The COVID-19 elimination strategy: Implications and opportunities for NZ

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Outline

- Strategic choices for pandemic responses
- Components of COVID-19 elimination strategy
- Impact of the elimination strategy
- Key Questions about Elimination
- Conclusions
- Key lessons for the future





Learn

Assessing Pandemics





Assessing pandemics

Factors influencing response to pandemics, include:

- Transmissibility of pathogen Ro, Reff
- Severity particularly case fatality risk (CFR) & infection fatality risk (IFR)
- Inequalities impact of pandemic & response
- **Controllability** effectiveness of interventions
- Feasibility of response public sector capacity to respond, public acceptability & adherence
- Economics cost of action and inaction, counterfactuals
- **Certainty** availability & quality of information, science capacity, awareness of options, experience/dogma



Strategic Choices for Pandemic Responses

Estimated mortality from COVID-19 pandemic in NZ:

- Modelled, assuming Ro=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

• 1918 influenza pandemic = 9,000 deaths (0.8% population)

Source: Wilson et al, University of Otago 2020.

Strategic Choices for Pandemic Responses

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





Strategic choices for pandemic responses: Light-bulb moments

- 1. January 2020 It's a serious global pandemic
- 2. February 2020 It can be contained/eliminated

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 for Pandemic Response



Source: Dowdle, MMWR Supple. December 1999 / 48 (SU01);23-7



Strategic Choices for Pandemic Responses

Mitigation strategy

- Pandemic influenza plan
- Aims to 'flatten the peak'
- Used by NZ for COVID-19 until mid-March
- Widely used in Europe & North America
- Sometimes linked to 'Herd immunity'
- Often evolved to Suppression strategy



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

Strategic Choices for Pandemic Responses

Elimination strategy

- Developed for COVID-19 in NZ in Feb-March 2020
- Effectively adopted by NZ Gov on 23 March with decision to pursue rapid lockdown with ~100 COVID-19 cases, no deaths

New Zealand's elimination strategy for the COVID-19 pandemic and what is required to make it work

Michael G Baker, Amanda Kvalsvig, Ayesha J Verrall, Lucy Telfar-Barnard, Nick Wilson

In this editorial we summarise the threat posed by the COVID-19 pandemic, the justification for the elimination strategy adopted by New Zealand, and some of the actions required to maximise the chances of success.

What is the size and nature of the threat?

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has shown a relentless ability to infect the world's population. The virus is highly infectious, with each case typically infecting 2–3 others (a reproduction number [Ro] of about 2.5). the fact that populations take measures to protect themselves.³ Under one of the more likely scenarios if the country's current elimination strategy fails, New Zealand could expect approximately 14,400 deaths.³ In addition, large numbers of people who are ill and hospitalised could swamp health services at all levels and prevent the delivery of elective services and preventive care.

A poorly controlled pandemic will greatly increase health inequities. Like seasonal influenza in New Zealand, risk is particularly concentrated in older people and those with severe comorbidities.⁴ Therefore Mapri and Bacific peoples could be more Source: Baker, Kvalsvig, ... Wilson, NZ Med J, 3 April 2020





ESCIONAL STRATEGY AND PLAN OF ACTION For

Measles and Rubella Elimination in the Western Pacific



Components of elimination strategy

Intervention logic for pandemic response strategies



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.

Kvalsvia 2020

Components of 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. Preventing community transmission

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



Elimination: Border Management



Source: Stats NZ

Elimination: Testing & Contact Tracing



Swabbing for Covid-19, Wellington, May 2020



Source: MoH website



Elimination: Hygiene measures

Traditional infectious disease hygiene:

- Stay at home if sick
- Wash your hands
- Respiratory hygiene: cough & sneeze into tissue/elbow

COVID-19 transmission:

- Asymptomatic & presymptomatic source
- Respiratory droplets and aerosols
- -> MASKS

(Mass Masking = source control & some personal protection)

Te Papa Face Mask



Face mask with HELIX iso" Filter





F



"Wear this mask to lower virus sharing."

Dr Michael Baker

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Elimination: Physical distancing (lockdown)

New Zealand COVID-19 Alert Levels Summary

- 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 Zealan dan doverseas, 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, emergen cy 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 Levels1, 2 and 3 apply).

Updated 5 June 2020

Unite against COVID-19

ELIMINATION STRATEGY – New Zealand is working together to eliminate COVID-19									
Alert Level	RiskAssessment	Range of Measures (can be applied locally or nationally)							
Level 4 – Lockdown Likely the disease is not contained	 Communitytransmission is occurring. Wides pread outbreaks and new clusters. 	 Paople instructed to stay at home in their bubble other than for essential personal movement. Safe recreational activity is allowed in local area. Travel is severally limited. Aligatherings cancelled and all public venues closed. 	 Business es dosad exceptiforessentialservices (e.g. supermarkets, pharmacies, clinics, petrol stations) and lifeline utilities. Educational facilities closed. Rationing of supplies and requisitioning of facilities possible. Reprioritisation of healthcare services. 						
Level 3 – Restrict High risk the disease is not contained	 Community transmission might be happ ening. New clusters may emerge but can be controlled through testing and contact tracing. 	 Paople instructed to stayhome in their bubble other than for as sertial 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), orone metre in cortrolled environments like schools and work places. Paople musts tay within their immediatehousehold bubble, but can expand this to reconnect with does family / whianau, or bring in caregivers, or support is disted people. This extended bubble should remain exclusive. Schools (years to 10) and Early Childhood Education centres cans afely open, but will have limited capacity. Childron should learn athome if possible. People must twork from homeunies that is not possible. Business es can open premises, but cannot physically interact with customers. 	 Low risk local recreation activities are allowed. Publicvenues are closed (e.g. libraries, museums, cinemas, food courts, gyms, pools, playgrounds, markets). Gatherings of up to 10 people are allowed butonly for wedding services, funerals and tanginanga. Physical distancing and public health measures must be maintained. Healthcare services use virtual, non-contact core distainers, with limited exemptions for others). Paople at high risk of severe liness (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	 Household transmission could be occurring. Single or is okted cluster outbreaks. 	 People can reconnect with friends and family, and socialisein 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 storage. Keep onemetre physical distancing in controlled environments like workplaces, where practicable. No more than 100 people at gatherings, including weldings, birthdays and funensis and tangharga. Business es can open to the public if following public health guidance including physical distancing and record keeping. Alternative ways of working are encoursiged where possible. Hospitality businesses must keep groups of customers separated, seated, and served by a single person. Maximum of 100 people at atime. 	 Sport and recreation activities are allowed, subject to conditions on gatherings, record basping, and – where practical–physical distancing. Public weaks such as museums, Ibraries and pools can open if they comply with public health measures and ensure 1 metre physical distancing and record basping. Event facilities, including chemas, stadiums, concert weaks and can inco 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 schools, early learning services and tertiary education. There will be appropriate measures in place. Poople at higher-risk of severelliness from COV D-19 (ag, those with underlying medical conditions, aspecially If not will-controlled, and senior§ are encounged 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	 COMD-19 is uncontrolled oversess. Isolated household transmission could be occurring in New Zealand. 	 Border entrymeasures to minimise risk of importing COVID-19 cases. Intensive testing for COVID-19. Rapid contact tracing of any positive case. Self-is diation and quarantine required. Schools and workplaces open, and must operate safely. No restrictions on personal movement but people are encouraged to maintain a record of where they have been. 	 No restrictions on gatherings but organisers encouraged to maintain records to enable contracttracing. Stay home if you'resick, reportflu-like symptoms. Was hand dry hands, cough into elbow, don't touch your face. No restrictions on domestic transport – avoid public transport or travel if sick. No restrictions on work places or services but they are encouraged to maintain records to enable contact tracing. 						



Elimination: Physical distancing (lockdown)

Our World in Data



COVID-19: Government Response Stringency Index

The Government Response Stringency Index is a composite measure based on nine response indicators including

Source: Hale, Webster, Petherick, Phillips, and Kira (2020). Oxford COVID-19 Government Response Tracker - Last updated 5 August, 01:30 (London time)

Note: This index simply records the number and strictness of government policies, and should not be interpreted as 'scoring' the appropriateness or effectiveness of a country's response. OurWorldInData.org/coronavirus • CC BY





Main motorway into Wellington, Alert Level 4, May 2020



Impact of Elimination Strategy

Source: Baker, Wilson, Anglemyer. NEJM e56 DOI: 202010.1056/NEJMc2025203, 20 August 2020



Impact of Elimination Strategy Death rate from COVID-19, OECD countries

COVID-19 cumulative death rate (per million)



Impact of elimination strategy Infection Fatality Risk

Donald trump – Risk factors

- Age = 74 years
- BMI = 30
- Income = low (\$750 federal income tax in 2016)
- Homeless (impending eviction)



Over-75s remain the most at-risk

Infection-fatality rate by age group in England



Source: MRC Biostatistics Unit, University of Cambridge (12 October)

12%

Impact of elimination strategy Equity and 'Social Safety Net'

- Elimination protects vulnerable populations from pandemic infections
 → inherently pro-equity
- But, vulnerable populations exposed to **unintended consequences**:
 - Direct effects of interventions, such as lockdowns
 - Indirect effects from economic recession
- Need for economic & social support Eg,
 - Income support
 - Food security
 - Healthcare access

Food Bank at Kokiri Marae, Wellington



Key Questions and Conclusions about Elimination Strategy

- 1. Is Elimination **Sustainable**?
- 2. Does Elimination **Protect the Economy** or Sacrifice it?
- 3. Is Elimination Generalisable to **Diverse Jurisdictions**?
- 4. Is Elimination Generalisable to Diverse Pandemics?
- 5. Can elimination be **Done Better**? ie more effectively with less disruption?



1. Is elimination sustainable? **Resurgence planning & management in NZ**

Border failures – 8 known

- Auckland August **Community** cluster 179 cases (incl. 3 deaths)
- Auckland MIQ facility maintenance worker Aug) 1 case 2.
- Auckland **MIQ** facility nurse infected (Sept) 1 case 3.
- Christchurch **MIQ** facility cluster (Sept) 6 cases
- Auckland Marine employee cluster (Oct) 3 cases
- Christchurch **MIQ** facility nurse #1 (Nov) 2 cases
- Christchurch **MIQ** facility nurse #2 (Nov) 1 case
- Auckland **MIQ** armed forces cluster (Nov) 5 cases (incl. Case D + E)





1. Is elimination sustainable? Resurgence planning & management in NZ

Rapid response:

- High levels of testing, **contact tracing**, isolation/quarantine
- Alert level increased during in Auckland Aug Cluster
- Mass masking on public transport & aircraft



2. Does Elimination Protect the Economy?



*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

2. Does Elimination Protect the Economy?

	Country/ jurisdic-	Popul- ation	Peak strin-	Cumulative COVID-19	Case rate	Cumulative	Cumulative mortality rate	GDP change in 2020 (%),		
Region	tion	(millions)	gency	cases	(per million)	deaths	(per million)	(IMF Project)		
European (n=14) and North American (n=2) countries with population > 10 million										
Europe	UK	68.0	79.6	1,574,562	23,145	57,031	838	-9.8		
North Am	USA	331.8	72.7	13,228,456	39,870	269,367	812	-4.3		
Mean		54.1	80.7	1,609,474	26,718	36,622	618	-7.5		
Median		37.9	82.9	621,078	24,933	13,666	606	-7.2		
East Asian and Australasian jurisdictions (n=4) using an elimination strategy (articulated or otherwise)										
East Asia	China	1439.3	81.9	86,490	60	4,634	3	1.9		
East Asia	Taiwan	23.8	30.6	625	26	7	0.3	0.0		
Australasia	Australia	25.6	79.2	27,867	1,088	907	35	-4.2		
Australasia	NZ	5.0	96.3	2,040	408	25	5	-6.1		
Mean		373.4	72.0	29,256	396	1,393	11	-2.1		
Median		24.7	80.6	14,954	234	466	4.0	-2.1		

3. Is Elimination Generalisable to Diverse Jurisdictions? Rate per million of confirmed cases in Victoria (Australia) and UK



C.-Search

Source: Tony Blakely, University of Melbourne

3. Is Elimination Generalisable to Diverse Jurisdictions? Impact of Lockdown on COVID-19 epidemic in Victoria (Australia)



Source: Tony Blakely, University of Melbourne

4. Is Elimination Generalisable to Diverse Pandemics? Near elimination of seasonal influenza in NZ





Source: Huang, et al MedRxiv. Nov 2020

4. Is Elimination Generalisable to Diverse Pandemics? Reduced all-cause mortality & EWM in NZ





Source: Telfar Barnard et al. Submitted Dec 2020

5. Can elimination be done better? More effectively with less disruption

NZ

- 5 million people
- 1,943 Cases = 388 / million
- 25 Deaths = 5 / million
- Stringent lockdown
- Elimination with outbreaks
- No dedicated public health agency
- Mask use not established
- No digital contact tracing
- Late border management

Taiwan

- 24 million people
- 550 Cases = 23 / million
- 7 Deaths = 0.3 / million
- No lockdown
- Sustained elimination
- Dedicated public health agency
- Mask use widely established & promoted
- Digital contact tracing
- Early border management



Source: Summers et al. Lancet Regional Health-Western Pacific. 2020 Oct 21:100044

5. Can elimination be done better?

Moving to an 'all hazards' approach for diverse pandemic threats





Source: Kvalsvig & Baker, J Royal Soc NZ, In press, 2021

Conclusions about COVID-19 Elimination

- **1. Preferable to mitigation/suppression** based on public health, equity, and economic benefits
- **2.** Successful and sustainable in diverse jurisdictions with different geographic, political, and socioeconomic contexts
- Probably the preferred strategy for responding to new
 emerging infectious diseases with pandemic potential and
 moderate to high severity, while key parameters estimated
- 4. Enhanced by investing in public health infrastructure to support effective risk assessment and a rapid evidence-informed response





Key lessons for the future

Effective Science + Good Political Leadership



C This article is more than 2 months old The conversation Five ways New Zealand can keep Covid-19 Coronavirus outbreak cases at zero Modelling shows it is very likely New Zealand has eliminated Michael Baker coronavirus. Keeping it that way is the next big challenge and Nick Wilson Coronavirus - latest updates Mon 8 Jun 2020 04.02 BST • See all our coronavirus coverage ~ 📒 308 205

Key lessons for the future

- Opportunity for broad *reset* and increased focus on managing major global health threats
- Most NZers want a green recovery*
- More *equitable* society also assists with collective action against future threats

*Source: Massey Uni Survey, August 2020. 7/10 NZers want a green recovery. <u>https://www.newstalkzb.co.nz/news/business/seven-</u> in-10-kiwis-want-a-green-covid-19-recovery-survey/



Key lessons for future

Application of elimination approach to other IDs:

Eradicated diseases

Smallpox, Rinderpest

Global eradication underway

• Poliomyelitis (polio), Dracunculiasis, Yaws

Pandemic diseases where elimination is possible

• Emerging ID (eg COVID-19), Pandemic influenza

Regional elimination established or underway

- Measles, Rubella
- Hookworm, Lymphatic filariasis, Onchocerciasis, African trypanosomiasis, Malaria, Rabies,
- Syphilis, nvCJD (from BSE)

Other diseases where elimination proposed

- HIV, Hepatitis B, Hepatitis C, TB
- HPV (cervical cancer), H. pylori (stomach cancer)



Key lessons for future

"COVID-19 is not a pandemic. It is a syndemic." Richard Horton, The Lancet, 26 September 2020

Syndemic Management of the Biology and Treatment of Infections and Chronic conditions (SYMBIOTIC)- New HRC funded programme based at University of Otago, Wellington

Aims to **break the cycle** linking infectious diseases, long-term conditions and poverty



Summary

- Importance of Effective Science + Good
 Political Leadership, with high-quality risk assessment & rapid, decisive response
- Elimination appears to protect health & economy more than alternative mitigation/suppression strategies
- Opportunity to strengthen public health capacity
- Opportunity for major reset towards a more equitable & sustainable society



Can we learn the lessons of history?



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- Based at the University of Otago, multiple collaborations
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- Goal: To support an effective and equitable pandemic response
- Researchers from Universities (x3), CRI, Community group
- Funding from HRC, philanthropic organisations, Universities

Photo credits: Luke Pilkinton-Ching







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