What can we learn from COVID for future wastewater surveillance ?

An Australia-NZ perspective

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For the **ColloSSoS** Group

ColloSSoS

Collaboration on Sewage Surveillance of SARS-CoV-2

Credit : Melbourne Water

Core Program Elements	Pathogens	Components
Sentinel surveillance	Current threats	Ongoing sampling, analysis and reporting Planned actions and communications - including escalation with changed sampling
Preparedness	Likely future threats	Scenario planning Operational preparedness R&D to address key knowledge gaps
Agile surveillance response	Specific emerging threat	Refine plan for specific emerging threat Rapid laboratory method validation (if needed) Implementation of changed surveillance

Relevant for the dynamic COVID threat - As well as more broadly

COVID-19
declared a PHEIC
30 Jan 2020

"We need our collective knowledge, insights and experience to answer the questions we don't have answers to, and to identify the questions we may not even realise we need to ask"

Dr Tedros
WHO Director General

THREAT :

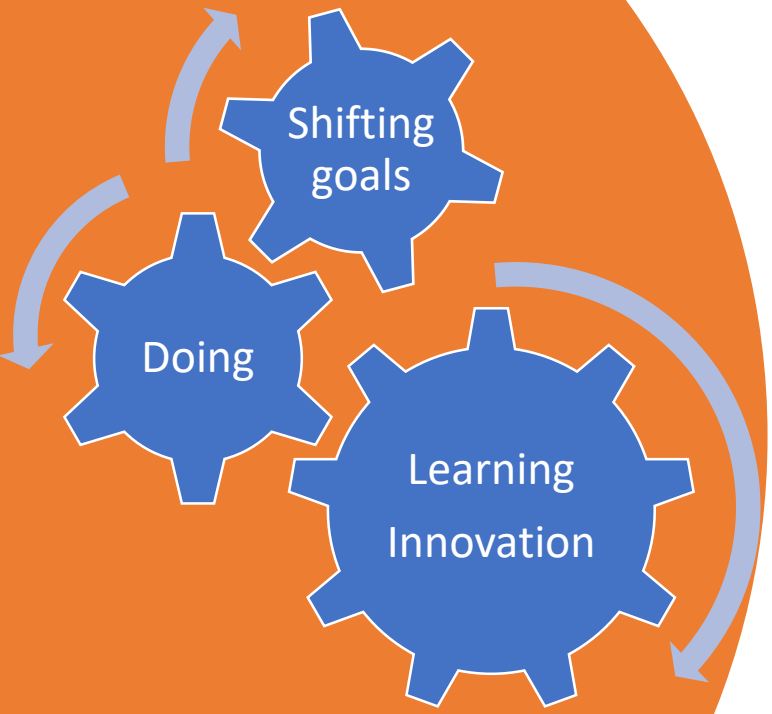
- Public Health Emergency of International Concern
- COVID pandemic unprecedented and highly dynamic

OPPORTUNITY :

- Wastewater pooled population testing
- Existing capability – polio, illicit drugs, environmental monitoring and research
- Could it play a useful role ?

GAP = HUGE

- No scaled wastewater surveillance programs
- Limited sampling options
- Key knowledge gaps
- Little intersectoral collaboration and resources
- Focus of COVID response elsewhere



FEB 2020

Australia – New Zealand journey

ColoSSoS
Collaboration on Sewage Surveillance of SARS-CoV-2

- Aus-NZ intersectoral collaboration galvanized
- Open interdisciplinary learning collaboration
- Enabled rapid development and innovation
- Enabled jurisdiction-specific responses in dynamic emergency period
- Ongoing Community of Practice

Victoria
Case Study
~6.5 million

Victoria Wastewater Surveillance Program

- **Local multidisciplinary collaboration** connected to **ColoSSoS** and **global** collaborations
- Department of Health leadership within COVID response
- 3 labs : 1 private and 2 research
- 15+ water utilities + sampling contractors
- Advisory partners – research, polio ref lab
- Local public health units
- **Goal :** To implement a **highly adaptive program** providing **timely intelligence** to **inform public health decisions**

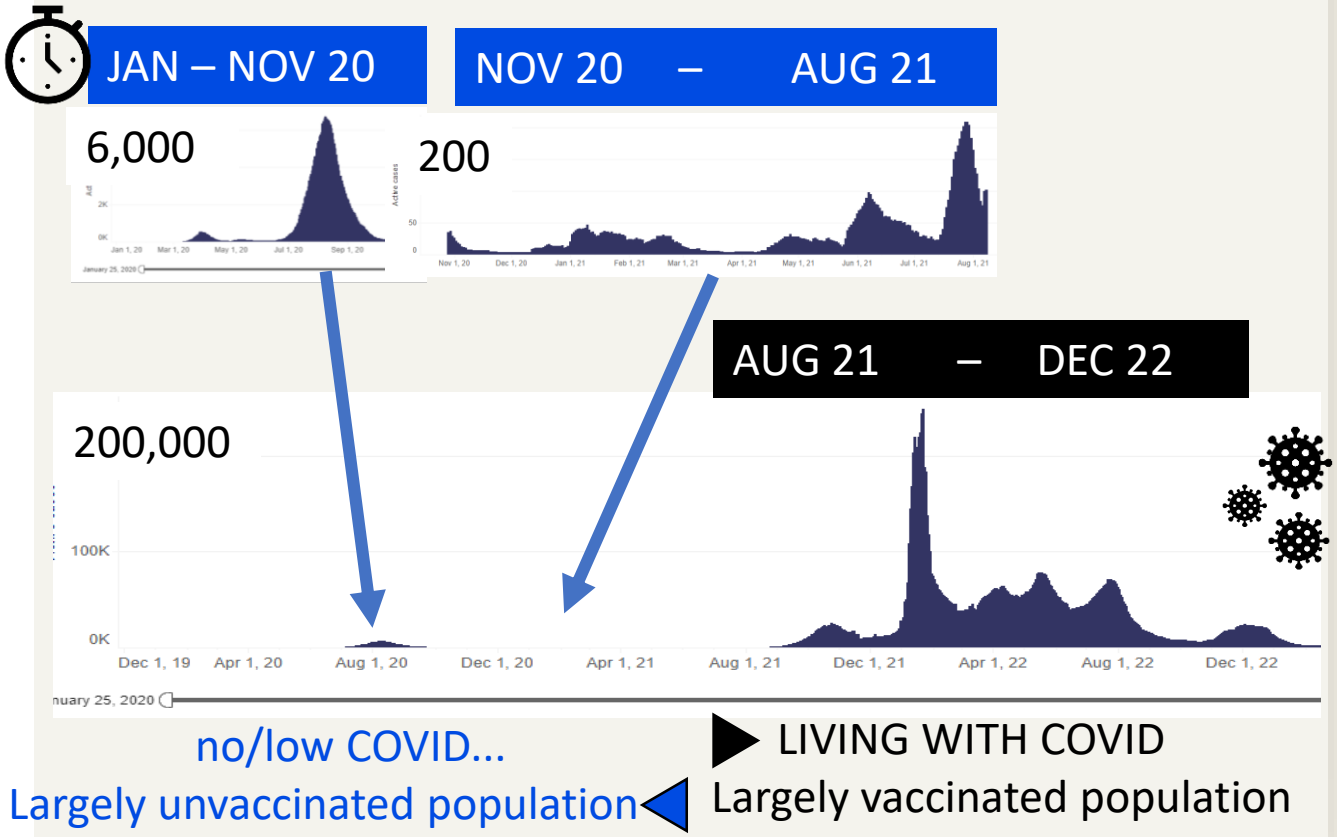
Credit : Monash University

Dynamic Context

Three broad phases

1. **no/low COVID** with **vulnerable unvaccinated** population : ~19 months onset to late 2021
2. **High prevalence** and **highly vaccinated** population - m**onoclonal waves**
3. Overtaken by **polyclonal period with rapid virologic change**

ACTIVE CASES IN VICTORIA



Value (Early to late ‘21)

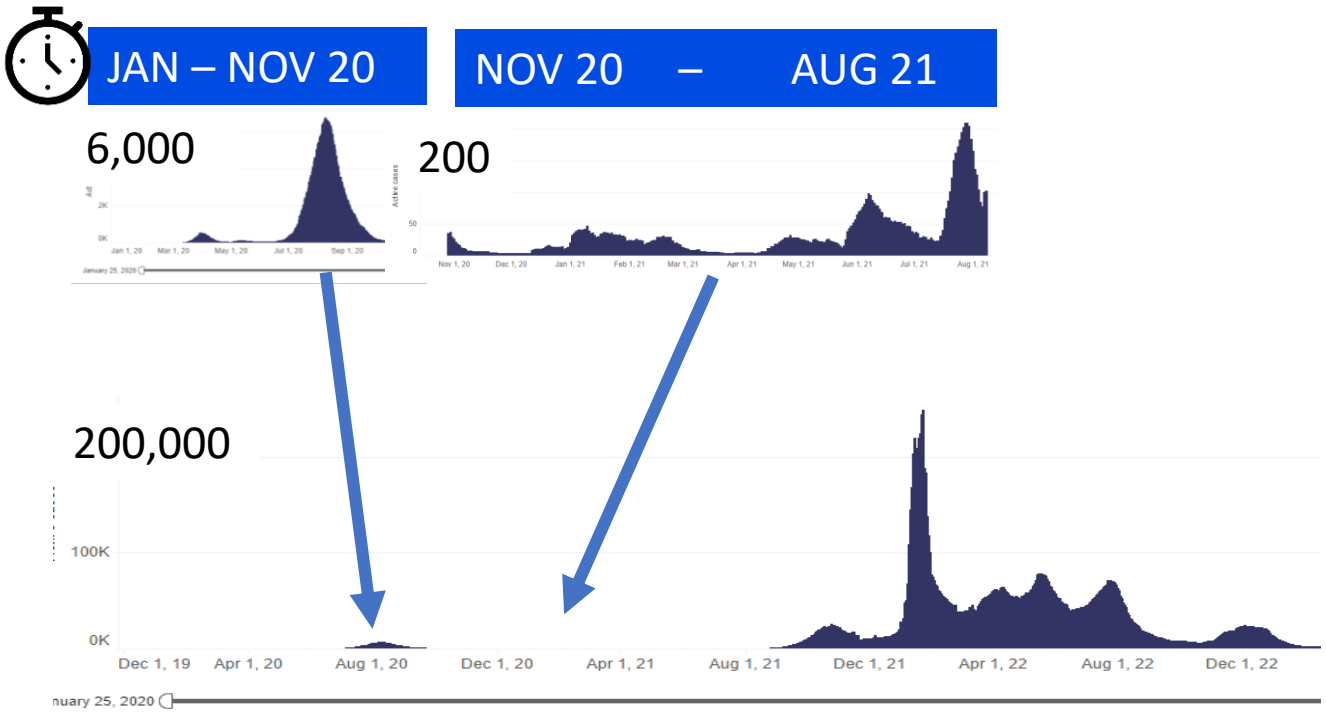
No/Low disease + highly vulnerable population

- ✓ Timely detection of undiagnosed cases to contain community outbreaks

Presence/Absence

Sampling to “Actionable areas”

ACTIVE CASES IN VICTORIA

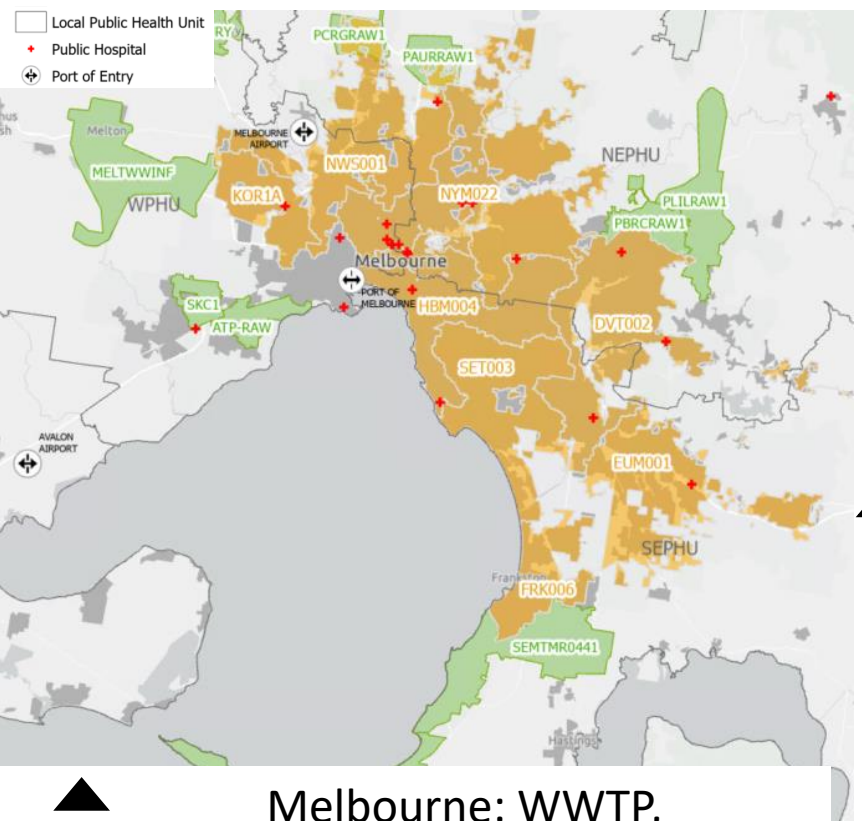


“no/low” COVID...

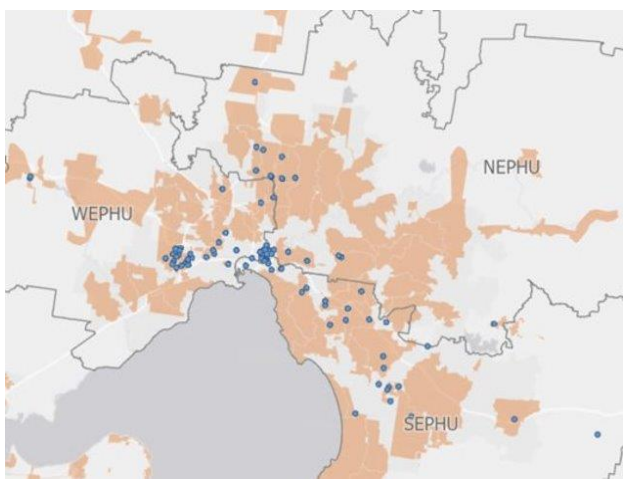
Largely unvaccinated population

Toolkit - Powerful flexible tool

Choice of catchment relates to use case combined with innovation of passive samplers and sensitivity of analytic assays …



Melbourne: WWTP, subcatchments, airports, at risk sites



Melbourne: Facility level : e.g. high–risk industry and subcatchments

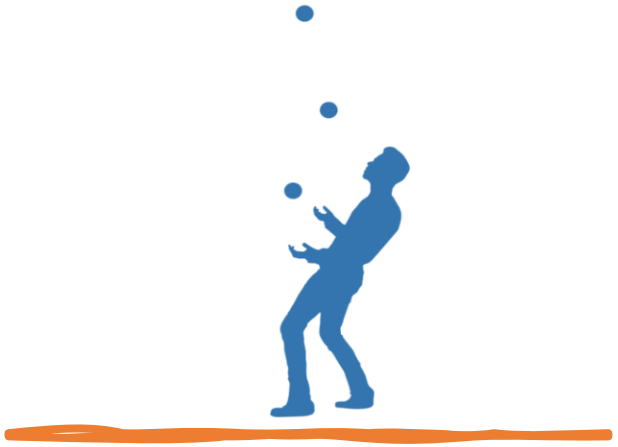
Passive sampler improved “Moore Swab”

Credit : EPHM Lab - Monash Uni.

WWTP

In sewer system

Credit : Melb. Water

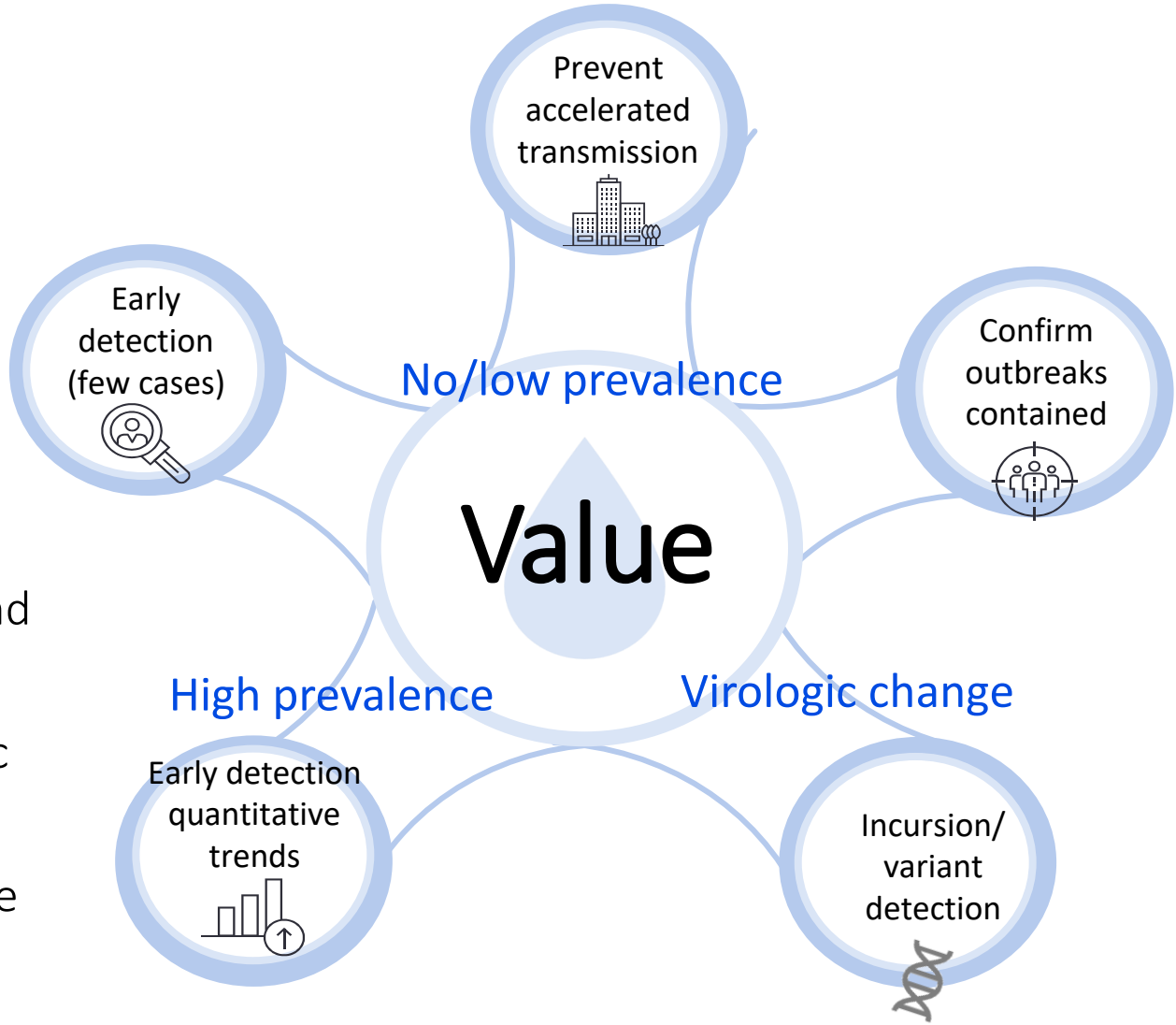


Preparedness : forward planning of various COVID scenarios

Agile Response : All were relevant and were applied for limited time periods

Core surveillance : required periodic change to be fit for purpose

Relevance: Lessons learned applicable to other pathogens



Early detection (few cases)

Prevent accelerated transmission

Contain outbreaks

Value

Varied settings - **Geographic areas**

- Targeted to smaller populations relevant for action and risk communication
  - Smaller towns and areas within cities
  - Trigger targeted sampling
  - Confirm absence of transmission
- Multiple examples of early alerts and specific actions triggered
  - e.g. regional town of Shepparton

Update: New COVID-19 wastewater detections in regional Victoria

"If you live or work in these areas ... please get tested.

Early detection (few cases)

Prevent accelerated transmission

Contain outbreaks

20,000

SEP ’21

Industry sites▼

WINTER JUNE-AUG ‘21

200

▲High rise social housing – Melbourne

Varied settings – **Localised site level**

- Industry sites
- High-rise social housing
- Residential aged care
- Correctional facilities
- Schools
- Military facility
- Festivals/sporting events

Anticipated PIVOT…

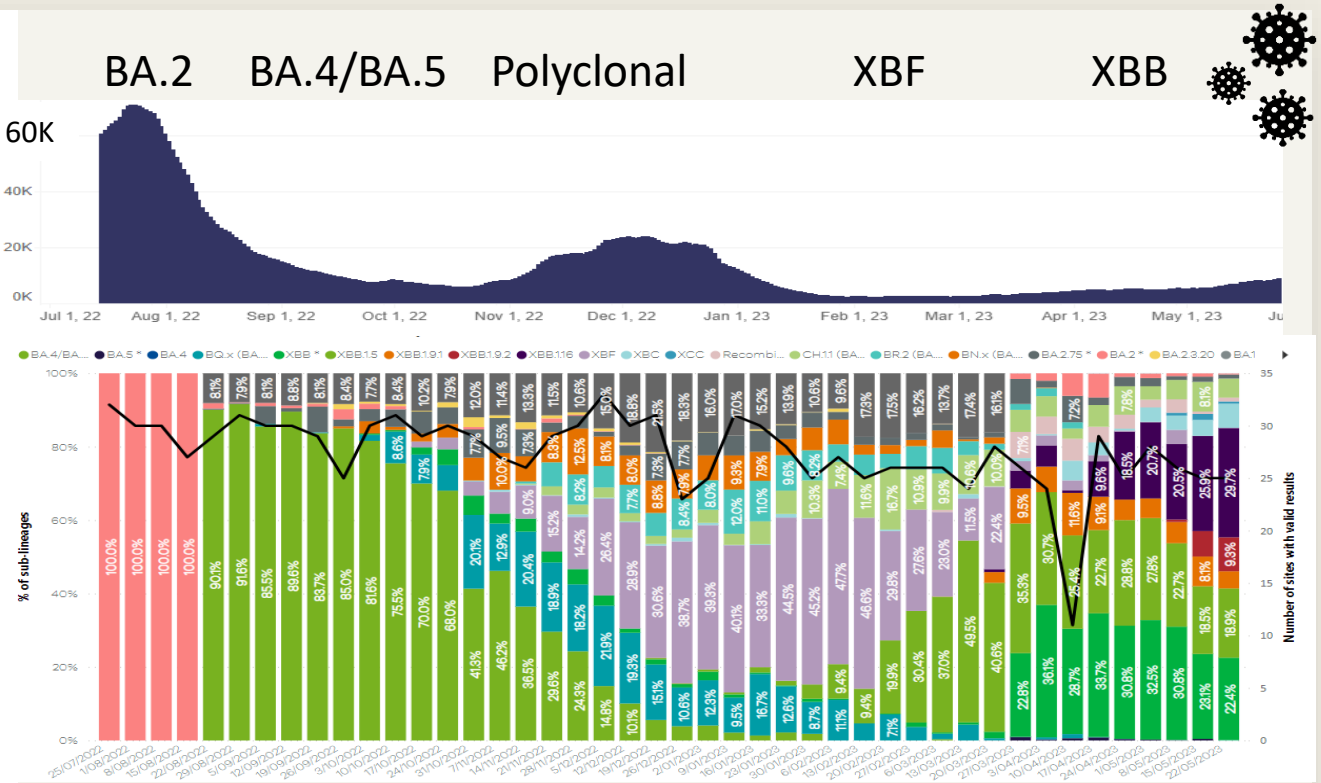
Context of high prevalence, highly vaccinated population and rapid virologic genetic change

Value (From late ’21)

- ✓ Early detection of new variants and their growth
- ✓ Community transmission levels

Sampling to “Actionable areas”

Bigger populations + airport



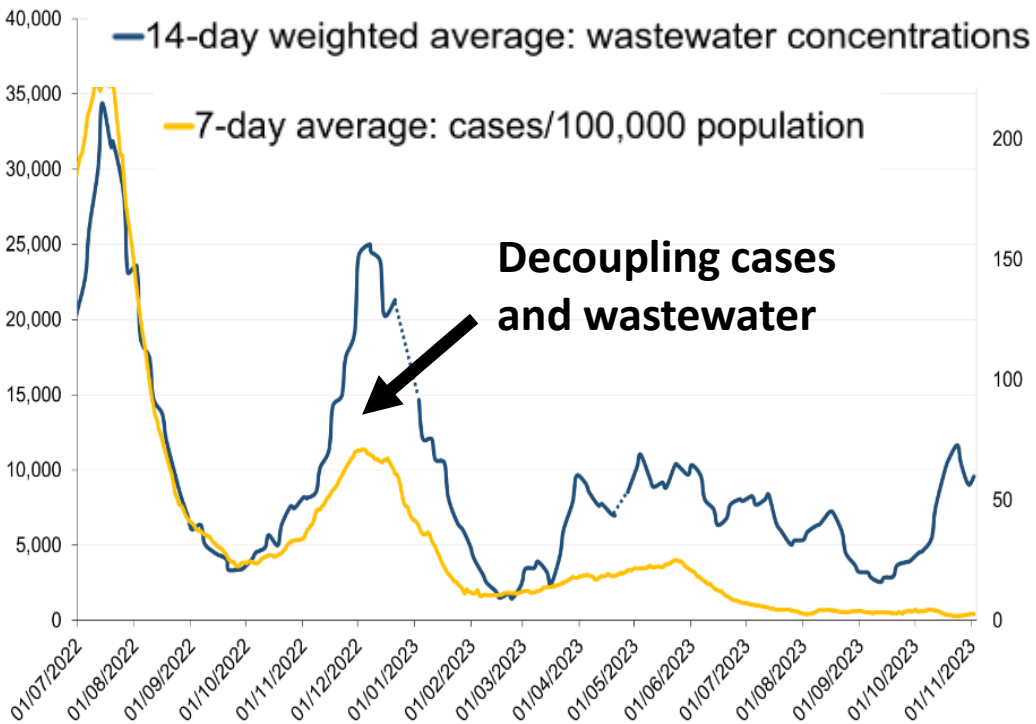
Variant distribution in wastewater over time : Victoria

* See Aaron JEX presentation

FIAT LUX
Walter+Eliza Hall
Institute of Medical Research

Increasing relative value

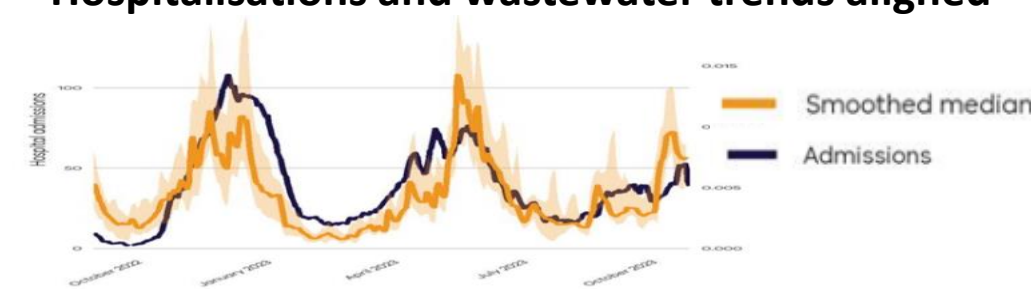
- Previously community transmission trends were reflected in reported case trends
- Now quantitative wastewater trends are the best source of trend information
- Increased value for trends and for modelling input to forecast future cases
- Population normalization to control for rain/ dilution and population movement (PMMOV)



Perth, Western Australia. 1 July 2022 – 1 Nov 2023

COVID-19 wastewater surveillance (health.wa.gov.au)

Hospitalisations and wastewater trends aligned



Melbourne, Victoria. Oct 2022 – 28 Oct 2023

Victorian COVID-19 surveillance report | health.vic.gov.au

THE TAKE-HOME MESSAGES

Open collaboration such as achieved by ColoSSoS group is golden

DYNAMIC

Surveillance, preparedness and agile response are interconnected

Plan them together and **update frequently**

ACTIONABLE

Part of the surveillance mosaic

Provide relevant intelligence timely, actionable, affordable – pathogen and context specific

AGILE

WWS tools are incredibly flexible

Use the flexibility purposively

Consider localized sampling

CAPABLE

Core surveillance provides substantive preparedness

Ensure capability in key areas including innovation, learning and sharing

TEAM

Diverse specific skillsets working together

Create and nurture partnerships - the critical enabler

THANK YOU to all the ColoSSoS TEAM !

High performing, inter-disciplinary, agile and willing...

Water utilities

Melbourne Water
North East Water
SA Water
South Gippsland Water
Hunter Water
Sydney Water
Yarra Valley Water
South East Water
Gippsland Water
PowerWater
Barwon Water
Greater Western Water
Water Corporation
Goulburn Valley Water
Lower Murray Water
Central Highlands Water
Coliban Water
East Gippsland Water
wannonWATER
GWMWater
Water Services Association of Australia

collaborate innovate impact

NZ and Australian health departments

Water Research Australia
Water Futures
Victoria State Government – Health and Human Services
Northern Territory Government
Government of Western Australia – Department of Health
Ministry of Health
Government of South Australia – SA Health
ESR – Science for Communities
NSW Government – Health
Queensland Government – Queensland Health

Global Water Research Coalition
The Water Research Foundation
intelligent water networks
Canadian Water Network

European Commission

ColoSSoS

Collaboration on Sewage Surveillance of SARS-CoV-2

Innovation, laboratory and sampling partners

Monash University
VIDRL
The University of Melbourne
Flinders University
University of South Australia
AWQC
ALS
The University of Newcastle Australia
Walter+Eliza Hall Institute of Medical Research
Australian Government – Department of Industry, Science, Energy and Resources – National Measurement Institute

Private sector

Sydney Water Monitoring Services™
Chevron Australia
isle
BHP

Enabled by global collaboration - including JRC/GWRC Town Halls !!