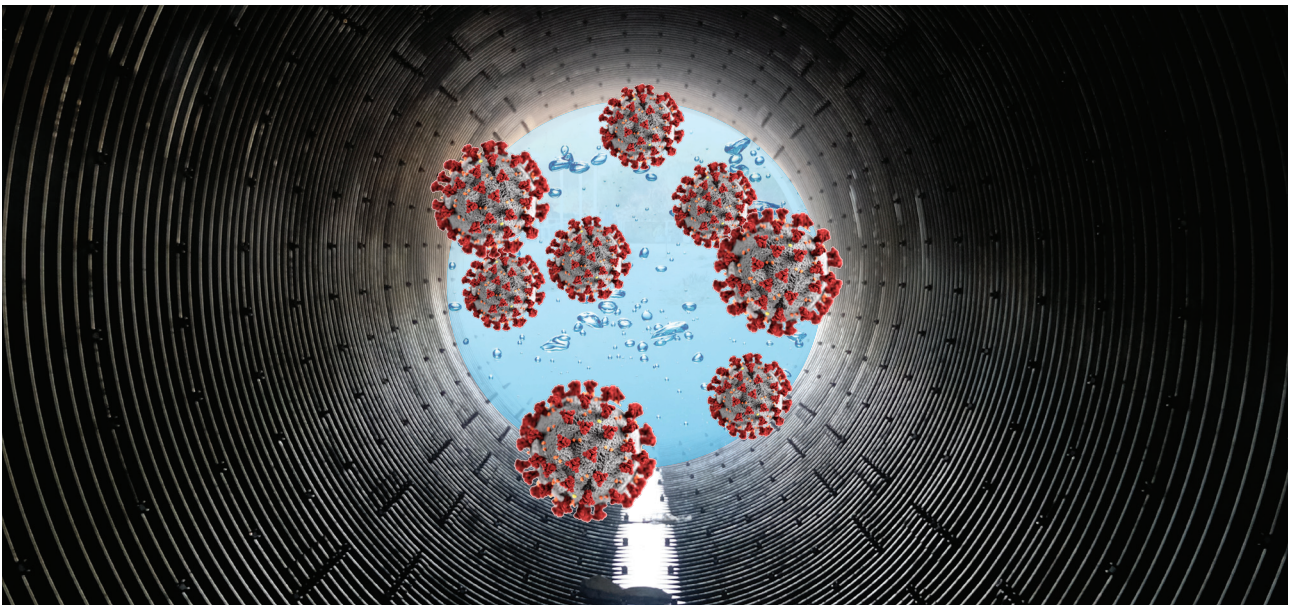


# COVID-19 Surveillance in Wastewater: Communications and equity



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**INNOVATION** is a key part of scientific discovery and technological development. Wastewater-based epidemiology (WBE) techniques, where wastewater samples from treatment plants are tested for various substances that give insights into population health, is one such innovation.

WBE has been applied to monitoring trends in illicit drug usage, and more recently it has been used to measure concentrations of the SARS-COV-2 virus to inform the COVID-19 pandemic response. Innovative technologies can challenge the accepted ethical frameworks and public acceptance, as by their very nature they move into new territory. Consideration also needs to be given as to what benefits and harms the new technologies could bring, and whether it might result in mitigating or strengthening existing social, cultural, health and economic inequities.

## DRUGS IN WASTEWATER STUDY

The Social Systems team at ESR started investigating issues of public acceptance, ethics and equity related to WBE technologies in 2020. The initial interview study used a Critical Systems Heuristic framework, to explore the motivation and purpose, power and control, expertise and knowledges, and legitimacy associated with use of WBE technologies from the perspectives of participants involved in governance of WBE, ethics, or data governance.

This study found that the participants were less concerned with the ethics of the technology itself than with the purpose of the WBE usage, and who was making the decision about WBE use. For example, there was less support for measuring illicit drug use through WBE for law enforcement purposes, compared to using the same data to support improved addiction and rehabilitation health services. The participants also strongly supported the idea that decisions around use of WBE should include the input of diverse voices, particularly Māori, so that the potential impact of the technology use on different demographic groups was well considered.



## COVID-19 IN WASTEWATER STUDY

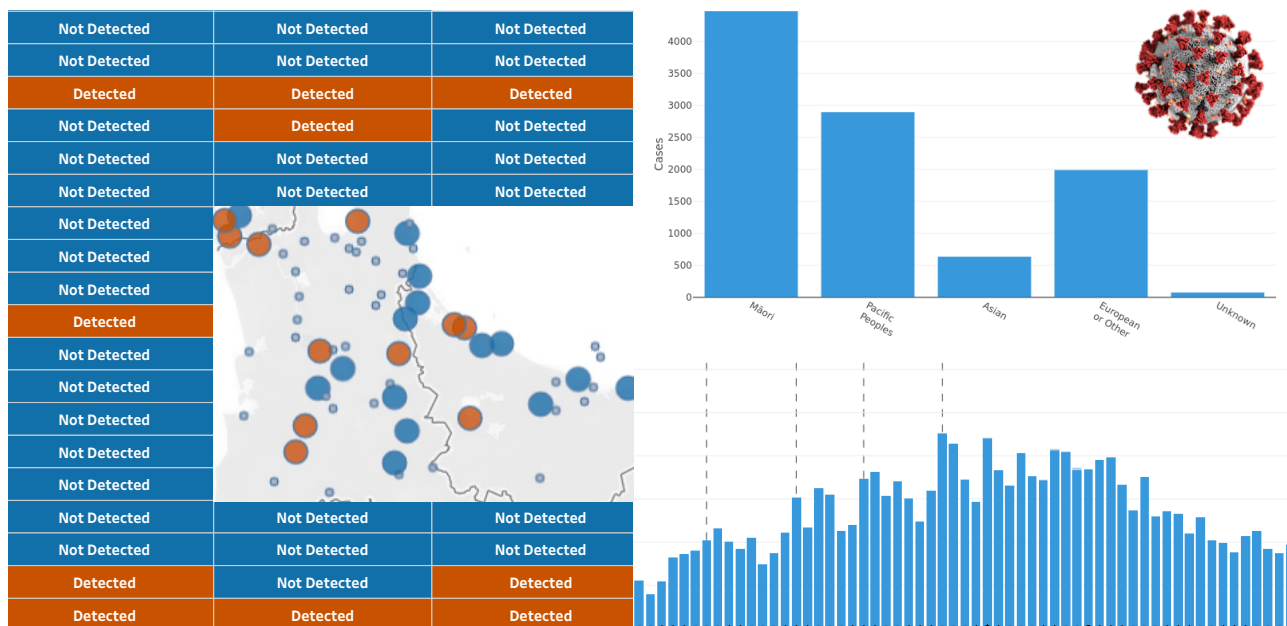
This research was extended when WBE technologies were used to monitor virus levels to help inform the public health response to the COVID-19 pandemic, and MBIE provided funds for further research in this area. During the pandemic, the public accepted many restrictions on their liberties that would not usually be accepted, such as restrictions on travel and business activity, and submitting to testing and quarantine. The widespread acceptance of WBE to support the COVID-19 health response should be seen in that light, and not taken for granted that this meant there were no ethical issues to be considered.

The need for ethics discussion was recognised by international collaborations dedicated to COVID-19 surveillance in wastewater [1-3]. The ESR Social Systems team also conducted a questionnaire with a group of WBE experts to gauge the emergent ethical and equity issues, particularly for the context of Aotearoa New Zealand and Australia.

COVID-19 surveillance in wastewater brings together different disciplines, and in some countries, bringing together people who do not always work closely. A major division between disciplines is environmental health/public health. 'Environmental scientists' in this context are those involved with wastewater such as environmental science researchers, water engineers and local authority infrastructure planners and operators, and 'public health authorities' are those involved in public health, such as epidemiologists, public health agencies, decision makers and front-line staff.

A lack of collaboration and communication between these disciplines is particularly a problem in countries where there are many institutions to coordinate, and environmental and public health expertise are siloed rather than integrated. ESR is in a unique position in that wastewater testing, viral genomic sequencing and public health epidemiology are all located within the one institution, and therefore communications between those groups and with the national health authority (the New Zealand Ministry of Health/Manatū Hauora) is comparatively straightforward and beneficial.

The ESR study, including literature review, highlighted that in terms of using wastewater testing for public health surveillance, both environmental scientists and public health authorities have ethical responsibilities. The public health authorities have primary responsibility for the pandemic health response, and for engagement with the communities to establish the needs and concerns. The environmental scientists have primary responsibility for the quality of the data, and for ensuring that the public health authorities understand the data and the limitations of the science. Both groups have responsibility for good communications and understanding the others' constraints and operating frameworks, as well as for the security of the data.



## PUBLIC HEALTH SURVEILLANCE USING WASTEWATER TESTING

Wastewater testing for COVID-19 is a public health surveillance tool, and therefore the ethical guidelines for public health surveillance are applicable [1, 2, 4, 5]. The guidance can be summarised under the four principles of Common good, Equity, Respect for persons, and Good governance.

### COMMON GOOD

- Any surveillance method must contribute to the common good in a significant way, in order to justify overriding individual rights such as informed consent.
- The science of wastewater testing should be developed so there is confidence in the quality, validity and reliability of the data, that it is an effective measure of the viral load in the wastewater and that this result reliably correlates to the presence of COVID-19 cases in the community.
- Where there is a choice of methods to provide similar data, the least invasive method should be preferred. Wastewater testing is certainly less invasive than other surveillance techniques, however at this stage it provides different information, that of population-wide levels of the virus and is therefore being used as a complementary method rather than a replacement for any other surveillance.
- The method should be effective in informing the public health response. If wastewater testing is not providing additional information to other surveillance methods, then justification for its use is limited.
- There is some common good value in not only providing the data from wastewater testing to the public health authorities, but also making it publicly available in some form.



## EQUITY

- Evaluation of wastewater testing, with a focus on the impact on existing health inequities, is necessary to ensure that health inequities are improved and not exacerbated. Community perspectives in this evaluation would be essential.
- Communities with existing poor health outcomes should be prioritised for receiving the benefits of wastewater testing, along with focused attention on avoiding stigmatisation of those communities.

## RESPECT FOR PERSONS

- The size of the catchment area that is tested and the extent of aggregation of the data that is publicly reported must be carefully considered, to meet the objectives both of informing the public health response and avoiding stigmatisation. This would probably involve reporting more detailed data to the public health authorities than to the public.
- Security of the data, particularly of the detailed data, should meet existing public health data security standards.
- The use of the data must be for the public health response. Any other use would need to be justified separately.

## GOOD GOVERNANCE

- Governance includes established processes for decision-making, transparency and accountability. This requires the deliberate involvement of diverse voices, to be able to anticipate a variety of problems and issues.
- The diverse voices should include Māori perspectives as required by Te Tiriti o Waitangi, as input to both the environmental science and the public health aspects of wastewater testing.
- Community engagement is important, and public health authorities should have established mechanisms for community consultation on a range of issues so that these mechanisms can be called on as situations arise such as extending wastewater testing to public health surveillance for the pandemic.
- Good governance includes close collaborations and good communications.

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