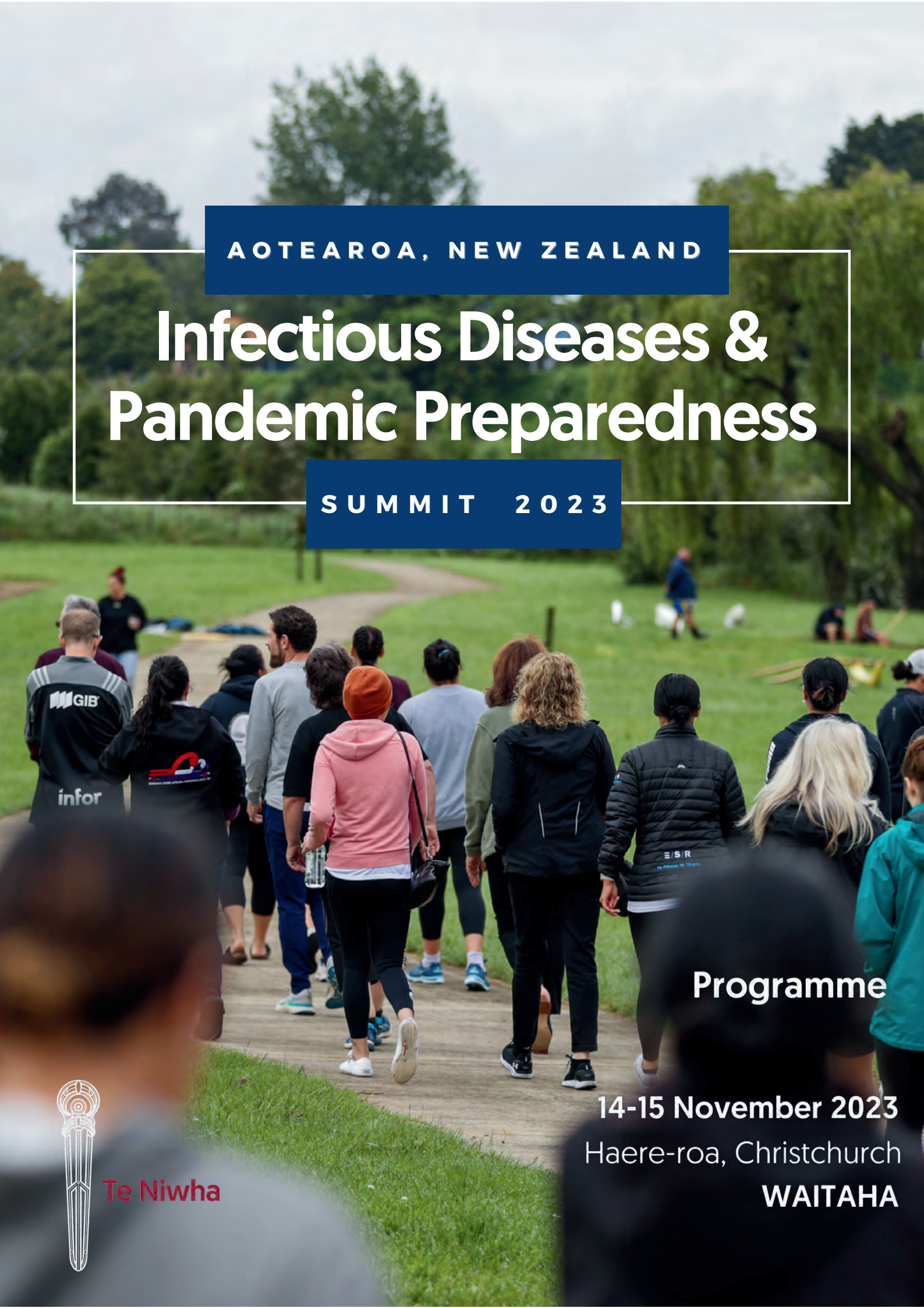


AOTEAROA, NEW ZEALAND

# Infectious Diseases & Pandemic Preparedness

SUMMIT 2023

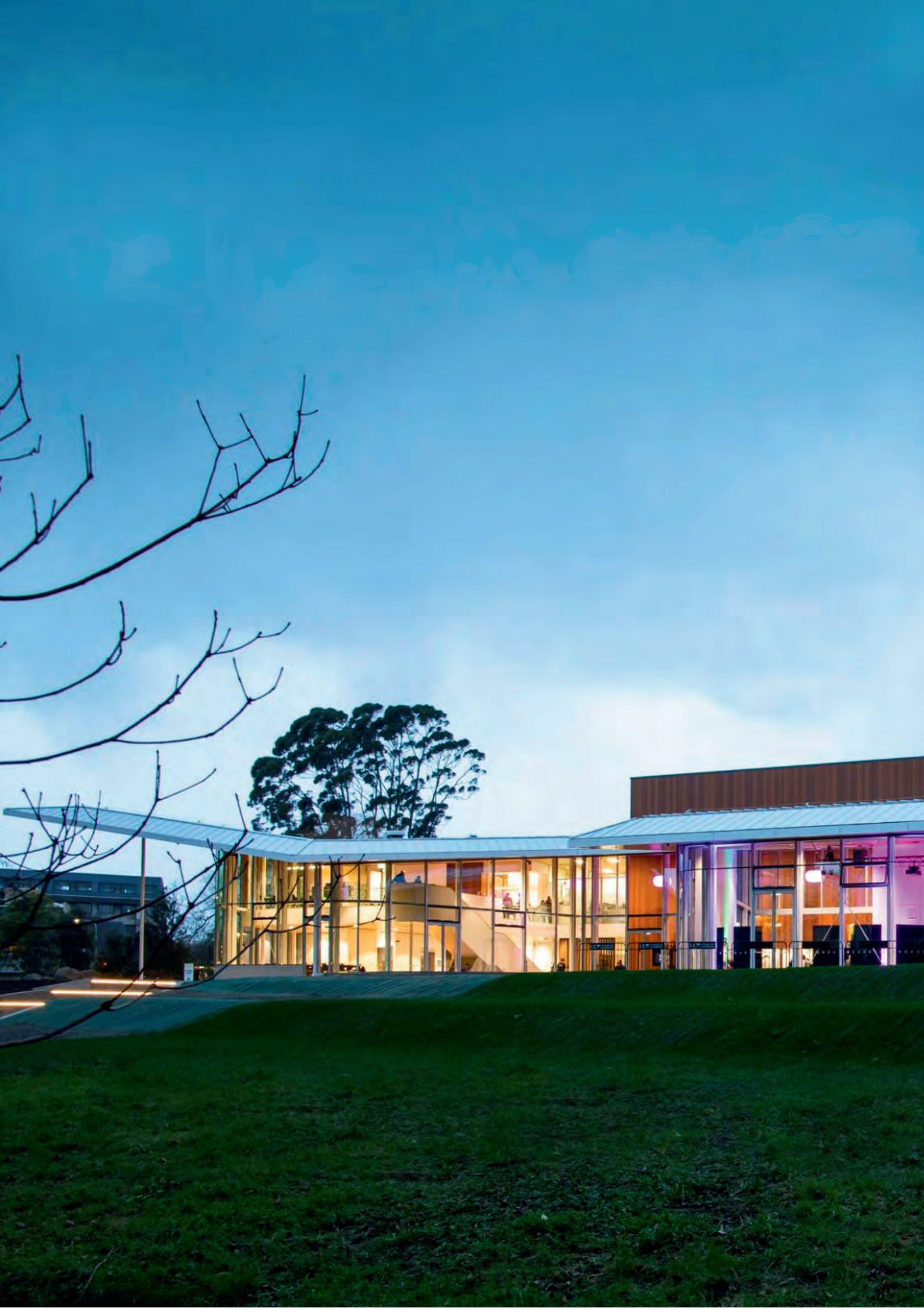
## Programme

**14-15 November 2023**

Haere-roa, Christchurch

**WAITAHA**

Te Niwha



# MIHIMIHI

## Kia niwha te ngaakau ki ngaa mahi atawhai i te iwi

*Kiingi Taawhiao*

He hoonore he kororia
he maungarongo ki runga te whenua oo Waitaha
nei raa aku mihi whakaiti aku whakaaro pai ki ngaa ruunaka
ki ngaa mana whenua
ki ngaa ahi kaa
otira ki a koutou katoa
nau mai haere mai ki teenei hui taumata mate urutaa
teenaa koutou
teenaa koutou
teenaa koutou katoa

It has been a year since we launched Te Niwha at Tuurangawaewae marae. In that time, Te Niwha has developed our strategic and operational infrastructure and made strides towards our Mission of building world-class research capability for pandemic preparedness and emerging and current infectious diseases. Te Niwha recently released the research projects, leaders within their research priority areas we have commissioned. We are proactively commissioning.

We have thought very hard about the programme and you will find strong and joined up sessions from on the ground to international, transdisciplinary approaches to diagnostic and therapeutic technologies. The short talks offer a range of speakers and to save choosing which to go to - we will listen to each, together.

It is an honour to have you with us, we look forward to meeting again,

Ngaa manaakitanga

Te Pora Thompson & Professor Nigel French
Director Chief Science Advisor

Te Niwha

# HAERE ROA

Opened in 2019, Haere-Roa serves as the centre for University of Canterbury's Student Association and a hub for student welfare and advocacy, as well as student club, meeting, hospitality and event spaces.

The name Haere-roa, translated as the longest stream or the long wanderer, was gifted to the UCSA by mana whenua, Ngāi Tūāhuriri and is linked to the Ōtākaro Avon River, which flows past the site.

A respectful relationship to the landscape was formed by engagement with UC Mana Whenua Cultural Narrative with ecological enhancements of native flora and fauna to ensure Haere-roa is a place where respect for water, land and people are acknowledged.

# Tuesday 14 November

**Registrations open from 8.00am**

**9.00 am** Mihi Whakatau

**9.30 am** Opening Kōrero: Te Pora Thompson & Dr Fiona Cram

**9.45 am** **Session ONE:** Iwi Māori Pandemic and Infectious Diseases Response

This keynote shares an insight into the local, regional and national response experience during the recent COVID-19 pandemic. We will hear about the challenges and opportunities for research.

**Keynote**: Kaiwhakahaere Lisa Tumahai
**Chaired by:** Rahui Papa

**10.30am** **Kapu Tī** - Morning Tea served in the atrium

**10.45 am** **Session TWO:** Pandemic Preparedness Perspectives: Insights, Initiatives, & Equity Actions

A global perspective on pandemic preparedness and specific insights on the COVID-19 response in the Pacific Region and internationally. The panel will discuss the unique proposition Aotearoa New Zealand has to offer towards global efforts for equity.

**Speakers:** Sir Andrew Pollard, Riki Nia Nia & Dist. Professor David Murdoch
**Chaired by:** Dame Karen Poutasi

**11.45 am** **Session THREE:** Lifting Future Leaders of Aotearoa Infectious Diseases Research

The Te Niwha Mission is to build world-class research capability in Aotearoa New Zealand. It Is incumbent upon us all to support our emerging leaders by nurturing the development of emerging researchers. Te Niwha will introduce our future leaders of infectious diseases research: Te Niwha scholarship recipients will speak to their projects.
**Special Guest Speaker:** Sir - Tā Jerry Mateparae

**12.15pm** **Tina - Lunch** will be served in the atrium **during Poster Presentations**

**1.15 pm** **Session FOUR:** Diagnostics, Therapeutics & Vaccine Development: A spotlight on New Advancements

With a reliance on innovation and advances in biomedical research - speakers in this session will share insights into new initiatives rounding with a panel discussion on the opportunities to be biomedically prepared for future pandemics and outbreaks, and how to nurture, support and build capabilities in these fields.

**Speakers & Panellists:** Professor Gary Evans, Dr Natalie Netzler (Te Niwha Project), Professor Richard Beasley & Dr Rebecca McKenzie.
**Chaired by:** Dr Lucia Schweitzer

**2.20pm** **SHORT TALKS** **Chair:** Dr Natalie Netzler

| Speakers | Kōrero - Talk |
|---|---|
| **Dr Amy Scott-Thomas**<br>University of Otago | **Te Niwha Research Project** \| Using bacterial cell-free DNA to detect infectious disease with ease. |
| **Dr Craig Billington**<br>ESR | **Te Niwha Research Project** \| Rapid point-of-use testing for infectious diseases in the community. |
| **Richard Dean**<br>ESR | On deploying mobile deep learning for rapid point-of-use testing. |
| **Assoc. Prof. Mark Thomas**<br>University of Auckland | **Te Niwha Research Project** \| Addressing inequity in antibiotic use: strengthening antimicrobial stewardship throughout Aotearoa to improve the health of New Zealanders. |
| **Dr Colin McArthur**<br>MRINZ | **Te Niwha Research Project** \| The Randomised Embedded Multifactorial Adaptive Platform Community Acquired Pneumonia (REMAP-CAP) Trial: what have we learned and where are we going? |

**3.00 pm** **Kapu Ti - Afternoon Tea** will be served in the atrium

**3.30 pm** **SHORT TALKS** - Continued **Chair**: Dr Tim Chambers

| Speakers | Kōrero - Talk |
|---|---|
| **Dr Samuela Ofanoa**<br>Moana Connect | Impact of COVID-19 on Pacific people's vaccination beliefs and behaviours rates: Preliminary findings. |
| **Faletoese Asafo**<br>Moana Connect | Impact of Respiratory viruses on Pacific families with pre-school children in Auckland, Aotearoa New Zealand |
| **Chanae Ihimaera**<br>Te Whatu Ora | Moving forward from invisibilisation and silencing of Pacific peoples population health data |
| **Dr Jerram Bateman &**<br>**Dr Karyn Maclennan**<br>University of Otago | **Te Niwha Research Project** \| Supporting antiretroviral therapy (ART) uptake and adherence for people living with HIV in Aotearoa New Zealand (StART) |

# Tuesday 14 November

**SHORT TALKS** - Continued

| Speakers | Kōrero - Talk |
|---|---|
| **Dr Julie Bennet**<br>University of Otago | **Te Niwha Research Project \|** Hurts less, lasts longer: Applying Maori and Pacific patient-centered models to implement subcutaneous infusions of high dose penicillin to prevent RH disease. |
| **Professor Cameron Grant**<br>University of Auckland | The ARROW Trial: Prevention of Wheezy Illness Healthcare Visits in Preschool-Aged Children |
| **Adj. Prof. Alex Semprini**<br>MRINZ | **Te Niwha Research Project \|** Addressing gaps in the surveillance and response to influenza-like illness: Community pharmacy-based feasibility study |
| **Assoc. Prof. Andy Anglemyer**<br>University of Otago | Population and contact tracer uptake of New Zealand's QR-code-based digital contact tracing app |
| **Dr Sijin Zhang**<br>ESR | JUNE-NZ: an Artificial Intelligence enabled infectious disease modelling framework for Aotearoa |
| **Melemafi Porter**<br>MRINZ | **Te Niwha Research Project \|** Time to seriously consider needle length for IM vaccination |
| **Professor Peter McIntyre**<br>University of Otago | **Te Niwha Research Project \|** Safety and immunogenicity of Measles, Mumps, Rubella (MMR) vaccine delivered by aerosol or intradermally versus standard intramuscular in young adults |
| **Professor Michael Plank**<br>University of Canterbury | Estimating the number of lives saved by Covid-19 vaccines in Aotearoa New Zealand |

**5.00 pm** **Day ONE complete**

Abstracts are at the end of programme and available on TeNiwha.com

# Wednesday 15 November

**7.30-8.30 am** **Parakuihi - Breakfast**
prepared and served by Te Niwha Team & Haere Roa

**8.45 am** **WORKSHOP:** Te Tiriti o Waitangi, Relationships & Partnerships in Research

An interactive session unpacking Te Tiriti o Waitangi principles in research and to gain insight to the importance of being engaged with whānau, marae, hapū and iwi to form authentic and enduring relationships and partnerships for research. Participants can submit their questions in advance at: https://ybl5a74cpgu.typeform.com/to/jdFVclHy

Facilitator: Rahui Papa
**Chaired by:** Tegan Porima-Friend

**9.45 am** **SHORT TALKS** **CHAIR:** TEGAN PORIMA-FRIEND

| Speakers | Kōrero - Talk |
|---|---|
| **Janell Dymus**<br>Ngā Rangatahi ā Iwi | **Te Niwha Whanake Rangahau Project** \| Ngā Kawenga i Rangiātea |
| **Assoc. Prof. Marama Muru-Lanning**<br>University of Auckland | **Te Niwha Research Project \|** Pai atu te ārai atu i te mate i te rongoā i te mate |
| **Dr. Sarah Jefferies**<br>ESR | Ethnic Equity in Aotearoa New Zealand's COVID-19 Response: A descriptive epidemiological study |
| **Assoc. Prof. Amanda Kvalsvig**<br>University of Otago | Community surveillance of respiratory infections: a critical void in Aotearoa New Zealand. |

**10.30am** **Kapu Tī - Morning Tea** will be served in the atrium

**11.00 am** **SESSION SIX:** Is It a Bird? Is It a Plane? Interdisciplinary Partnerships Facilitating Future Pandemic Preparedness

The multifaceted aspects of surveillance and response to zoonotic pathogens must take an interdisciplinary and interagency approach. Our panellists will explore the state of preparedness in Aotearoa New Zealand when it comes to these scenarios, highlighting both strengths and areas for enhancement.

**Speakers & Panellists:** Professor Michael Bunce, Dr Emma Sumner, Bex Joslin & Dr Fiona Callaghan
**Chaired by:** Dist. Professor Nigel French

# Wednesday 15 November

**12.15 pm** **Tina - Lunch** will be served in the atrium

**12.45 pm** **SHORT TALKS** **CHAIR:** Professor Michael Plank

| Speakers | Kōrero - Talk |
|---|---|
| **Dr Brent Gilpin** ESR | Unravelling the mysteries of Yersiniosis in Aotearoa |
| **Dr Jo Chapman** ESR | **Te Niwha Research Project \|** Making use of wastewater from aircraft and individual buildings for better infectious disease epidemiology and response |
| **Dr Tim Chambers** University of Otago | **Te Niwha Research Project \|** A national burden of disease analysis of water-borne disease in Aotearoa New Zealand from community drinking water infrastructure |
| **Dr Lucia Rivas & Maria Hepi** ESR | **Te Niwha Research Project \|** Understanding the surveillance barriers and the health burden of emerging disease threats for Aotearoa: Vibrio as a case study |
| **Dr Una Ren & Tia Haira** ESR | **Te Niwha Research Project \|** Community-based surveillance of severe bacterial pathogens to guide prevention and control |
| **Dr Anna Brooks** University of Auckland | Long Covid: the quest to characterise immune dysfunction |
| **Professor Paula Lorgelly** University of Auckland | Establishing a Long COVID Registry in Aotearoa New Zealand: early results from Mātauranga Raranga on the health and quality of life impacts of long COVID |

**1.45 pm** **SESSION SEVEN:** Likely Pandemic Agents and Scenarios

Te Niwha launch the report: "Likely Future Pandemic Agents and Scenarios: An epidemiological and public health framework". This Te Niwha funded and Ministry of Health partnered strategic project will be discussed by the members of the project team who will present their findings and discuss the implications.

**Speakers & Panellists:** Dist. Professor Nigel French, Professor Michael Plank, Professor Jemma Geoghegan, Professor Michael Baker, Dr Pippa Scott, Dr Fiona Callaghan and Assoc. Professor Amanda Kvalsvig,, Dr Pippa Scott, Dr Fiona Callaghan and Assoc. Professor Amanda Kvalsvig,
**Chaired by:** Te Pora Thompson

**3-3.30 pm** **WHAKAKAPI - CLOSING**

# NGA KAIKŌRERO MANUWHIRI
# SPECIAL GUEST SPEAKERS

## DR FIONA CRAM
Ngāti Pahauwera

**OPENING ADDRESS**

Dr Fiona Cram is a social psychologist and **founder of Katoa Ltd.**, an indigenous research organisation. Alongside Professor John Fraser Fiona is **Co-Chair of the Te Niwha Steering Group.** She was previously a Senior Research Fellow and Deputy Director of the International Research Institute for Māori and Indigenous Education at the University of Auckland, and a Visiting Research Fellow at the Eru Pomare Māori Health Research Centre, Otago School of Medicine, Wellington.

## LISA TUMAHAI
Ngāti Waewae

**KEYNOTE**: IWI MĀORI PANDEMIC AND INFECTIOUS DISEASES RESPONSE

Lisa is **Kaiwhakahaere (Chairperson)** of Te Rūnanga o Ngāi Tahu. She has served in tribal governance for over 20 years and has held the role of Kaiwhakahaere for the last seven. She is an active leader for her hapū, Ngāti Waewae, and a commercial director for her Papatipu Rūnanga (Marae entity) on Te Tai Poutini West Coast. Throughout the duration of the Covid-19 Pandemic, Lisa served as co-chair of the Pandemic Response Group for National Iwi Chairs Forum alongside Mike Smith, providing leadership and guidance to iwi Māori and Māori groups seeking advocacy and support to elevate critical needs for Māori and reprioritising policy programmes of the Crown.

## RIKI NIA NIA
Ngāti Kahungunu,
Ngāi Tūhoe, Tonga

**SPEAKER**: PERSPECTIVES ON PANDEMIC PREPAREDNESS: INSIGHTS, INITIATIVES, AND EQUITABLE ACTION

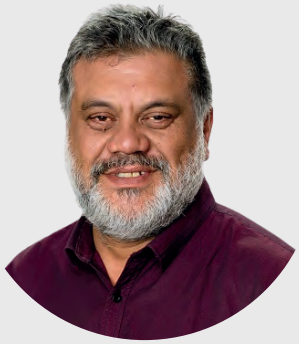
Riki is the **Chief Executive Officer** for Te Rau Ora - Te Rau Ora is a national Māori organisation committed to improving Māori Health through leadership, education, research and evaluation, health workforce development and innovative, systemic transformation. Riki has significant health sector and workforce leadership experience across 25 years of executive leadership in District Health Boards and most recently as the interim District Co-Director of Te Whatu Ora Waikato and the interim Regional Director Te Manawa Taki for Te Aka Whai Ora.

# NGA KAIKŌRERO MANUWHIRI
# SPECIAL GUEST SPEAKERS

## SIR ANDREW POLLARD

**SPEAKER**: PERSPECTIVES ON PANDEMIC PREPAREDNESS: INSIGHTS, INITIATIVES, AND EQUITABLE ACTION

Sir Andrew is **Director** of the Oxford Vaccine Group in the Department of Paediatrics at the University of Oxford and a consultant paediatrician at Oxford Children's Hospital and Fellow of St Cross College. His research includes novel observations on the B cell response in early childhood, the design, development and clinical evaluation of vaccines in UK, Asia, Africa and Latin America. He was the chief investigator for the clinical trials of the Oxford-AstraZeneca COVID-19 vaccine, which led to authorisation of the vaccine for use in more than 180 countries with over 3 billion doses distributed.



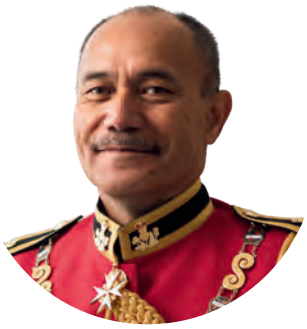
## RAHUI PAPA

Ngāti Korokī Kahukura

**SUMMIT MASTER OF CEREMONIES** & **WORKSHOP FACILITATOR**: TE TIRITI O WAITANGI, PARTNERSHIP AND RELATIONSHIPS IN RESEARCH

Rahui Papa is Chair of Ngāti Korokī Kahukura, Orator and Spokesperson with a background in Broadcasting, Education, Settlement Negotiations and Governance. Rahui has served as a Director on Iwi, Maaori and Non-Maaori holding companies as well as ministerial committees, national and local boards.

Rahui plays an integral role in the Iwi Leaders' Forum, providing advice to Ministers and Crown officials on matters of national significance.



## TA JERRY MATEPARAE

Ngāti Tūwharetoa, Ngāti Kahungunu

**SPEAKER**: PERSPECTIVES ON PANDEMIC PREPAREDNESS: INSIGHTS, INITIATIVES, AND EQUITABLE ACTION

Tā Jerry Mateparae is the current Healthier Lives Governance Group and Kāhui Māori Chair and a member of Te Taumata Niwha for Te Niwha. Tā Jerry has spent almost 50 years in public service. He has a Master of Arts with First Class Honours from the University of Waikato, and was recognised as one of their distinguished alumni in 2009. In May 2011, Sir Jerry received an honorary doctorate from Massey University.

He was awarded Singapore's highest military award, the Darjah Utama Bakti Cemerlang (Tentera) [Distinguished Service Order (Military)], from the President of Singapore, S R Nathan, in May 2011.

# NGA KAIKŌRERO MATUA
# PANEL SESSION SPEAKERS

DR NATALIE NETZLER
Ngaati Ruanui, Ngaati Hauaa, Ngati Haamoa

**SPEAKER:** SESSION 4 | DIAGNOSTICS, THERAPEUTICS AND VACCINE DEVELOPMENT: A SPOTLIGHT ON NEW ADVANCEMENTS

Natalie is a **Senior Lecturer** at the Faculty of Medical and Health Sciences, Molecular Medicine and Pathology at the University of Auckland. She is a virologist with Samoan, Māori and European heritage. Natalie has a PhD in virology from the University of New South Wales in Australia and is interested in the development of antivirals, vaccines and the impact of genetics on viral infection susceptibility and clinical outcomes.

DR REBECCA MCKENZIE

**SPEAKER:** SESSION 4 | DIAGNOSTICS, THERAPEUTICS AND VACCINE DEVELOPMENT: A SPOTLIGHT ON NEW ADVANCEMENTS

After completing her PhD on CRISPR-Cas technology, Rebecca returned to New Zealand in 2021 to work at The Malaghan Institute of Medical Research as a **Postdoctoral Research Fellow** for the Vaccine Alliance Aotearoa New Zealand (VAANZ). As part of the Molecular Biology team in the Hugh Green Cytometry Centre she is focused on building the capabilities to produce RNA for pre-clinical vaccine and therapeutic research and their translation to the clinic.

BEX JOSLIN

**SPEAKER:** SESSION 6 | IS IT A BIRD? IS IT A PLANE? INTERDISCIPLINARY PARTNERSHIPS FACILITATING FUTURE PANDEMIC PREPAREDNESS

Bex is **Manager for Surveillance and Standards** at the Ministry of Health. Bex studied Psychology and Educational Psychology at Victory University of Wellington, followed by a Postgraduate Diploma in Education, Counselling and Guidance at Massey University.

EMMA SUMBER

**SPEAKER:** SESSION 6 | IS IT A BIRD? IS IT A PLANE? INTERDISCIPLINARY PARTNERSHIPS FACILITATING FUTURE PANDEMIC PREPAREDNESS

Emma is a **veterinary epidemiologist** and subject matter expert for the Ministry of Primary Industries with animal disease control core capabilities. Liaising with internal and external stakeholders, including all-of-government agencies, industry representatives and partners in the formulation and development of animal disease policies. Current responsibilities and projects include:

DR PIPPA SCOTT

**SPEAKER:** SESSION 6 | IS IT A BIRD? IS IT A PLANE? INTERDISCIPLINARY PARTNERSHIPS FACILITATING FUTURE PANDEMIC PREPAREDNESS

Pippa is an **Epidemiologist** working in the Public Health Agency within Manatū Hauora. Her previous research interests include methods of assessment of vaccine related data, as well as infectious disease transmission. Her move to government work began in 2020 near the beginning of the COVID-19 pandemic, and she now works within a team providing analysis and insights into a range of public health topics.



Te Niwha · University of Otago · E/S/R Science for Communities He Pūtaiao, He Tāngata · Ministry of Business, Innovation & Employment Hīkina Whakatutuki · Manatū Hauora

DR FIONA CALLAGHAN

**PANELLIST**: SESSION 6 | IS IT A BIRD? IS IT A PLANE? INTERDISCIPLINARY PARTNERSHIPS FACILITATING FUTURE PANDEMIC PREPAREDNESS & **PANELLIST**: SESSION 7 | LIKELY PANDEMIC AGENTS

Fiona is the **Chief Advisor (Epidemiology)** for the Intelligence, Surveillance and Knowledge group in Aotearoa's Public Health Agency. Fiona gained her PhD at the University of Pittsburgh School of Public Health, and began her career at the FDA and NIH in the US, before moving into epidemiological research positions in the biotechnology industry. Fiona joined Aotearoa's COVID-19 response in 2020, stepping into her current role in July 2023.

PROFESSOR
GEMMA GEOGHEGAN

**SPEAKER**: SESSION 7 | LIKELY PANDEMIC AGENTS

Jemma holds the **Webster Family Chair in Viral Pathogenesis** and is a Rutherford Discovery Fellow at the University of Otago in the Department of Microbiology and Immunology. She is an evolutionary virologist with a strong research focus on emerging infectious disease. Her research focuses on determining the fundamental patterns and processes of viral evolution, ecology and emergence. Jemma's research involves using metagenomics to reveal the diversity, structure and evolution of the virosphere; examining the evolution of major viral infections, including SARS-CoV-2; and developing new analytical and computational approaches to analyse aspects of virus evolution. Jemma holds a joint position at the Institute of Environmental Science and Research.

ASSOC. PROF.
AMANDA KVALSIG

**PANELLIST**: SESSION 7 | LIKELY PANDEMIC AGENTS

Amanda has a dual background in clinical paediatrics and epidemiology, and is a **Research Associate Professor** in the Department of Public Health, University of Otago. Her research activities currently have a strong focus on New Zealand's response to the COVID-19 pandemic; she is the lead researcher of Co-Search, a COVID-19 research collaborative and SYMBIOTIC, a newly-funded HRC programme which aims to investigate the two-way relationships between infectious disease and long-term conditions.

Amanda's other research interests are centred on the social determinants of health and wellbeing: topics include other infectious diseases (particularly meningococcal disease), breastfeeding, child poverty, and early child development.

DIST. PROFESSOR
DAVID MURDOCH

SPEAKER: SESSION 2 | PANDEMIC PREPAREDNESS PERSPECTIVES: INSIGHTS, INITIATIVES, & EQUITY ACTIONS

David is the **co-leader of The Infection Group** at the University of Otago and a Senior Associate in the Department of International Health at Johns Hopkins School of Public Health, and a clinical microbiologist at Canterbury Health Laboratories. David served as Vice-Chancellor of the University of Otago from February 2022 to March 2023. David's main research interests are the epidemiology, diagnosis and prevention of respiratory tract infections, pneumococcal disease, legionellosis, bloodstream infections, and the role of vitamin D in infectious diseases.

PROFESSOR
RICHARD BEASLEY

**SPEAKER**: SESSION 4 | DIAGNOSTICS, THERAPEUTICS AND VACCINE DEVELOPMENT: A SPOTLIGHT ON NEW ADVANCEMENTS

Richard is a physician at Wellington Regional Hospital, **Director** of the Medical Research Institute of New Zealand, and Professor of Medicine at Victoria University of Wellington. He is an Adjunct Professor at the University of Otago and Visiting Professor, University of Southampton, United Kingdom.

# NGA KAIKŌRERO MATUA
# PANEL SESSION SPEAKERS

PROFESSOR
MICHAEL BUNCE

**SPEAKER:** SESSION 6 | IS IT A BIRD? IS IT A PLANE? INTERDISCIPLINARY PARTNERSHIPS FACILITATING FUTURE PANDEMIC PREPAREDNESS

Michael was appointed as the **Chief Science Advisor** at the Department of Conservation in 2022. He studied genetics, followed by a PhD in virology. He then applied his DNA skills within the field of ancient and environmental DNA, where he spent the next 20 years (at Universities in Oxford, Canada and Australia) extracting DNA from a wide variety of biological material. In 2019, he took up the position of Chief Scientist at the EPA but in 2020 was seconded into Aotearoa's COVID-19 response, where he wrote science advice and policy.

PROFESSOR
GARY EVANS

**SPEAKER:** SESSION 4 | DIAGNOSTICS, THERAPEUTICS AND VACCINE DEVELOPMENT: A SPOTLIGHT ON NEW ADVANCEMENTS

**Director** of Te Kāuru - Ferrier Research Institute, Gary has recently served as the Chief Science Advisor at MBIE for four years. With a chemistry background, he boasts 100+ publications, 15 US patents, and an H-index of 43. He played a pivotal role in developing Mundesine, Ulodesine, and Galidesivir, collectively licensed for millions of NZD. His applied research earned him the inaugural MacDiarmid Medal from the New Zealand Royal Society.

PROFESSOR
MICHAEL BAKER

**SPEAKER:** SESSION 7 | LIKELY PANDEMIC AGENTS

Michael is a **public health physician and Professor** in the Department of Public Health at the University of Otago. He has a wide range of public health research interests, with a focus on infectious diseases, environmental health, and improving housing conditions. He took a leading role in shaping New Zealand's Covid-19 pandemic response, particularly the elimination strategy. Michael leads a multidisciplinary research group, the Health Environment & Infection Research Unit (HEIRU), which has researched and published extensively on Covid-19 and pandemic preparedness. He has a strong interest in science communication and directs the newly launched Public Health Communication Centre.

PROFESSOR
MICHAEL PLANK

SPEAKER: SESSION 7 | LIKELY PANDEMIC AGENTS

Michael is a **Professor in Applied Mathematics** at Te Whare Wānaga o Waitaha | University of Canterbury. During the pandemic, he played a leading role in mathematical modelling of Covid-19 to inform the government response. He has also devoted significant effort to public communication about the contribution of modelling to the pandemic response strategy. He has ongoing research interests in mathematical modelling for pandemic preparedness and response.

## TE TIRITI O WAITANGI, PARTNERSHIP AND RELATIONSHIPS IN RESEARCH

**To participate and contribute to research in Aotearoa, New Zealand that is innovative and impactful requires those in the field to have a firm understanding of Te Tiriti o Waitangi and how it applies in a local, regional and national context.**

Join us for an interactive session with Iwi leader Rahui Papa to support the unpacking of Te Tiriti o Waitangi principles in research and gain insight to the importance of being engaged with whānau, marae, hapū and iwi to form authentic and enduring relationships and partnerships for research.

This workshop provides a safe space to engage and ask the questions. Participants can submit their questions in advance using the QR code. You may also do this anonymously if you choose.

## Cross-country Assessment of the Unique Contributions of Psychological Factors to Vaccination: Perspectives on the COVID-19 Pandemic

Peter Adu[1], Tosin Popoola[2], Naved Iqbal[3], Anja Roemer[4], Sunny Collings[1], Clive Aspin[1], Oleg N. Medvedev[5], and Colin R. Simpson[1,6]

1. School of Health, Wellington Faculty of Health, Victoria University of Wellington, New Zealand 2. College of Health, Medicine and Wellbeing-School of Nursing and Midwifery, The University of Newcastle, Australia. 3. Jamia Millia Islamia, New Delhi, India 4.School of Psychology, Massey University, New Zealand..5. School of Psychology, University of Waikato, New Zealand. 6. Usher Institute, The University of Edinburgh, United Kingdom

**Abstract**: Evaluating the unique contributions of psychological factors to vaccination attitudes is important but largely unexplored in the existing literature. We aimed to identify the most relevant and significant psychological factors in relation to COVID-19 vaccination attitudes in Ghana, Germany, New Zealand, and India. We sampled 1822 participants from the general populations of India (n=411), New Zealand (n=413), Ghana (n=523), and Germany (n=413) to participate in a cross-sectional online survey including measures on COVID-19 vaccination attitudes and relevant psychological factors such as compassion towards others, dispositional optimism, religiosity, psychological distress, positive affect, perceived social status, and self-compassion. The data was analysed using stepwise linear regression. Our results on the COVID-19 vaccination attitudes revealed distinctive strong direct predictors, explaining significant portions of the variance. In Ghana, positive affect (7%) and optimism (4%) emerged as the strongest contributors, while in India, self-compassion (66%) and dispositional optimism (16%) strongly impacted COVID-19 vaccination attitudes, dispositional optimism (5%) was the strongest predictor in New Zealand, along with compassion towards others (1%). In Germany, compassion towards others (2%) was the strongest positive predictor, while psychological distress (3%) strongly inversely impacted COVID-19 vaccination attitudes. Religiosity accounted for the smallest variability (.003 - .1%) in COVID-19 vaccination attitudes across all countries. Understanding the unique influence of psychological factors on vaccination attitudes in diverse countries can inform tailored interventions to improve vaccination coverage, highlighting the importance of promoting positive psychological resources for improved health outcomes.

**Alignment with the organisation:** The organization's area of concentration is "Behavioural, social, and health education approaches to infectious disease prevention in communities". This research clearly falls within this scope, as this study examined the influence of psychological factors on COVID-19 vaccination attitudes in different countries, which is a critical aspect of behavioural and social approaches to infectious disease prevention. By investigating the psychological factors affecting vaccination attitudes, this research addressed the importance of understanding the human behaviours and attitudes that can impact the success of vaccination efforts in communities. Furthermore, the study resonates with the organization's vision of a "strong, prepared, and unified network" in response to infectious threats. Thus, the study was conducted in multiple countries (Ghana, Germany, New Zealand, and India), demonstrating a global perspective, and promoting cross-country understanding of vaccination attitudes. This aligns with the idea of a unified network in response to infectious diseases, as it highlights the need for tailoring interventions and strategies that consider the unique psychological factors influencing vaccination decisions in different regions. In this way, we are being accountable to the different countries, acknowledging the importance of targeted interventions to the needs and preferences of these communities. Moreover, the mission to identify the most relevant psychological factors to support preparedness for infectious disease challenges aligns with the organization's mission of ensuring New Zealand has a world-class research capability. This research contributes valuable insights into the psychological determinants of vaccination attitudes, which can inform evidence-based strategies for improving vaccination coverage and ultimately enhancing community health.

## Population and contact tracer uptake of New Zealand's QR-code-based digital contact tracing app

Chambers T, Anglemyer A, Chen A, and Atkinson J.

University of Otago, Wellington; University of Otago, Dunedin; University of Auckland; ESR

This study aimed to understand the population and contact tracer uptake of the QR-code based function of the New Zealand COVID Tracer App (NZCTA) used for digital contact tracing. We created a retrospective cohort of all COVID-19 cases between August 2020 and February 2022. Cases of Asian and Other ethnicities were 2.6 times (aRR 2.58; 95%CI 2.18-3.05) and 1.8 times (aRR 1.81; 95%CI 1.58- 2.06) more likely, respectively, than Māori cases to generate a token during the Delta period, which persisted during the Omicron period. Contact tracing organisation also influenced location token generation--cases handled by National Case Investigation Service staff were 2.03 (95% CI 1.79-2.30) times more likely to generate a token than cases managed by clinical staff at public health units. Public uptake and participation in the location-based system independent of contact tracer uptake was somewhat high (45%), and closely correlated with perceived COVID-19 risk in the community. The positive predictive value of the QR-code system was estimated to be nearly 0%, suggesting virtually no identified close contacts were true close contacts. We found that the QR-code based function of the NZCTA likely made a negligible impact on the COVID-19 response in relation to isolating potential contacts. Key factors influencing this conclusion include: public access to full participation in the system being substantially impacted by contact tracer utilisation of the NZCTA data; the delays built into the manual system from case creation to push notification decisions; and the risk messaging that was provided to contacts.

Future development and implementation of these tools require careful consideration and consultation with the wider health sector and community to ensure maximal participation. Aligning with Te Niwha's mission, vision, and Kawenata Charter: our work underscores the importance of equitable public health response to infectious disease preparedness and the ramifications when these goals are not met.

### Electronic Health Record-Based SARI Surveillance Feasibility Investigation

Scott J[1], Anglemyer A[1,2], Liu B[3], McNeill A[1], and Jefferies S[1]

1) Health Intelligence Team, Institute of Environmental Science and Research; 2) Dept of Preventive and Social Medicine, University of Otago; 3) Health Intelligence, Counties Manukau

**BACKGROUND** Severe Acute Respiratory Infection (SARI) surveillance is an important component of acute respiratory illness surveillance. It provides critical information on disease severity, pathogen virulence and the impact of interventions for national and international intelligence. Sentinel SARI surveillance in Auckland is resource-intensive and cannot currently be expanded to improve representativeness, timeliness and early warning function. We investigated whether electronic health record (EHR) data for patients at Middlemore Hospital could be used for SARI surveillance.

**METHODS** We collected retrospective EHR data (2021-22) and derived SARI cases using chief complaint codes (2021 only) for patients 20 or older. Weekly SARI activity rates were compared (Spearman's rank correlation) with the trends obtained from current SARI surveillance manged by ESR. Sensitivity and positive predictive values (PPV) of the alternative system compared to current SARI surveillance were calculated. A secondary analysis augmented the chief complaint codes with fever data obtained using a text mining algorithm developed with Counties Manukau's data and informatics team.

**RESULTS** The primary analysis using complaints coding alone (2021 data) had very low sensitivity (8.7%) and low PPV (33%), suggesting only a third of patients identified with SARI through the alternative system are true SARI patients. However, with text mining fever data added (2022 data), the sensitivity (33.0%) and PPV (53.7%) both improved considerably.

**DISCUSSION** We found that using an EHR-based SARI surveillance system together with text mining for fever flags could prove useful, but improvements are needed. Further investigation into demographic representativeness is underway. Currently, it is unclear whether this system would be feasible, equitable, or useful in other regions or among paediatric populations.

**Aligning with Te Niwha's mission, vision, and Kawenata Charter:** Our work strives to improve Aotearoa's SARI surveillance system to expand beyond Auckland to improve our Mahi tahi to better detect and respond to acute respiratory diseases.

### Impact of Respiratory Viruses on Pacific Families with pre-school Children in Auckland, Aotearoa New Zealand

Faletoese Asafo, Adrian Trenholme, Cass Byrnes, Karen McBride- Henry, Shirley Lawrence, Mary Roberts

Moana Connnect, University of Auckland

Respiratory tract infections are a leading cause of morbidity and mortality in Aotearoa New Zealand (AoNZ) with Influenza and Respiratory Syncytial Virus (RSV) being key contributors. Pacific peoples in AoNZ are vulnerable to respiratory virus infections. Furthermore, respiratory infections can pose a significant burden on Pacific peoples who already experience hardship disproportionately in AoNZ.

In 2020, non-pharmaceutical interventions (NPI) in the form of border closure and lockdown restrictions were employed to reduce the transmission of COVID-19 in AoNZ. These interventions dramatically reduced the disease burden caused by influenza, RSV, and other respiratory viruses. However, with restrictions easing there was an emergence of these viruses. Identifying what respiratory viruses were present in the community provided a key opportunity to learn more about the transmission and behaviour of these viruses and the impact they had on vulnerable groups in AoNZ.

The current study employed a mixed method design including a surveillance study of preschool children (<5 years) in the community and a qualitative study exploring the experiences of Pacific families with preschool children (<5 years) who have had a respiratory virus infection. The surveillance was driven through the community and Early Childhood Education centres (ECE). Expanding surveillance of preschool children through the community and ECE centres will support the understanding of the respiratory virus disease burden for Pacific families and children in NZ. It is essential that policymakers in health and social services are aware of these impacts and design interventions to address them for the health and well-being of Pacific families.

This study aligns with the Te Niwha mission and vision by improving the understanding of the impacts of respiratory viruses and therefore better preparing Aotearoa and Pacific peoples for current and future respiratory viruses

## Time to seriously consider needle length for IM vaccination

Richard Beasley, Gabby Shortt, Melemafi Porter, Marjan Doppen, Thomas Hills, Mark Weatherall

Medical Research Institute of New Zealand (MRINZ)

Intramuscular (IM), compared to subcutaneous (SC), administration of vaccines can increase the risk of injection site reactions. The public health significance is that adverse events after immunisation contribute to vaccine hesitancy, which may reduce vaccine uptake, and increase the prevalence of vaccine-preventable disease. Immunogenicity of some vaccines, such as Hepatitis B and Influenza, is also reduced if administered by SC rather than IM injection. The standard needle length for deltoid IM injection is 25mm. This may be inadequate to ensure IM vaccine deposition in up to 45% of obese adults. The high prevalence of obesity in Aotearoa means there is a need for evidence to guide optimal needle length selection for IM vaccines. There are little or no specific recommendations in immunisation guidelines about needle size selection. Research reporting skin-to-deltoid muscle distance, measured by ultrasound, identified that either arm circumference or BMI cut points are practical ways to select needle length for successful IM vaccination. Using the Aotearoa deltoid vaccination site, an arm circumference of ⩾35cm for men and ⩾30cm for women, are cut points above which a 38mm needle is needed for IM vaccine deposition.

It is essential to identify if IM delivery of the bivalent COVID-19 booster is needed for full therapeutic effect and if inadvertent SC delivery increases reactogenicity. Our Te Niwha funded randomised controlled trial will compare immunogenicity and reactogenicity following IM or SC vaccination in 486 adults recruited from community pharmacies in A/NZ. If differences are identified between delivery routes, this will highlight the need to include established needle length cut points in vaccination guidelines, and develop appropriate implementation strategies.

**This research aligns with Te Niwha's mission and vision** providing evidence to support optimal vaccination practice in Aotearoa, and internationally, to reduce the risk of current, ongoing, and emerging infectious disease threats.

## Rapid point-of-use testing for infectious diseases in the community

Craig Billington (1), Courtney Lynch (1), Lauren Baker (1), Anower Jabed (1), Karmun Chooi (2), Heidi Baker (1), Richard Dean (1), Erasmus Smit (1) and Rachel Fleming (1)

(1) ESR, (2) Plant and Food Research

In this project, we are responding to the Te Niwha mission by building research capability for Aotearoa in rapid point-of-use molecular diagnostics for future infectious disease challenges. COVID-19 has taught us that there are significant inequities in access to healthcare which may be as a result of cultural, economic or geographic factors (or all three). By shifting the detection of diseases from the laboratory or hospital to on-site testing in communities, this allows individuals and communities to take control of their own health and environmental resources and be[er prepares the whole of Aotearoa to monitor and respond to future pandemics or other disease challenges. We wish to abide by the principles of tūhonotanaga and hononga by building relationships and working in partnership with communities to ensure their needs and aspirations are central to the research. We will do this by le]ng the communities guide development of their priority diagnostic assays and incorporating their knowledge of how best to deploy the technology in their communities.

Our team have already developed several rapid point-of-use CRISPR-Cas assays for human respiratory viruses and plant viruses, with further bacterial and forensics applications in progress. Through this work we have developed several field useable assay formats, including a mobile phone app to record results. We are working with Te Niwha to use this knowledge to help build national capacity for rapid diagnostics targeted to remote and underserved communities. Specifically, we are seeking community engagement and participation in assay design, listening to community priorities and developing at least one new assay to address testing needs of highest importance, enabling community co-development of rapid diagnostics hardware (including cultural considerations), testing of prototype assays and equipment in community, and developing a path forward for future rapid diagnostic use in remote and underserved communities

## PRobenecid-boosted Oral antibiotic dosing in the SNAP trial

Maxim Bloomfield, Genevieve Walls, Diana McNeill, Viliame Tutone, Hannah Burden, Mei Zhang, Paul Chin

Aotearoa Clinical Trials, Te Whatu Ora

Staphylococcus aureus bacteraemia (SAB) is estimated to affect over 1100 people per year in NZ and carries a mortality of 15-20%. Māori and Pacific peoples have over double the incidence of other New Zealanders. The current 'standard of care' treatment for SAB is a minimum of two weeks of intravenous (IV) beta-lactam antibiotic therapy, often extending to 4-6 weeks of IV therapy. This is highly resource-intensive and there are inequities in NZ with regards to accessing home-based IV treatment, particularly affecting rural and Māori/Pacific populations. This pharmacokinetic study looks to confirm pre-clinical evidence suggesting that co-administration of oral probenecid with an oral beta-lactam achieves antibiotic blood levels equivalent to those achieved via IV administration. Robust clinical evidence supporting this combination oral therapy would likely translate to shorter hospital stays, reduced IV-line associated risks, significantly reduced costs to the health system, and reduced inequity of access to home-based treatment for SAB.

## **Long Covid:** the quest to characterise immune dysfunction

Anna Brooks - University of Auckland

Long Covid, also known as post-acute sequelae of SARS-CoV-2 infection (PASC), is a complex condition that can affect individuals' weeks or even months after they've been infected with the virus. Symptoms can vary widely and may include fatigue, shortness of breath, chest pain, cognitive dysfunction, and muscle pain. While the exact cause of Long Covid is not fully understood, it is believed to result from a combination of factors, including the virus itself (acting as a viral reservoir or causing persistence), reawakening of dormant (latent) viruses, and disruptions to the immune, nervous, and vascular systems. Additionally, mitochondrial dysfunction is suspected to contribute to the fatigue-associated symptoms.

An essential step in bridging the link between viral infection and disease is the establishment of longitudinal cohort studies that encompass diverse participant groups. The results of a significant nationwide study reveal that the impacts of COVID-19 have been more severe for Māori, Pasifika, and disabled individuals, raising concerns about the potential disproportionate adverse impact of Long Covid on these communities. A fundamental tenet of our approach has been to partner with individuals who have lived experience of post-viral illnesses, ensuring equitable representation and active engagement with Māori and Pasifika participants.

As a nation, Aotearoa New Zealand carries the responsibility of actively engaging in the global effort to gain deeper insights into the consequences of infections within our distinct demographic. In response to these pressing challenges, our research programme is devoted to unravelling the intricacies of virally induced immune dysfunction. By delving into the intricacies of the enduring effects of infection on our immune system, our efforts are poised to lay the groundwork for the development of diagnostic tools and therapeutic interventions

## Developing Novel Peptide Antibiotic Treatments for Drug Resistant Gram-negative Bacterial Infections

Alan Cameron - 1) University of Auckland, School of Chemical Sciences 2) Maurice Wilkins Centre for Molecular Biodiscovery

Gram-negative infections are a serious health concern. Many of the causative agents appear on the World Health Organisations Priory-1 list. The need for novel and effective treatments is increasing as resistance towards our current last-resort therapies are now spreading globally. The mcr-1 gene is a mobile colistin resistance gene, responsible for resistance towards the polymyxin family of lipopeptide antibiotics. Despite severe nephrotoxicity, these are the current last line of defence to multi-drug resistant Gram negative infections. In our research we seek to develop novel polymyxin analogues in which the nephtotoxicity is attenuated and also the emerging resistance is evaded. We will present significant progress towards these goals, in which a chemoenzymatic approach was used to modify commercially available polymyxin scaffold and how purely synthetic chemistry is now being applied to novel polymyxin scaffolds discovered through overseas genome mining efforts.

This research is led by postgraduate students, the emerging leaders of science in Aotearoa. The research is a highly collaborative effort with multiple centers across NZ, bringing people together and concurrently building capacity for science excellence as our direct research goals are realised through these key partnerships.

## Making use of wastewater from aircraft and individual buildings for better infectious disease epidemiology and response

Chapman, J.R.; Lanning, M.-L.; Hepi, M.; Eaton, C.; Em, S.; Mills, K. and Gilpin, B.G.

ESR, University of Auckland, Waikato Endowed College

Testing sewage for the presence of infectious disease, known as wastewater- based epidemiology (WBE), is a powerful tool for assessing disease burden in communities without the need for individualised testing. It allows for cost- effective, non-invasive and unbiased disease screening of whole communities, and can be deployed in areas traditionally underserved by healthcare surveillance. In Aotearoa, WBE is currently used to monitor COVID-19 levels in communities of over 5000 people. Much less focus has been placed on local- scale WBE, such as at the level of sampling individual buildings and small communities, which may be vulnerable to out-sized and inequitable impacts due to undetected disease spread. In addition, sampling wastewater collected from aircraft serving long-hail international routes is not currently undertaken but may provide an opportunity to identity ingress of infectious microorganisms into Aotearoa.

In this talk, we will describe our Te Niwha funded project that aims to strengthen Aotearoa's WBE platform. This will be achieved via improving our understanding of the social licence and ethical implications of wastewater surveillance through community and stakeholder engagement, establishing methods for sampling at various scales, and undertaking risk assessments for wastewater detections.

This project aligns with the Te Niwha charter and mission by in several ways. First, by placing particular emphasis on soliciting indigenous views of wastewater surveillance. We will partner with Māori communities via kāhui kaumātua and local hui to co-design future WBE efforts, such as the scale at which sampling should be undertaken, and the route via which results should be communicated back to communities. Second, the project seeks to establish appropriate methodology for sampling wastewater at small scales such as individual buildings and aircraft to improve future pandemic preparedness. Third, we plan to train future WBE leaders. Ultimately, this work aims to improve equitable outcomes for infectious disease wastewater surveillance in Aotearoa

## On deploying mobile deep learning for rapid point-of-use testing

Richard Dean [1], Ting Xiang [2], Rachel Qiu [1], Craig Billington [1], Rachel Flemming [1]

[1] ESR, [2] Auckland University

Rapid diagnostic testing using CRISPR-Cas and related technologies will shift the diagnosis of diseases from the laboratory or hospital to on-site testing in communities. Doing so removes barriers to healthcare, reduces costs and significantly increases the speed of testing – getting a result in a matter of minutes rather than a matter of days.

To support a community-based roll out of rapid diagnostics tests, ESR data scientists looked at steps of the testing process where artificial intelligence (AI) algorithms could help prepare samples and analyse test results. One promising area is in the crucial image processing step to analyse a colour change reaction of samples in a PCR tube.

In this presentation we will describe how we were able to deploy image processing AI direct to a mobile phone via nothing more than visiting a web page in a phone's browser. We will describe the steps undertaken to train a computer vision model, discuss how we benchmarked algorithm performance on a range of devices, and how we will work with community-based partners to develop the app as part of the recently announced Te Niwha project "Rapid Point-of-use testing using CRISPR-Cas and related technologies".

This project responds to the Te Niwha mission by building research capability for Aotearoa in the area of rapid point-of-use diagnostics for infectious disease. We wish to ensure kaitiakitanga and tūhonotanga by ensuring we are working with communities and ensuring their needs and aspirations are central to the research.

## Clinical characteristics of children <16 years of age admitted with laboratory-confirmed Influenza 2022

Ava Elsmore

Influenza in children causes much higher rates of hospitalisations and mortality compared to adults with a highly variable clinical presentation. This research aims to identify the common clinical characteristics of children presenting with influenza infection. Distinguishing influenza from influenza-like illnesses presenting with similar characteristics is an important area to address considering the present Covid-19 pandemic. The study will identify risk factors and demographics associated with influenza severity, to improve the efficiency of influenza diagnosis, and resource management in hospitals. Traditionally Māori have been disproportionately affected by influenza and this study will look at ways to mitigate poor outcomes in our tamariki.

## Unravelling the mysteries of Yersiniosis in Aotearoa

Brent Gilpin, Lucy Rivas, Bridget Armstrong, Beverley Horn, Peter Cressey, Jackie Wright, Hugo Strydom, Kirstin Thom, Ashley Orton, Beth Robson, Susan Lin, Paula Scholes, Jing Wang, Fiona Whero

ESR and Community & Public Health, Regional Public Health.

Yersiniosis is a gastrointestinal infectious caused mainly by the bacteria Yersinia enterocolitica (YE). There were 1,294 notified cases in 2022, which at a rate of 25.3 cases per 100,000 population is at least 10-fold higher than other similar countries.

We report a 17-month study of notified human cases of yersinosis within two regions of New Zealand, incorporating a case-control study and whole genome sequencing (WGS) analysis of YE isolates obtained from clinical cases and from food testing.

Of the 290 notified yersiniosis cases reported within the study period, 248 cases were interviewed and consented to participating in the case control study completing telephone questionnaires of potential exposures and disease burden. A diverse range of genotypes of YE were found with over half YE sequence type 12 (McNally 7 gene ST12), 6% ST14, 3% ST18, and 4% Y. pseudotuberculosis. The other 33% were one of 43 different YE biotype 1A STs. Concurrently almost 500 food samples were tested with 17% containing isolates identified as either ST12, ST14 or ST18. Raw pork had the most positive samples. YE biotype 1A was found in almost 50% of samples tested including raw pork, beef, lamb and poultry.

Analysis of questionnaires identified that pork and contact with nappies were significantly associated with infection with YE ST12, while Biotype 1A infection was associated with exposure to a range of uncooked vegetables. Other meats, water and direct animal contact were not significantly associated with illness.

This molecular epidemiological study provides new insights which are applicable to a range of current and future infectious disease challenges. The disease burden is of greater impact than widely appreciated, and molecular genotyping is crucial to understanding the disease and designing future interventions. This project has required a partnership among researchers, public health, central government and patients involved. We are particularly cognisant of the contribution of those patients, and committed to providing feedback on the findings of the study to all those who were afflicted.

## **The ARROW Trial:** Prevention of Wheezy Illness Healthcare Visits in Preschool-Aged Children.

Cameron Grant (1,2), Marisa van Arragon (1, 2), Owen Sinclair (Te Rarawa) (3), Simone Watkins (1), Arun Gangakhedkar (3), Rebecca Alekzander (4), Alex Wallace (5), Anita Lala (6), Angus Goodson (6), Natalie Martin (7,8), Gloria Dainty (9), Pete Vuillermin (10), Jess Pinto (10), Sarah McNab (11), Peter Sly (12), Katherine Lee (13), Rachel Schembri (13), Lisa Gold (10).

(1).University of Auckland (2).Starship Children's Hospital (3).Waitakere Hospital (4).Kidz First Children's Hospital (5).Waikato Hospital (6).Tauranga Hospital (7).University of Otago (8).Christchurch Hospital (9).Dunedin Hospital (10).Deakin University (11).Royal Children's Hospital, Melbourne (12).University of Queensland (13).Murdoch Children's Research Institute, Melbourne.

**Background:** Wheeze is a common cause of hospital admission of preschool-aged children worldwide and the most common cause in Australia and New Zealand. Current prevention strategies are ineffective and potentially harmful. Novel approaches are needed.

OM-85 is an orally administered bacterial lysate that stimulates immune responses against viral infections and reduces the excessive inflammation associated with wheezing episodes. In placebo-controlled trials, OM-85 reduces recurrent respiratory infections in children. Larger studies are required to evaluate whether OM-85 prevents wheeze-related hospitalisations.

**Research Design & methodology:**

Research Aim: To determine if an orally administered bacterial lysate (OM-85) prevents hospital admissions for acute wheezy illnesses in children aged 1-5 years.

Research Questions: In children aged 1-5 years with recurrent wheeze, does OM-85 prevent: (1) hospital readmission with wheezy illnesses?; (2) subsequent recurrent wheeze events?

Hypothesis: Among children aged 1-5 years with recurrent wheeze, OM-85 reduces the proportion re-hospitalised with a wheezy illness in the next 12 months.

Setting: 45 hospitals in Australasia including seven in New Zealand. We are also seeking to enrol children through engagement with Māori and Pacific Organisations which care for children.

Design: A multi-centre, double-blind, placebo-controlled, parallel-group RCT.

Participants: Children 1-5 years old presenting with recurrent wheeze to study hospitals. Sample Size: 2268 children with recurrent wheeze (1134 OM-85, 1134 placebo).

Treatment duration: OM-85, (or placebo) daily for the first 10 days of each month for 12 months.
Intervention: OM-85 capsules containing 3.5 mg of lyophilized bacterial lysates.
Primary outcome: Proportion of children with a second wheezy illness hospitalisation. Secondary outcomes: 1-Time to, 2-Number of wheezy-illness hospitalisations; 3-Number of wheeze episodes; 4-Healthcare utilisation; 5-Parent productivity loss; 6-Child/Parent Quality of Life.
Statistical methods: Primary outcome: Logistic regression. Secondary outcomes: Time to readmission-Survival analysis. Number of readmissions and wheeze episodes-Poisson regression. Economic Analysis: Primary-Cost-effectiveness analysis. Secondary-Family impact via cost- consequence analysis.

HOW THE WORK ALIGNS WITH TE NIWHA'S MISSION, VISION AND KAWENATA-CHARTER: Most childhood wheezing illnesses now occur in the preschool age group, with acute respiratory infections (ARI) being the frequent precipitant. The pathophysiology of ARI-related wheeze in preschool aged children differs from that of asthma in older children. Treatments and preventive strategies need to be specifically designed for wheezy illnesses in the preschool age group. Current treatment approaches for ARI-related wheezy illnesses in preschool aged children are neither effective nor safe.

We have a responsibility to consider new ways to treat preschool wheeze so that children do not have recurrent healthcare visits for this condition and their whānau do not experience the stress, worry, sleepless nights, lost employment, and other lost opportunities that result from recurrent hospital admissions of preschool-aged children. One important step that is necessary to achieve this is to form relationships with different organisations that provide care for preschool-aged children. This project utilises the knowledge base that has described the contributions of western lifestyles and industrialisation that have resulted in wheezy illnesses being such a problem for our tamariki and their whānau.

## **The Randomised Embedded Multifactorial Adaptive Platform Community Acquired Pneumonia (REMAP-CAP) Trial:** what have we learned and where are we going?

Thomas Hills, Colin McArthur, Anthony Jordan (Ngāti Wai), Matire Harwood (Ngā Puhi), Susan Morpeth, Richard Beasley, and Anne Turner. On behalf of The REMAP-CAP Investigators

Medical Research Institute of New Zealand

The COVID-19 pandemic brought into sharp focus the need for evidence from well- designed randomised clinical trials to understand the effectiveness of therapeutic interventions. However, building new clinical trials and trial networks during a pandemic can be challenging and inefficient. The REMAP-CAP adaptive platform trial was established following the 2009 H1N1 influenza pandemic to identify the optimal treatment of patients with severe community-acquired pneumonia (CAP). REMAP-CAP was able to adapt quickly during COVID-19, recruiting its first COVID-19 patient prior to the WHO declaration of a pandemic.

Through a network of over 300 sites in 15 countries, we have recruited >10,000 COVID- 19 patients to date, contributing to the evidence base that guides the management of critically ill COVID-19 patients by identifying effective treatments (e.g. corticosteroids and interleukin 6 receptor antagonists), ineffective treatments (e.g. convalescent plasma and antiplatelet drugs), and harmful treatments (e.g. hydroxychloroquine and lopinavir/ritonavir).

We now return our focus on improving the care of patients hospitalised with CAP, including those outside of intensive care units, and those with CAP caused by pathogens other than SARS-CoV-2. We will evaluate a range of questions including:

- Which antibiotics are the best for the empiric treatment for patients hospitalised with CAP?
- Do corticosteroids improve outcomes in CAP caused by infections other than SARS- CoV-2?
- Do immune modulator medications like interleukin 6 receptors improve outcomes in severe influenza?
- Do influenza antivirals improve outcomes in patients with influenza?
- What the longer-term effects following severe CAP and what can we do to improve these?

We will focus on seasonal influenza, helping achieve Te Niwha's vison of preparedness for both current and future infectious diseases challenges. We aim to ensure that REMAP-CAP remains well-placed to generate evidence about the best therapeutics for future pandemic threats and that REMAP-CAP can do so with leadership from Aotearoa.

## Moving forward from invisibilisation and silencing of Pacific peoples population health data

James Greenwell, Mary Silcock (Tangata Tiriti), Chanae Ihimaera (Ngāti kuri, Ngāpuhi & Toi, Mutalau – Niue)

Manatū Hauora & Te Whatu Ora

In an era of outbreak science and increasing use of predictive technologies, kaitiakitanga/ guardianship, where we are accountable to those involved in or affected by research is essential for the fulfilment of mahi tahi/collaboration in intelligence work. Invisibilisation of populations remains a pressing issue for Pacific health intelligence. Health and surveillance data collection, analysis and dissemination methods systematically mis-characterise Pacific peoples and their complexity. If people are not counted in ways reflecting how they live and see themselves, the surveillance activities we manage and intelligence reports we disseminate can bias outbreak identification, case definitions, diagnoses, and basic epidemiology. In support of Te Niwha and the aspirations of its principle of rangatiratanga/leadership we will present the findings from the current state analysis for Te Mana Ola: The Pacific Health Strategy. Many of our processes have failed to recognise the diversity and intersectional needs of Pacific peoples in the way we collect data and conduct surveillance. Enabling ethnically specific Pacific input into how and what data is collected, analysed, interpreted and reported on that is informed and led in culturally appropriate ways has been successful in some limited circumstances over the last three years. It is essential to build on this success for our pandemic preparedness.

Manatū Hauora is developing a Pacific Health Intelligence team to do this work. The remit and functions of this team will be presented along with the planning for a chart book publication programme in 2024. Future tūhonotanga/partnership will be needed with the research community to support the vision for this work, where there is unity and Pacific communities have their interests, aspirations and priorities at the forefront of all infectious disease research.

## Understanding the surveillance barriers and the health burden of emerging disease threats for Aotearoa: Vibrio as a case study.

Maria Hepi [1], Lucia Rivas [1], Nicola King [1], Jackie Wright [1], Rob Lake [1], Peter Cressey [1], Liza Lopez [1], Wendy Dallas-Katoa (Ngāi Tahu, Kāti Mamoe, Waitaha; [2]

1]ESR2] Self employed consultant

Vibrio infections present as gastroenteritis or tissue infections that can be mild or very serious. These bacteria live naturally in aquatic environments and people become infected from eating contaminated kaimoana (seafood) or coming into contact with contaminated water.Aotearoa is seeing more Vibrio infections in recent years. Recent outbreaks have involved several cases identified as Māori who probably became ill from consuming kaimoana collected in some regions of Aotearoa. Vibrio thrive in warm water, so as climate change brings warmer temperature, Vibrio could increase in Aotearoa as seen in other countries.

The current surveillance system in Aotearoa is not capturing all vibriosis cases accurately.This represents an area where under-reporting is likely occurring and therefore the burden of disease is also underestimated. This scenario is likely to be the case for other infectious disease in Aotearoa as well. More widely, emerging findings of current research (from some members of the team) has found that there is some unconscious bias of doctors when it comes to testing and following up Māori patients when they present with gastrointestinal disease. This raises serious equity concerns regarding access to health care and prioritisation of the interventions to reduce gastrointestinal infections. Furthermore, the pathways of delivering trusted public health messages and alerts of risk to communities (such as in outbreaks) needs further research to improve impact.

Through fostering relationships and collaborations from different disciplines, we will strive to identify key gaps and seek ways to improve the public health surveillance system for Aotearoa, using Vibrio as an exemplar. We will also continue to explore the barriers that Māori face with testing and follow up of gastrointestinal disease. These relationships will be essential to co-design and co-deliver pathways to deliver trusted public health messages and alerts of risks to communities (such as outbreaks).

## Infectious disease elimination: Lessons from existing elimination efforts and Aotearoa New Zealand's path forward

Constanza Jackson [1], Cheryl Davies [2], Carmen Timu-Parata [1], Peter Saxton [3], Amanda Kvalsvig [1], Michael Baker [1]

[1] University of Otago Wellington, [2] Tu Kotahi Māori Asthma Trust, [3] University of Auckland

The 2020s may soon become known as the decade of infectious disease (ID) elimination. Aotearoa New Zealand (NZ) has a long tradition of successful elimination programmes targeting serious IDs, such as smallpox, tetanus, and diphtheria. More recently, elimination successfully delayed the widespread transmission of COVID-19 in NZ, allowing crucial time for vaccination development and deployment. NZ is now at a critical juncture to fine-tune and expand its elimination initiatives to reduce disease burden in other areas such as elimination of HPV and Helicobacter pylori which are leading causes of cancer. These IDs cause a much higher burden of disease in Māori and Pacific Peoples than in Pakeha. Consequently, elimination can greatly improve health equity.

There is a need for practical guidance on the optimal design and implementation of an elimination approach towards IDs in NZ, along with an action plan that identifies the steps of programme implementation as well as critical gaps to address. A key part will be measures needed to maximise effective use of an elimination approach in NZ and health equity. Consequently, this approach is both action and community orientated. This presentation proposes changes to Aotearoa New Zealand's infectious disease response that will be created in collaboration with Māori decision makers and community from design to implementation. We would like to highlight two key aspects relevant to this presentation. Tino Rangatiratanga – The proposed paradigm shift in infectious disease elimination programme design upholds the tenet of Māori self- determination, independence, and autonomy. Hononga – Collaborative design of future elimination programmes is needed to establish long lasting and purposeful and supportive relationships between researchers, Mana Whenua, and the community. From these relationships, effective infectious disease elimination programmes can be developed that will deliver meaningful improvements in population health.

## Ethnic Equity in Aotearoa New Zealand's COVID-19 Response: A descriptive epidemiological study

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**Background:** We investigated whether ethnic equity was achieved in Aotearoa New Zealand's COVID-19 response and outcomes, from COVID-19 elimination in June 2020 through to the progressive reopening of New Zealand's international border in April 2022. This work is important to tiakitanga in better understanding the impacts of the COVID-19 response and lessons arising. It has been conducted through collaboration with leaders across organisations with key roles in the pandemic health response.

**Methods:** We performed a descriptive epidemiological study of all COVID-19 cases, all patients tested for SARSCoV-2, and all people vaccinated against COVID-19. We considered equity of outcomes and public health strategies in terms of demographic features and disease outcomes, transmission and vaccination patterns, time-to- vaccination and testing rates.

**Findings:** There were 1,570 cases per million, 137.8 hospitalisations per 100,000, and 9.9 deaths per 100,000 during the study period. The risk of COVID-19 was approximately 9 to 35-fold higher for Pacific peoples, 1.5 to 8-fold higher for Māori, and 1 to 2-fold higher for Asians than European or others during three major variant outbreaks. Overall, Māori and Pacific peoples had 2.5-fold and 4.9-fold the age-standardised risk of hospitalisation, and 4-fold and 9-fold the age-standardised risk of death, respectively, of European or others. Māori and Pacific peoples had lower vaccination coverage at critical points in the response and slower access to two-dose vaccination following age-based eligibility than European or others. High rates of testing were maintained and were highest among Māori and Pacific peoples.

**Interpretation:** New Zealand's response resulted in stark inequities in COVID-19 outcomes and access to vaccination affecting Māori and Pacific peoples. Early vaccine programme planning with high-risk communities, prioritisation which accounts for systematic ethnic disadvantage, and the ongoing need to prioritise equity in all response decisions are key recommendations. Addressing the social determinants of health inequities ahead of the next pandemic is critical

**Navigating the Pandemic:** A Timeline of Tūranga Health's Adaptive and Responsive Approach to COVID-19

Shirley Keown (Rongowhakaata), Lief Keown (Rongowhakaata), Elisabeth Moore

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This presentation showcases a Māori led project conducted by a Māori led organisation, Tūranga Health (TH), which is living and breathing within Te Ao Māori. Tūranga Health is an iwi health provider based in Tūranganui-a-Kiwa, North Island, New Zealand. The organisation provides a wide range of programmes aimed at uplifting health and wellbeing of Tūranga iwi communities, Ngāi Tāmanuhiri, Rongowhakaata, and Te Aitanga a Māhaki, and beyond. These programmes are built on the organisational values of putting whānau first and manaaki upfront.

As part of a project funded by the Ministry of Health, we produced a timeline of key elements of Tūranga Health's organisational approach during the National COVID 19 Pandemic. The timeline was used to develop a narrative description of the complex and fast-paced responses. Multiple methods were used for the collection and recording of events, including gathering dates from company, regional, national, and global media, past weekly staff meetings, social media, and workshops with staff. There was limited information when starting to timeline the events, but a larger narration was achieved by piecing together data from multiple reliable sources. Vaccination numbers at the different settings were extracted from internal databases and annual company reports. The data that was collected for the timeline was information to set context to the approach occurring correspondingly at a national level and alongside internal company data. These data and events were placed chronologically in a timeline that describes Tūranga Health's response from 2020 to December 2022. Events were recorded by date in Word Documents and charted using Powerpoint. As a result, this timeline illustrates the adaptive and responsive nature of Tūranga Health's Covid-19 response.

**Community surveillance of respiratory infections: a critical void in Aotearoa New Zealand.**

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Respiratory infections are extremely common in children but Aotearoa NZ lacks an effective community-based early warning system for outbreaks or new pandemics. There is an urgent need to address this major area of vulnerability. This presentation will discuss key design aspects of a community surveillance system that can provide rapid and actionable evidence to a range of end-users including communities, schools, infectious disease modellers, and public health decision-makers.

Existing healthcare-based surveillance systems tend to under-count children and children are tested for infections less often than adults, so we still don't fully understand how infections spread between schools, homes, and other community settings. This information lack and its consequences have been important pandemic lessons for NZ.

More positively, we have new capabilities that enable us to close this critical gap. Rapid antigen testing has been transformational, enabling whānau to identify a case and prevent onward transmission, and Māori community providers and others have developed effective and trusted communication systems to keep whānau informed. The SHIVERS WellKiwis cohort provides a model of high-quality community respiratory surveillance that can be extended to guide action by whānau, education settings, and public health agencies.

Alignment to the Mission of Te Niwha (To ensure New Zealand has world-class research capability to respond to serious infectious disease threats): Rapidly-available, high-quality information about community respiratory outbreaks is vital infrastructure for protecting the population against severe pandemic and endemic diseases.

Alignment to Te Niwha Kawenata: Rangatiratanga and Aroha: Better respiratory surveillance will enable children, whānau, leaders, and educators to access knowledge to protect themselves and others.

Tūhonotanga and Mahi Tahi: A notable aspect of COVID-19 in Aotearoa is that the pandemic response has been conducted not just by public health officials, but by everyone. A new surveillance system should build on this experience, locating Māori solutions within communities themselves.

### **Pai atu te ārai atu I te mate I te rongoā I te mate:** Prevention is better than cure

Marama Muru-Lanning (Waikato, Maniapoto, Ngati Whatua), Hilary Lapsley, Tia Dawes, Soriya Em, Heather Battles, Ilze Ziedins, Keri Mills

From the earliest days of the COVID-19 (Mate Korona, KOWHEORI-19) pandemic, Māori providers, iwi and marae put in place a variety of strategies to prevent infection gaining entry to or spreading within their rohe. Strong efforts were made to support whānau, especially kaumātua, through the various lockdowns. Once vaccinations became available it soon became apparent that vaccination equity did not exist, but under pressure from Māori health advocates, Māori-led vaccination campaigns used innovative and successful methods to reach the communities they knew well. Their collective efforts are an expression of tino rangatiratanga and proof of what communities can achieve when resourced and given the opportunity to take-action. It is imperative that we learn from these efforts in order to prepare for possible future pandemics and outbreaks of infectious disease. This project seeks to understand the tikanga, structures and community efforts that underpinned the Māori response to COVID-19 via case studies involving Māori health providers, kaumātua and other rangatira with key roles in the COVID-19 response. Our case studies will take place in four different rohe: Te Hiku o te Ika, Ngāti Hine, Ngāti Whātua ki Ōrakei and Waikato-Tainui. Using qualitative and quantitative methods, underpinned by our firm commitment to Kaupapa Māori methodologies including co-design and whakahoki kōrero (dissemination), our research fully aligns with the values and principles of the Te Niwha Charter. This research will enhance pandemic preparedness to ensure equity, rangatiratanga and better outcomes in the future for Māori.

### Host HDAC2 during influenza virus induced innate immune response

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Influenza A virus (IAV) seasonal epidemics in the human population contribute to high morbidity and great consequences for global public health. The efficacy of annual influenza vaccines varies every year, and antiviral drug resistance is on the rise. It is therefore imperative that we discover new targets and design alternative anti-influenza strategies. In recent years, host histone deacetylases (HDACs) have been discovered as novel host defence factors which harbour anti-IAV abilities. The antiviral mechanism of these HDACs is yet to be fully understood. Initial data indicated that HDACs are involved in the host innate immune response against IAV. In this project, the expression of HDAC2 was manipulated in human lung epithelial cells, which were subsequently infected with IAV. Utilizing quantitative real-time PCR and western blotting, the mRNA and protein levels of various innate immune response genes were measured over 24 hours of infection, respectively. The results show that overexpression of HDAC2 significantly upregulates the innate immune response genes: IFITM1 & 3, viperin, and MX1 at either the mRNA or protein expression levels. This data affirms that HDACs are involved in regulating the expression of innate immune response genes during IAV infection. These findings provide insight into the complex immune pathways which may be regulated by HDACs during IAV infection and a basis for further research in infectious diseases.

### **Establishing a Long COVID Registry in Aotearoa New Zealand:** early results from Mātauranga Raranga on the health and quality of life impacts of long COVID

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Long COVID – new, returning or ongoing symptoms months after a COVID infection – is expected to be the most significant and enduring impact of the COVID-19 pandemic. Manatū Hauora funded the establishment of a Long COVID Registry to generate evidence regarding the manifestation of long COVID in Aotearoa. The project has the gifted name Mātauranga Raranga; referring to knowledge sharing, thoughts weaving, focus and working together to create something beautiful, useful and with purpose.

The registry is ten linked survey modules designed in partnership with people with lived experience of long COVID. Individuals who self-report as having long COVID (in part due to a lack of diagnoses and specialist referrals) are asked about their infection(s), asked to report their symptoms and quality of life, asked whether they have sought care and support for their symptoms, asked about any effects on their employment and also asked about any impacts on whānau. The modules are designed to allow respondents to do as little or as much as their long COVID symptoms – often fatigue/brain fog – allow. Fuller results will be presented, but to date 851 individuals have registered. 73% of respondents are female, and the average age is 49 years old. The most common symptoms are fatigue (90%), brain fog (78%) and sleep issues (67%), and these have mostly not changed (50% of respondents) or worsen (30%) over time. Prior to their index COVID infection respondents retrospectively report health-related quality-of-life similar to New Zealand population norms (0.889 on EQ-5D-5L) and now with long COVID they report EQ- 5D-5L of 0.523 (similar to individuals with cancer).

The registry is a key component of understanding the ongoing burden of infectious disease threats and it can inform pandemic preparedness activities. The project is overseen by a Kaitiaki Rōpū which operates under a Te Tiriti Relationship Framework.

## Safety and immunogenicity of Measles, Mumps, Rubella (MMR) vaccine delivered by aerosol or intradermally versus standard intramuscular in young adults

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**Background:** In Aotearoa, despite no "home grown" measles (Me), re-introductions happen: in 2019, >2000 cases, badly affecting Māori and Pacific people. No "home grown" Me means waning vaccine-acquired immunity is a concern in young adults, especially health care workers, with second MMR dose at 4 years (now 15 months). We report year 1 results from a randomized controlled trial (RCT) of MMR vaccine given into lungs by aerosol (Ae) vs intradermal (ID) [small needle just under skin] vs standard needle into muscule (IM) to compare antibody responses: how big? how long-lasting? Methods: RCT participants received Priorix vaccine by Ae, ID or IM route and recorded symptoms from day 3 to 14 by SMS or in-person. Non-RCT participants provided pre- and post-MMR blood. Me Ab measured at least 28 days after MMR [scale: zero to 300 in arbitary units (AU); <16.5 = not protected].

**Results:** 67 students had Ae (21), ID (26) or IM (18); 36 received IM outside the RCT. General (Ae 42.9%, ID 38.5%, IM 38.9%) and local (38.5% ID vs 33.3% IM) reactions were similar. In 76 with pre- and post-MMR bloods, Geometric Mean Titres (GMT) increased from 21.5 to 131.5 (Ae), 31.8 to 100.8 (ID) and 13.9 to 131.0 (IM). Limited to 48 Me Ab negative students, GMTs increased from 8.0 to 146.7 (Ae), 7.0 to 83.8 (ID) and 7.6 to 116.9 (IM). Compared to IM, the GMT ratio was 1.2 (95% CI 0.4-3.4) for Ae and 0.8 (0.3-2.2) for ID. About 10% (1 Ae, 1 ID, 3 IM) still had Me Ab < 16.5 AU post- MMR.

**Conclusion:** MMR by Ae or ID had similar safety and immunogenicity to standard IM. If our results hold up with larger numbers and over time, and communities prefer Ae or ID, they could be important tools to improve vaccine protection.

## Rescuing the last line defence antibiotics, the polymyxins

Robert Mullin, Scott Ferguson, Greg Cook, Veronika Sander, Jane Allison

The University of Auckland, University of Otago

AMR represents a growing threat globally, with infections caused by S.aureus, E.coli and N. gonorrhoeae posing the most risk to NZ (Pullon et al., 2016). By 2050, AMR infections will cost the global economy trillions in healthcare costs and loss of productivity (Dadgostar, 2019).

E.coli and N. gonorrhoeae are Gram-negative bacteria, and their infections require drugs that target them with specificity and potency. The polymyxins are a class of antimicrobial peptides that destroy the outer cell membrane of Gram- negative bacteria (Manioglu et al., 2022). Despite their potency, polymyxins are known to enter kidney cells and cause damage at a frequency of 41% (Akajagbor et al., 2013). The lipid tail portion of the molecule is known to be associated with toxicity.

The aim of this project is to introduce a thioester-linked lipid tail which is envisaged to be selectively cleavable in the high glutathione concentration of the kidney leading to non-toxicity. There is some literature precedent for this strategy, via a disulfide linked lipid (Slingerland et al., 2022), however the incorporation of a thioester is thus far unprecedented. In alignment with Te Niwha charter vision, a network of Aotearoa's experienced researchers have contributed their expertise to this project to determine the potency (Prof Greg Cook, University of Otago) and toxicity (Dr Veronika Sander, The University of Auckland) of our thioester analogues.

For New Zealand, our over-burdened health system is plagued by inequitable outcomes for certain ethnic groups. Māori are 2.14 times more likely to be admitted to hospital for infectious diseases than other ethnic groups, and more likely to be prescribed antibiotics (Whyler, 2018). Therefore, in line with the Te Niwha Charter Article Three – Ōritetanga (Equity), this project will contribute to improving equitable outcomes for Māori in NZ's healthcare system.

## Antiviral potential of repurposing cancer drugs

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Viruses and cancer both hijack processes and cellular pathways in our body to take control, grow and spread. One of the central pathways that controls growth, survival, metabolism and the immune response is called the phosphatidylinositol-3-kinase (PI3K) signalling pathway. This pathway has been shown to be switched on by cancer, and therefore drugs that block or inhibit this pathway have been shown to be effective chemotherapy treatments. Similar to cancer, many viruses that cause disease are known to switch on this PI3K pathway, to help them multiply and spread. As with cancer treatments, some PI3K inhibitors have been shown to work as antivirals, stopping viruses from multiplying and causing disease, for example Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which caused the COVID-19 pandemic.

We are looking at repurposing several PI3K inhibitors that are already in various stages of clinical development at the Auckland Cancer Society Research Centre (ACSRC) to identify those that have antiviral activities.

This study demonstrates the therapeutic potential of repurposing PI3K inhibitors for treating viral infections, which could offer a broad-spectrum antiviral solution for viral threats such as SARS-CoV-2 as well as new disease-causing viruses.

Through this research we have an opportunity to develop a platform of capabilities and capacity for meaningful antiviral therapy development in Aotearoa to rival other nations. Our proposed project has Māori co-leadership and co-design and aims to develop safe and effective broad-spectrum antivirals to combat significant viral pathogens with pandemic potential such as SARS- CoV-2, influenza and future novel or re-emerging viral threats. Supporting a world-class platform for viral research locally will help us to develop tools to prevent excess morbidity and mortality from viral diseases that impact on our Māori whānau, Pacific communities and all populations in Aotearoa and beyond. Dr Netzler worked closely with Pacific and Māori communities during the COVID-19 pandemic as a trusted source of information on vaccines and antivirals to build trusted relationships. From this work we heard our communities strongly support the development of new tools to fight viral diseases. We will continue to build on these community relationships to ensure all perspectives are valued and considered during development.
Through our interdisciplinary collaborative approach, we draw on the combined expertise of our researchers and communities to ensure transparency, integrity and two-way communication throughout the process.

## Impact of COVID-19 on Pacific people's vaccinaQon beliefs and behaviours rates: Preliminary findings

Samuela 'Ofanoa, Faletoese Asafo, Mary Roberts, Seini Taufa, Dantzel Tiakia, Elizabeth Wilson, Jaepeth Tiakia, Michaela Roberts, Kalesita Pole, Lois Chu Ling, Amio Ikihele, Jacinta Fa'alili-Fidow.

Moana Connect

Pacific peoples have been disproportionately represented among positive COVID-19 cases in New Zealand, particularly during the 2021 outbreaks in Auckland. The 2021 Delta outbreaks highlighted the high rates of Pacific children infected during its early stages and ongoing vaccination inequities, which was partly corrected through community leadership and mobilisation. During the delta outbreak Moana Research conducted rapid insights for the Department of Prime Minister and Cabinet (Moana Research, 2021) and identified that approximately 50% of those who were not planning on receiving the COVID-19 vaccination were concerned about the side-effects of the vaccination. The novelty of the vaccine was a significant factor. Moana Connect and the Ministry of Health (MoH) have established a research project using the Kakala model to drive a mixed-method approach exploring the understanding of the impacts of COVID- 19 on Pacific peoples' immunisation beliefs and behaviours.

This research follows two phases: 1) utilising MoH vaccination data and other data sources to explore the impact of the introduction of COVID-19 vaccinations on other Pacific children's vaccination rates (i.e. MMR and flu) and 2) talanoa with Pacific families with children to explore their views and understanding of vaccinations, any changes over time, and how can we ensure that Pacific families receive the right immunisation information. The research project is currently in progress and aims to provide recommendations to influence future immunisation work with Pacific, including the vital role that communities and families can play.

This work aligns with the Te Niwha Charter mission and vision by ensuring that Aotearoa, particularly Pacific peoples, are well prepared for future and emerging infectious diseases. It ensures that world class research is utilised to inform policies, and health services reducing the impacts and spread of infectious disease among population groups that are most vulnerable and in need improving equity in health.

### Estimating the number of lives saved by Covid-19 vaccines in Aotearoa New Zealand

Michael Plank, Samik Datta, Giorgia Vattiato, Oliver Maclaren

University of Canterbury, NIWA, Manaaki Whenua, University of Auckland

Aotearoa New Zealand had one of the most effective Covid-19 pandemic responses in the world. The strategy was successful because it prevented widespread community transmission until after high vaccine coverage had been achieved. However, despite the fact this limited the number of pandemic deaths to low levels relative to other countries, significant inequities persist in the health impact of Covid-19. In particular, the vaccine rollout failed to adequately prioritise Māori and the Māori death rate has been significantly higher than the New Zealand European rate.

Quantitative estimates for the number of lives saved and the number of hopsitalisations averted by Covid-19 vaccination are important, yet difficult to make from raw epidemiological data. In this talk, I will present the such estimates from using a mathematical model of Covid-19 transmission and impact. The model has been fitted to epidemiological data and vaccination rates in Aotearoa New Zealand for 2022-23. The model was then run under various counterfactual scenarios representing different levels of vaccine uptake in different groups.

The results confirm that vaccination was highly effective at reducing the health burden from Covid-19, though show that more Māori lives could have been saved had vaccine coverage been equitable.
The work describe aligns with Te Niwha's mission, vision and Kawenata as it contributes to lessons learned form the Covid-19 pandemic, supports preparedness for future infectious disease threats and potential pandemic agents, and addresses inequities in health outcomes.

### How much enteric disease (diarrhoea) is transmitted via drinking water?

Farnaz Pourzand, Simon Hales, Tim Chambers, Michael Baker - University of Otago, Wellington

Enteric diseases such as campylobacteriosis and cryptosporidiosis can be transmitted through consumption of contaminated food or drinking water, or via contact with infected livestock or people. Dominant modes of transmission vary according to local circumstances. Understanding how enteric diseases are being transmitted can inform prevention and control measures. All modes of transmission can often be reduced by behavioural or hygiene measures, but systemic changes that reduce contamination at source are also required.

We have explored several methods of analysing disease notifications and environmental data in order to understand the potential role of drinking water in transmission of enteric disease in Aotearoa. We present analyses of selected laboratory confirmed enteric diseases (2000 to 2020), using graphs of daily notifications, maps of average notification rates, combined space- time approaches and regression models. The results are not conclusive, but suggest associations between livestock densities and enteric disease rates in rural areas. Certain historical outbreaks of enteric diseases are likely to have been caused by contamination of source water following heavy rainfall events.

This unpublished work in progress is shared in the spirit of collaboration (hononga) and accountability (tiakitanga), with a view to developing further partnerships (tūhonotanga) with communities affected by waterborne diseases, and learning how our work can best be improved to reduce the burden of enteric disease. Ultimately, making the sometimes invisible burden of waterborne pathogens and disease more visible may contribute to greater opportunities for self determination (tino rangatiratanga) by mana whenua of catchments and waterways (awa) and support actions to protect the special qualities (mauri) of fresh water.

### Using bacterial cell-free DNA to detect infectious disease with ease

Amy Scott-Thomas, Stephen Chambers (1) Katie Wolf (1) Elizabeth Chernysheva (1) Martin Kennedy (1) Alison Miller (1) Trevor Anderson (2)

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Infectious diseases are traditionally diagnosed by culturing the microorganism causing disease. However, in many cases a diagnosis can be difficult to achieve due to the inability of obtaining a suitable sample and the failure to reliably grow the organism in a laboratory environment. The use of quantitative polymerase chain reaction (qPCR) is becoming more widespread in diagnostic laboratories and can offer a platform to diagnose infectious disease quickly and accurately.

When microorganisms invade the body, they release fragments of their own cell-free DNA (mcfDNA) which can be found in the blood and urine of patients. Since blood and urine are routinely obtained from patients during a hospital stay, they are ideal samples for diagnosing infectious diseases. Unfortunately, mcfDNA levels in blood and urine are low, preconcentration is required to increase mcfDNA to levels that are detectable.

Platform 1 will use special beads to capture the pathogens mcfDNA in urine, which will then be analysed by quantitative polymerase chain reaction (qPCR) to determine if the pathogen is present in the patient. This answer will be achievable within 8 hours.

Platform 2 will increase the pathogen mcfDNA from a patient sample using PCR, the PCR product is then incubated with a microbe specific CRISPR-Cas reagent which provide a fluorescence read-out if the pathogen mcfDNA is present in the patient sample.

Both platforms offer opportunities for fast non-invasive diagnosis that could be used in remote locations and modified in the future to diagnose emerging pathogens or provide point-of-care diagnostics.
This project aligns with Te Niwha's mission by supporting world class research to develop diagnostic platforms that can be used to enhance the diagnosis of otherwise hard to diagnose infectious diseases. These platforms can be used for the diagnosis of numerous infectious diseases including those that disproportionally affect Māori and Pasifika communities.

## Selective under-representation of Pacific peoples in population estimates for health indicator measurements in Aotearoa New Zealand misinforms policy making.

Gerard JB Sonder (1,2), Corina Grey (1,3), Debbie Ryan (1), Jacqueline Cumming (1), Andrew Sporle (4), Phillip C Hill (5).

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**Background and aims** The 'Census of Populations and Dwellings' is the five yearly count of people and dwellings. Best available populations (BAP) are population projections based on census and demographic assumptions developed for healthcare planning and funding but are also used to monitor population health. Pacific people are systematically undercounted, but the impact on health measures and surveillance is not well studied. For COVID-19 vaccination coverage, health service user (HSU) data were considered more accurate denominators than BAP but introduced new biases. We examined the impact of both types of population counts on health indicators by ethnic group and geographic area.

**Methods** We investigated the interaction between geographic area and ethnicity by comparing BAP and HSU data. For the indicators 'access to primary care' and 'uptake of cervical cancer screening' we replaced BAP population counts with HSU counts and examined the impact this had on different ethnic groups in different geographic areas.

**Results** The census 2018 response rate declined by 10% from 2013, but for Māori and Pacific people this was 21% and 23%, respectively. Census undercount was highest in Counties Manukau which has the largest Pacific population. The difference between HSU count and BAP estimate was also largest in these populations, reflecting their higher underestimate in BAP. Both health indicators in Counties Manukau are currently estimated as highest for Pacific compared to other ethnic groups and "access to care" consistently exceeds 100%. Changes in trends coincided mostly with adjustments in BAP. Based on HSU, both indicators were lowest for Pacific compared to other ethnic groups.

**Conclusion.** The current use of BAP denominators does not enable reliable monitoring of health indicator trends, including surveillance of infectious diseases for Pacific people. HSU denominators are not suitable to monitor health indicators. New, transparent, digital ways of obtaining more reliable, timely, less biased, population data are urgently needed to monitor testing and vaccination coverage in future pandemics and to guide policymaking under the new health reforms.

ALIGNMENT WITH TE NIWHA mission and vision: "Having insight in, and access to, equitable population data is a prerequisite to making informed decisions and promoting equitable health in populations and communities" [United Nations]. Although underrepresentation of Pacific people in population statistics in Aotearoa has long been known and is well documented, the issue was first addressed when COVID-19 vaccination was rolled out and vaccination coverages in some ethnic and age groups exceeded 100%. The denominator was ad hoc replaced by another biased denominator. Access to more equitable population data is needed for more accurate surveillance in general and during outbreaks and pandemics.

### **JUNE-NZ:** an Artificial Intelligence enabled infectious disease modelling framework for Aotearoa

Sijin Zhang, Alvaro Orsi and Richard Dean - ESR

At ESR, in collaboration with international partners, we are at the forefront of developing a cutting-edge public health modelling framework that leverages Agent Based Models (ABMs) and the latest AI technology. In this framework, ABMs have been integrated into a deep neural network to investigate complex social interactions, particularly in the context of infectious disease. The model simulates complex social interactions at the individual level, offering highly detailed outputs for various social settings.

The objective is to create an integrated infectious disease risk assessment system that encompasses observation, analysis, prediction, and policy intervention for New Zealand. It is expected that the model outputs can be presented in both dashboard and traditional report formats, enabling investigation of communicable diseases from different stakeholders.

In a recent application, the model was employed to investigate the 2019 measles outbreak in New Zealand. We find that the model can simulate the outbreak's evolution and peak remarkably well. Moreover, we extensively explored various policy interventions within the model and thoroughly examined their potential impacts.

This project demonstrates that by leveraging the latest AI technology and the capabilities of traditional agent-based models, we gain deeper insights into the dynamics of disease outbreak events. This, in turn, helps us (1) alert and predict the potential disease outbreak (Te Niwha's theme - Surveillance), and (2) make more informed decision related to infectious disease outbreak in different community settings (Te Niwha's theme - Prevention)

### New Zealand AI-Driven COVID-19 Hospitalisation Forecasting System

Jiawei Zhao, Alvaro Orsi, Joanne Chapman, Joanne Hewitt - ESR

The COVID-19 pandemic presented opportunities to design innovative methods to track and anticipate disease patterns in communities. ESR plays a crucial role in this effort by conducting wastewater testing across New Zealand on behalf of the Ministry of Health to identify the presence of SARS-CoV-2, the virus that causes COVID-19.

Here we present an AI-based hospitalisation prediction system to report weekly forecasting of rates of hospitalisation due to COVID-19 to the Ministry of Health. We leverage a state-of-the-art Transformer deep-learning architecture as the basis for the forecast model. The Transformer model, which is also the backbone of the new era of large language models such as ChatGPT, significantly improves prediction accuracy over traditional time series methods by effectively capturing intricate data patterns and temporal relationships. Our solution incorporates multiple covariate datasets to learn the intricate relationship between hospitalisations and other factors. Datasets include SARS-CoV-2 concentrations in wastewater, vaccination rates, SARS-CoV-2 variants present in the community, and reported COVID-19 cases.

This study signifies a substantial leap forward, in alignment with Te Niwha's mission, to aid the Ministry of Health in the effective allocation of healthcare resources. Furthermore, it serves as a notable contribution to the worldwide effort aimed at strengthening pandemic response strategies for future outbreaks.

# NOTES

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Te Niwha

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