2020 Prime Minister's Science Prize

Research team supporting New Zealand's COVID-19 response wins Prime Minister's Science Prize

The 2020 Prime Minister's Science Prize, the premier award for science that is transformational in its impact, has been awarded to Te Pūnaha Matatini for its COVID-19 response.

They are being recognised for their work that developed a series of mathematical models, analysed data and communicated the results to inform the New Zealand Government's response to the global pandemic.

The team has carried out mathematical modelling and analysis on all key areas needed for an informed response including disease spread, contagion, hospital capacity, contact tracing, outbreak genetic strain mapping and vaccination. Central to their work has been contextualised and specific data analysis and modelling for predicted impacts on at-risk communities, including Māori and Pasifika populations. They have operationalised these models through a partnership with Orion Health. In addition, team members have made significant and break-through efforts to communicate about the pandemic to the public and to monitor and counter misinformation and disinformation.

Diane Abad-Vergara from the World Health Organization said the COVID-19 work of Te Pūnaha Matatini has had significant health and social impacts for Aotearoa New Zealand and internationally "contributing to New Zealand's internationally coveted status as one of only a limited number of nation-states which have eliminated and contained the virus".

Te Pūnaha Matatini, meaning 'the meeting place of many faces' in te reo Māori, is hosted at University of Auckland and is a multidisciplinary Centre of Research Excellence. The centre was set up over five years ago to tackle the interconnected and interdisciplinary challenges of our time. Centre Director Professor Shaun Hendy MNZM FRSNZ, University of Auckland, quickly saw in early 2020 that there was a gap in providing the New Zealand Government with the data science it needed to make informed decisions to respond to the pandemic. He quickly assembled a team "to do this crazy thing, in a short space of time," and they have worked tirelessly to fill this need ever since.

It had started from a disease modelling exercise by Shaun in March 2020 to answer whether the Te Pūnaha Matatini annual team hui could take place in April 2020. "Our simulations told us 'No!'" Shaun had assumed that other groups were doing similar modelling, but then realised this was not being done. He got in touch with the Prime Minister's Chief Science Advisor Dame Juliet Gerrard, "and then questions started coming back the other way. Could you look at this scenario? Could you look at that scenario? And that's when I realised there just weren't a lot of modelling tools around and available and being used, and at that point, that's when I started having serious conversations with people about crash-starting this modelling programme."

Further modelling showed that the best course of action for New Zealand was to follow the mantra 'go hard and go early' if it was to avoid a large number of deaths. "The longer you wait before you take it seriously, the more intense the spread of the virus across society," Shaun said at the time.

Mathematical modeller Professor Michael Plank from the University of Canterbury worked on the early models of what would likely happen if COVID-19 was allowed to spread throughout the community. He recalls they spent a lot of time chasing the data to put into the model but once the predictions were coming out, it was very sobering: “Seeing the actual numbers in front of you made it seem a lot more real”.

The need for a ‘go hard, go early’ response was also made clear by modelling on how New Zealand’s health system would cope with an outbreak. It showed that the system would be rapidly overwhelmed. Statistician Associate Professor Ilze Ziedins, University of Auckland, was brought in to work on this with Dr Mike O’Sullivan and Associate Professor Cameron Walker from University of Auckland’s Faculty of Engineering. “It was this one moment where you bring all your knowledge and expertise to bear,” Ilze says.

The team has gone on to make sure their modelling work has served the health system and has worked with data science consultant Pieta Brown of Orion Health to ensure information is getting to where it’s needed throughout the health system at a regional and national level. Pieta is a Te Pūnaha Matatini Board Member and she said: “I am immensely proud of the work Te Pūnaha Matatini did in supporting New Zealand’s COVID-19 elimination strategy.”

Right from the beginning, data modelling and experience from previous pandemics made it clear that Māori and Pasifika peoples would be more badly affected if the COVID-19 virus got established in Aotearoa, due to systemic racism, poor quality housing and prevalence of pre-existing conditions that increase risks from the virus. “We had a board meeting and the experience of Māori in the 1918 pandemic came up. And that was a ‘penny drop’ moment and we realised then what an impact this pandemic could have and we started an equity modelling stream,” Shaun explains. Kate Hannah supported this work and they brought in statistician Andrew Sporle (Ngāti Apa, Rangitāne, Te Rarawa), University of Auckland, to assist with empowering local responses from iwi and regional communities. “Shaun and the modelling team put an equity lens on their work almost immediately, it wasn’t an afterthought. Equity was at the front and centre of their response,” Andrew says.
Communicating to the public about COVID-19 was another key strand of Te Pūnaha Matatini’s COVID-19 response. “It’s one thing to advise the Prime Minister, but the public have to understand what is going on as well,” Shaun says. Associate Professor Siouxsie Wiles MNZM, a microbiologist at University of Auckland, became one of the leading science communicators during the crisis, not only in New Zealand but internationally. From January 2020, “my phone didn’t really stop ringing,” she says. Siouxsie partnered with *The Spinoff* cartoonist Toby Morris to produce visualisations that went ‘viral’ and are being used by governments around the world and the World Health Organisation. Siouxsie was recently named 2021 New Zealander of the Year Te Pou Whakarae o Aotearoa for her COVID-19 science communication. Siouxsie says she is motivated by a desire to empower people, to explain the ‘here’s why’ for the actions they can take to protect themselves and others. She is “immensely proud,” of the work that she and Toby have done. Other team members Kate Hannah, Mike Plank, Associate Professor Alex James (University of Canterbury), Nic Steyn (University of Canterbury), Dr Rachelle Binny (Manaaki Whenua –Landcare Research) and Shaun Hendy also featured significantly as science communicators during the pandemic.

The next piece of the puzzle was better understanding New Zealand’s team of 5 million. Dr Dion O’Neale, University of Auckland, worked with a team who built a statistical model of everyone in New Zealand to better predict how the disease would spread. It layered education and workplace information with dwelling information and later added in community interaction data. He said the incomplete information from the 2018 Census has hampered the work. “For young Māori and Pacific men, 20% don’t have lodging information.” This is not because that number are homeless, he explained,

but the Census failed to get information on where they are living. Dion describes the last year as “All COVID, all the time” and rather than reflecting on what they have done, he keeps looking forward to what is needed.

Nic Steyn, University of Canterbury, is one of the early career researchers who worked with Dion on the contagion network. He says it has been the most amazing learning opportunity and also deeply rewarding to have been able to “be doing something to help the situation,” during lockdown and afterwards.

Another strand of Te Pūnahi Matatini’s work has been to analyse misinformation and disinformation. From the start of the pandemic, there has been an ‘infodemic’ – the over-abundance of information – some helpful some not – that makes it hard for people to find trustworthy sources and reliable guidance. The team have been monitoring the infodemic by measuring the prevalence of unreliable or untrustworthy sources in New Zealand social and mainstream media. Kate Hannah says early on they were seeing racist and xenophobic comments coming out about China and Italy and realised that “disinformation was going to be a key part of this pandemic”. She says that the key to countering it is to address the underlying fear that is causing the false belief with “good, accurate information” and not to repeat misinformation.

Te Pūnaha Matatini’s modelling work continues as New Zealand rolls out its COVID-19 vaccination programme. Mike Plank says they have been working on scenarios of what happens if we get another outbreak while doing the vaccine roll out and for understanding “what protection the vaccine is giving us”.

Reflecting on the win, Shaun says it’s been an “absolute pleasure” working with Te Pūnaha Matatini and the collaborators that joined the team for this work. “In a way it’s an unrepeatable experience, what we’ve been through.”

Shaun wanted to thank Aotearoa New Zealand “for listening to us, for trusting us -- it’s been incredible – and if we hadn’t had that trust, it would have all been for nothing. So, it has meant the most that the public has got behind us and they have taken what we have said seriously.

“We’re not winding up. We want to set up the tools we’ve developed and leave them for the next pandemic modellers. We had to build our tools from scratch and we don’t want Aotearoa to be caught in that situation again. So we will be leaving our tools, making them open so they can be maintained in perpetuity, so next time we meet an infectious disease crisis they are there for people to use.”

The award comes with a $500,000 prize and the money will allow the centre to turn its attention to other key issues that New Zealand faces.

ENDS