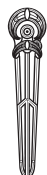


Executive summary

Likely future pandemic agents and scenarios:

An epidemiological and public health framework



Te Niwha

Ko te Whakakitenga.

**Mai Aotearoa ki te Ao
katoa, na ratou e mōhio
ana. Nei ra matou te
kaha rawa, te takatū me
te kotahitanga o mātou
whakahoki ki ngā mate
urutā me ngā mate
hōrapa i nāianei ā kia
puta mai.**

Vision.

**Ensuring Aotearoa
New Zealand's response
to current, ongoing
and emerging infectious
disease threats is
characterised domestically
and internationally
as strong, prepared
and unified.**

Horopaki. Background.

Aotearoa New Zealand's Ministry of Health published an influenza pandemic plan in 2017.

The plan was intended to “be adopted and applied to any pandemic event”¹ however, recent experiences with the COVID-19 pandemic underline the need to be better prepared for a wider range of potential pandemic agents and scenarios.

The influenza pandemic plan assumed that influenza could not be eliminated and did not recognise that an effective public health response could completely alter the course of an epidemic. This potential eventuality needs to be recognised and planned for.

This document is motivated by the need for a more comprehensive approach that considers a range of likely scenarios and agents, new technologies, and learnings from the COVID-19 experience.

¹ www.health.govt.nz/your-health/healthy-living/emergency-management/pandemic-planning-and-response/influenza-pandemic-plan

Kaupapa. Purpose.

The purpose of this document and the accompanying spreadsheet is to:

Identify and characterise agents that are most likely to cause future pandemics/Public Health Emergencies of International Concern (PHEICs) and possible scenarios resulting from such events².

Capture the key features that need to be considered during the interpandemic period (i.e. preparedness) and the multiple phases of an extant pandemic/PHEIC (i.e. response).

Provide a framework and essential material for the preparation of a pandemic plan that is fit-for-purpose now and into the future.

Identify capabilities that are needed to aid rapid decision making in the event of a new pandemic/PHEIC.

² N.B. An assumption throughout this document is that a future pandemic/PHEIC will be the result of an incursion into Aotearoa New Zealand.

Te horopaki ō Aotearoa. New Zealand context.

There are multiple distinctive characteristics of Aotearoa New Zealand that need to be considered and incorporated into pandemic/PHEIC preparedness, planning and response, in order to achieve equitable and effective outcomes. These include the following:

Te Tiriti o Waitangi is the founding document for Aotearoa New Zealand that provides for an obligation to the protection of Māori rights, ensures Māori exercise authority over their affairs and asserts protection and equity in achieving outcomes that are fair and just. All must be actively given effect to and applied in the development of future pandemic plans and responses. Te Tiriti affirms Māori Rangatiratanga in decision making and requires a partnership approach with the Crown. These relationships must be proactively developed and maintained to ensure equitable outcomes in future pandemic scenarios.

During the recent COVID-19 pandemic, Māori undertook a significant effort to ensure the safety and protection of their communities. A range of responses were considered and deployed and tikanga and kawa were adapted where required. The extensive and effective networks with their people and the wider community reinforced the requirement of partnership within pandemics. The future pandemic plan must heed to Te Tiriti o Waitangi to deliver an empowering, partnered and resourced strategy that will serve the Māori context.

Historically, Māori have experienced inequitable wellbeing impacts during pandemics and are persistently underserved by the healthcare system. In an outbreak, Māori partnered, led and delivered responses are key to ensuring the principles of Te Tiriti o Waitangi are given effect and upheld.



- Aotearoa New Zealand has a large, diverse population of Pacific Peoples, with strong ties to the Pacific Islands and specific obligations to Pacific Realm countries. The demography, location, community structure, employment and disproportionate impacts of disease outbreaks on Pacific Peoples needs to be incorporated into preparedness and pandemic planning. This includes continued Pacific community and provider engagement and participation in planning and responses.
- Aotearoa New Zealand’s relative isolation and ability to control borders facilitated the rapid implementation of high stringency measures during the early phases of the COVID-19 pandemic. In addition, the population has been relatively compliant to reasonable, proportionate and clearly justified public health measures.

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Part A: **Potential pandemic agents.**

Influenza remains one of the most likely pandemic agents, but Aotearoa New Zealand needs to be prepared for a wider range of other pathogens. We have assembled a table of potential pandemic agents and described their biological and epidemiological characteristics.



Part B: **Pandemic preparedness and planning.**

Pandemic typologies provide potential pandemic scenarios based upon knowledge of past events, allowing pandemic preparedness and assessment during the early response phases. These can be refined as the pandemic progresses. Typologies allow planning by predicting the physical, psychological and socioeconomic harm that might be caused, and guide the development and implementation of appropriate responses.

We consider two approaches to typology, one based on the type of scenario, informed by features of previous PHEICs, and one based on characteristics of the pathogen. Important characteristics include transmissibility, clinical severity, visibility, controllability and certainty of knowledge. We show how some example pathogens can be mapped onto these typologies, which can inform an assessment of the potential pandemic impact on the population.

The following are important considerations for pandemic preparedness and planning:

- Being prepared for a pandemic requires investing in the range of capabilities needed to respond effectively. Capabilities, including **relationship building and trust**, need to be developed and maintained during the interpandemic period.
- **Reactive and proactive preparedness.** Planning for the range of scenarios identified requires consideration of both reactive preparedness (capacity to stand up an effective pandemic response very rapidly if need be) and proactive preparedness (having resources already in day-to-day operation that prevent the spread of infectious diseases). Reactive preparedness includes assessment of the controllability and impact of an emerging pandemic to determine an appropriate response, but these characteristics are themselves modifiable. Proactive preparedness, including surveillance, can thus be seen as an ongoing, purposeful activity of setting resources in place to maximise the controllability and minimise the impact of a range of infectious diseases with pandemic potential.
- **Equity.** It is essential that equity is centred in pandemic planning. Evaluation of preparedness begins by identifying generic and specific resources needed for a range of pandemic scenarios, but also includes assessment of how readily and how equitably these resources can be accessed.
- **Supporting, enabling and partnering with Māori.** This will ensure preparedness is undertaken in the context of their relationships, aspirations and priorities.
- **Community empowerment.** Reinforcing Māori and Pacific Peoples considerations, self-determination, community networks and data sovereignty.
- **Legislation.** Reviewing current legislation, with reference to the range of likely scenarios, would help the preparation of relevant material that could form the basis of future legislation. If conducted during the interpandemic period as part of pandemic planning and preparedness, this would expedite the preparation and passage of new bespoke legislation through Parliament when the need arises and avoid attempting to design general legislation for national emergencies that may not be suitable for particular situations or partnership under Te Tiriti o Waitangi.
- **All of government response.** Adopting a coordinated, all-of-government response is essential to any successful pandemic response and is more likely to succeed if people have trust in government, which is built upon good governance. Currently, frameworks are in place with the Coordinated Incident Management System (CIMS) and National Security System (NSS) to coordinate across agencies. These are designed to be adapted to the needs of a specific emergency, such as a pandemic.
- **Triaging signals in the early phase of a potential outbreak.** All pandemics start with an outbreak, but most outbreaks do not become pandemics. There is usually a high degree of uncertainty at the earliest stages, and it is unclear if an emerging incident has the potential for national impact. Manatū Hauora | Ministry of Health (MoH) utilises its incident management process to triage and escalate as needed.

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Mathematical modelling is a powerful tool for supporting impact assessment and strategy development, interpreting raw epidemiological and clinical data streams, providing situational awareness, evaluating control measure effectiveness, and comparing alternative policy options.”

- **One Health and zoonoses.** Many outbreaks are zoonotic in origin involving either spill over or sustained transmission. Responses require a coordinated One Health-based, cross-agency approach, with additional challenges that need to be considered compared to a pandemic involving clinical cases only.
- **Surveillance, diagnostics and laboratories.** Surveillance systems need to be capable of detecting unusual clinical infections as well as outbreaks of disease to ensure data is available to inform pandemic planning. Systems are also needed to characterise vector populations capable of transmitting disease. Diagnostic tests must be available for known agents and consideration needs to be given to how diagnostic tests would be developed for unknown pathogens, how highly virulent agents would be handled, how scalable the diagnostic tests are, digital management of testing and reporting, and the stability of supply chains. Laboratory testing capacity and expertise needs to be maintained for a future pandemic response. Contingency planning for supply of medications and equipment that can be challenging to source in a pandemic (e.g., reagents, diagnostic assays, and medications for non-pandemic conditions) is also needed.
- **Genomics and modelling.** Real-time genomic analysis can enhance understanding of dominant transmission pathways, outbreak investigation and contact tracing, prevalence and impact of different pathogen subtypes and overall epidemic dynamics. Mathematical modelling is a powerful tool for supporting impact assessment and strategy development, interpreting raw epidemiological and clinical data streams, providing situational awareness, evaluating control measure effectiveness, and comparing alternative policy options. These capabilities need to be developed and resourced.

- **Healthcare.** The capacity of hospitals and intensive care units is critical to responding to an infectious disease outbreak and maintaining population health. Health care systems are complex, and a fuller evaluation of capacities in these areas is warranted. Aspects for consideration include: the treatment of severe cases of pandemic illness; isolation of infectious hospitalised people; and the management of rapid diagnostics to allow rapid treatment and limiting transmission. In addition, the system will need to maintain “business as usual” healthcare, ensuring that cultural and equitable care is uncompromised for Māori, Pacific Peoples, Tāngata Whaikaha, and the medically vulnerable, while maintaining an adequate workforce and protecting health care workers.
- **Therapeutics and vaccines.** Access to treatments could potentially reduce severity of pandemic illness and/or reduce transmission. Mechanisms must be in place to optimise existing treatments, and ensure their affordability, accessibility, and availability to Māori, Pacific Peoples, Tāngata Whaikaha and those that are medically vulnerable. Additionally, establishing local capacity for vaccine manufacture could be considered to allow participation in distributed manufacturing of pandemic vaccines (avoiding reliance on vaccine supply from overseas).
- **Contact tracing.** Outbreak investigation and contact tracing that is community led and trusted, complements public health teams in traditional outbreak investigation and contact tracing, which needs to be well resourced. Aotearoa New Zealand would also benefit from developing a strategy for digital contact tracing and being prepared to rapidly roll out a well-designed and inclusive system. Trust in the system and data confidentiality are paramount for both methods to be effective.
- **Borders.** A border response can prevent, reduce or delay importation of the pandemic pathogen into Aotearoa New Zealand. This would require a coordinated response between multiple government agencies and private sector organisations. Attention should be given to minimising risk of transmission within and from any isolation facilities and developing mechanisms to take individual circumstances into consideration when prioritising travellers for access to isolation facilities. Options for home isolation should also be explored.

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Part C: **Pandemic response.**

A pandemic is a highly dynamic situation, and an effective response must be adaptable and recognise that the best course of action depends on the current epidemiological situation and likely future trajectory. This is reliant on high-quality surveillance and data management systems and real-time analytical and modelling tools to deliver situational awareness.

With this in mind, we identified three broad, inter-dependent elements of a pandemic response:

1. **Impact assessment** – an evaluation of the potential impact of the pandemic on Aotearoa New Zealand’s population. This includes direct impacts of the infectious disease itself and indirect impacts on health (including mental health), education and the economy. Indirect impacts may stem from increased demands on the healthcare system or from the measures taken to control the pandemic. It is also important to assess how impacts are distributed. It is highly likely that Māori and Pacific Peoples will be at an elevated risk during a pandemic.
2. **Strategy development** – designing an overarching strategy to guide the response, for example elimination (“keep it out”), suppression (“stamp it out”) or mitigation (“manage it”). Strategy choice is not a one-off event: it is likely that strategy will shift during a pandemic, for example from elimination to suppression to mitigation. However, this may not be a straightforward progression with predictable timings, and strategy needs to be responsive to unexpected events or new information.
3. **Control measures** – selecting and implementing control measures to deliver strategic aims. The choice of control measures will depend on: the characteristics of the pathogen and its amenability to different interventions; the impact assessment, which will inform the appropriate level of intervention and proportionate response; and the strategic objectives. It is important to monitor and evaluate the effectiveness and costs (including indirect harms) of control measures.

These elements are supported by the key capabilities outlined in [Part B](#). These three elements will need to be revisited, refined and updated over time as new information about the pathogen and the interventions used to control it becomes available, and as the epidemiological situation evolves.



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