

The COVID-19 Elimination strategy: Why it was the best choice for New Zealand

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Talk to U3A July 2020

Outline

- Strategic choices for COVID-19 response
- Mitigation vs elimination
- Components of elimination strategy
 - Exclusion at borders
 - Case and outbreak management
 - Reducing transmission
- Impact of elimination strategy
- Uncertainties
- Strengths & Weaknesses of Response
- Maintaining COVID-19 elimination

Strategic choices for COVID-19 response

Factors influencing response to COVID-19, include:

- Health impact – particularly case fatality risk
 - Transmissibility of pathogen – R_0
 - Controllability – effectiveness of interventions
 - Certainty of information – science capacity, awareness of options, experience, dogma
 - Feasibility of response – public sector capacity to respond, public acceptability & adherence
- Economics – cost of action and inaction
- Impact on inequalities

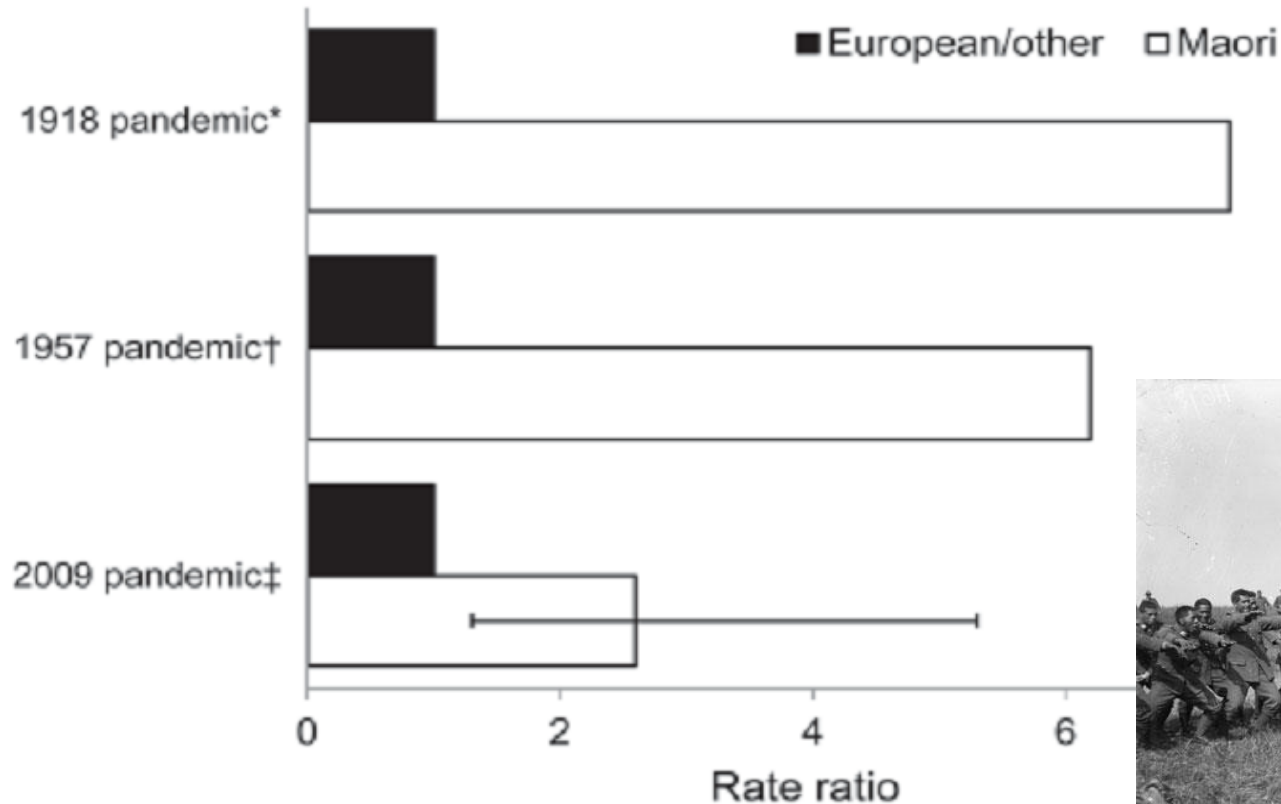
Strategic choices: Health impact

Estimated mortality from COVID-19 pandemic:

- Modelled, assuming $R_0=2.5$, 25% control
- 57% population infected
- Peaks after 5 months – 1650 in ICU
- 28,300 hospitalised (0.6% population)
- 12,700 deaths (0.3% population)
= mortality of 25 seasonal influenza seasons

Strategic choices: Health inequalities

Mortality rates for Māori vs non-Māori in 3 successive influenza pandemics



Source: Wilson et al 2012, *Emerg Infect Dis*



Light-bulb moments

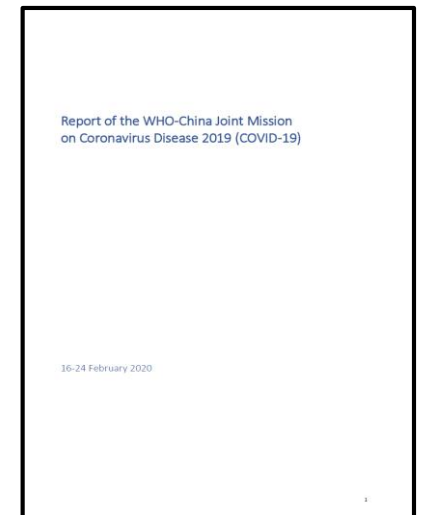
1. January 2020 - It's a global pandemic

2. February 2020 - It can be contained/eliminated/stopped

3. March 2020 - NZ is not ready, 'lockdown' needed



Source: Wu et al.
Lancet 31 Jan 2020



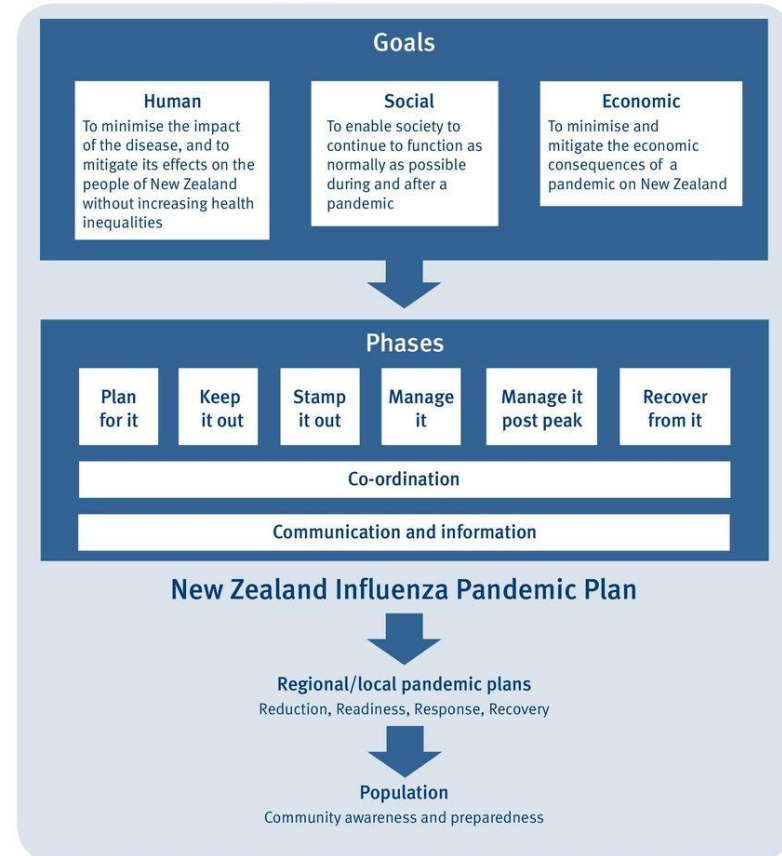
Source: Aylward et al,
WHO, 28 Feb 2020

Strategic choices: Mitigation

Mitigation

- Pandemic influenza plan
- Aims to 'flatten the curve'
- NZ approach up until mid-March

Figure 1: New Zealand strategic approach to a pandemic



Ministry of Health. 2017. New Zealand Influenza Pandemic Plan: A framework for action (2nd edn). Wellington: Ministry of Health.

Strategic Choices: Elimination

- Elimination – Disease absence from a country or region, eg, poliomyelitis, measles, rubella
- Eradication – Global absence of infection, eg, smallpox
- Elimination approach aims to ‘stop the curve’
- NZ switched to this approach – 23 March



Source: Baker et al 2020, *NZMJ*, *MJA*

Components of COVID-19 elimination strategy

1. Exclusion of cases

- *Keep it out* – Border Management

2. Case and outbreak management

- *Stamp it out* – Testing, contact tracing, isolation/quarantine

3. Reducing transmission

- Reducing transmission per contact – Hygiene measures, Masks
- Reducing contacts – Physical distancing & travel restrictions

1. Exclusion – Border Management

Key components:

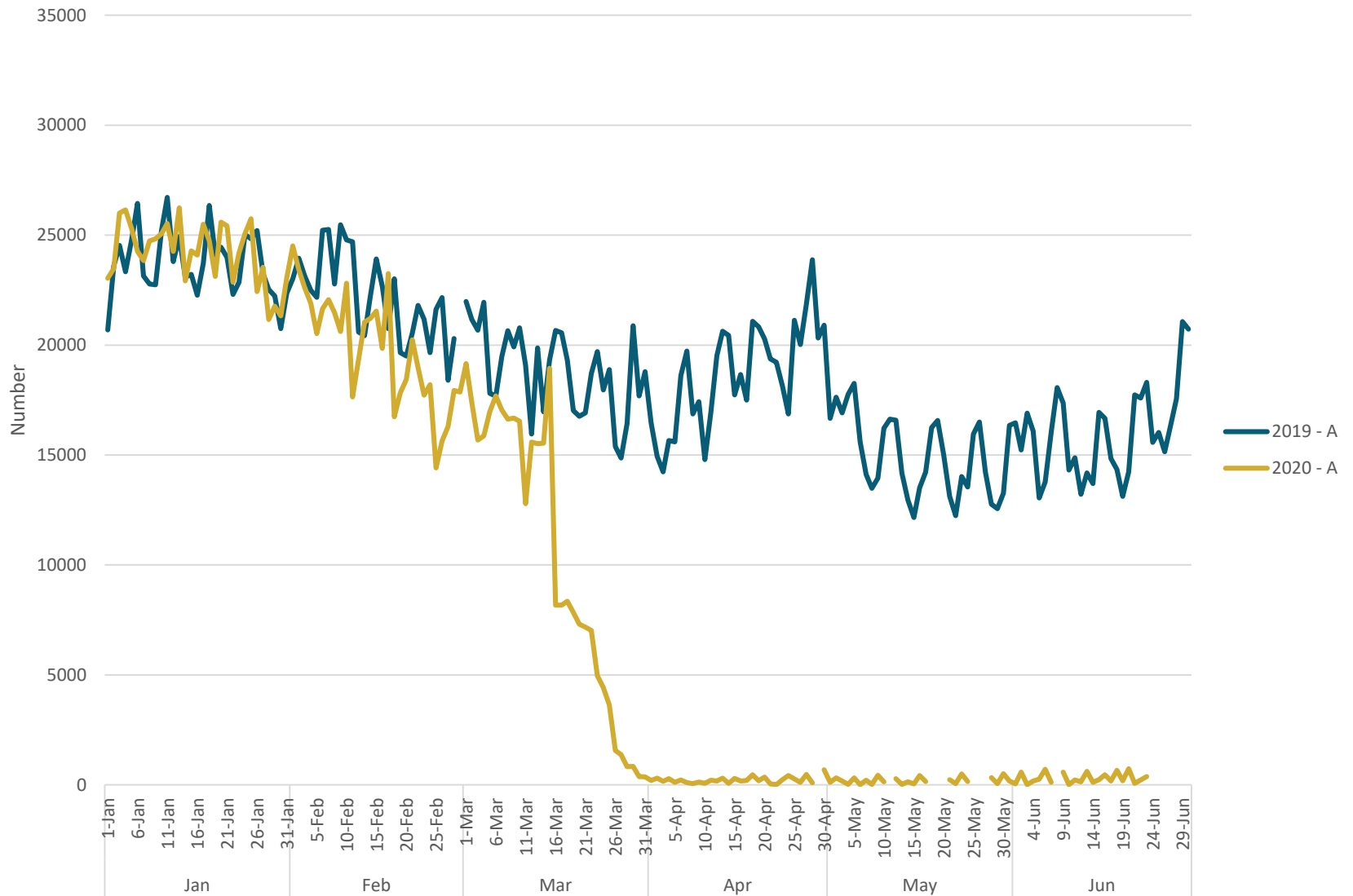
- Entry restrictions (near closure)
- Self-isolation
- Supervised isolation, Managed quarantine
- Practices with aircrew and seaports

Key dates:

- 2 Feb – Entry restrictions & self isolation
- 14 March – Cruise ships banned
- 19 March – NZ borders closed to all except NZ citizens
- 9 April – Supervised isolation, Managed quarantine

1. Exclusion – Border Management

Arrivals to New Zealand, by day of border crossing, January-June, 2019-20



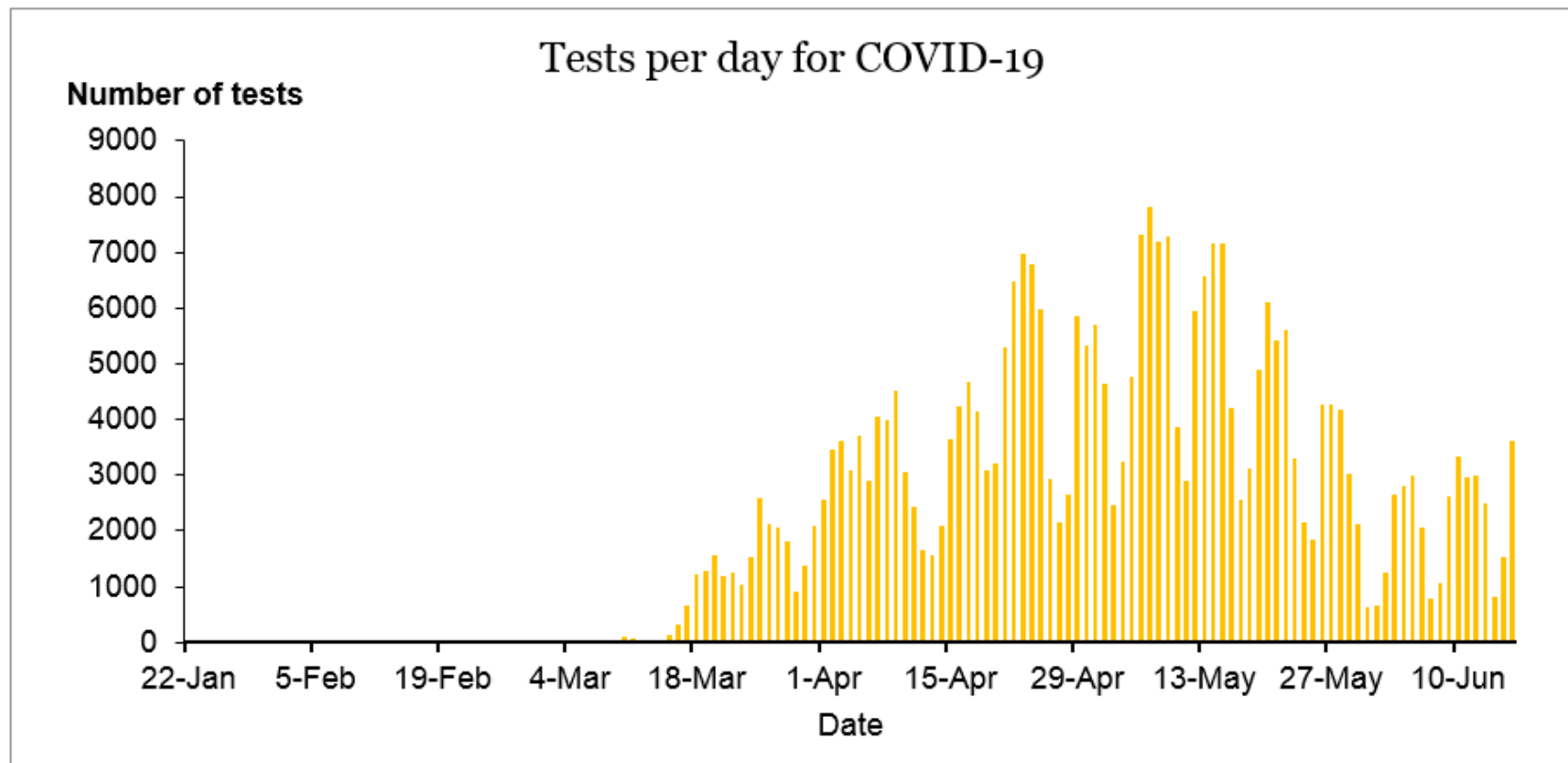
2. Case and contact management

Key components:

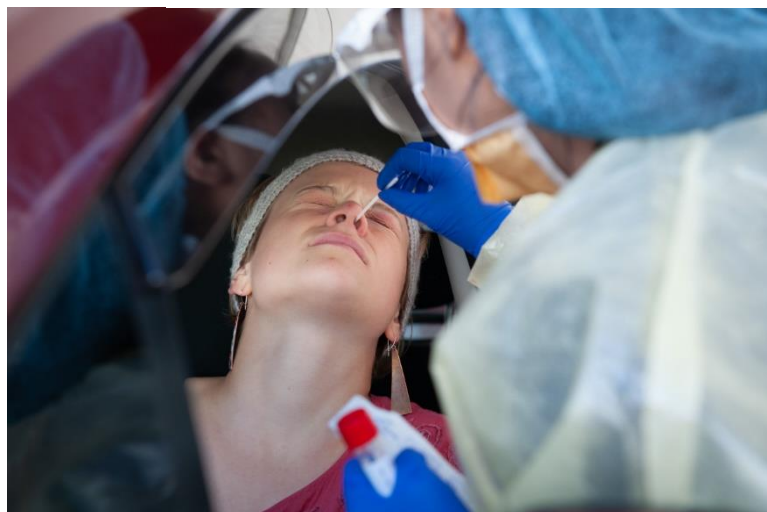
- Establish & increase testing capacity
- Primary care, community testing (CBAC capacity)
- Contact tracing
- Case and contact isolation
- **But**, limited digital assistance with contact tracing

Key dates:

- 2 Feb Diagnostic test for COVID-19 available
- 18 March 1000+ tests per day
- 24 March National Close Contact Service created



Source: MoH website



Swabbing for Covid-19, Wellington, May 2020

3. Reducing transmission – ↓Reproduction No.

Intervention logic for pandemic response strategies

Types of control measures

Physical distancing, cough etiquette, masks, hand hygiene, infection control in healthcare settings

Case isolation and contact quarantine, working from home, school closures, restricting mass gatherings, border controls

Antiviral treatment for COVID-19 may have a role in reducing the duration of infectivity

How they work

↓ **Transmissibility**

Risk of transmission per contact

↓ **Contact rate**

Average rate of contact of susceptibles with infected

↓ **Duration**

of infectivity

↓ **R**

The logic: Stopping the pandemic means reducing the reproduction number (R) to less than 1. The 3 drivers are **transmission, contact rate, and duration of infectivity.**

3. Reducing transmission – Alert levels

New Zealand COVID-19 Alert Levels Summary

Unite
against
COVID-19

- The Alert Levels are determined by the Government and specify the public health and social measures to be taken in the fight against COVID-19. Further guidance is available on the Covid19.govt.nz website.
- The measures may be updated based on new scientific knowledge about COVID-19, information about the effectiveness of control measures in New Zealand and overseas, or the application of Alert Levels at different times (e.g. the application may be different depending on if New Zealand is moving down or up Alert Levels).

- Different parts of the country may be at different Alert Levels. We can move up and down Alert Levels.
- Essential services including supermarkets, health services, emergency services, utilities and goods transport will continue to operate at any level. Employers in those sectors must continue to meet health and safety obligations.
- Restrictions are cumulative (e.g. at Alert Level 4, all restrictions from Alert Levels 1, 2 and 3 apply).

Published 25 May 2020

ELIMINATION STRATEGY – New Zealand is working together to eliminate COVID-19

Alert Level	Risk Assessment	Range of Measures (can be applied locally or nationally)
Level 4 – Lockdown Likely the disease is not contained	<ul style="list-style-type: none"> Community transmission is occurring. Widespread outbreaks and new clusters. 	<ul style="list-style-type: none"> People instructed to stay at home in their bubble other than for essential personal movement. Safe recreational activity is allowed in local areas. Travel is severely limited. All gatherings cancelled and all public venues closed. Businesses closed except for essential services (e.g. supermarkets, pharmacies, clinics, petrol stations) and lifeline utilities. Educational facilities closed. Rationing of supplies and rationing of facilities possible. Reprioritisation of healthcare services.
Level 3 – Restrict High risk the disease is not contained	<ul style="list-style-type: none"> Community transmission might be happening. New clusters may emerge but can be controlled through testing and contact tracing. 	<ul style="list-style-type: none"> People instructed to stay home in their bubble other than for essential personal movement – including to go to work, school if they have to, or for local recreation. Physical distancing of two metres outside home (including on public transport), or one metre in controlled environments like schools and workplaces. People must stay within their immediate household bubble, but can expand this to reconnect with close family/whānau, or bring in caregivers, or support is dated people. This extended bubble should remain exclusive. Schools (years 1 to 10) and Early Childhood Education centres can safely open, but will have limited capacity. Children should learn at home if possible. People must work from home unless that is not possible. Businesses can open premises, but cannot physically interact with customers. Low risk local recreation activities are allowed. Public venues are closed (e.g. libraries, museums, cinemas, food courts, gyms, pools, playgrounds, markets). Gatherings of up to 10 people are allowed but only for wedding services, funerals and tangihanga. Physical distancing and public health measures must be maintained. Healthcare services use virtual, non-contact consultations where possible. Inter-regional travel is highly limited (e.g. for essential workers, with limited exemptions for others). People at high risk of severe illness (older people and those with existing medical conditions) are encouraged to stay at home where possible, and take additional precautions when leaving home. They may choose to work.
Level 2 – Reduce The disease is contained, but the risk of community transmission remains	<ul style="list-style-type: none"> Household transmission could be occurring. Single or isolated cluster outbreaks. 	<ul style="list-style-type: none"> People can reconnect with friends and family, and socialise in groups of up to 100, go shopping, or travel domestically, if following public health guidance. Keep physical distancing of two metres from people you don't know when out in public or in retail stores. Keep one metre physical distancing in controlled environments like workplaces, where practicable. No more than 10 people at gatherings, including weddings, birthdays and funerals and tangihanga. Businesses can open to the public if following public health guidance including physical distancing and record keeping. Alternative ways of working are encouraged where possible. Hospitality businesses must keep groups of customers separated, seated, and served by a single person. Maximum of 100 people at a time. Sport and recreation activities are allowed, subject to conditions on gatherings, record keeping, and – where practical – physical distancing. Public venues such as museums, libraries and pools can open if they comply with public health measures and ensure 1 metre physical distancing and record keeping. Event facilities, including cinemas, stadiums, concert venues and casinos can have more than 100 people at a time, provided that there are no more than 100 in a defined space, and the groups do not mix. Health and disability care services operate as normally as possible. It is safe to send your children to school, early learning services and tertiary education. There will be appropriate measures in place. People at higher-risk of severe illness from COVID-19 (e.g. those with underlying medical conditions, especially if not well-controlled, and seniors) are encouraged to take additional precautions when leaving home. They may work, if they agree with their employer that they can do so safely.
Level 1 – Prepare The disease is contained in New Zealand	<ul style="list-style-type: none"> COVID-19 is uncontrolled overseas. Isolated household transmission could be occurring in New Zealand. 	<ul style="list-style-type: none"> Border entry measures to minimise risk of importing COVID-19 cases. Intensive testing for COVID-19. Rapid contact tracing of any positive case. Self-isolation and quarantine required. Schools and workplaces open, and must operate safely. Physical distancing encouraged. No restrictions on gatherings. Stay home if you're sick, report flu-like symptoms. Wash hand dry hands, cough into elbow, don't touch your face. No restrictions on domestic transport – avoid public transport or travel if sick.

3. Reducing transmission – per contact

Key components

- Physical distancing
- “Stay at home if sick” message
- Handwashing
- Cough etiquette
- Infection control in healthcare settings
- **But**, no promotion of mass masking (=wearing of mainly reusable fabric face masks by public)



3. Reducing transmission – Physical distancing

Key components

- Closure of schools, workplaces, public transport
- Stay at home in ‘bubble’ at level 4
- Physical distancing 2 metres
- Limited travel

Key dates

- Level 4 – 26 March
- Level 3 – 28 April
- Level 2 – 14 May



Main motorway into Wellington, Alert Level 4, May 2020



Physical distancing, Alert Level 3, May 2020



Flyer delivered to all NZ households, March 2020

6 Jan: Ministry of Health send border advisory to stakeholders with regard to the WHO risk assessment of COVID-19.

2 Feb: Entry restrictions placed on foreign nationals travelling from, or transiting through, mainland China. Those who can enter the country must self-isolate for 14 days.

28 Feb: Temporary travel restrictions placed on incoming travellers from Iran. Cabinet confirmed it will not exempt international students from any of the travel restrictions in place.

29 Feb: Health staff begin meeting direct flights landing at New Zealand airports from Hong Kong, Japan, South Korea, Singapore and Thailand.

14 March: Cruise ships banned from coming to New Zealand.

Every person entering New Zealand from anywhere in the world required to self-isolate for 14 days, excluding the Pacific

Strict border exist measures for people travelling to the Pacific.

19 March: NZ borders closed to all travellers except NZ citizens and residents. Gatherings of >100 people cancelled.

New Zealanders advised not to travel overseas.

9 April: All new arrivals go into quarantine or managed isolation in an approved facility for a minimum of 14 days.

Alert Level Response

21 March: Prime Minister announces 4 level alert system and places NZ on Level 2. Prime Minister announces that people 70 years and older and those with compromised immune systems should stay home as much as possible. People should work from home if they can, and limit travel.

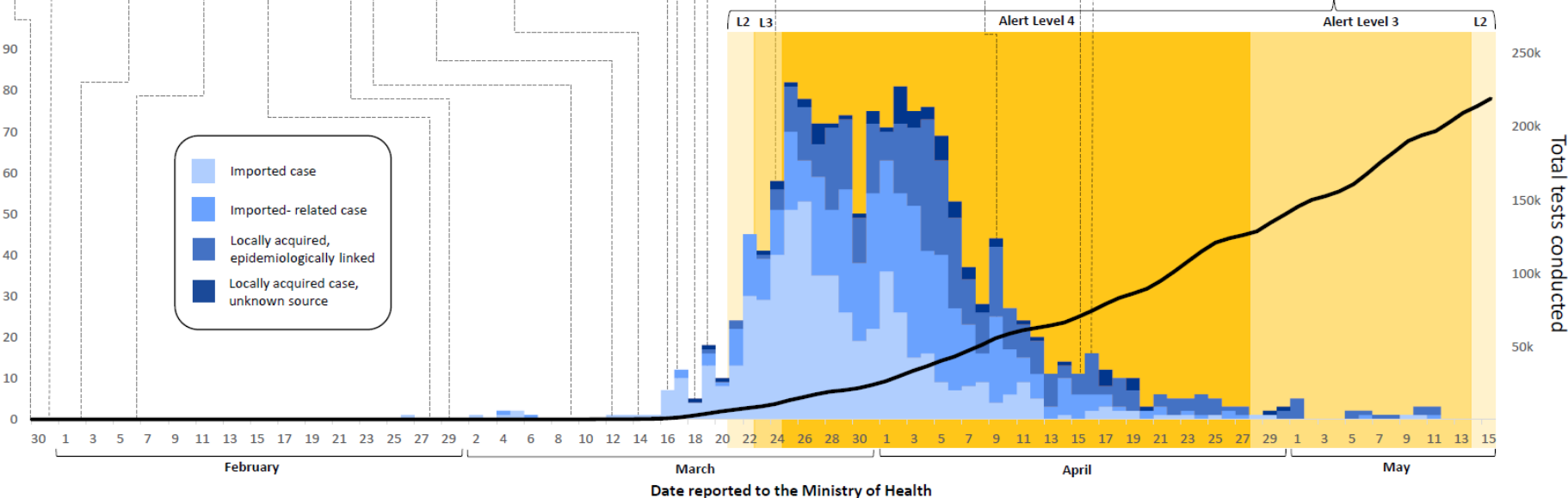
23 March: Prime Minister increases Alert Level to 3 and issues an Epidemic Notice under section 5 of the Epidemic Preparedness Act 2006. People are instructed to stay at home from 24 March. Schools and other facilities close.

25 March: Alert Level raised to 4. All non-essential businesses to close and state of emergency declared. The Prime Minister tells NZers to stay home in their household "bubble" - a concept to help people understand who they may have close contact with.

20 April: Prime Minister announces NZ will remain in Level 4 for an additional five days until the end of 27 April.

28 April: NZ moves into Alert Level 3. Bubble extended to close family, caregivers, or to support isolated people. Businesses can open premises but cannot physically interact with customers. People must work from home unless it is not possible.

14 May: NZ moves into Alert Level 2 with restrictions eased over a seven day period in three stages. All workplaces, public venues, and education facilities can open subject to public health and workplace safety requirements.



2 Feb: Diagnostic test for COVID-19 available in New Zealand

8 Feb: Two New Zealanders aboard the cruise ship Diamond Princess are confirmed to have the virus.

26 Feb: First COVID-19 case in NZ reported as a traveller returning from Iran. Case confirmed on 28 February.

9-13 March: the World Herford Conference held in Queenstown, which becomes NZ's first significant cluster.

15 March: Daily testing for COVID-19 exceeds 100 for the first time.

18 March: Daily testing for COVID-19 exceeds 1,000 for the first time.

21 March: A wedding in Bluff takes place, which becomes NZ's largest cluster with nearly 100 cases.

29 March: First COVID-19 death reported.

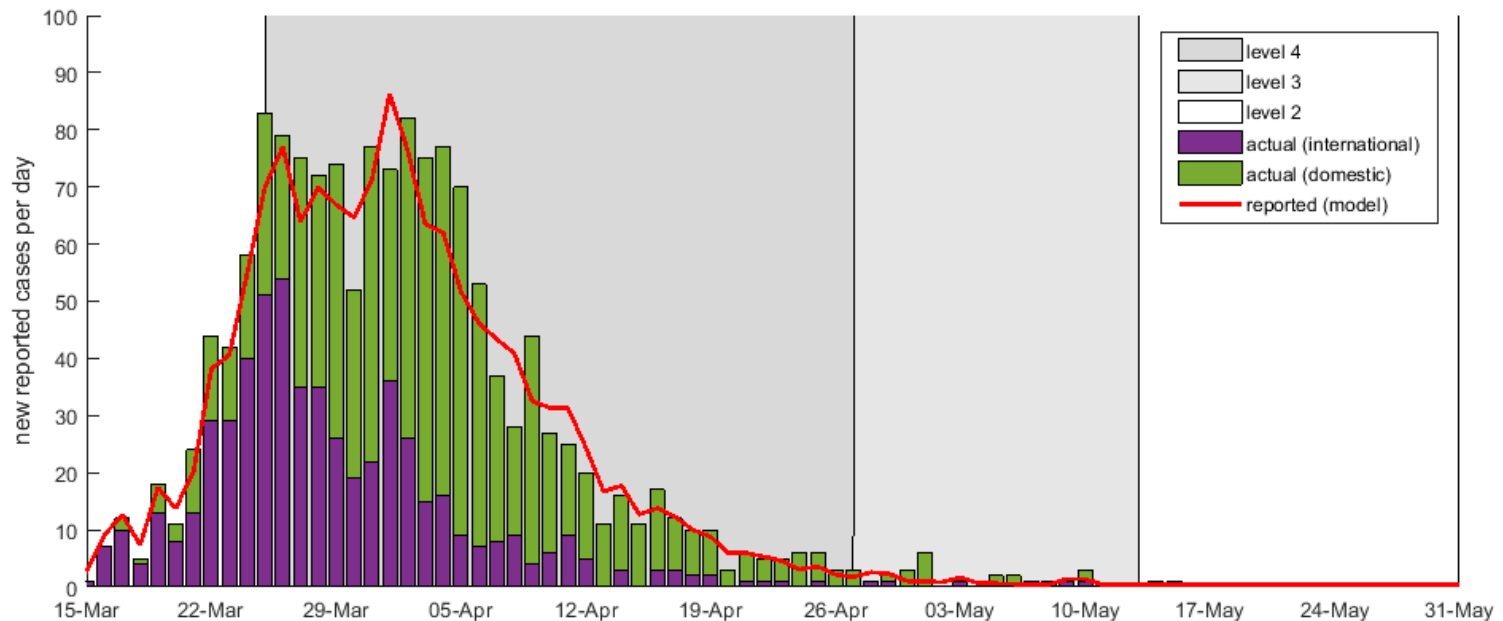
3 April: Last significant cluster identified - 50 people at an aged residential care facility in Auckland.

2 May: First day of no new reported cases of COVID-19 since 11 March.

Impact of Elimination Strategy

Simulated and actual daily numbers of new local and imported cases (confirmed and probable). Effective reproduction number (R_{eff})

- Prior to lockdown: $R_{\text{eff}} = 1.8$ (best-fit to case data)
- Level 4 $R_{\text{eff}} = 0.35$ (best-fit)
- Level 3 $R_{\text{eff}} = 0.95$ (assumed)
- Level 2 $R_{\text{eff}} = 1.7$ (assumed)



Source: Rachelle Binny, Shaun Hendy et al, University of Auckland

Impact of Elimination Strategy

Reaching elimination

- Absence of detected cases for a defined period eg, 28 days*
- Presence of a high performing surveillance system
- With defined exclusions eg, cases identified at borders and placed in effective isolation/quarantine

*Usually specified according to statistical likelihood, eg 95% probability of elimination. Distinct from active cases.

Impact of Elimination Strategy

Plan Pandemic Strategy

Implement Pandemic Strategy

Exit path

Pandemic planning: Assess threat, choose strategy, select interventions* implement ongoing surveillance and evaluation, fine-tune mix of interventions

1. Exclusion strategy: Maximum action to **exclude disease**
Eg. Pacific Island countries and territories

2. Elimination strategy: Maximum action to **exclude disease** and **eliminate chains of transmission**. Eg. Mainland China, Taiwan, New Zealand; also as per SARS

3. Suppression strategy: Action increased in stepwise and targeted manner to **suppress case numbers and outbreaks**.
Eg. Most countries in Europe

4. Mitigation strategy: Action taken to 'flatten the curve' and protect the most vulnerable. **Pandemic wave continues, but lower peak**. Eg. Sweden at least initially

5. No substantive strategy: **Largely uncontrolled pandemic wave**. Eg. Most low-income states

Return to carefully managed 'new normal' (3 months in Asian countries). Requires persisting quarantine at borders until vaccine and/or antivirals available

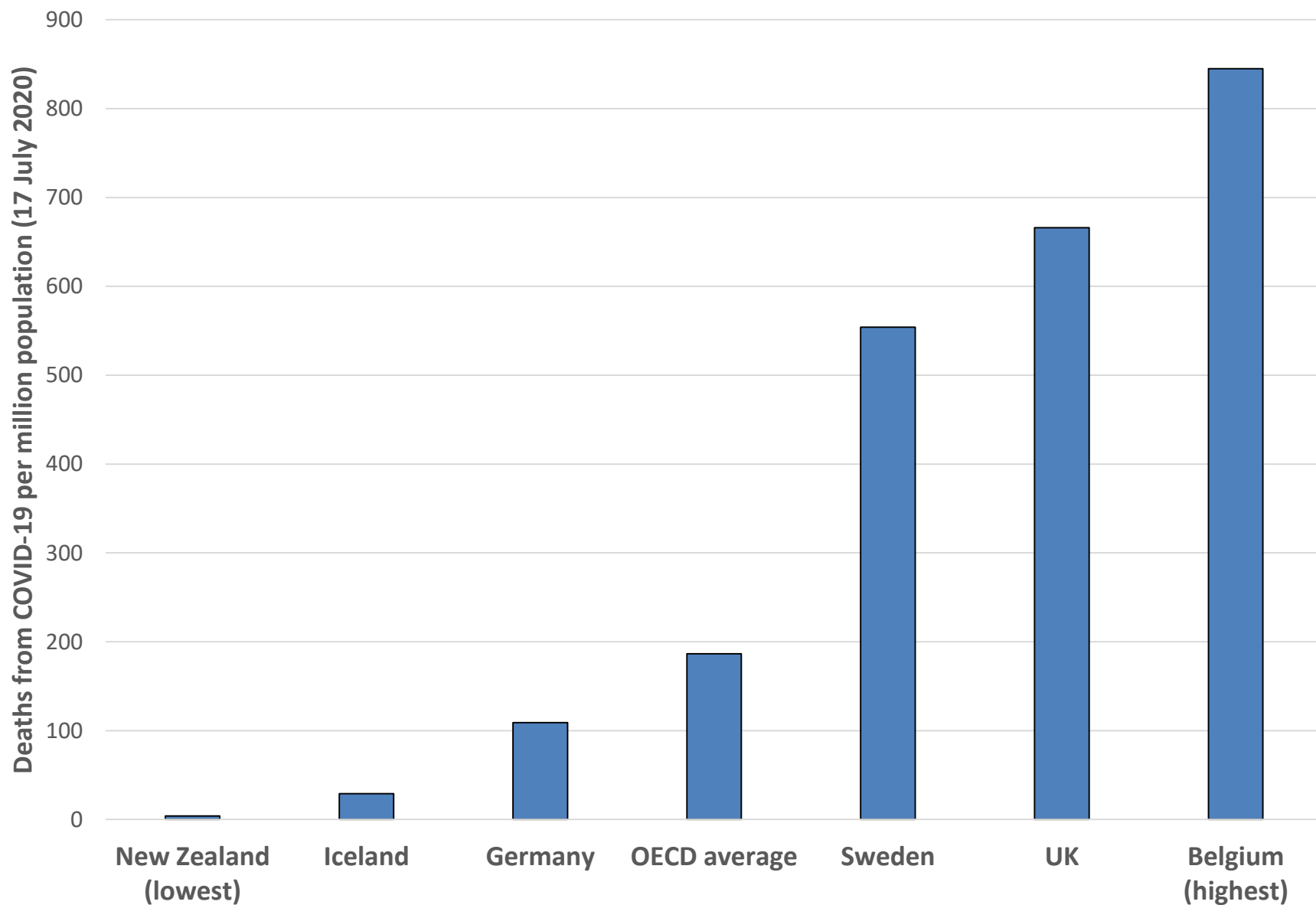
Prolonged control measures until vaccine and/or antivirals available: (12-18+ months) or switch strategies

Pandemic spreads through population until immunity and/or vaccine and/or antivirals available: (12-18+months)

***Control interventions:** (1) Border controls to 'keep it out'; (2) Case isolation & contact quarantine to 'stamp it out'; (3) Improved hygiene and use of masks; (4) Physical distancing; (5) Movement restrictions; (6) Combinations including 'lock-down'

NB. There are multiple other interventions to mitigate harm, focussed on health services & protecting vulnerable

Death rate from COVID-19, OECD countries



Maintaining COVID-19 elimination

Threats to NZ's COVID-19-free status

- Risk of failures of border management (isolation, quarantine, air crew, ship crew)
- Inadequate surveillance to quickly detect an outbreak from a border control failure

Wider threats

- Indirect health effects of response & global situation
- Economic hardship & risk of increasing inequalities (socioeconomic and ethnic)
- Multiple global health consequences (eg, funding cuts to the World Health Organization)

Maintaining COVID-19 elimination

- Upgrades to border management (eg, electronic bracelets)
- Upgrade the Alert Level System (eg, face mask use in Level 2 in buses etc)
- Enhance contact tracing with digital tools eg, Bluetooth enabled card/device; explore telecoms data (South Korea)
- Rapid review of NZ response & establishment of dedicated national public health agency, plus thorough Commission of Inquiry



Uncertainties

- Global pandemic control – vaccines +/- antivirals
- Effectiveness and duration of immunity
- Optimal mix of strategies for managing outbreaks and maintaining elimination – face masks, contact tracing
- Managing risk of inbound travel
- Overall social and economic consequences of response strategies

Strengths and weaknesses of NZ response

Strengths


- Effective political leadership, decisive action (border restrictions; stringent lockdown)
- Effective strategic advice from epidemiologists/public health sector
- Chief science advisors, accessible decision-makers
- Effective communication with the public (Prime Minister; Director General) – “Team of Five Million”
- High public trust and engagement (good rule following)

Strengths and weaknesses of NZ response

Weaknesses

- Eroded, fragmented and underfunded public health infrastructure (poor pandemic preparedness)
- Too reliant on “self-isolation” of returning travellers
- Uncontrolled volumes of returning travellers
- System failures at quarantine facilities (security etc)
- Deficient face mask policy (eg, for Alert Level 2)
- Too slow to adopt appropriate digital technology for contact tracing (eg, CovidCard)
- Too slow with surveillance systems (testing wastewater)

Collaborative research programme



What we do

In just a few months, COVID-19 infection has become a global pandemic. This new coronavirus presents unique challenges for pandemic control. Aotearoa New Zealand has chosen an elimination strategy to contain spread of the virus. Both the pandemic itself and the response are having profound and inequitable impacts on health and wellbeing in this country and neighbouring Pacific countries.

The goals of this research are to:

1. Describe the pandemic and its population health impacts in New Zealand and the Pacific
2. Evaluate the response to help shape and improve its effectiveness and equity
3. Contribute to long-term improvements in New Zealand's ability to manage pandemic threats
4. Identify health, equity and sustainability benefits arising from a well-designed recovery

Who we are

Co-search brings together a diverse multidisciplinary team that includes:

- Pandemic experts from Otago, Massey, and Auckland universities including epidemiology, microbiology, vaccine strategy, and disease modelling scientists
- Māori researchers (including partnership with Kōwhiri Māori in Wellington)
- Pacific researchers associated with the University of Otago
- Emergency management experts from the Massey Joint Centre for Disaster Research
- Systems science experts from ESR
- University of Otago students running a project that aims to understand lived experience of the pandemic
- A photographer and videographer from the University of Otago Wellington who will contribute to the historical record by visually documenting the pandemic and the response

Co-search is led by Professor Michael Baker (Director) and Dr Amanda Keeling (Lead Researcher) at the Department of Public Health, University of Otago Wellington. It includes a network of more than 20 collaborating researchers, 3 universities, a Crown research institute, community organisations and an international advisory group.







Funding

- Health Research Council (HRC) and the Ministry of Health (MHC 20/2466 [Pi: Baker] & 20/250 [Pi: Gray])
- Sargood bequest, Wigram Foundation and other donors
- Salary and administrative support from Otago, Massey, and Auckland Universities


For more information

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Dr Amanda Keeling amanda.keeling@otago.ac.nz

Programme manager: Dr Virginia Signor virginia.signor@otago.ac.nz



13 June 2020



Co-Search projects

Pandemic epidemiology

Aim: To generate a comprehensive epidemiological description of the pandemic, and its impacts and requirements | Lead: Michael Baker michael.baker@otago.ac.nz

Rig data modelling

Aim: To use an individual-based network model of contagion to simulate the effects of interventions | Lead: Sean Hens sean.hens@univie.ac.at

Population impacts

Aim: To assess the impact of both the pandemic and pandemic response on population wellbeing, with a particular focus on equity impacts | Lead: Amanda Keeling amanda.keeling@otago.ac.nz

Māori-led research

Aim: To evaluate a Māori based pandemic response and reflect on lessons for the future | Lead: Cheryl Davis cheryl.davis@univie.ac.at

Pandemic response planning

Aim: To assess the effectiveness of pandemic response planning in NZ | Lead: David Johnston david.johnston@univie.ac.at

Systems research

Aim: To develop a systems understanding of community response and impact to guide response adaptation | Lead: Wat Watson watson@univie.ac.at

Border management and Pacific countries

Aim: To document and evaluate the effectiveness of border controls and the NZ response to COVID-19 in the Pacific | Leads: Lucy Teller Barnard lucy.teller.barnard@otago.ac.nz and Vilani Pulaka vilani.pulaka@otago.ac.nz

Physical distancing and masking

Aim: To understand responses to physical distancing and self-isolation | Lead: Lesley Gray lesley.gray@univie.ac.at

Contact tracing and digital tools

Aim: To develop interventions to enhance contact tracing | Leads: Ayesha Vimal ayesha.vimal@otago.ac.nz and Andy Angermeyer andy.angermeyer@univie.ac.at

Vaccination strategies and infrastructure

Aim: To support development and delivery of an effective, equitable and safe COVID-19 vaccination strategy | Lead: Mike Turner mike.turner@univie.ac.at

Lived experience







Aim: To understand lived experience of the pandemic and response measures | Lead: Louise Signor louise.signor@otago.ac.nz

Benefits from a well-designed recovery

Aim: To investigate opportunities arising from a well-designed recovery | Lead: Tim Chambers tim.chambers@otago.ac.nz

Images and media

Aim: To provide a visual description of the COVID-19 pandemic and response | Lead: Luke Pilkinton-Ching luke.pilkinton-ching@otago.ac.nz

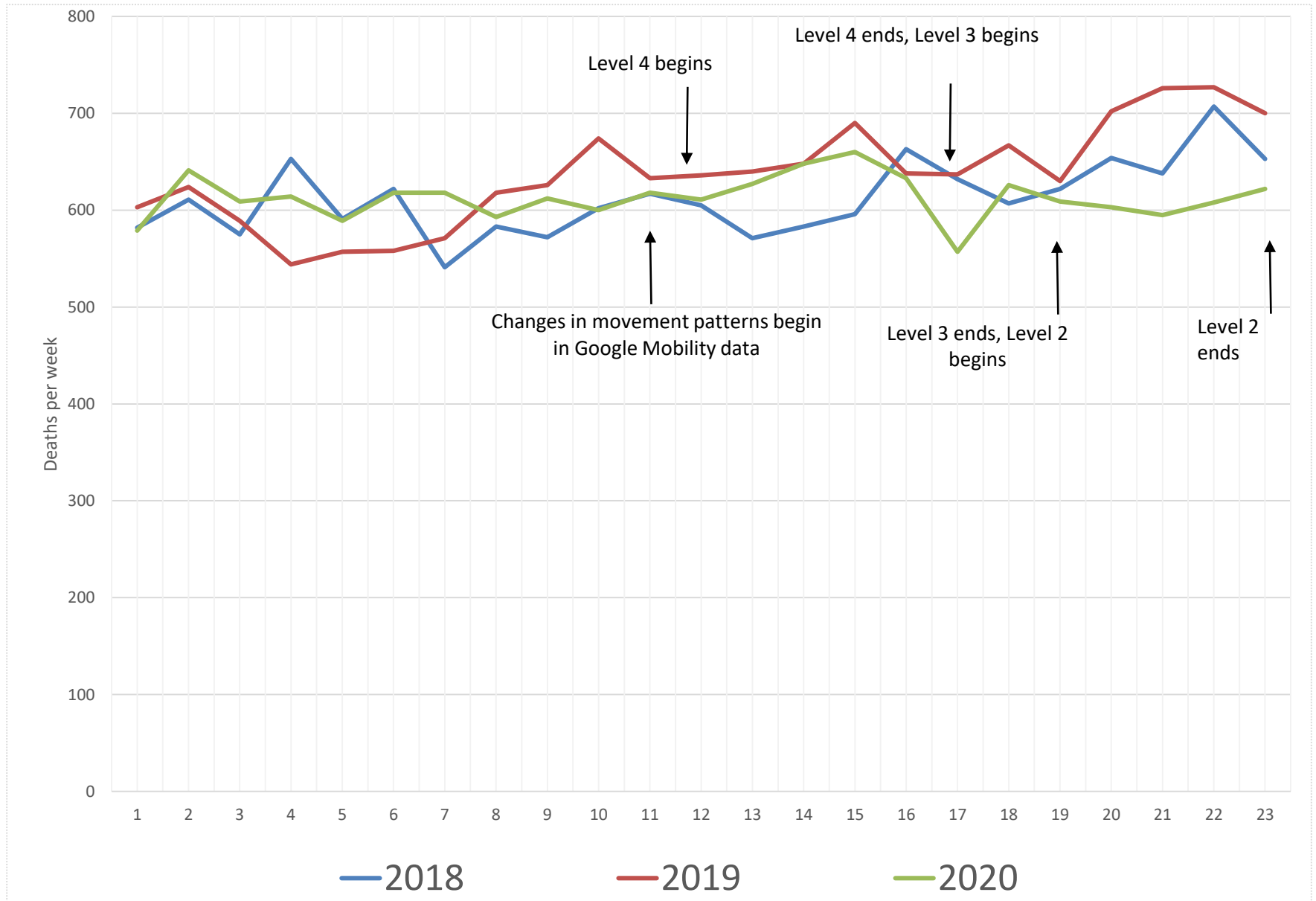


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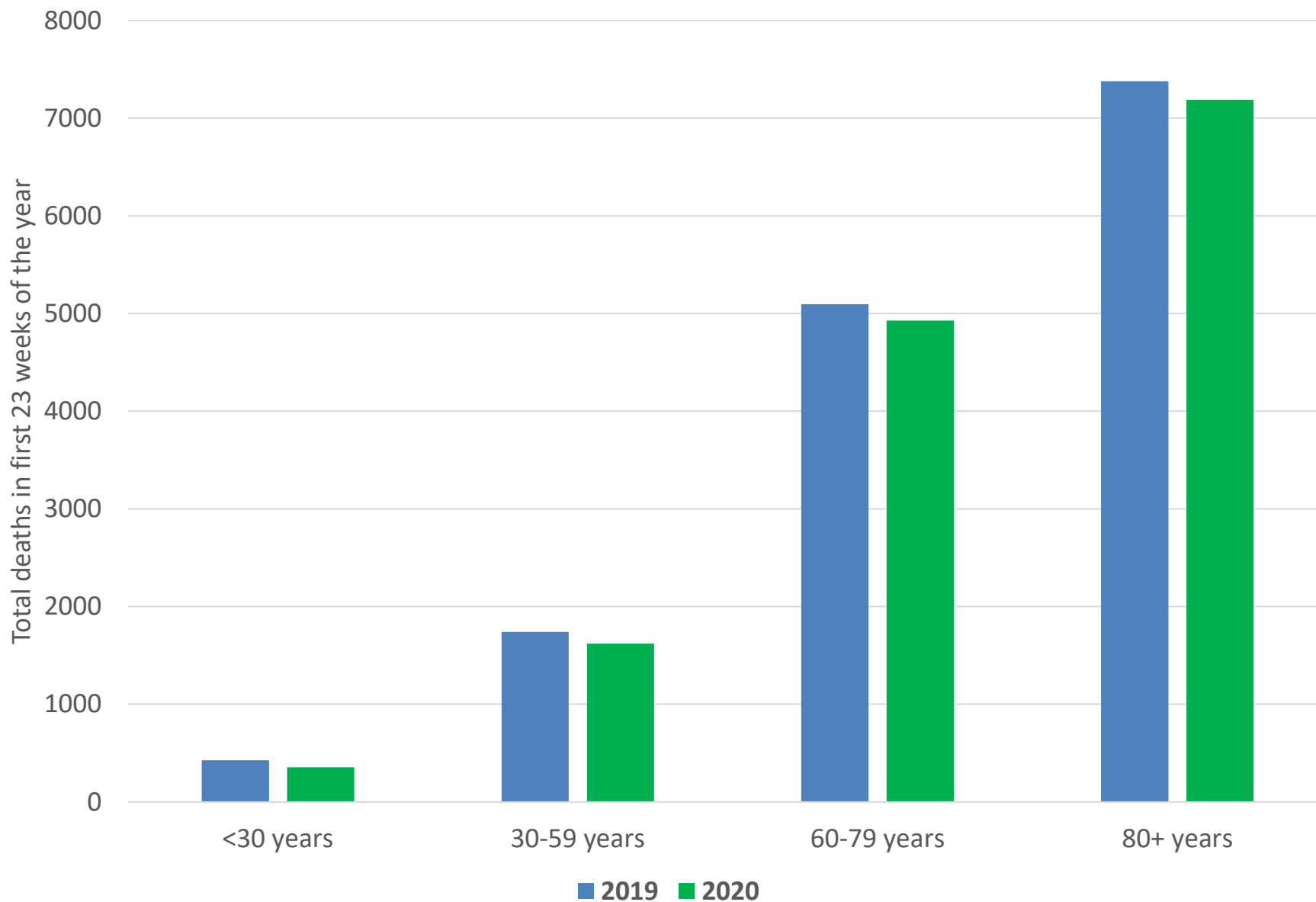


Collaborative research group
Multiple funders including Health Research Council and philanthropists
Please contact us if interested

Incidental benefits: Reduced weekly deaths in lockdown (548 fewer deaths than in 2019)



Reduced weekly deaths in all age-groups during lockdown



Economic impacts

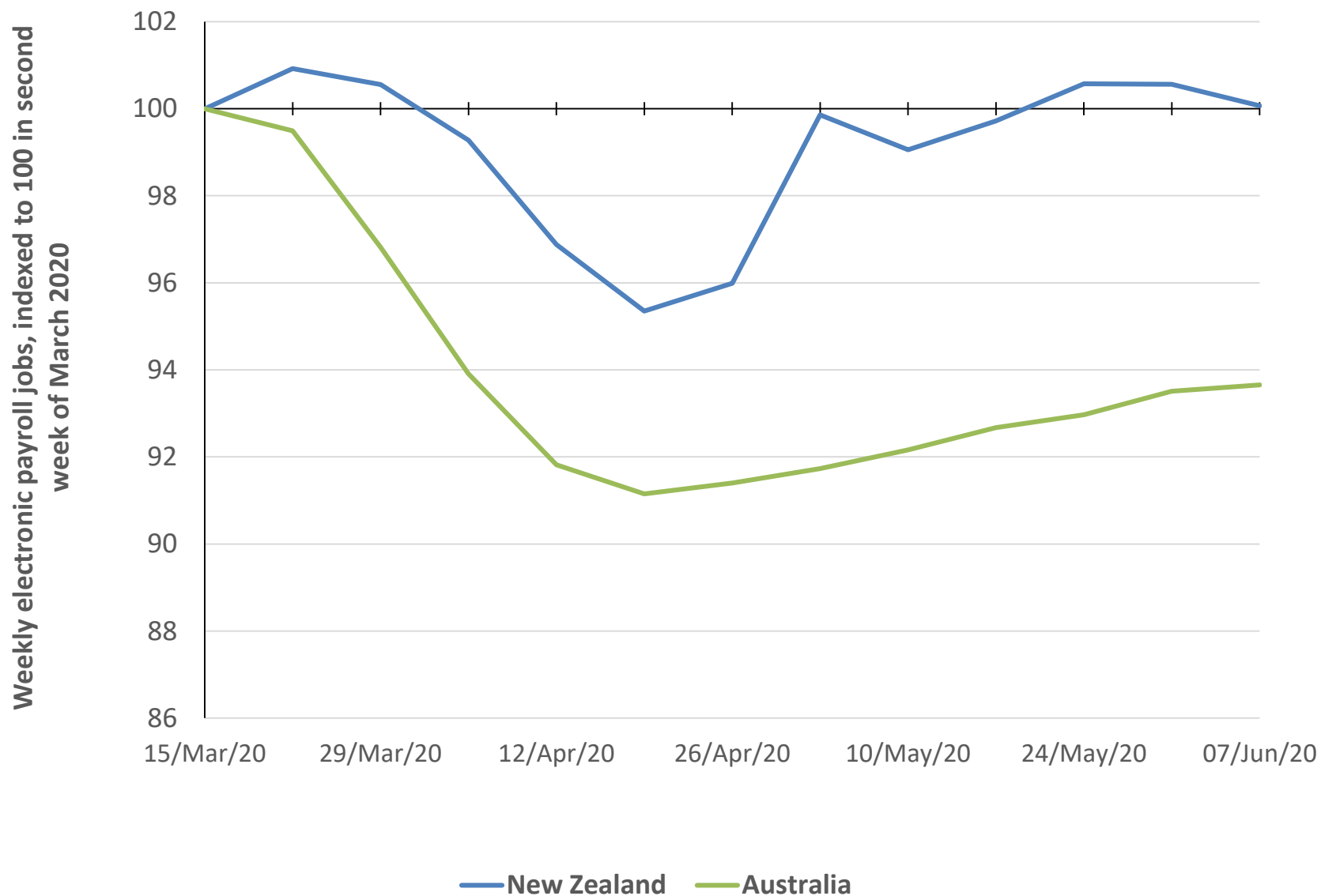
Mitigation:

- Major NZ Government economic stimulus
- Job creation programmes (eg, conservation work)
- NZers shifting from international to domestic tourism

Outcomes:

- Collapse of international tourism / international students (but 60% of tourism was domestic)
- Increased unemployment but many other indicators show return to normal or even improvements (eg, monthly earnings up, stock exchange up, major exports up (dairy, meat, fruit))

Preliminary weekly electronic payroll jobs estimates for NZ & Australia



Summary

- Elimination success by “Team of 5 Million” (lowest deaths in OECD)
- Countries using a suppression strategy – worse health and economic impacts and risk of further lockdowns (eg, as per Melbourne)
- Some adverse economic impact for NZ – but also some bounce back
- NZ still at some small risk of border control failures – still gaps to address in its defences (eg, improved contact tracing, mask policy)

