for *Salmonella* Typhi—the organism causing typhoid

https://www.coalitionagainsttyphoid.org/tackling-typhoid-with-environmental-surveillance/

WHO: Context of “Environmental Surveillance” in the bigger “Public Health Surveillance” picture

Surveillance System Site/ Context	Immediate case notification	Cluster investigations	Mortality surveillance	Serologic surveillance	Genomic surveillance	Environmental surveillance
Community		X	X	X	X	X
Primary Care sites		X		X	X	
Hospitals		X	X	X	X	
Sentinel ILI/ARI/ SARI sites					X	
Closed settings*	X	X	X	X	X	X
Health care-associated SARS-CoV-2 infection	X	X	X	X	X	
Travelers at Points of Entry		X			X	X



Public health surveillance for COVID-19

Interim guidance
14 February 2022

World Health Organization

Key points

The objectives of COVID-19 surveillance are to:

- **monitor SARS-COV-2 incidence and COVID-19 morbidity and mortality** among different age groups and population groups at higher risk for developing severe disease and death
- track potential epidemiological changes over time
- **detect and contain outbreaks of new SARS-CoV-2 variants** and continue monitoring the trends of existing variants
- guide the **implementation and adjustment of COVID-19 control measures including isolation of cases, contact tracing and quarantine of contacts**, while enabling safe resumption of economic and social activities
- evaluate **the impact of the pandemic** on health care systems and society
- **contribute to the understanding of the co-circulation of SARS-CoV-2, influenza, other respiratory viruses** and other pathogens.

Key actions for comprehensive COVID-19 surveillance are to:

- use, adapt and strengthen **existing surveillance systems** (including influenza-like illness/severe acute respiratory infection systems and sentinel sites)
- **strengthen laboratory and testing capacities, particularly at sub-national levels**
- mobilize the **public health workforce to carry out case finding, contact tracing,** as per WHO guidance, **and testing.**

Testing

- **Nucleic acid amplification test (NAAT) testing is the reference standard** method to identify SARS-CoV-2 infection. If other diagnostic methods are used, the number of tests conducted and infections confirmed by each diagnostic method used should be recorded and reported.
- **Antigen-detecting rapid diagnostic tests (Ag-RDTs)** rely on direct detection of SARS-CoV-2 viral proteins, are much faster and simpler to perform, and offer rapid, inexpensive, and early detection of the most infectious SARS-CoV-2 infections in places where NAAT testing is not available. The case definitions include Ag-RDT as a confirmation method.
- It is also important to **collect information on testing criteria and document changes in the testing strategy** and the denominators for SARS-CoV-2 testing to provide context for analyses

COVID-19 surveillance reporting recommendations from Member States to WHO-HQ

- **daily cases and deaths**, as per IHR regulations
- **required weekly reporting to WHO of detailed surveillance variables**:
  - age and gender of cases and deaths, (probable and confirmed)
  - cases and deaths among health and care workers,
  - number of cases hospitalized, and discharged,
  - number of persons tested with NAAT and other testing methods.
- **vaccination**: doses administered, number of persons fully vaccinated.

What is new in this version

This version has been developed through a structured process of which the inception pre-dates the emergence of the variant of concern Omicron. Consequently, several recommendations retained from the prior version of this guidance may be challenging to implement in the current context. However, because several important amendments are introduced here, this guidance is being issued while the process has already begun to adapt the next version to the evolving epidemiological and societal context of the COVID-19 pandemic. New elements include:

- update of contact definitions, in line with latest contact tracing guidance
- definitions of Variant of Concern and Variant of Interest, in line with latest statements from the Technical Advisory Group for Virus Evolution
- surveillance of variants: referencing to Interim Guidance for surveillance of SARS-CoV-2 variants published on 9 August 2021

Source: WHO Public health surveillance for COVID-19 14 February 2022 Interim guidance https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/publications-and-technical-guidance/2022/public-health-surveillance-for-covid-19-interim-guidance,-14-february-2022

Previous Environmental Surveillance WHO documents

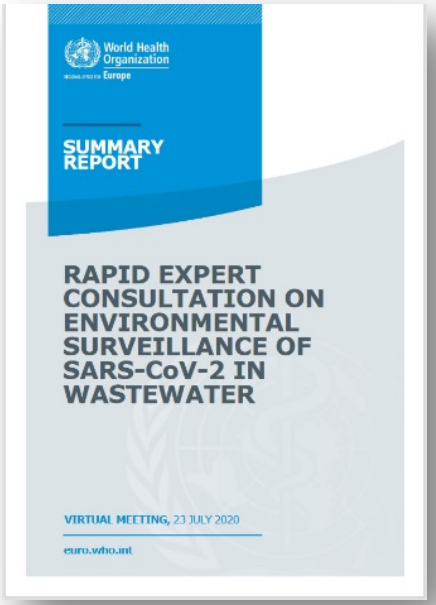

Status of environmental surveillance for SARS-CoV-2 virus

Scientific brief
5 August 2020

World Health Organization

Background

- Public Health Leadership
- Association between virus shedding,
  clinical disease and detection of RNA fragments
- Sampling approaches
- Methods and standardisation
- Costs and benefits
- Quality assurance

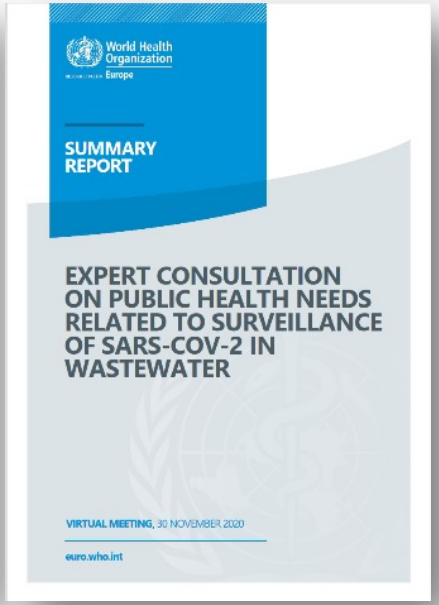

World Health Organization
Europe

SUMMARY REPORT

RAPID EXPERT CONSULTATION ON ENVIRONMENTAL SURVEILLANCE OF SARS-CoV-2 IN WASTEWATER

VIRTUAL MEETING, 23 JULY 2020

euro.who.int


World Health Organization
Europe

SUMMARY REPORT

EXPERT CONSULTATION ON PUBLIC HEALTH NEEDS RELATED TO SURVEILLANCE OF SARS-COV-2 IN WASTEWATER

VIRTUAL MEETING, 30 NOVEMBER 2020

euro.who.int

https://www.who.int/publications/i/item/WHO-2019-nCoV-sci-brief-environmentalSampling-2020-1

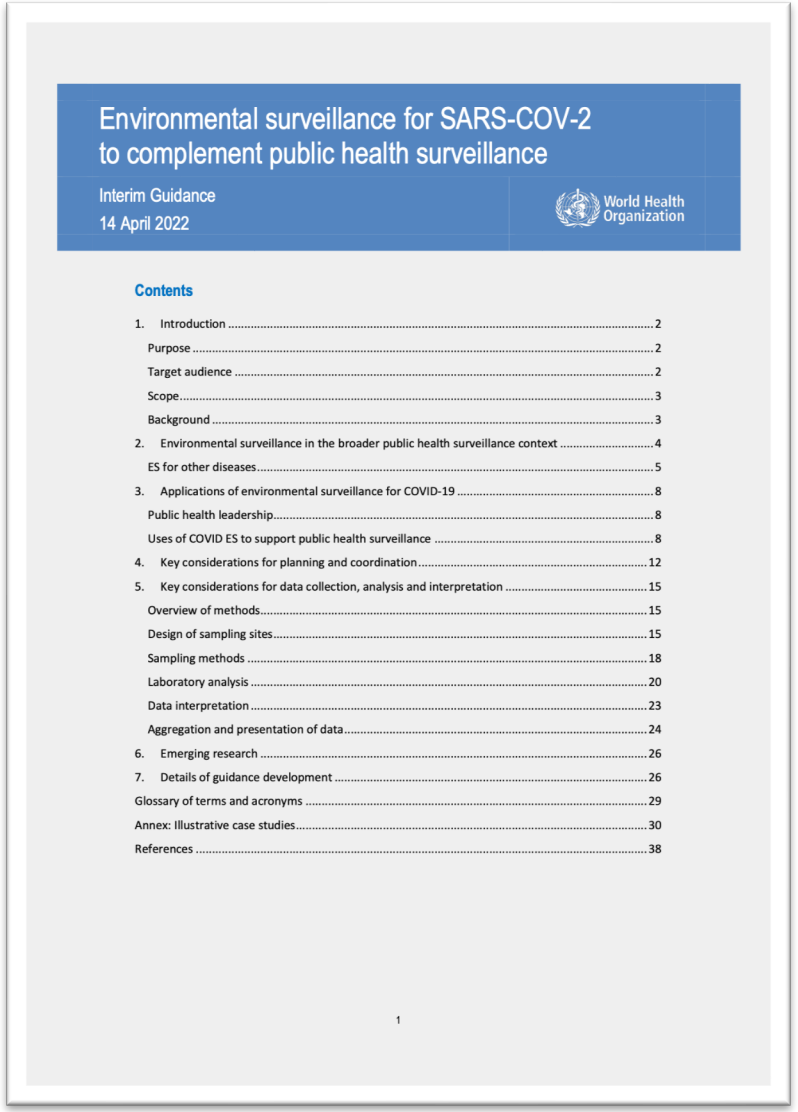
https://www.euro.who.int/en/health-topics/environment-and-health/water-and-sanitation/publications/2020/rapid-expert-consultation-on-environmental-surveillance-of-sars-cov-2-in-wastewater-summary-report-2020

https://www.euro.who.int/en/health-topics/environment-and-health/water-and-sanitation/publications/2021/expert-consultation-on-public-health-needs-related-to-surveillance-of-sars-cov-2-in-wastewater-summary-report-virtual-meeting,-30-november-2020

Latest Environmental Surveillance WHO document

- **Not** an advocacy piece for WBE/ES
- Public Health **Leadership**
- Acknowledging **association** between virus shedding, clinical disease and detection of RNA fragments
- **Potentially useful** in some contexts and situations
- Overview of **typical workflow** (but not details of methods):
  - Sampling approaches
  - Methods and standardisation
  - Quality assurance
- Broad comment on **costs and benefits**
- Examples of **one-page case studies** illustrating use cases – focus on those that are health agency led

https://www.who.int/publications/i/item/WHO-HEP-ECH-WSH-2022.1



Environmental surveillance for SARS-COV-2 to complement public health surveillance

Interim Guidance
14 April 2022

World Health Organization

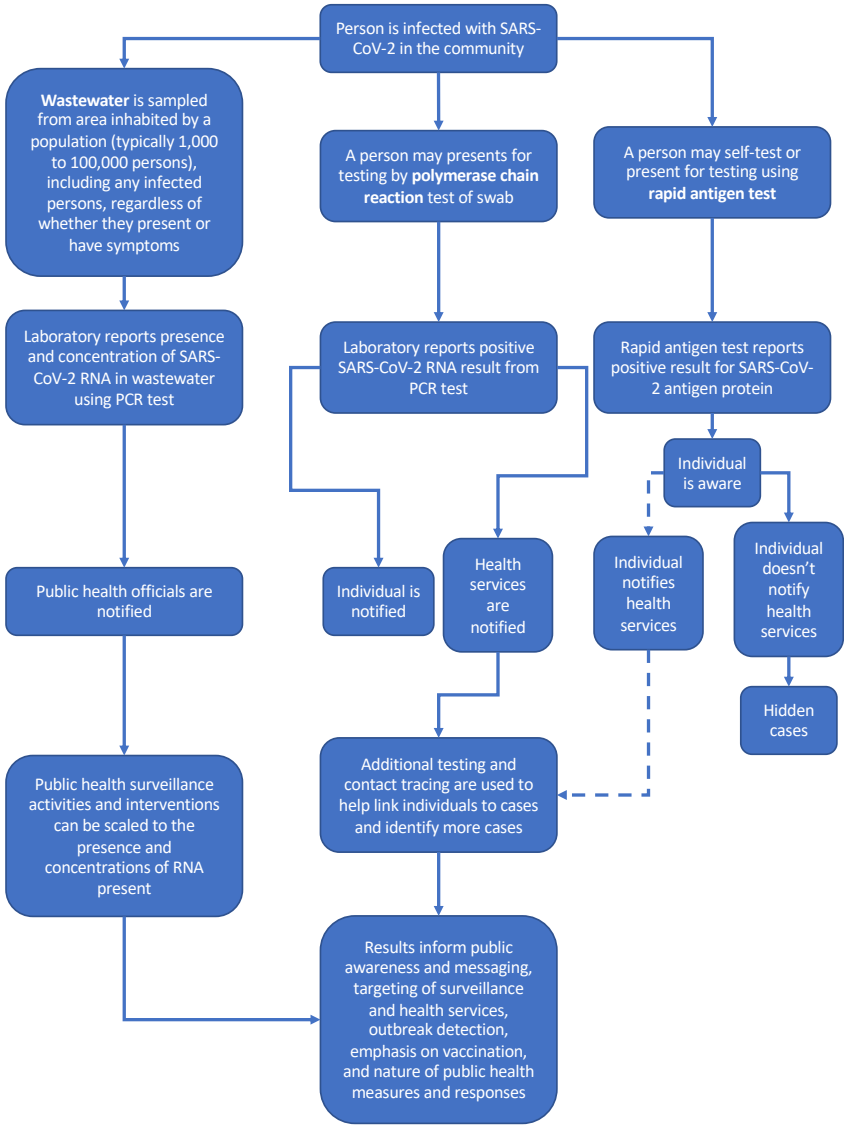
Contents

1. Introduction ... 2
Purpose ... 2
Target audience ... 2
Scope ... 3
Background ... 3
2. Environmental surveillance in the broader public health surveillance context ... 4
ES for other diseases ... 5
3. Applications of environmental surveillance for COVID-19 ... 8
Public health leadership ... 8
Uses of COVID ES to support public health surveillance ... 8
4. Key considerations for planning and coordination ... 12
5. Key considerations for data collection, analysis and interpretation ... 15
Overview of methods ... 15
Design of sampling sites ... 15
Sampling methods ... 18
Laboratory analysis ... 20
Data interpretation ... 23
Aggregation and presentation of data ... 24
6. Emerging research ... 26
7. Details of guidance development ... 26
Glossary of terms and acronyms ... 29
Annex: Illustrative case studies ... 30
References ... 38

1

Comparative workflow

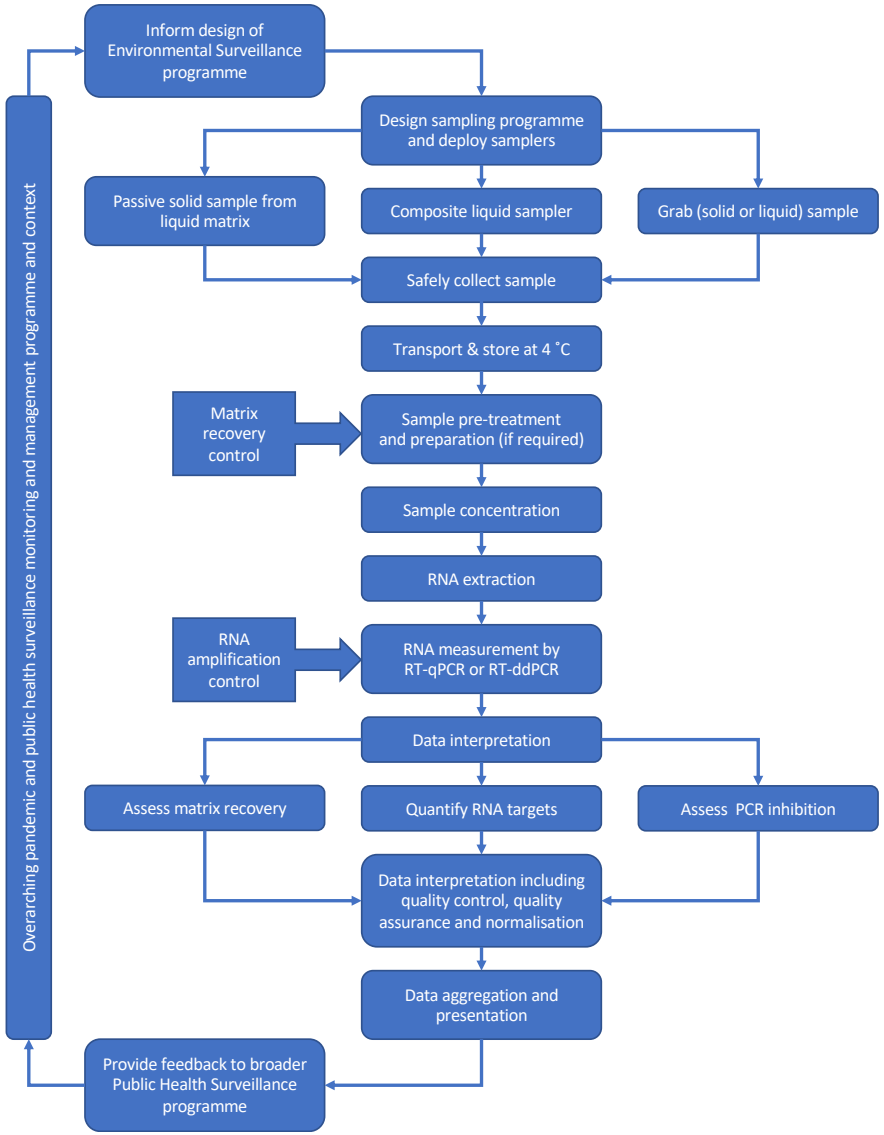
Comparing the workflows
of three most commo
surveillance methods
(wastewater surveillance,
PCR tests and
rapid antigen tests)



26/04/2022

Typical workflow

Wastewater testing workflow example



Purposes and use cases

- Depends on phase of epidemic
- Sampling of wastewater in cities/communities:
  - Early warning - watching trends in circulation, including resurges
  - Confirmation of virus circulation, or the absence thereof
  - Hot spot tracking in sub-catchments of cities
- Yes/No in virus circulation in patients, staff and visitors (hospitals, nursing homes, universities)
- Investigation of variant circulation
- Tracking history of virus introduction

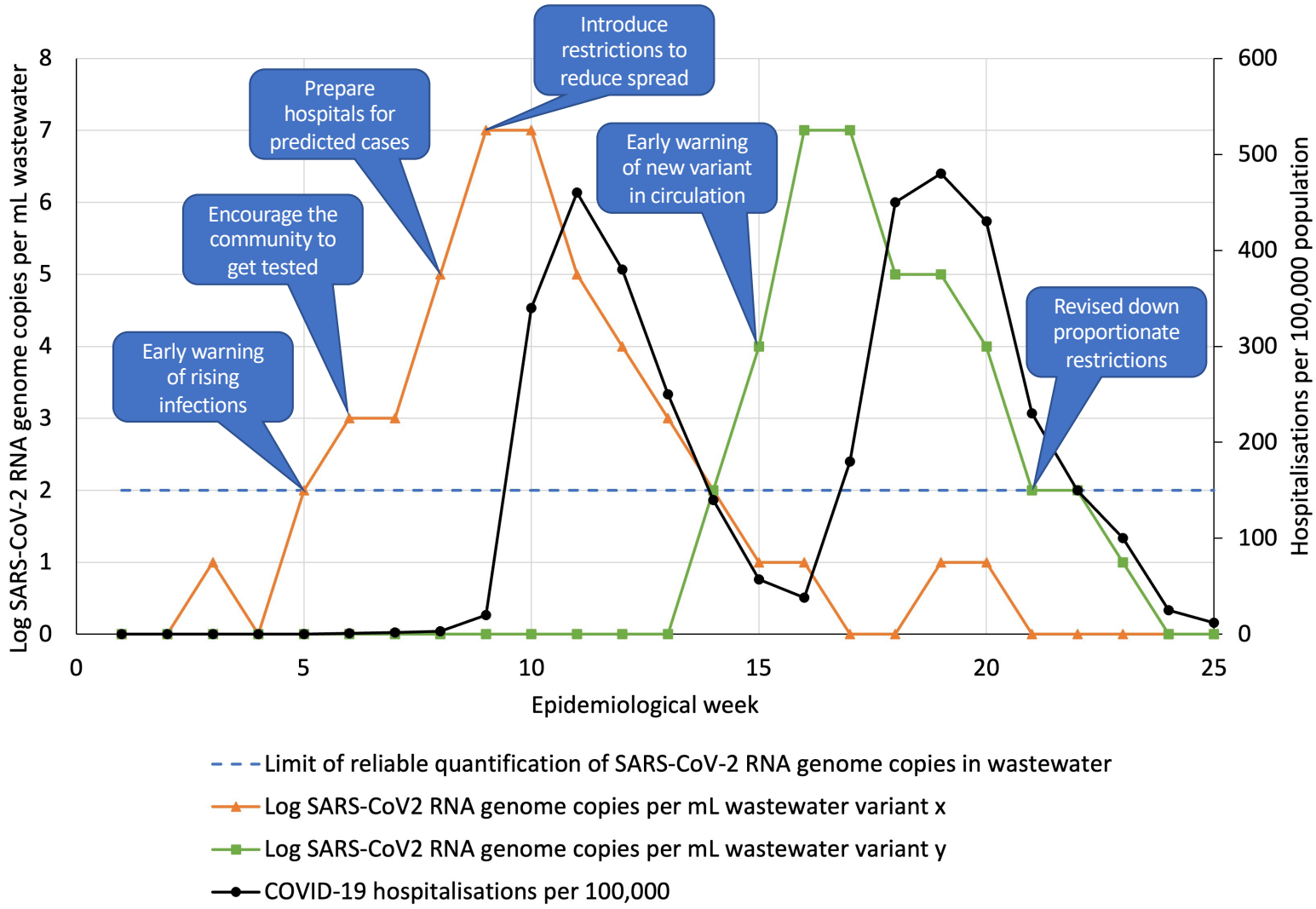
COVID-19 WEEKLY SURVEILLANCE IN NSW

Epidemiological week 45, ending 7 November 2020

www.health.nsw.gov.au/coronavirus

			5 Sep	12 Sep	19 Sep	26 Sep	3 Oct	10 Oct	17 Oct	24 Oct	31 Oct	7 Nov
Pop.	**Sewage treatment plant**	**LHD**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**
163,374	Quakers Hill	WSLHD										p
119,309	Rouse Hill	WSLHD										
37,061	Riverstone	WSLHD										
163,147	St Marys	NBM&WSLHD										p
73,686	Shellharbour	ISHLHD										
196,488	Wollongong	ISHLHD										
Regional sites												
16,068	Bombo	ISHLHD										
14,700	Bowral	SWSLHD										
14,000	Mittagong	SWSLHD										
9,000	Moss Vale	SWSLHD										
32,000	Ulladulla	ISHLHD										
11,000	Culburra Beach	ISHLHD										
147,500	Gosford-Kincumber	CCLHD										
-	Wyong-Toukley	CCLHD										
	Bateau Bay	CCLHD										
	Woy Woy	CCLHD										
5,000	Perisher	M&SLHD										
8,400	Thredbo	M&SLHD										
3,000	Jindabyne	M&SLHD										
8,000	Cooma	M&SLHD										
500	Charlottes Pass	M&SLHD										
51,750	Albury composite	M&SLHD										

Use cases


Introduce restrictions to reduce spread
Prepare hospitals for predicted cases
Early warning of new variant in circulation
Encourage the community to get tested
Early warning of rising infections
Revised down proportionate restrictions
Log SARS-CoV-2 RNA genome copies per mL wastewater
Hospitalisations per 100,000 population
Epidemiological week
0
1
2
3
4
5
6
7
8
0
100
200
300
400
500
600
0
5
10
15
20
25
Limit of reliable quantification of SARS-CoV-2 RNA genome copies in wastewater
Log SARS-CoV2 RNA genome copies per mL wastewater variant x
Log SARS-CoV2 RNA genome copies per mL wastewater variant y
COVID-19 hospitalisations per 100,000

Summary 1

- Surveillance of SARS-CoV-2 RNA in wastewater can provide important complementary information in public health decision-making, alongside with information from clinical testing
- It is not a replacement for clinical testing: a relative tool to observe trends and not an absolute tool to make conclusions about prevalence
- It has its particular strength as a “secondary tool” to detect virus in absence of clinical evidence: “We look for surprises.”
- Public dashboards contribute to keeping vigilance in the general population – as a means for influencing personal behaviours, if paired with public health advice in response to the findings

Summary 2

- The health sector needs to be in the lead – it is the end user of the information:
  - Design of the surveillance programming, including site selection
  - Analyses of findings and integration with clinical data along interpretation flow charts
  - Communication of the findings to the public (public trust)
- To gain the best possible return, strong coordination models are essential, involving
  - Wastewater service providers
  - Environmental/wastewater departments
  - Labs
- Reported challenges:
  - Time gaps between sampling and availability of data
  - Normalisation of data in observing trends
  - Lack of harmonized sampling and testing protocols

Summary 3

- Costs associated with such surveillance appear high when applied at scale (EU Umbrella Study: annual cost 25k EUR per WWTP @ 2 samples/week)
- Uptake in low resource settings must not divert resources from clinical testing, essential public health responses, and water and sanitation service provision
- Costs are not unimaginable in well-resourced settings, in particular when included in longer-term programming and integrated with other sampling purposes (beyond COVID-19)
- Costs also need to be compared with avoided costs to society (e.g. in situations where sewer surveillance provides early warning and thus early intervention opportunities)
- Wastewater-based epidemiology in sentinel cities bears benefits beyond COVID-19, including poliovirus, enteric viruses, AMR, emerging chemical agents, substance abuse

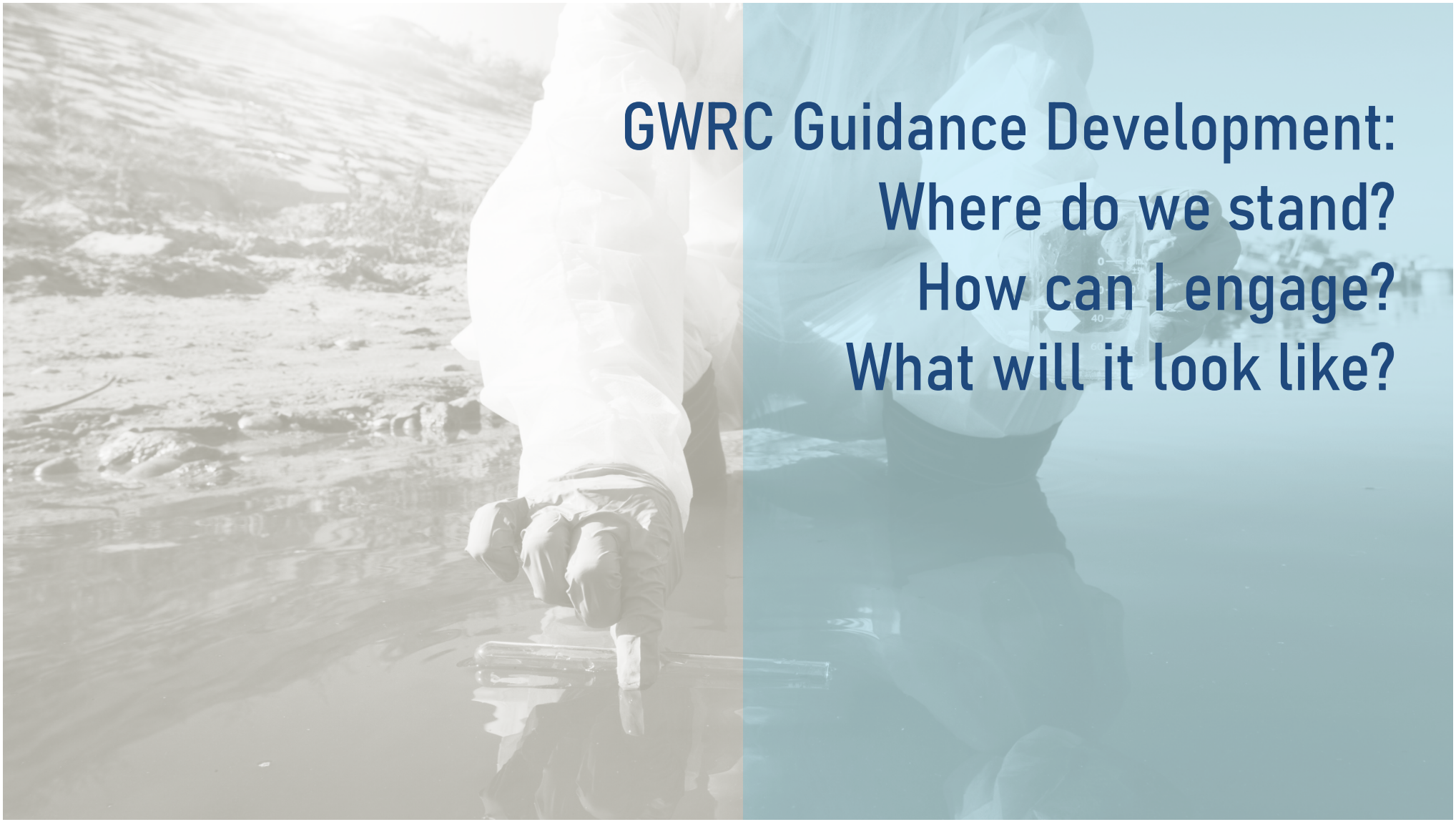
WHO vs GWRC/EU

WHO guidance

- High level
- Targeted to health agency

GWRC/EU guidance

- More in depth
- Operational and implementation



GWRC Guidance Development:
Where do we stand?
How can I engage?
What will it look like?

Sewage Surveillance Working Group

Network	Share	Solve	Relationships	Efficiency
A space to share and network with stakeholders working in the field of Wastewater surveillance of COVID-19	A forum to share best practices, progress, methodologies, outcomes and interpretation of results, plus communication via different channels such as health departments	A space to address common concerns, barriers and problem solving	Create a long term connection and collaboration between leading researchers in the field of Wastewater surveillance of COVID-19	Minimising duplication

High Level Overview and Best Practice Guide on how to undertake wastewater based surveillance of SARS-CoV-2 and its variants for Practitioners & Operators

Global Water Research Coalition

Purpose:

- **EC Recommendation 2021/472**
- Joint Research Centre (European Commission' Science Services): develop and deploy framework for collaborative exchange platform for wastewater-based surveillance of SARS-CoV-2 and its variants.
- Create: "guide for operators and practitioners" for EU Member States.

Objective:

- Explore how sewage data has been used and interpreted in **making public health decisions** with the overall agenda of advancing equity and health.
- Open, inclusive and coordinated approach bringing together experts and public health and water professionals to highlight sampling strategies and methods used

How:

- EC to team up with the GWRC + other experts/public health authorities

High Level Overview and Best Practice Guide on how to undertake wastewater based surveillance of SARS-CoV-2 and its variants for practitioners & Operators

Global Water Research Coalition

Need to validate sampling and analysis methods
Document and review the methodologies used by the various European and International laboratories

The guide will be drafted with the following requirements in mind:

- Identify methods that are practical and cost effective for a national surveillance programme
  - low and high prevalence countries
  - highlight the respective minimum requirements
- Determine common workflows and protocols and variations and normalising between those
- Looking for input into various sampling and analytical techniques that have been used, the do's and don'ts
- Highlight case studies that demonstrate how data has been used and interpreted for **critical health decisions**.

Strategically align & consolidate international knowledge & best practice in a coordinated, open and inclusive way

Contents

1. High Level Overview
2. Health agency leadership
3. Sampling
4. Transportation Protocols
5. Measurement and testing methodologies
6. Data analysis and visualisation –to communicate to the public, health agencies, and sewer workers
7. Case studies
8. Recommendations & future outlook

1. High level overview

Introduction, Scope and Background

Relationship to WHO's health-agency focused guidance vs. this operations-focused guidance

Relationship to other documents and guidance provided for specific jurisdictions vs. this global guidance

Specificities of high vs low resource settings

Specificities of rural vs populated areas

Health and safety of workers

2. Health agency leadership

- Context of Sewage Surveillance in Public Health Surveillance
- General benefits to the health agency
- How health agencies lead sewage surveillance
- Net costs after realised savings from Sewage Surveillance
- Early warning of change
- Link to health promotion (protective measures, vaccines, testing)
- Planning for hospital care requirements
- Health security

3. Sampling

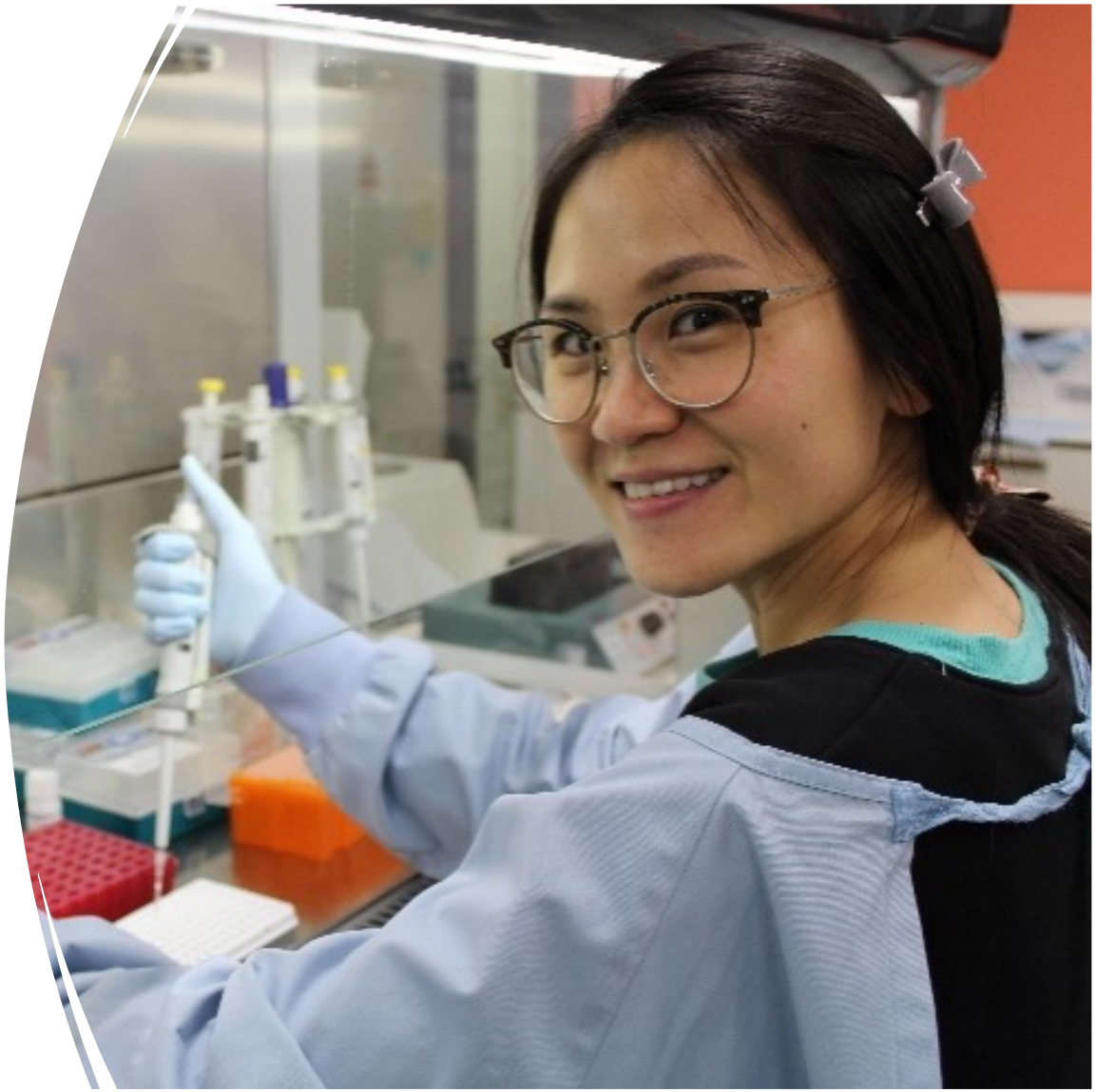
- Grab and passive sampling and strategies
- Wastewater Sampling at inlets of WWTP
- Wastewater Sampling at specific locations in the sewershed (manholes, conjunction, subsystems)
- Wastewater Sampling in confined locations (vessels, buildings,)
- Wastewater and Environmental Sampling in situation without sewage system including informal settlements and septic systems
- Sludge Sampling in WWTPs

4. Transportation protocols

- Storage containers and conditions
- Stability tests and assessments
- Hygiene
- Shipments
- Chain of custody

5. Measurement and Testing Methodology

- Gene targets, primers and probes
- RT-qPCR
- dd-PCR
- Controls
- Detection of mutations and variants
- Next gen sequencing
- Genomics



6. Data Analysis and Visualisation

- Data normalisation
- Data models
- Data documentation and quality (including usage rights, authorisations, interoperability, AQC, etc.)
- Statistical analysis and correlation
- Data visualisation
- Decision support and data interpretation tools
- Trend analysis and forecasts
- Algorithm standard and data crunching

is progressing to assess the significance of the results. For example, it is not currently known the minimum number of cases that can be detected in a catchment. A small number of cases in a large sewage catchment may not be detected by sewage surveillance due to factors such as dilution, inhibition, reduction in shedding over the infection period or movement of cases.

The table below shows results for the last 10 weeks for sites that have had detections. Full result from all sites across NSW are available in Appendix D.

Table 4. Locations with SARS-CoV-2 detections in sewage samples in the last 10 weeks, NSW, 3 January 2021 to 20 March 2021

		16-Jan	23-Jan	30-Jan	6-Feb	13-Feb	20-Feb	27-Feb	6-Mar	13-Mar	20-Mar
Pop.	**Location**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Sydney Sites											
69,245	Warriewood										
57,933	West Hornsby										
318,810	Bondi							n	n	n	n
1,857,740	Malabar 1							n	n	n	n
	Malabar 2										
181,005	Liverpool				n						
161,200	Glenfield										
1,341,986	North Head						n	n			
Sydney Network Sites											
Bondi	Paddington Sewage Network										
Malabar	Homebush SPS										
Malabar	Botany Sewage Network										
North Head	Camellia SPS - South										
North Head	Auburn Sewage Network										
Glenfield	Minto Sewage Network										
Liverpool	Ireland Park Sewage Network										

Sampling commenced week ending 18 July 2020

not sampled or analysed

SARS-CoV-2 not detected

SARS-CoV-2 detected

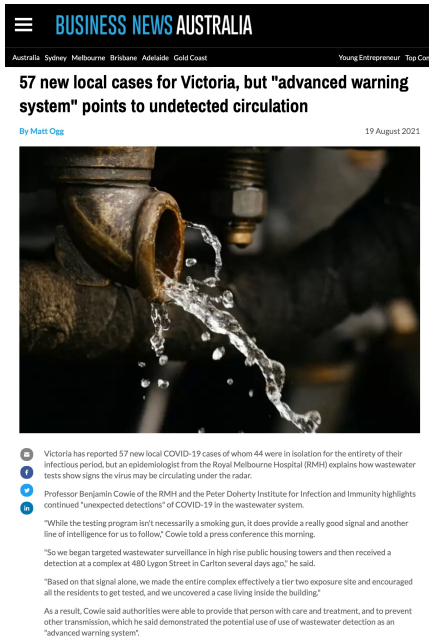
SPS Sewage Pumping Station

n result from network sites

Interpretation: In the week ending 20 March, 135 sewage samples were tested for fragments of SARS-CoV-2. Of these, there were five detections –taken from the Bondi and Malabar treatment plants, and the sewage network at Paddington (within the Bondi catchment), Homebush (within the Malabar catchment) and Botany (within the Malabar catchment). These areas all receive sewage from quarantine hotels with known cases. There were no regional detections.

7. Case studies

- Australia
- Austria
- Canada
- EU
- France
- Germany
- Italy
- Netherlands
- Portugal
- South Africa
- Spain
- Switzerland
- Turkey
- UK
- US



BUSINESS NEWS AUSTRALIA

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57 new local cases for Victoria, but "advanced warning system" points to undetected circulation

By Matt Ogg 19 August 2021

Victoria has reported 57 new local COVID-19 cases of whom 44 were in isolation for the entirety of their infectious period, but an epidemiologist from the Royal Melbourne Hospital (RMH) explains how wastewater tests show signs the virus may be circulating under the radar.

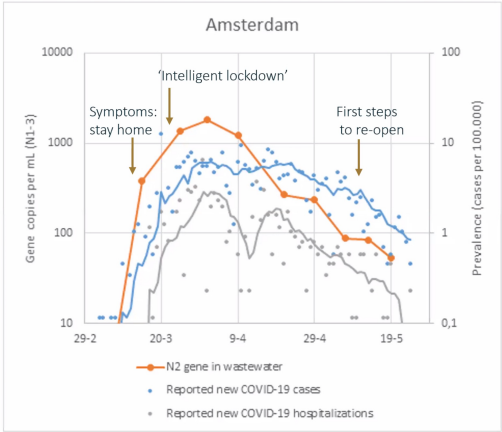
Professor Benjamin Cowie of the RMH and the Peter Doherty Institute for Infection and Immunity highlights continued "unexpected detections" of COVID-19 in the wastewater system.

"While the testing program isn't necessarily a smoking gun, it does provide a really good signal and another line of intelligence for us to follow," Cowie told a press conference this morning.

"So we began targeted wastewater surveillance in high rise public housing towers and then received a detection at a complex at 480 Lygon Street in Carlton several days ago," he said.

"Based on that signal alone, we made the entire complex effectively a tier two exposure site and encouraged all the residents to get tested, and we uncovered a case living inside the building."

As a result, Cowie said authorities were able to provide that person with care and treatment, and to prevent other transmission, which he said demonstrated the potential use of use of wastewater detection as an "advanced warning system".



Apollo Bay residents urged to get tested for COVID-19 after virus found in sewerage

By Melissa Cunningham
September 5, 2020 — 5.45pm

Save Share A A A

Case studies
- operational
- health leadership
- open to share

Early warning high risk building-scale application

Global Water Research Coalition

Date	Mid-August 2021, reported 19/August/2021
Location	480 Lygon Street Carlton, Melbourne, Victoria, Australia https://goo.gl/maps/gi7vxsKfZCx5DiHf7
Spatial context	Single building – public housing high-rise apartments
Sampling method	Passive sampler on the sewer line https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8291133/
Test Method	Electronegative membrane in passive sampler https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8291133/ Qiagen Extraction Kit https://www.qiagen.com/au/products/discovery-and-translational-research/dna-rna-purification/rna-purification/microbial-rna/rneasy-powerwater-kit/ Perkin Elmer China CDC SARS-CoV-2 https://perkinelmer-appliedgenomics.com/home/products/sars-cov-2-real-time-rt-pcr-assay-ce-ivd/ Monash University https://www.monash.edu/engineering/davidmccarthy
Clinical context	Low community case loads. Most clinical samples at the time were 'non-detect'. Most sewage samples at the time were expected to be 'non-detect' away from quarantine facilities.
Pandemic context	Rising limb of a new wave following new variant (delta strain) due to transfer from New South Wales outbreak https://www.coronavirus.vic.gov.au/victorian-coronavirus-covid-19-data
Benefit	"Early warning"
Details	• The apartment block was already on the targeted wastewater surveillance program as a site of interest. • The wastewater testing was returning negative results. • There were no known cases. • But then it returned an unexpected positive result. • This was followed up by targeted clinical testing which identified a case and in turn other cases in two apartment blocks. • The early warning from wastewater couples to the clinical response helped reduce the spread and contain the cluster.
URL	Example: https://www.abc.net.au/news/2021-08-15/victoria-records-25-new-covid-19-cases/100378244 Summary: https://www.businessnewsaustralia.com/articles/57-new-local-cases-for-victoria--but--advanced-warning-system--points-to-undetected-circulation.html Brief mention: https://www.abc.net.au/news/2021-08-19/victoria-new-covid-cases-melbourne-hospital-case/100389120

8. Recommen-dations & future outlook

Introduction, Scope and Background

Relationship to WHO's health-agency focused guidance vs. this operations-focof workers

Research Needs

Capacity and Training requirements

Sewage surveillance as tool for emerging threats and pollutants of emerging concern

Impact of vaccination rollout

Financing

How can you get involved

- Review and input to the guidance
- Provide completed case studies and examples
- Demonstration of practical operational programs
- Summary of how stakeholders are engaged
- How funding was secured
- Challenges faced and overcome

Way to contribute:

Case studies: fill out standard templates and provide in a consistent format for a range of contexts. Covering:

- Health agency engagement and leadership
- Program designs
- Use cases (early warning, trends, localised, concentrations, variants)
- Pandemic context (low and high incidence settings)
- Socioeconomic context
- Wastewater infrastructure context
- Funding sources, stakeholders and partners

References: to proven operational practices - explain their relevance and applicability

- Methods
- Communication tools
- Infographics (with permission to use/adapt)
- Program overviews
- Costs and benefits – business cases

Contributors/Co-authors

Would you like to contribute to the guidance document ?

Global Water Research Coalition

Contact:

Stéphanie Rinck-Pfeiffer

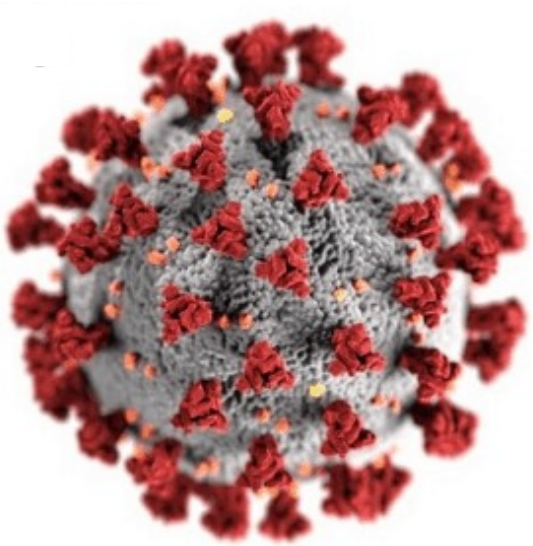
Global Water Research Coalition (GWRC)

globalwaterresearch@gmail.com

www.globalwaterresearchcoalition.net/

or

Bernd Manfred GAWLIK
European Commission
DG Joint Research Centre
bernd.gawlik@ec.europa.eu
https://ec.europa.eu/jrc/



Organisation: Ismahane Remonnay (Veolia), Jean Francois Loret (SUEZ), Gertjan Medema (KWR), Dan Deere (Water Futures & WaterRA ColoSSoS) - link to WHO