



Reflections on a large R&I project: Wastewater-based monitoring for public health surveillance

Davey Jones



PRIFYSGOL
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UNIVERSITY



A 10-year research journey.....



No environmental standards
for viruses

SURVEILLANCE AND OUTBREAK REPORT

International linkage of two food-borne hepatitis A clusters through traceback of mussels, the Netherlands, 2012

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This report describes an outbreak investigation start- age groups has led to increasing age and severity of Hepatitis A could therefore re-emerge in North America or western Europe, epidemic, affecting mostly adults, with a decrease in the age of infection [1]. In the Netherlands, the incidence of hepatitis A in 2010 was 1.3 cases per 100,000 population [2]. Hepatitis A is a notifiable disease in the Netherlands. Cases, including routine surveillance data, are reported in the Netherlands. Cases, including routine surveillance data, are reported in the Netherlands. Cases, including routine surveillance data, are reported in the Netherlands. Surveillance is intensified in areas with no travel history to endemic countries. For these

An aerial photograph of a wastewater treatment plant. It features several large circular tanks, rectangular basins, and various pipes and structures. The surrounding area is green with some trees and buildings.

Addressing a policy-relevant question



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Oysters behind norovirus outbreak in New Zealand



By Joe Whitworth+
07-Feb-2017
Last updated

Norovirus Causes Outbreak Linked to Oysters

April 19, 2017

By: James Peacock

The Washington State Department of Health announced recently that it was investigating an outbreak of Norovirus associated with people eating raw oysters. These reports come from all over the state, though it is unknown exactly just how many cases of Norovirus are being reported. As number of reported illnesses has increased, it has become more and more clear where the contamination is coming from. Having tracked down the harvest areas responsible for the contamination, there were several small recall associated with this outbreak. Shellfish that were harvested from the closed areas were recalled on March 2, April 4, and April 5.



Norovirus outbreak from B.C. oysters makes dozens sick

Vancouver oyster bar owner expects his business to take a hit, as health officials issue warning

By Rafferty Baker, CBC News



Services Contact

MARLER CLARK
THE FOOD SAFETY LAW FIRM

Raw Oyster Norovirus Outbreak in Seattle

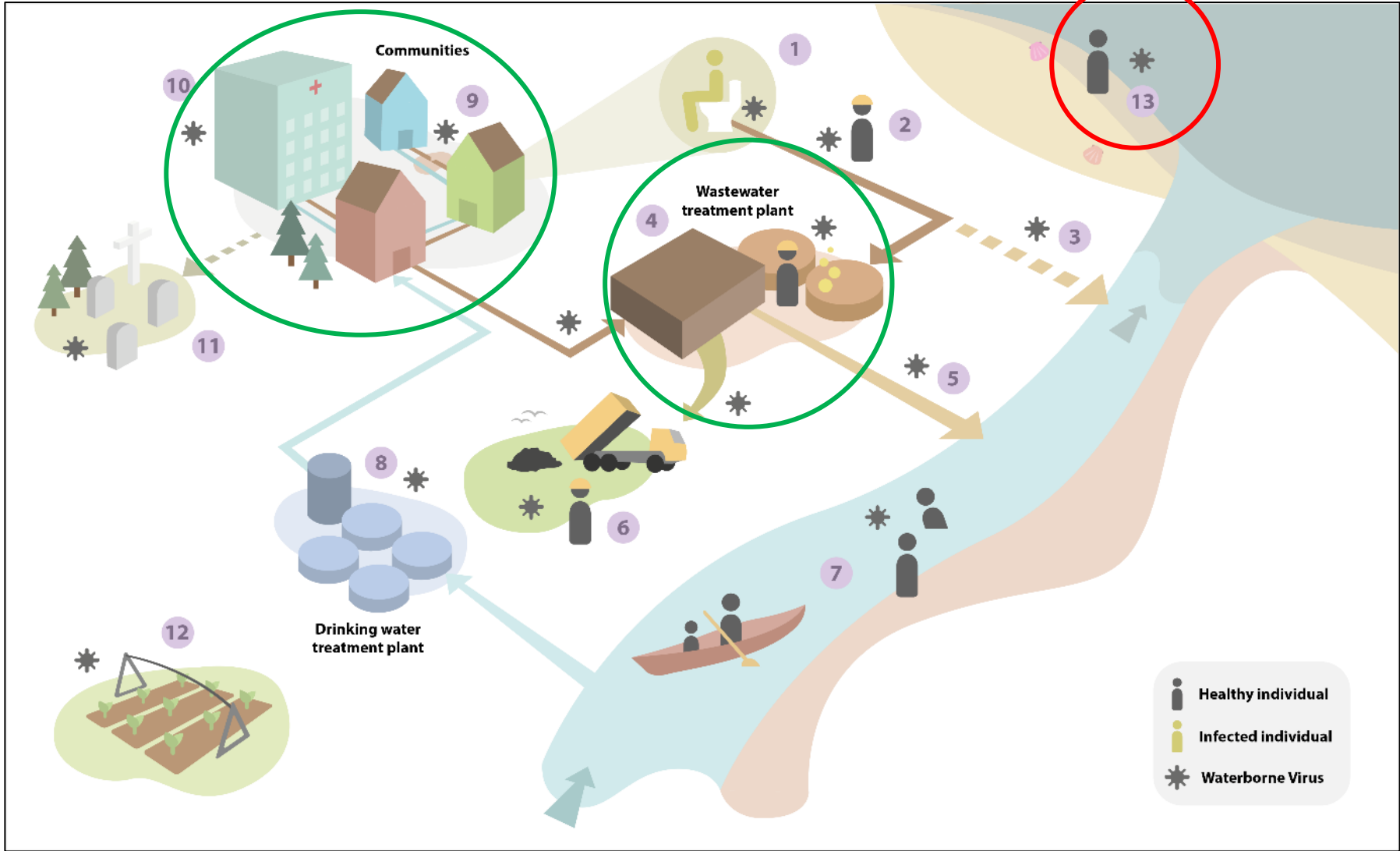
By Anthony Marangon on January 31, 2017

POSTED IN FOOD POISONING INFORMATION

Public Health recently investigated a cluster of norovirus-like illness associated with consuming raw oysters. Norovirus is the name of a group of viruses that cause viral gastroenteritis. Norovirus is found in the stool and vomit of infected people and is usually spread person-to-person or by contaminated food. Consuming raw or undercooked shellfish, particularly raw oysters, also increases the chances of becoming ill with norovirus. Symptoms of norovirus include nausea, vomiting, watery diarrhea, stomach cramps, fever, chills, headache, and body aches. Norovirus illnesses typically last 12-60 hours.



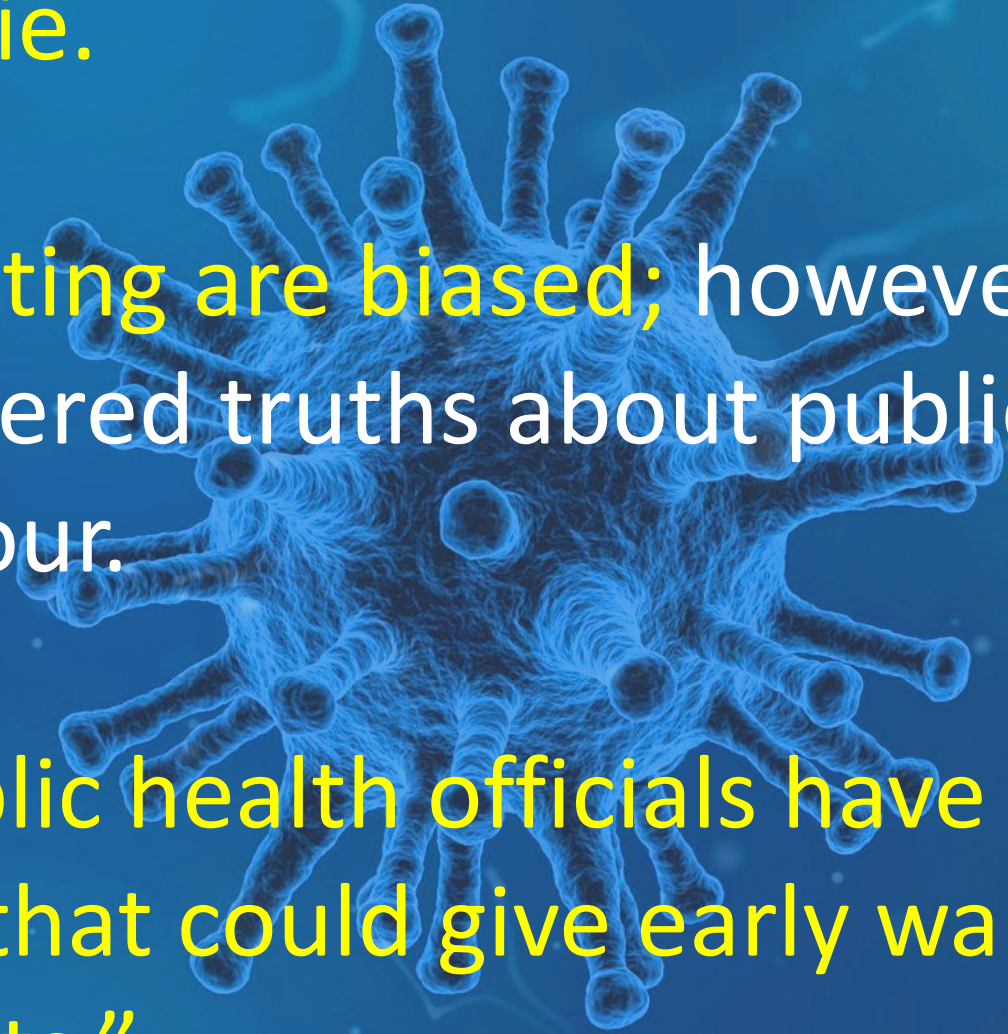
On 1/9/17, Public Health was notified of 4 cases of norovirus-like illness from the same meal party who had consumed raw oysters at Taylor Shellfish (located at 124 Republican St in Seattle) on 1/4/17. Two females and two males became ill 20-29 hours after consuming



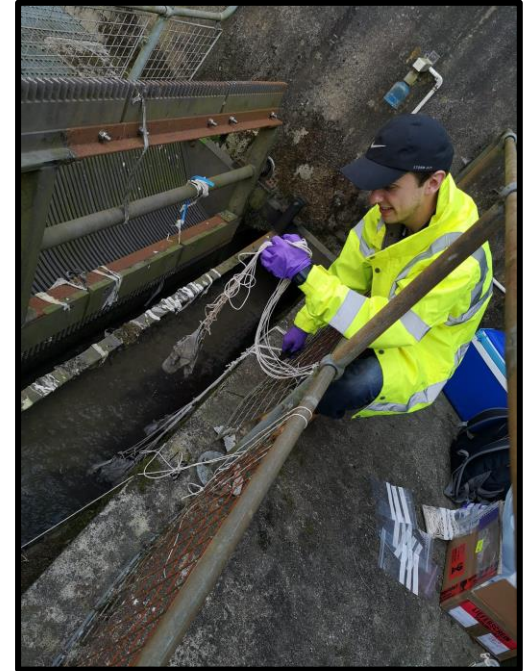
"Wastewater doesn't lie.

Surveys and self-reporting are biased; however, sewage contains unfiltered truths about public health, society and its behaviour.

It's the crystal ball public health officials have dreamed about - one that could give early warning of emerging health threats."

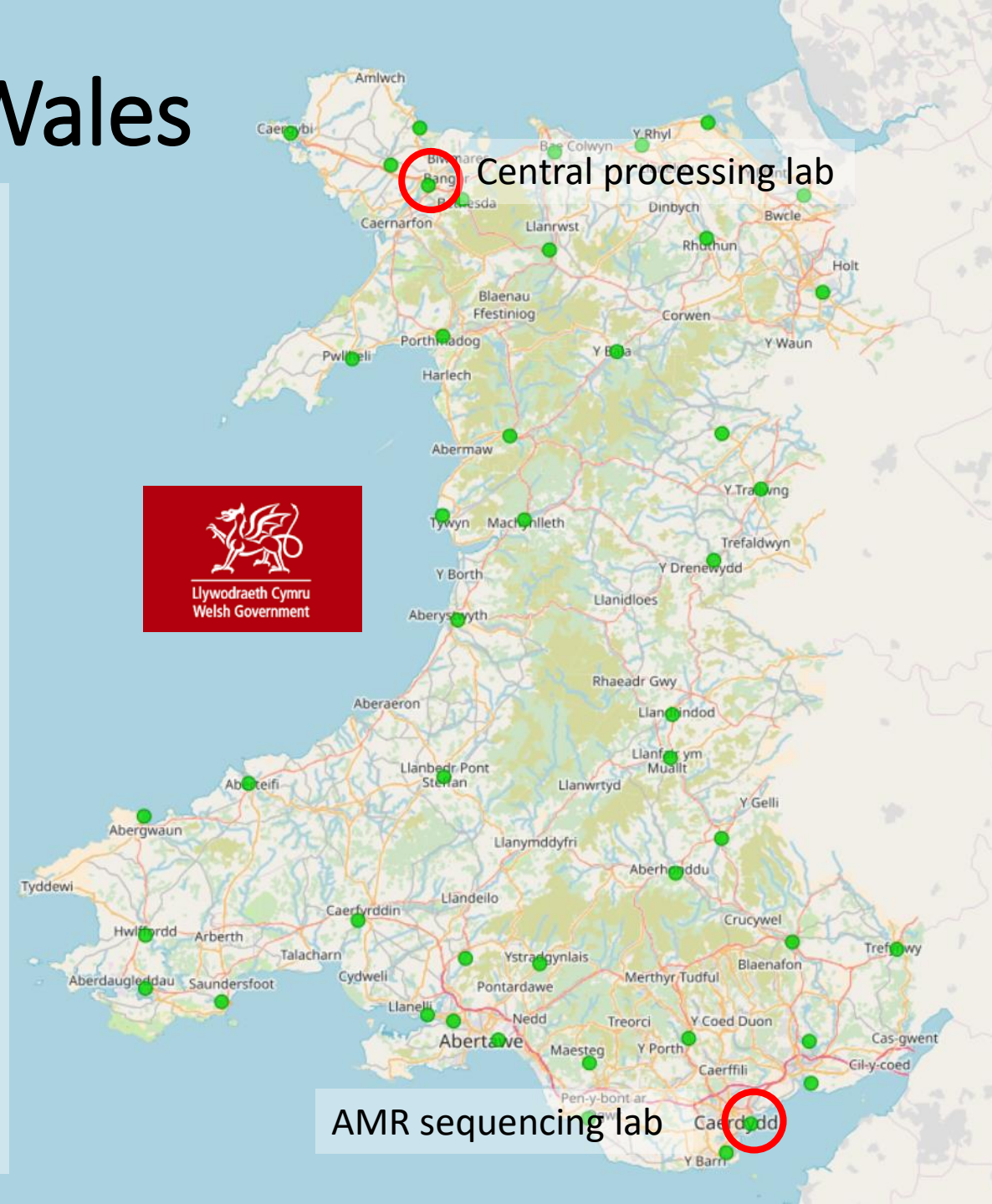


Different sampling approaches used in the UK

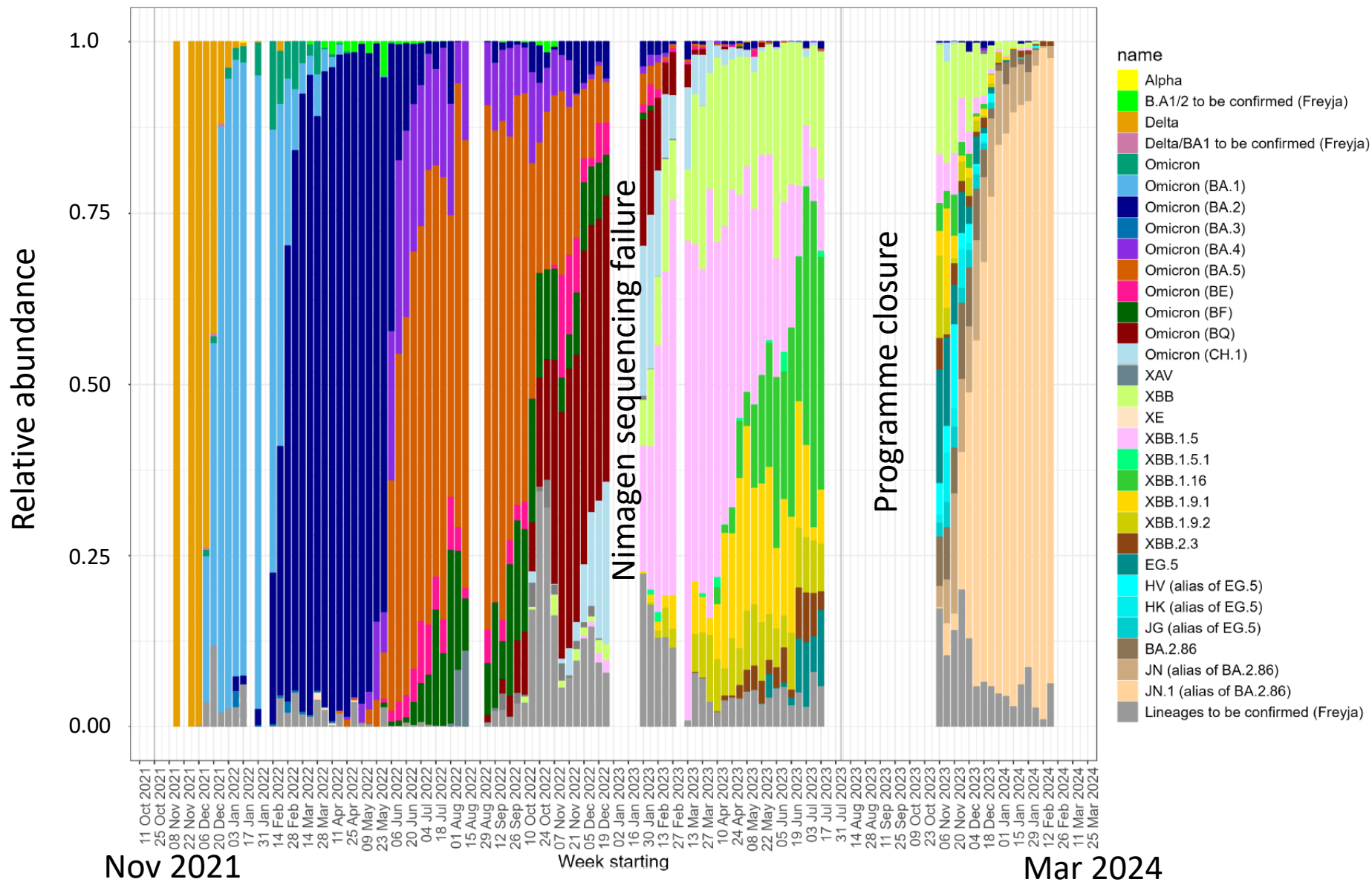


Wastewater monitoring in Wales

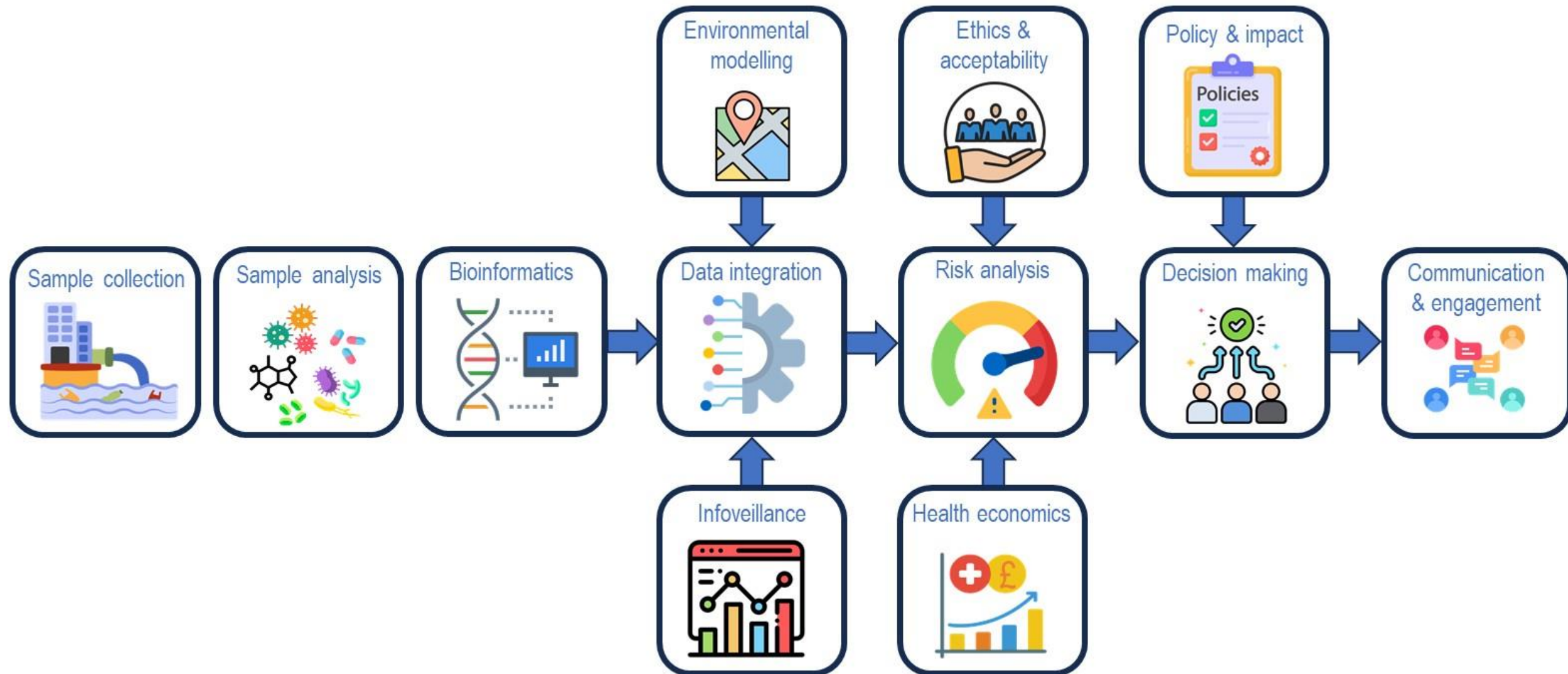
- Wales undertakes a comprehensive wastewater monitoring programme across **47 municipal WwTW**.
- 3 days-a-week, 24-hour composites of influent (and some effluents).
- ~75% of Welsh population covered (2.4m people covered).
- Monitoring SARS-CoV-2, Influenza, Norovirus, RSV, Enterovirus, Polio and antibiotic resistant genes (ARGs). Policy relevant questions where we can give answers.
- Pilot trials (illicits, pharmaceuticals, protozoal pathogens, culturable AMR).
- Running for > 2 years (some sites since March 2020).



Variants of SARS-CoV-2 mapped weekly



Interdisciplinary expertise needed to deliver a wastewater-based public health surveillance system



Wastewater lab and field team



Positives

- Empowered the team to optimise and make changes.
- Remit to innovate and develop new assays.
- Visits from programme leads from UKHSA and WGov.
- Inclusion on journal papers.
- Registering for MRes degrees.

Negatives

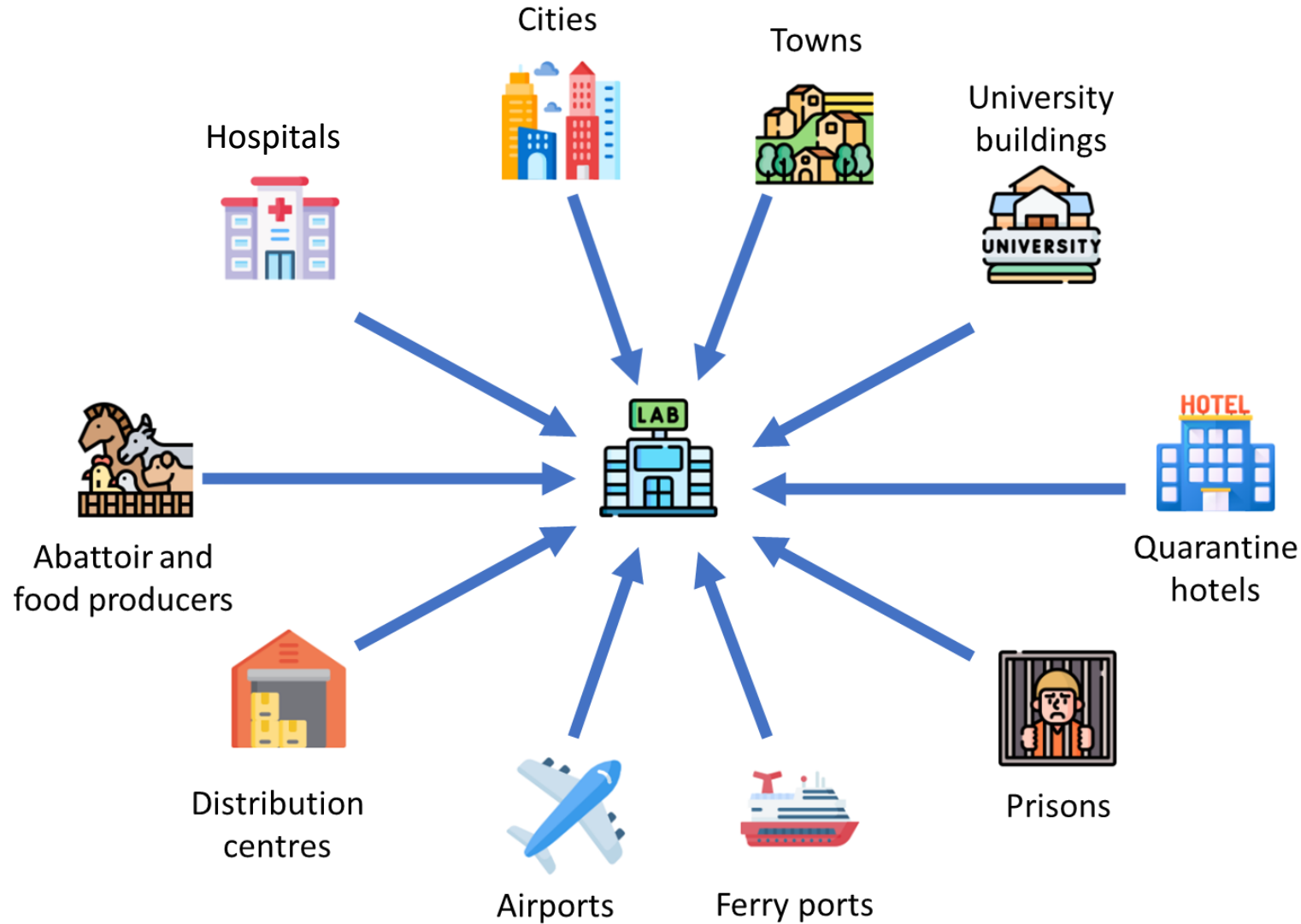
- Short-term contracts.
- Lab closure.

Wastewater monitoring in Wales is operated and funded by Welsh Government

We also acknowledge the support from all our collaborators



Wastewater-based testing for pathogens in the UK

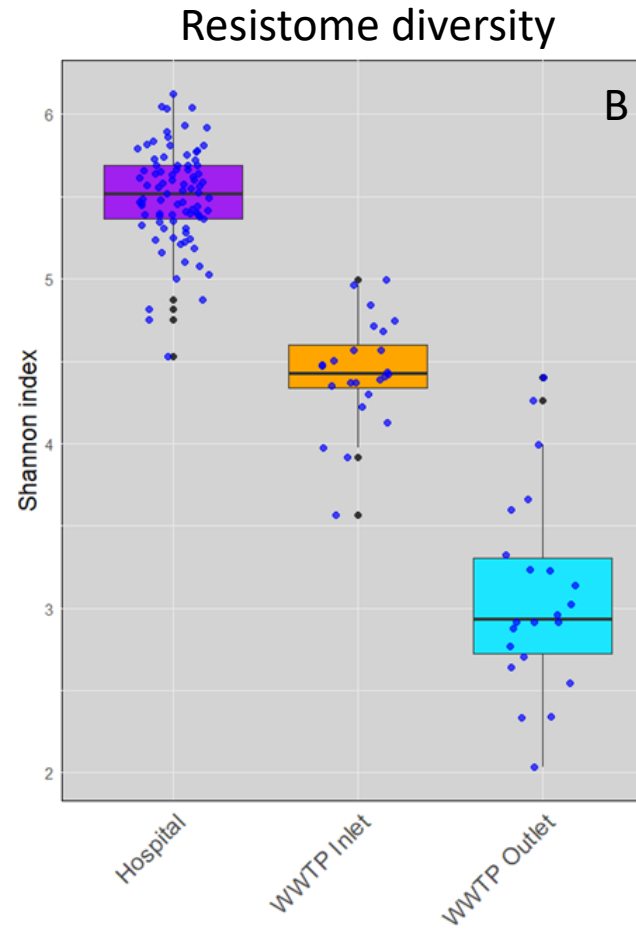
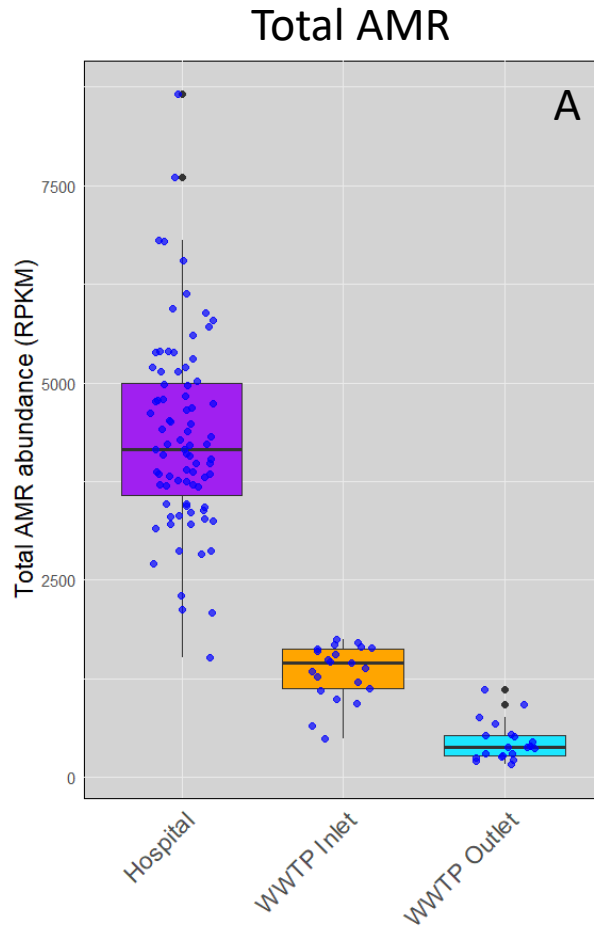


UK Health
Security
Agency



Llywodraeth Cymru
Welsh Government

Prevalence and diversity of antibiotic resistance genes (ARGs) in hospital and WWTP wastewater



- Higher abundance and diversity of antibiotic resistance genes (ARGs) detected in hospital wastewater compared to WWTPs
- Still a baseload of ARGs released through treated effluents into receiving waterbodies

Wastewater testing is cost effective, unbiased and publicly acceptable

- £18000 million spent on COVID-19 measures
- £12500 million COVID-19 lockdowns cost the Welsh economy
- £1850 million NHS Test and Trace cost in Wales
- £55 million ONS expenditure on the COVID Infection Survey
- £1 million/year for wastewater testing but provides multiple other benefits



HM Government

UK Biological
Security Strategy

Wastewater surveillance is
now embedded in the UK
Biological Security Strategy



CENTERS FOR DISEASE
CONTROL AND PREVENTION



World Health
Organization

Reflections on what went right and wrong



- Wastewater monitoring proved to be highly successful in multiple contexts
 - Cost-effective and unbiased
 - Low ethical burden, publicly acceptable
 - High throughput, rapid reporting with national capability
 - Supports clinical programmes
 - Working with different organisations
 - Interdisciplinary working to maximise speed of adoption
 - Embedded research (Wales was world leading)
- Funding insecurity and staff retention
 - Data integration/availability
 - Reagent failure
 - Resistance to change



Oysters behind norovirus outbreak in New Zealand



By Joe Whitworth+

07-Feb-2017

Last updated on 07-Feb-2017 at 08:08 GMT

No

Vancouver Services Contact

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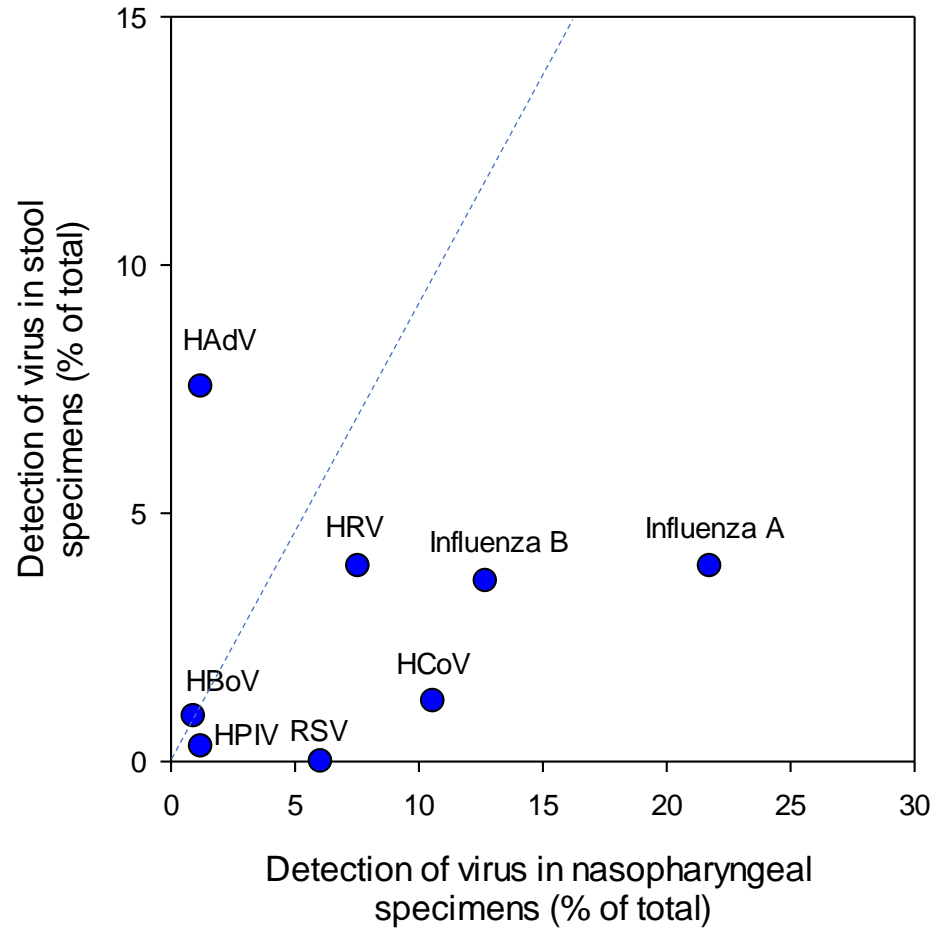
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Addressing a topic of local, national and international interest





Faecal and respiratory shedding of viruses

Timeline from conception to national implementation

