

# Aotearoa New Zealand's COVID-19 Surveillance Strategy

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## Executive summary

Aotearoa New Zealand is aiming to eliminate COVID-19 and is pursuing this through a range of control measures to stop the transmission in the community. The elimination strategy aims to:

- eliminate transmission in Aotearoa New Zealand
- prevent the emergence of new cases and ongoing transmission from new arrivals.

Achieving the goal of elimination requires comprehensive surveillance that collects, collates and analyses data on COVID-19, the effectiveness of the response, and on the wider impacts of the epidemic. Effective implementation of COVID-19 surveillance means that decision makers will have rapid access to information and evidence that is generated from a complex data environment. The creation and development of surveillance systems is a continual conversation with the sector and experts about what information we need to provide for decision making, what we should be measuring and how we can collect the data.

Indirect impacts of COVID-19 are important, but do not lie within the scope of this strategy.

The overall goal of COVID-19 surveillance is to monitor, evaluate and inform the equitable delivery of Aotearoa New Zealand's COVID-19 elimination strategy. Underneath this goal there are five objectives. Specific surveillance questions address each objective.

Objective	Questions
Objective One: Identify cases for public health management	How can we detect new cases early?
Objective Two: Evaluate the effectiveness of the public health response	Are we detecting new cases early enough to be effective? What is the degree of undetected infection? How effective are the public health measures at the border? How effective are case and contact management? What is the capacity of the health system to respond?
Objective Three: Generate knowledge about disease risks and patterns	How infection is spread and who is at risk? What is the impact on specific population groups? What do we understand about population immunity and serology to SARS-CoV-2?
Objective Four: Monitor to ensure equity	How equitable is testing? How equitable is case and contact management? How equitable are infection prevention and control measures? How equitable are the public health measures at the border?
Objective Five: Engender public and stakeholder confidence and participation in the response	What is the level of community acceptance and adherence to control measures?

The surveillance activities we will take to address these objectives and questions are:

Objective	Surveillance activities
Objective One: Identify cases for public health management	<ul style="list-style-type: none"> <li>• Collect, analyse and report on data from border testing, community testing, case investigation and management, contact tracing and management and background scanning for trends and emerging disease.</li> <li>• Implement a process for developing recommendations for action.</li> </ul>
Objective Two: Evaluate the effectiveness of the public health response	<ul style="list-style-type: none"> <li>• Develop a risk-based approach to identifying and managing cases.</li> <li>• Monitor and improve testing data and results (positive and negative).</li> <li>• Monitor syndromic and sentinel surveillance systems.</li> <li>• Maintain and improve collection of case data.</li> <li>• Model scenarios.</li> <li>• Monitor molecular epidemiology of all cases.</li> <li>• Monitor and review public health and infection control measures.</li> <li>• Monitor capacity of the health system to respond.</li> <li>• Measure timeliness of systems (eg, swabbing, contact tracing).</li> <li>• Undertake serological testing and serosurveillance.</li> <li>• Monitor border and incursion risk.</li> </ul>
Objective Three: Generate knowledge about disease risks and patterns	<ul style="list-style-type: none"> <li>• Descriptive epidemiology: analysis of data on cases, contact tracing, testing and demographics. Analysis of case characteristics and case outcomes. Analysis of risk factors, source and transmission dynamics, including by molecular epidemiology.</li> <li>• Modelling disease spread.</li> <li>• Develop a risk framework for assessing high risk locations and populations, and continuously review the testing plan to optimise testing approaches.</li> <li>• Review existing research and evidence, and commission new research.</li> </ul>
Objective Four: Monitor to ensure equity	<ul style="list-style-type: none"> <li>• Establish routine information sharing with Māori and Pacific and operational stakeholders to identify gaps and discuss options to address them.</li> <li>• Work with Māori and Pacific stakeholders to identify inequities and options to address them.</li> <li>• Routinely monitor data by ethnicity (prioritised or total response as appropriate).</li> <li>• Improve the accuracy of ethnicity data where possible.</li> <li>• Ensure effective communication with Māori and Pacific peoples and their whānau/families.</li> <li>• Ensure Māori and Pacific representation on expert advisory groups.</li> <li>• Take recommendations to change national guidance and policies where required.</li> </ul>
Objective Five: Engender public and stakeholder confidence and participation in the response	<ul style="list-style-type: none"> <li>• Collate, undertake or commission research to answer questions about the effectiveness of control measures, behavioural influences on adhering to control measures, barriers to accessing testing.</li> <li>• Collect stories of community driven initiatives that have had a positive impact on the community response and resilience to the pandemic.</li> <li>• Develop a surveillance communications strategy.</li> <li>• Measure the prevalence of behaviours using aggregated data on human movement.</li> <li>• Monitor changes in public knowledge, understanding and behaviour.</li> <li>• Implement long term participatory survey(s) to gather information on public adherence and acceptance of control measures.</li> <li>• Develop mechanisms to enable community groups to participate in surveillance activities.</li> </ul>

## Surveillance of COVID-19 to inform public health action

Aotearoa New Zealand is aiming to eliminate COVID-19 and is currently pursuing elimination through a range of control measures to stop the transmission in the community. The elimination strategy aims to:

- eliminate transmission chains in Aotearoa New Zealand
- prevent the emergence of new transmission chains originating from cases that arise from outside the country.

Elimination does not mean eradicating the virus from Aotearoa New Zealand; rather it is being confident we have eliminated chains of transmission in our community and can effectively contain any future imported cases from overseas until we have safe and effective treatments and/or vaccines.

The pillars of Aotearoa New Zealand's elimination strategy are:

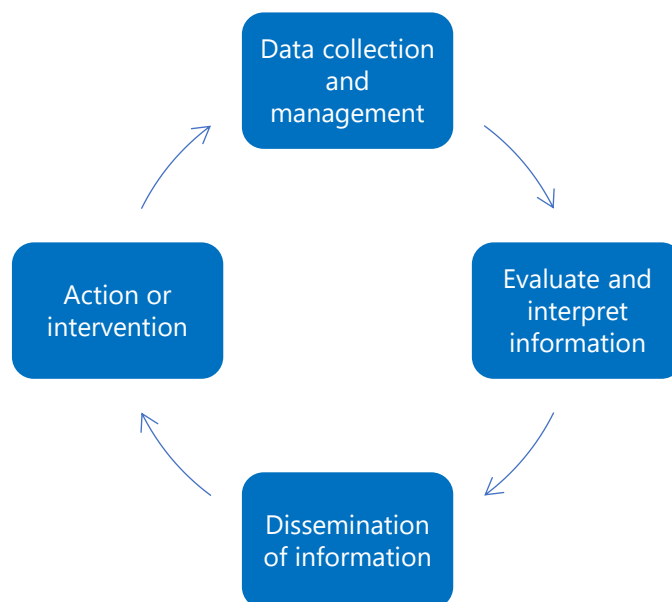
- **Keep it out** – Border settings, managed isolation and quarantine: *strong but proportionate border settings flex and adapt as health security settings shift*
- **Prepare for it** – Detection and Surveillance: *best-evidence protocols ensure cases are detected and transmission is controlled; Public Health Measures – base-level public health behaviours*
- **Stamp it out** – Contact Tracing & Case Management: *targeted and timely activities minimise impacts of new outbreaks across the community and health system; Stronger public health measures: public adherence to tailored health interventions is high due to trust and confidence in our health settings*
- **Manage the impact** – Health system preparedness: *proactive planning ensures a proportionate response to manage future impacts*

Achieving the goal of elimination requires comprehensive surveillance that collects, collates and analyses data on COVID-19, the effectiveness of the response, and on the wider impacts of the epidemic. The surveillance system monitors and informs all pillars of the elimination strategy.

Public health surveillance is a cornerstone of this elimination strategy. Comprehensive surveillance should ensure the systematic, ongoing, collection, management, analysis and interpretation of data followed by the timely dissemination of that data to inform public health action (planning, implementation and evaluation of public health practice). The overarching goal is to support public health surveillance activities to get the right information to the right people at the right time.

Surveillance can be represented by a cycle of continuous improvement of surveillance inputs and outputs that stimulate policy development and further research by identifying issues that require action or further information.

Figure 1: The cycle of public health surveillance



## Core surveillance activities

**Data collection, management, integration and analysis** – of quantitative and qualitative data on cases, testing, contact tracing, molecular epidemiology, border management and public adherence to public health advice.

**Evaluation and interpretation of information collected** – evaluation of data and modelling is aimed at answering specific surveillance questions and will be guided by experts in public health, communicable diseases, microbiology, epidemiology, statistics and Māori and Pacific health.

**Dissemination of information** – provide information to enable others to act on the data, recommendations and guidance developed through surveillance activities.

### Action or intervention

- Develop recommendations and advice for decision makers including Government, the Ministry of Health, other government agencies, district health boards, public health units, primary care, laboratories, Māori and Pacific health providers and others making operational decisions that support the COVID-19 response.
- To optimise the timely identification of cases and support case and contact management.
- Ensure the recommendations and guidance created through surveillance support decision making.

## Surveillance information, analysis and interpretation

Effective implementation of COVID-19 surveillance means that decision makers have rapid access to information and evidence that is generated from a complex and ever-changing data environment. The creation and development of surveillance systems is a continual conversation with the sector and experts about what information we need to provide for decision making, what we should be measuring and how we can collect the data.

Analysis and interpretation include:

- descriptive analyses, reporting numbers, proportions, and distributions by person, place and time
- quantitative epidemiology focused on gathering and analysing data to answer carefully formulated questions about the nature of the disease and its transmission

- mathematical modelling of pandemic and response scenarios to explore options for control
- other analysis such as surveys and research to answer specific questions, such as understanding societal behaviours in response to public health measures.

Many sources of data contribute to the multiple objectives within the surveillance framework. This includes the systematic collection of data from multiple transactional databases to qualitative research and intelligence from people working at the front line.

A description of the surveillance information currently being collected is provided in Appendix C.

## Expert advice and guidance

Expert advice is critical to developing surveillance systems and interpreting the data that is obtained from these systems. We will work with a core group of experts from public health, communicable diseases, epidemiology, statistics, science, Māori and Pacific health and those with specific process knowledge across different control areas (eg, border, contact tracing, case investigation, testing, public health units, district health boards, laboratories and primary care).

The purposes of this expert group are to:

- provide advice on the development of surveillance analyses and metrics
- support and provide advice on analytical methods and monitoring indicators
- engage with the data to develop recommendations.

Other expertise will be commissioned or utilised as required to help answer the surveillance questions.

## Review of this strategy

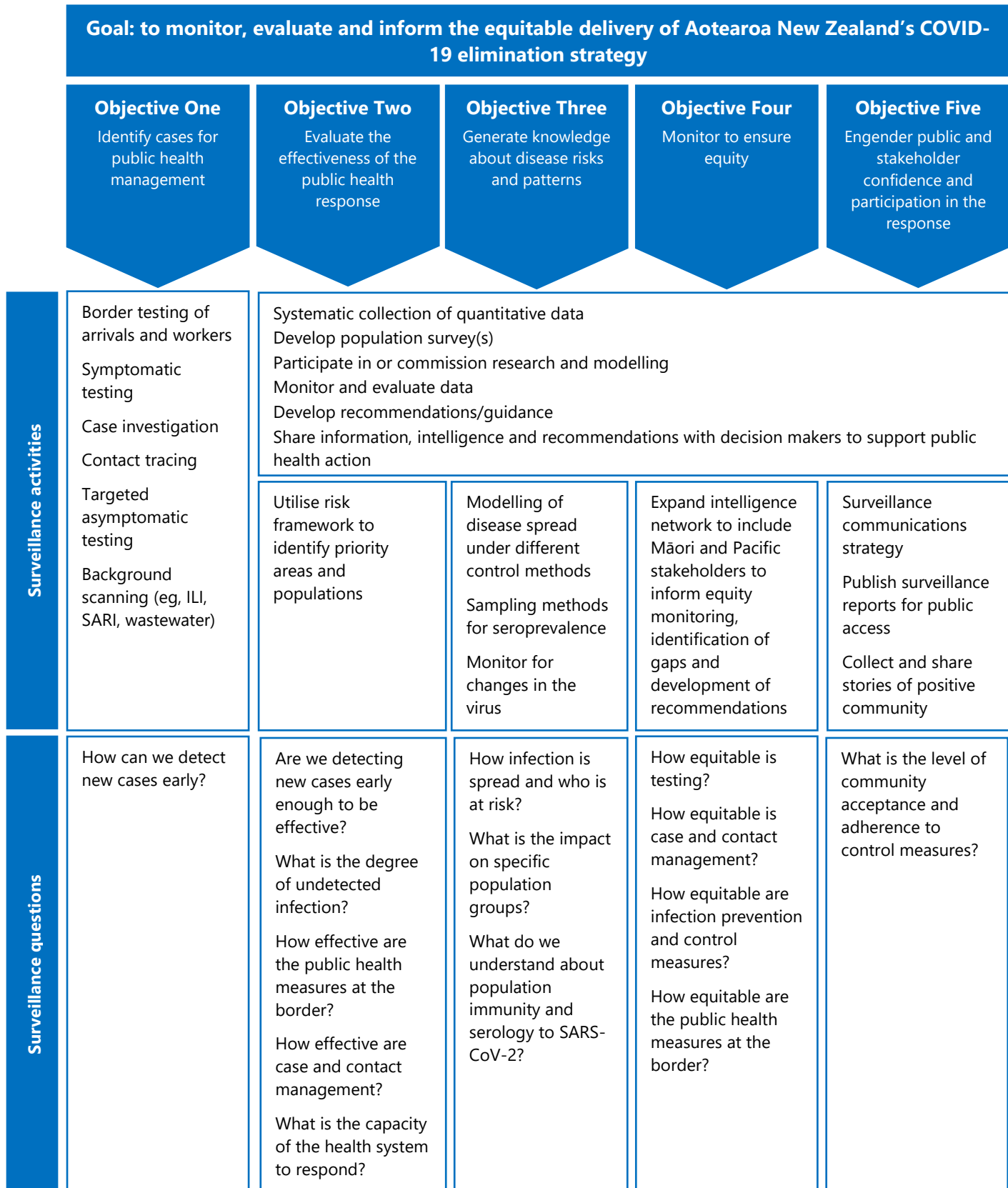
This strategy will be reviewed as required or at least within six months to ensure it remains fit for purpose. For example, this strategy will be reviewed with the introduction of a COVID-19 vaccine into the country.

## Five surveillance objectives support the elimination strategy

The Surveillance Strategy is a comprehensive framework that describes Aotearoa New Zealand's approach to surveillance for COVID-19 and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) the virus that causes COVID-19. It describes the key objectives, questions to answer and what surveillance activities are needed to provide the information and knowledge required to achieve the Aotearoa New Zealand's goal of elimination.

We have identified five surveillance objectives and associated activities that provide the current framework for surveillance planning to fulfil the national strategic goal of COVID-19 elimination. The five objectives described are core infectious disease surveillance functions, with primary responsibility lying with Public Health Intelligence within the Ministry of Health, working with and ESR and individual public health units as a key partner for infectious disease surveillance and control.

Figure 2: Surveillance objectives and activities for supporting Aotearoa New Zealand's elimination goal





To deliver on these objectives, surveillance needs to bring together data from a range of sources to address the specific questions which underpin well-informed actions at various stages of pandemic management. In the context of a continuously evolving understanding of SARS-CoV-2 and COVID-19, surveillance approaches should also continue to evolve to meet changing information needs, circumstances and priorities.

The understanding and mitigation of inequitable consequences of COVID-19 cuts across all surveillance aims.

## Indirect impacts of COVID-19 and non-COVID-19 health needs are not included in this surveillance strategy

The surveillance of any indirect impacts of COVID-19, including non-COVID-19 health needs, lies outside the core infectious disease surveillance described in this strategy. However, we recognise that the wider impact of the COVID-19 response presents a risk to equity of health outcomes, particularly for high risk populations including Māori and Pacific peoples. These impacts will be the focus of dedicated work to monitor and respond to wider inequity issues arising from COVID-19. This work will require health services analysis expertise from a range of perspectives, particularly including Māori, both within and beyond the Ministry of Health.

## Objective One – Identify cases for public health management

Identification of cases for public health management is the primary and fundamental objective of this surveillance strategy. Early detection of cases allows prompt public health action to prevent further transmission of COVID-19 in Aotearoa New Zealand.

Enhanced surveillance measures will vary over the course of the COVID-19 pandemic, as Aotearoa New Zealand moves between periods of active case finding to rule out significant undetected disease and periods of ongoing surveillance to ensure rapid detection of emerging disease transmission in the population.

The approaches for detecting cases early are outlined below.

**Routine testing of overseas arrivals at the border and routine testing of border workers** – the introduction of new cases through the border is the most likely reason for potential failure of Aotearoa New Zealand's elimination strategy. Quarantine and testing at the border should be proportionate to the risk. Detailed requirements are provided in border legislation and protocols, see Appendix A.

**Testing of symptomatic people in the community** – provide strategic and operational guidance for the risk-based prioritisation of COVID-19 molecular diagnostic testing of symptomatic people. The Testing Plan (*Aotearoa New Zealand's COVID-19 Testing Plan*) and Testing Guidance (*COVID-19 testing guidance to the health sector*) outline the approach to risk-based testing in the community.

**Targeted testing of asymptomatic people in the community** – identification and testing of people considered to be at high risk from COVID-19. This includes border workers and others who are assessed to be at high risk of exposure, and through population sampling.

**Case investigation** – involves identifying the source of a case's infection in order to determine and ring-fence clusters to prevent further disease transmission. Case investigation also informs our understanding of transmission risks in Aotearoa New Zealand, including those at the border, and at managed isolation and quarantine facilities. Case investigation may include epidemiological linking, whole genome sequencing and environmental testing and assessment.

**Contact tracing** – involves identifying, testing and quarantining close contacts of a case. This is integral to ensuring that any disease transmission in the community is quickly contained, and also provides information on the transmission characteristics of clusters.

**Background scanning** – surveillance of other sources of information to signal trends and identify areas where COVID-19 is more likely to emerge or be present will support the early detection of COVID-19 cases. Background scanning may include:

- syndromic and sentinel surveillance such as people presenting with acute respiratory infections (ARI) and influenza-like illness (ILI) syndromes in the community, and with severe acute respiratory infection (SARI) in hospitals.
- Healthline ILI related calls and FluTracker ILI/ARI surveillance provide other methods to monitor community trends.
- wastewater and/or environmental testing to potentially identify places where the virus may be present.

### What we will do

Border testing, community testing, case investigation and management, and contact tracing and management are mandated by and guided by specific orders, protocols, strategies and guidance as listed

in Appendix A List of guidance documents. These key documents guide the activities of those implementing the response at an operational level.

To ensure our response is guided by the best evidence and science, we will collect, analyse and report on data from these activities. This information will be used to evaluate whether changes or improvement are required within these strategies and activities.

Mechanisms by which decision makers can consider recommendations have been implemented and will continue to be strengthened. For example, if analysis of testing data identifies gaps in testing, this analysis along with recommendations will be highlighted in the *COVID-19 testing guidance to the health sector*. In addition to the baseline testing plan, recommendations may advise on testing in areas where there have been recent cases, after large events or in higher risk groups not covered by the mandatory testing regimes (eg, tourism and service workers).

This information, alongside district health board's local knowledge, will support their operational decisions on where and who to test. This closure of the cycle from analysis to action is the ultimate goal of COVID-19 surveillance.

## Objective Two – Evaluate the effectiveness of the public health response

Rapid identification of cases of COVID-19, and effective public health management and responses to them, underpin our ability to achieve and maintain Aotearoa New Zealand's COVID-19 management goals. The process of evaluating the effectiveness of the public health response to optimise the identification of cases is therefore the second objective of the Surveillance Strategy. This objective is effectively an improvement process based on the best information available to us.

The COVID-19 Testing Plan is a key pillar underpinning surveillance and will leverage off sentinel and syndromic surveillance, including influenza-like illness surveillance, which will also contribute to flags for increased risk-based testing.

### Surveillance questions

Evaluation of surveillance data will be guided by the following surveillance questions.

- Are we detecting new cases early enough to be effective?
- What is the degree of undetected infection?
- How effective are the public health measures at the border?
- How effective is case and contact management?
- What is the capacity of the health system to respond?

The central function of case and contact management is to detect and interrupt transmission chains. Monitoring and reporting need to be optimal to ensure that weak points in the control system are swiftly identified and remediated and to ensure that equity is central to control.

All arrivals into Aotearoa New Zealand by commercial air flight are now required to be isolated or quarantined for 14 days at a designated facility. There are however exceptions, such as arrivals by air crew, and arrivals by other means such as private vessels.

Indicators of failure of the public health measures at the border will include any onward transmission from an imported case, any cases (and onward transmission) in those exempt from quarantine, and any cases, imported or linked to importations which are diagnosed after the quarantine period. Any cases in those at high risk of border exposure because of their employment will also represent a failure to protect these groups.

### What we will do

- Develop a risk-based approach to identifying and managing cases.
- Monitor testing data and results (positive and negative).
- Monitor syndromic and sentinel systems.
- Monitor the quality and timeliness of collection of case data.
- Monitor the effectiveness of contact tracing process and data collection.
- Undertake modelling of different response scenarios using agreed statistical protocols (eg, for the number of tests required to provide a level of assurance cases will be detected early enough to avoid a significant outbreak; capacity to respond under different scenarios and requirements).
- Monitor molecular epidemiology of all cases by performing whole genome sequencing to support case investigation, source attribution and understanding of changes in the virus (as described in the Testing Plan).
- Monitor and review public health and infection control measures (community, border, health care and other high-risk settings) to ensure they effectively minimise the risk of transmission.

- Monitor capacity of the health system to respond equitably to:
  - testing: If testing capacity is insufficient, develop methods and processes to sample testing high risk populations to prioritise high risk populations and improve likelihood of identifying cases
  - case management
  - contact tracing
  - secondary and tertiary care (eg, ICU beds and ventilators, workforce)
- Measure timeliness of systems (eg, swabbing, laboratories to test, case identification, contact tracing):
  - monitor and report on the timeliness of case and contact identification and quarantine or isolation, numbers of contacts per case, number of secondary cases, number of casual contacts, number of contacts that become cases (broken down by close and casual).
- Undertake serological testing to differentiate current and historical infections and whether management is required and serosurveillance to monitor transmission amongst the wider population and immunity.
- Monitor border and incursion risk (eg, number and origin of border arrivals, establish genomic library).

## Objective Three – Generate knowledge about COVID-19 disease risks and patterns

Understanding SARS-CoV-2, the virus that causes COVID-19, and its burden in order to inform the public health response is a core infectious disease surveillance function. Throughout the response, generating knowledge about the burden of COVID-19 and its risks and patterns will continue to be a fundamental part of COVID-19 surveillance.

Reporting of the characteristics of COVID-19 in Aotearoa New Zealand will continue to be a fundamental part of surveillance. This will include reporting of case notification data, including demographics (age, sex, ethnicity, and area level deprivation), geographic location and source of disease. Source of disease will be reported not only in terms of epidemiological linkage but also in terms of reason for testing, in order to evaluate the effectiveness of surveillance methods.

Improvements to the quality of the data will be ongoing and will include linkage to NHI records to ensure that the quality of ethnicity data is consistent and understood. Using this case information and linked contact information it will be possible to better understand the transmission dynamics, including the incubation period and the serial interval, as well as the severity and equitable impact of disease in the Aotearoa New Zealand context. This information can be examined over time and compared to international experiences and will be used to refine Aotearoa New Zealand's case definition, testing and case management criteria.

### Surveillance questions

Evaluation of surveillance data will be guided by the following surveillance questions.

- How infection is spread and who is at risk?
- What is the impact on specific population groups?
- What do we understand about population immunity and serology to SARS-CoV-2? (including vaccination status once deployed)

### What we will do

- **Descriptive epidemiology** – integrated data on cases, contact tracing, testing (including negative tests), demographics. Analysis of case characteristics in person, place and time, inequities, disease severity and case outcomes in primary and secondary care (hospitalisations, deaths, post-discharge morbidity and sequelae). Analysis of risk factors, source (epidemiological linkages, reason and setting for testing) and transmission dynamics, including by molecular epidemiology WGS.
- **Modelling disease spread** – evaluation of data and modelling to compare expected levels (case numbers, hospitalisations and deaths). This modelling will be guided by experts in public health, communicable diseases, epidemiology, statistics and Māori and Pacific health. The principal quantitative modelling is being conducted by Te Pūnaha Matatini (TPM), with data provided from a range of government agencies to allow modelling of networks, and the analysis of scenarios for the effectiveness of Alert Levels as well as different characteristics of the underlying disease. Case information is provided to TPM researchers to support this work.
- **Review methods for systematic sampling of high-risk populations** – Develop a risk framework for assessing high risk locations and population, and continuously review the testing plan to optimise testing approaches.
- **Review existing research and commission new research** – review international evidence on coronavirus characteristics, on COVID-19 disease risks and patterns changes in the virus. Where

# COVID-19

there are obvious knowledge gaps the Ministry of Health will commission research via a competitive process.

## Objective Four – Monitor to ensure equity

Surveillance can provide insights about the experience and health outcomes of particular populations or priority groups at higher risk during the COVID-19 epidemic and can inform effective responses that will support equitable outcomes.

Historically pandemic responses have preferentially benefited non-Māori, and failed to protect whānau, hapū, iwi and Māori communities from the worst outcomes. The Crown's commitment to Te Tiriti o Waitangi requires applying the principles of tino rangatiratanga, equity, active protection, options and partnership. Surveillance is both a key tool for effecting aspects of these principles, and a check on how effectively they are applied.

This Surveillance Strategy specifically aims to focus on equity for Māori, Pacific peoples and other priority groups at higher risk of poorer health outcomes if disease is contracted.

### Surveillance questions

Surveillance information should enable us to assess how equitable our public health measures are and inform priority areas for action. The overarching question we want to answer is how equitable is our elimination strategy?

The specific questions are:

- How equitable is testing?
- How equitable are case and contact management?
- How equitable are infection prevention and control measures?
- How equitable are the public health measures at the border?

### What we will do

In order to improve equity within the surveillance approach and response measures we will:

- establish routine information sharing with Māori and Pacific and operational stakeholders to identify gaps and discuss options to address them
- work with Māori and Pacific stakeholders to identify inequities and options to address them.
- routinely monitor data by ethnicity (prioritised or total response as appropriate)
- provide advice to district health boards to target specific groups
- improve the accuracy of ethnicity data where possible
- ensure effective communication with Māori and Pacific peoples and their whānau/families.
- ensure Māori and Pacific representation on expert advisory groups
- take recommendations to change national guidance and policies where required.

Relationships with key providers and community representatives provide important intelligence and advice that inform the Māori and Pacific COVID-19 response plans. We would utilise these existing networks to establish routine information sharing, effective communication and collaboration to improve the intelligence we draw on to inform the response a national level.

In order to meet the surveillance objectives, the surveillance questions need to be analysed by ethnicity and/or priority group except where fundamental data limitations do not allow this.

We need to ensure that the surveillance information systems collect and record or link to accurate ethnicity (or other priority groups) data. Linking to ethnicity information derived from the National Health Index allows analysis by prioritised ethnicity, in accordance with best practice in presenting ethnicity information in Aotearoa New Zealand. Prioritised ethnicity data can create an undercount for Pacific



peoples if they also identify as Māori therefore where appropriate analyses by total response ethnicity will be undertaken.

Principles of equitable use of data and information including data sovereignty and equal explanatory power will be built into COVID-19 surveillance collection, analysis and reporting, with transparency and timeliness. The balance between privacy rights and public health also will be explicitly considered.

Surveillance to monitor equity will cover:

- **Testing** – Comprehensive testing and equity of access to testing services when needed, is core to ensuring that our public health response is effective for all populations. The Ministry of Health provides guidance to district health boards on testing for priority populations. Surveillance includes collection, analysis and reporting of the testing data by ethnicity and age group to ensure adequate coverage is maintained and that testing is reaching priority groups. To understand whether access to testing is equitable ethnic-specific and age-specific testing rates must take into account infectious disease risks for the specific group. For example, we may want to reach higher testing rates for Māori and Pacific peoples. Feedback of information on gaps identified by these analyses will be provided to front line services.
- **Case and contact management** – To ensure case and contact management are both effective and equitable for different ethnic groups we will collect and review surveillance information to continuously improve management. This will include systematic and clear documentation and information about cases, contacts and households, and the capacity and capability to identify and effectively manage cases and their contacts.
- **Infection prevention and control** – Providing the wrap-around and household support required to enable adherence to prevention and control measures, including safe and effective isolation and quarantine options.
- **Public health messages** – Work with stakeholders to assess whether public health messages are culturally appropriate and accessible to priority communities.

## Objective Five – Engender public and stakeholder confidence and participation in the pandemic response

The 'team of five million' is an important concept that should be nurtured. Public confidence and participation in the pandemic response is critical to the success of behavioural control measures.

Throughout the pandemic to date, stories have emerged about community groups taking action to prevent the spread of the disease, communicate key messages and support others with practical matters such as shopping for essential items. The value of this community participation to the response can be immeasurable and often goes unnoticed or undocumented.

Surveillance information systems, and the intelligence we glean from these, have limitations; not everything measured is important and not everything important is measured. This objective recognises the value in public participation in the response. The aim is to support this where we can by engendering public confidence in our activities and providing the right surveillance information to the right people who can act on it at a local level.

### Surveillance question

- What is the level of community acceptance of and adherence to control measures?

An understanding of adherence to individual and community-based behavioural recommendations (eg, social distancing) and variation by age, ethnicity and region is essential to optimise the response. The inclination as well as the ability to adhere to recommendations over time may change in different subsets of the population. These variations and how they change over time must be tracked and analysed so that corrective interventions can be targeted and made most useful.

### What we will do

- Collate, undertake or commission research to:
  - answer questions about the effectiveness of control measures under the different alert levels
  - understand the barriers and behavioural reasons why people do not adhere to control measures
  - understand barriers to accessing testing
  - collect stories of community driven initiatives that have had a positive impact on the community response and resilience to the pandemic.
- Develop a communications strategy to ensure the right information reaches the right people when they need it, this would include:
  - publishing surveillance information so it is accessible to the public
  - sharing findings of research that contribute to the positive narrative in the public domain about community initiatives.
- Measure the prevalence of behaviours using aggregated data on human movement (eg, traffic patterns, anonymised aggregated mobile phone data). Aggregated mobile phone data may provide ancillary information about adherence to control measures.
- Monitor changes in public knowledge, understanding and behaviour (eg, through a medium to long term structured survey or qualitative research).
- Implement surveys – long term participatory survey to gather information on public adherence and acceptance of control measures.

- Develop a mechanism to enable community groups to participate in surveillance activities, be it through the sharing of information and intelligence to co-designing communications and initiatives as the need arises.

## Dissemination of information to enable continuous improvement of our response

Dissemination of information, evidence and insights to inform action is a key function within the surveillance cycle.

A number of existing products have been generated during the initial phase of the pandemic and are now evolving into outputs more suitable for the longer term COVID-19 response. Below we provide the specific surveillance products that can be packaged for different audiences.

A more detailed public dissemination plan will be developed to complement this work, with input from key stakeholders on the information they seek for a variety of purposes.

Output	Description	Audience
Routine testing guidance (restricted distribution)	Guidance to DHBs that brings together the latest public health advice and surveillance data to support DHB decision making on where and who to test.	DHBs, primary care
Routine surveillance and monitoring report	Collation of weekly surveillance data and intelligence. The report will be developed with input from technical and clinical experts and will include: <ul style="list-style-type: none"> <li>• A summary of what the surveillance information is telling us</li> <li>• Identification of areas present risks to our response</li> <li>• Recommendations for decision makers</li> </ul>	Internal (MoH, ESR, PHUs, DHBs)
Interactive surveillance dashboards (restricted distribution)	Secure access to interactive dashboards for reporting, monitoring and operational decision making. Information will include: <ul style="list-style-type: none"> <li>• descriptive case epidemiology</li> <li>• outbreaks</li> <li>• international epidemiology</li> <li>• national syndromic surveillance trends</li> <li>• testing surveillance</li> <li>• risk maps</li> </ul>	MoH, ESR, DHBs, PHUs, primary care
Routine surveillance report (publicly available)	A report summarising key descriptive epidemiological information on the pandemic and response, for example the analysis of clusters and lessons that can be learned from their management. This report will incorporate expert advice and highlight any areas that need to be strengthened as part of our response.	People involved in strategy and operational roles including MoH, ESR, DHBs, PHUs, primary care  This document would be published on the Ministry of Health website and be accessible to the general public.
Stand-alone research and analysis on specific topics (distribution determined based on the nature of the information and audience)	Research and analysis created as part of the work to answer the surveillance questions	Determined based on the nature of the information

## Roles

### The Ministry of Health

The ownership of this Surveillance Plan sits with the expanded Ministry of Health Executive Leadership Team for COVID-19. The expanded Ministry of Health Executive Leadership Team is responsible for the Tiriti partnership in governance over the surveillance plan, as it is with other aspects of the COVID-19 response.

The management of the plan sits with the Health Intelligence Team in the Ministry of Health COVID-19 Response Hub, in consultation with the Office of the Director of Public Health, the Communicable Disease Team, the Population Health and Prevention Directorate, the Māori Insights Team, the Pacific Insights Team, and ESR as a lead provider of surveillance to the Ministry. The Chief Science Advisor, and the management of the Technical Advisory Group and subgroups both sit within the Ministry of Health COVID-19 Response Hub.

The Ministry of Health's COVID-19 Information Governance Group has overall responsibility for the governance of information specifically collected or used as part of the COVID-19 response over and above the routine collection and use of information in the Ministry of Health. This information governance group will have responsibility for considering issues of governance and data sovereignty over surveillance information, while respecting the principle of being as transparent with information as possible.

### Institute of Environmental Science and Research

ESR is responsible for coordinating national, real-time notifiable disease surveillance and data analysis, so case and transmission patterns throughout Aotearoa New Zealand can be monitored. ESR also develops and operates non-notifiable disease surveillance systems including syndromic surveillance of acute respiratory illnesses. ESR plays a central role as the national public health reference laboratory, undertaking diagnostic and reference testing including genetic analysis of COVID-19 strains. The surveillance teams operate EpiSurv, the national disease database, and other national information systems. ESR liaises with public health units on behalf of the Ministry of Health to support national surveillance and applied epidemiological investigations. ESR provides data to the Ministry of Health including case and testing data, analysis of transmission patterns, contact tracing information and phylogenomics. ESR provides intelligence reports to the Ministry of Health and public health units on key features of COVID-19 epidemiology. ESR also disseminates surveillance information into its dashboard, which has public and public health sector facing elements, and will continue to be developed further.

### District Health Boards and Public Health Units

District health boards both provide key elements of surveillance information to aggregate to a national picture and are consumers of surveillance information to support their response. Much of their key information is available from local sources, although guidance on surveillance testing is being provided nationally. District health board roles include:

- operating public health units and responsible for key elements of the front-line public health response, including notification, contact tracing and investigation of outbreaks
- responsibility for operationalising COVID-19 assessment and testing (both diagnostic and surveillance testing) in partnership with primary health organisations
- responsibility for commissioning or providing clinical treatment of COVID-19 cases in primary care and hospital settings

- the bodies with overall responsibility for the health of their district populations, and therefore tasked with addressing the indirect health consequences of the COVID-19 response.

## Primary Health Organisations

Primary health organisations are a source of valuable surveillance information, particularly on the population being assessed for COVID-19. Some primary health organisations have developed their own COVID-19 intelligence functions to allow them to allocate resources effectively at a very localised level.

Primary health organisation roles include:

- delivering the clinical care for the majority of COVID-19 cases
- much of the COVID-19 testing, both diagnostic and surveillance testing, whether conducted in general practice, CBAC or other community settings
- responding to demands for urgent care if deferred care increases health need, and
- maintaining the continuity and capability of primary care services under circumstances of fluctuating demand.

## Appendix A List of guidance documents

Document	Description
COVID-19 legislation	<a href="http://www.pco.govt.nz/covid-19-legislation/">http://www.pco.govt.nz/covid-19-legislation/</a>
Elimination Strategy for Aotearoa New Zealand	<a href="https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-elimination-strategy-aotearoa-new-zealand">https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-elimination-strategy-aotearoa-new-zealand</a>
Case definitions	<a href="https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-information-health-professionals/case-definition-and-testing-guidance-covid-19">https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-information-health-professionals/case-definition-and-testing-guidance-covid-19</a>
Testing Plan and Testing Guidance to the health sector	<a href="https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-testing-plan-and-testing-guidance">https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-testing-plan-and-testing-guidance</a>
Vaccine planning	<a href="https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-vaccine-planning">https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-vaccine-planning</a>
Contact tracing protocols	<a href="https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-health-advice-public/contact-tracing-covid-19">https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-health-advice-public/contact-tracing-covid-19</a>
Border protocols and exemptions	<a href="https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-border-controls">https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-border-controls</a>  Maritime: <a href="http://www.legislation.govt.nz/regulation/public/2020/0134/latest/LMS363151.html">http://www.legislation.govt.nz/regulation/public/2020/0134/latest/LMS363151.html</a>  Air: <a href="http://www.legislation.govt.nz/regulation/public/2020/0120/latest/LMS360123.html">http://www.legislation.govt.nz/regulation/public/2020/0120/latest/LMS360123.html</a>  COVID-19 Testing: <a href="http://www.legislation.govt.nz/regulation/public/2020/0208/latest/LMS391269.html">http://www.legislation.govt.nz/regulation/public/2020/0208/latest/LMS391269.html</a>  Isolation and Quarantine: <a href="http://www.legislation.govt.nz/regulation/public/2020/0241/latest/LMS401667.html">http://www.legislation.govt.nz/regulation/public/2020/0241/latest/LMS401667.html</a>
Alert level restrictions	<a href="https://covid19.govt.nz/alert-system/about-the-alert-system/">https://covid19.govt.nz/alert-system/about-the-alert-system/</a>

## Appendix B Surveillance questions

The following is an expanded list of questions that the surveillance strategy seeks to answer:

1. How can we detect new cases early?
  - 1.1. Are we testing enough symptomatic people distributed by ethnicity, age, geographic region to detect SARS-CoV-2 to detect if it is present in the population?
2. Are we detecting new cases early enough to be effective?
3. What is the degree of undetected infection?
  - 3.1. How much testing is enough to be sure that SARS-CoV-2 is absent from Aotearoa New Zealand using multiple streams of surveillance?
  - 3.2. Given all our sources of information, how can we be sure that SARS-CoV-2 is absent from Aotearoa New Zealand?
4. How effective are the public health measures at the border?
  - 4.1. What is the risk to Aotearoa New Zealand from travellers arriving from overseas?
  - 4.2. Where are overseas acquired infections detected?
  - 4.3. Which countries are the imported cases arriving from?
  - 4.4. Which countries have highest risk of importing a case?
  - 4.5. Are travellers acquiring infection while in the managed facility?
  - 4.6. What is the rate of infection in incoming travellers who are exempt from managed facilities? (aircrew, maritime, grooms for horses, diplomats, other exemptions eg, MBIE)
  - 4.7. Are staff at managed facilities catching COVID-19 from those arriving?
  - 4.8. What is the risk to the community from those exempt or from managed facilities?
  - 4.9. What is the level acceptance and adherence to border control measures?
5. How effective is case and contact management?
  - 5.1. How effective is the public health system in investigating cases, identifying close contacts and isolate or quarantine them in a timely manner?
  - 5.2. How effective is the public health system in identifying secondary contacts?
  - 5.3. Was/is there transmission between cases in isolation and household members (quantitative) and what were the factors that determined this (eg, crowding, household resources/income, knowledge of IPC methods) (quantitative and qualitative)?
  - 5.4. Was/is there transmission between patients/clients and healthcare workers (quantitative): Were appropriate IPC precautions in place and what was adherence to this (qualitative)?
  - 5.5. Have clusters occurred where breaches of Alert Level requirements are documented?
6. What is the capacity of the health system to respond?
  - 6.1. What is the capacity within the health system to identify cases, test and contact trace?
  - 6.2. What is the total number of patients by DHB who could be treated for COVID-19 under normal conditions, without DHBs reducing their capacity for delivering other care?



- 6.3. What alternative care solutions might be considered for providing continuity of care for COVID-19 in a primary care setting? (i.e. Healthline, or zoom-based consultations)?
- 6.4. Are there modern solutions for managing patients which reduce health sector workforce risk, and expand primary care's ability to provide health treatment?
7. How infection is spread and who is at risk?
  - 7.1. What can be learned from the experienced pattern of source of transmission that might help detect illness in a future outbreak?
  - 7.2. What can be learned (or surmised) about the effectiveness of the different personal and societal-based methods of protection?
8. What is the impact on specific population groups?
9. What do we understand about population immunity and serology to SARS-CoV-2?
  - 9.1. What is the level of immunity in different subsets of the population by occupation? (start with high risk occupations)
  - 9.2. What is the level of immunity in different subsets of the population by ethnicity or rurality?
10. How equitable is testing?
11. How equitable is case and contact management?
12. How equitable are infection prevention and control measures?
13. How equitable are the public health measures at the border?
14. What is the level of community acceptance and adherence to control measures?
  - 14.1. How effective are the public education campaigns, public awareness, access to testing facilities and ability to obtain a test? (in line with criteria in the case definition)
  - 14.2. How well do people understand the behavioural rules?
  - 14.3. How willing are people/communities to follow the behavioural rules?
  - 14.4. What percentage of people are following the behavioural rules?

## Appendix C Current surveillance mechanisms and developments

Aotearoa New Zealand has well established surveillance mechanisms that have been expanded to incorporate surveillance for COVID-19. Aotearoa New Zealand’s national COVID-19 surveillance operates to rapidly identify and respond to new cases, provide information about the characteristics of the virus and disease in Aotearoa New Zealand, evaluate the effectiveness of the response, and the wider impacts of the epidemic.

Below is a summary of the data available and the systems that have been established to collect and manage the data.

Surveillance	Description of system and developments
Case data	<p>The national notifiable diseases database (EpiSurv) was adapted early to enable local and national monitoring of cases and clusters of COVID-19 in Aotearoa New Zealand. This was enabled by a change to the Health Act Schedule 1 list of notifiable diseases, the development of COVID-19 case definitions, the establishment of COVID-19 case reporting to the national notifiable disease database, EpiSurv, data collection alignment with WHO international reporting requirements, and the establishment of SARS-CoV-2 diagnostic testing capability and direct electronic notification of results from diagnostic laboratories to EpiSurv and local Medical Officers of Health. This system allows the progressive enhanced targeting and expansion of case investigation and detection through changes to the case definition in conjunction with strategies to enhance healthcare access to people with acute respiratory illnesses and particularly vulnerable population groups (eg, tailored public health messaging, deployment of Community Based Assessment Centres and Mobile Testing Units).</p> <p>Intelligence from this system identifies key demographic characteristics of COVID-19 cases in Aotearoa New Zealand, illness severity, risk factors for disease, the sources of infection and how disease is spreading.</p>
Testing data	<p>A national results repository (Éclair) holds all negative and positive COVID-19 test results from laboratories around Aotearoa New Zealand. This will facilitate data management and analysis through the systems which utilise diagnostic testing data and inform surveillance performance measures including population coverage and equity, for example through linkage to key demographic characteristics via the NHI.</p>
Molecular epidemiology	<p>Whole genome sequencing has been conducted by ESR since the first wave of the pandemic. Whole genome sequencing took a more vital role in providing vital pieces of the puzzle which add to case information during the Auckland August outbreak.</p> <p>Whole genome sequencing of SARS-CoV-2 is being used to track genetic changes in the virus. This assists with outbreak investigations including source attribution, and with understanding the effects of different strains in Aotearoa New Zealand. Enhanced international surveillance of COVID-19 events, ongoing review of emerging scientific evidence and risk assessments, also contribute to informing the evolving understanding of COVID-19 in Aotearoa New Zealand.</p>

Serosurveillance	<p>Serological SARS-CoV-2 antibody tests (where we look for antibodies from a previous COVID-19 infection) and surveillance of the information is becoming more important as the pandemic progresses, and we look to find people who have had the disease but didn't know they were ill. There are tests and understanding the value of various test options will be important in knowing how they can best be applied. ESR has been evaluating several tests.</p> <p>Work by the New Zealand Microbiology Network and others to understand the performance of serological tests, and molecular diagnostic tests in different settings (eg, diagnostic via population studies), is ongoing.</p> <p>Seroprevalence surveys are under consideration and may play a greater role if COVID-19 becomes widespread to identify where and whether herd immunity exists.</p>
Contact tracing and management	<p>Contact tracing information is brought together in the National Contact Tracing Solution. This is combined with some case data from EpiSurv and laboratory testing data from Éclair in order to generate a range of metrics on contact tracing and cluster management. This data is used both operationally to manage cluster outbreaks, and as a management tool to monitor the timely performance of contact tracing, and the effectiveness of contact tracing for different communities. Data can be analysed by ethnicity.</p> <p>The integration of case data with contact tracing datasets is used to inform contact tracing performance metrics.</p> <p>Contact tracing app – the effectiveness of the contact tracing app continues to be enhanced through updates as improvements become apparent and available.</p> <p>Community trial of the COVID-19 contact tracing card – the card has been co-designed by the Ministry of Health, Te Arawa and Universities of Waikato and Otago. The cards use Bluetooth to exchange 'digital handshakes' with each other to keep an anonymised record of participants close contacts. The trial plans to recruit between 500–1000 of the Ngongotahā community in Rotorua. The trial will help the Ministry of Health understand how well the cards perform, whether they are compatible with contact tracing systems and if people accept and use them.</p>
Behavioural data	<p>A survey is already in the field focused on population knowledge, understanding and practice, powered to detect differences by age and ethnicity, including questions on the numbers of close contacts, physical distancing and mask wearing that can be used to understand current practice and monitor change. This is part of the wider Aotearoa New Zealand Health Survey process.</p>
Health system capacity	<p>The core public health capacity issue is the effectiveness of the contact tracing function. This is monitored as part of a set of independently advised metrics that have formed a basis for developing information about contact tracing and the pathway of a person presenting with symptoms from testing to diagnosis and follow and quarantine of close contacts.</p> <p>The capacity of the health system to respond to COVID-19 more broadly has been monitored on the basis of reports from individual DHBs, advising on the availability of inpatient beds, intensive care beds and ventilators. The capacity of primary health care services is not monitored on a routine basis but is the subject of regular updates with representatives of those services.</p>
Social media and big data	<p>ESR is exploring monitoring for emerging patterns and topics that may provide early indicators of infection.</p>

<p>Syndromic, sentinel and event-based surveillance</p>	<p>Surveillance of patients presenting with Acute Respiratory Illness (ARI) and Influenza-like Illness (ILI) syndromes in the community, and with Severe Acute Respiratory Infection (SARI) in hospitals (in Auckland and Counties Manukau DHBs) supports the early detection of COVID-19 in Aotearoa New Zealand.</p> <p>Enhanced syndromic surveillance systems have been implemented, including enhanced event based surveillance of local ARI and ILI outbreaks (reported to local Medical Officers of Health, recorded on EpiSurv, and including targeted testing for COVID-19 and influenza), and expansion of HealthStat (GP ILI consultation monitoring) to increase the sensitivity of ILI surveillance to detect local increases in community ILI activity, from the original 99 to 380 GP practices in second week of May.</p> <p>The expansion of HealthStat has been implemented with prioritisation of the recruitment of practices with greater Māori, Pacific, more socio-economically deprived enrolled populations, and increased representation in major centres for international travel arrivals, seasonal workers and tourism. It needs to be taken into account that given COVID-19 and the related response, previous baselines may not apply.</p> <p>Healthline ILI related calls and FluTracker ILI/ARI surveillance provides further information to monitor community trends. However, these have limitations as an early warning system in that they are variably subject to biases (eg, demography-related for both, and, for Healthline, COVID-19 response related, media influence on health seeking behaviours etc).</p> <p>When seasonally relevant and available, utilise existing ILI surveillance (HealthStat extension, Flutracker membership, and GP text mining); an assessment of the use of CBAC as part of the ILI surveillance is carried out (CBAC data and virological testing).</p> <p>Further enhanced community syndromic surveillance to monitor ARI/ILI presentations to GPs and CBACs using text mining is also under development. Other novel data including over the counter medicine sales, and prescription data are non-specific and have limited utility in the near term over and above routine syndromic surveillance.</p> <p>Community assessment and testing for COVID-19 during the first epidemic wave has been conducted in Community Based Assessment Centres (CBACs) and in general practice. A flexible system for standardised data collection and systematic and targeted sampling to cover both GP and CBAC based presentations is under development. This includes a community Healthlink reporting system to enable direct electronic notification (of suspected COVID-19 and other priority notifiable disease cases) from community (GP/CBAC) Practice Management Systems to Medical Officers of Health via EpiSurv based on a previously successfully piloted system.</p> <p>As the seasonal respiratory illness season passes, and the requirement to maintain adequate testing numbers to identify disease early, efforts will need to ensure that all symptomatic people continue to be tested and surveillance of other at-risk groups may need to be enhanced.</p> <p>The non-specific clinical picture of COVID-19 requires that community based systematic surveillance monitor ARI in keeping with the current COVID-19 case definition.</p> <p>Sentinel virological community ILI/ARI surveillance will reduce as the influenza season resolves increasing the importance of referring all people who meet the current case definition for testing.</p>
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<p>Research</p>	<p>ESR has been conducting research across several disciplines:</p> <p>Wastewater research – Testing for SARS-CoV-2 in wastewater is being considered as a novel approach to potentially identify otherwise undetected infection in communities to prompt further investigation. ESR are undertaking novel research into the testing of wastewater for the presence of SARS-CoV-2. Research is progressing but the data from the collection of samples are not yet actionable and there is currently no ongoing active wastewater surveillance programme tool to detect the presence of COVID-19 cases in the community. ESR is working with the Ministry of Health to feed any intelligence from the research in an appropriate way and looking at where limited resources within the research can be deployed. The overall goal long-term is for robust and reliable tools for the detection of SARS-CoV-2 in sewage, that can be used to identify any unrecognised COVID-19 infections in Aotearoa New Zealand. They also want to gauge how infectious it is in sewage and the persistence of SARS-CoV-2 in sewage. As part of method validation work and following the cluster of new cases in the community, wastewater samples are now being collected from other Auckland locations, and from a range of other regions in Aotearoa New Zealand and being sent to ESR for analysis.</p> <p>Saliva testing – ESR has a research project exploring whether individuals could give a saliva sample to be tested for SARS-CoV-2. This is based on overseas work that suggests that there may be a role for a test that is more comfortable for people, that could therefore be used more frequently. A nasopharyngeal sample is currently the best practice tool for diagnosis, and this is unlikely to change with the introduction of saliva as a sample, but ESR is looking at whether saliva samples could be used in certain settings as a screening tool.</p> <p>Flu research – long-established flu research has been expanded to include COVID-19. Two large-scale and long-term studies, SHIVERS-II and WellKiwis, will expand to include testing for SARS-CoV-2, the virus that causes COVID-19.</p>
<p>Border data</p>	<p>Information is collected from Border Operations, who administer border quarantine and isolation.</p> <ul style="list-style-type: none"> <li>• Data on arrivals (immigration)</li> <li>• Numbers of airline passengers quarantined</li> <li>• Case data from EpiSurv (travel, occupation including location, setting)</li> </ul> <p>Targeted surveillance of frontline staff at border-related settings: this includes in particular those employed at managed isolation and quarantine facilities, border facing personnel, and international airline and maritime crew. Aside from messaging to report any degree of clinical signs, testing of asymptomatic people in these groups is part of the current testing approach to eliminate COVID-19.</p>