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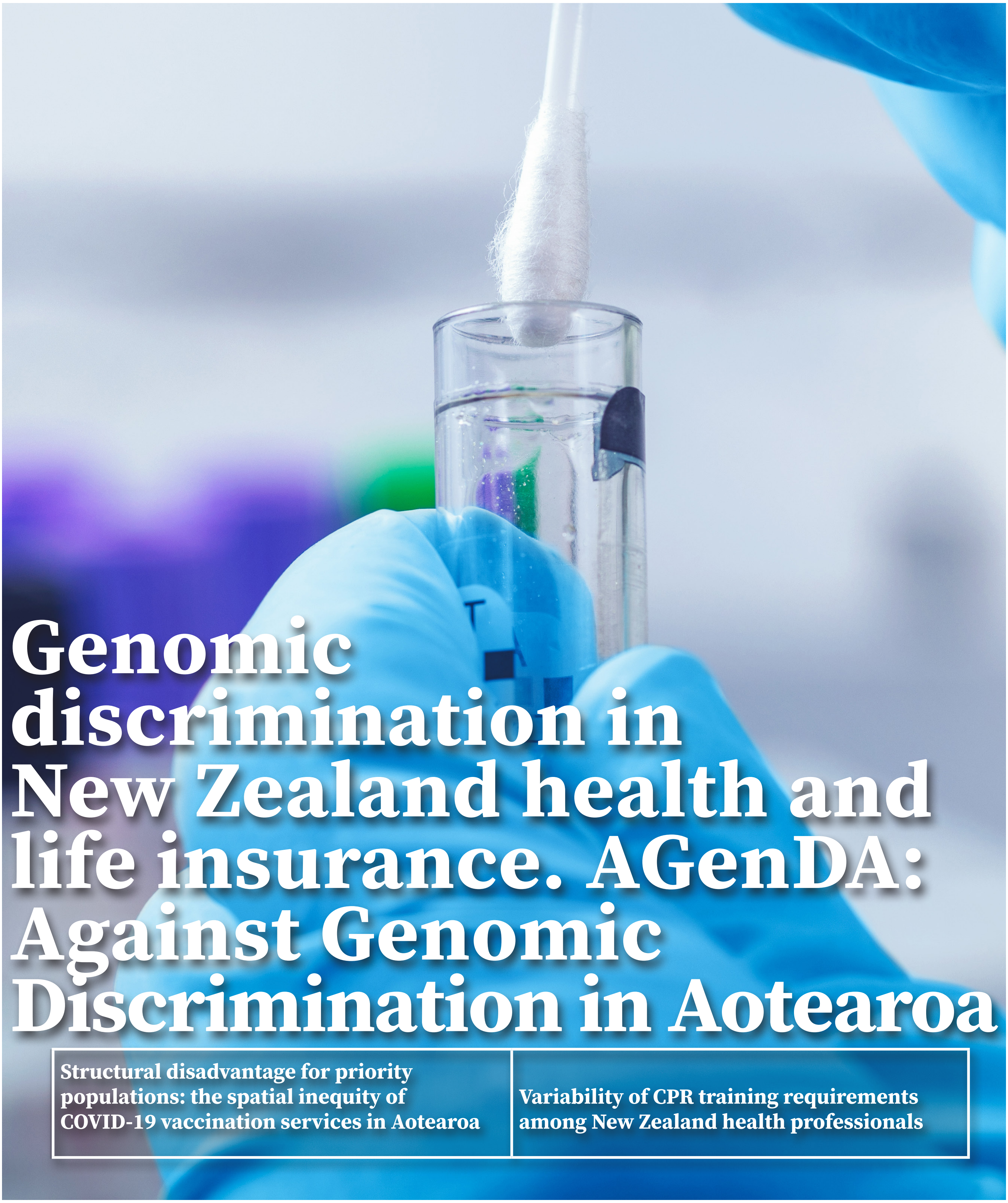

Genomic discrimination in New Zealand health and life insurance. AGenDA: Against Genomic Discrimination in Aotearoa

Structural disadvantage for priority populations: the spatial inequity of COVID-19 vaccination services in Aotearoa

Variability of CPR training requirements among New Zealand health professionals

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Summaries

The economic and health burden of infective endocarditis in Northland, New Zealand

Johanna M Birrell, Thomas Evans, Raewyn Fisher, Alan Davis, Lucille Wilkinson

Infective endocarditis is an infection of the heart valves, which can cause serious complications such as stroke and heart failure. This study found a high rate of severe infective endocarditis in Northland, particularly in the elderly Maori population. A large proportion of cases were caused by dental bacteria, which is a pattern usually seen in lower-income countries. Investment in community water fluoridation, oral health education and access to affordable dental care is recommended in Northland and is likely to be cost-effective.

Variability of CPR training requirements among New Zealand health professionals

Daniel Harvey, Jonathon Webber, Daniel W O'Brien

This study looked at the cardiopulmonary resuscitation (CPR) training requirements among the 17 types of registered health care professionals (e.g., Nurses, dentists, physiotherapists) and 20 different specialities of doctors (e.g., Surgeons, anaesthetists, GPs) within New Zealand. Considerable variability was found, with some professions having comprehensive training policies while others had none. The authors believe that CPR training at a level appropriate to the clinical setting should be compulsory for all health professionals, with a requirement to refresh this on a regular basis. They suggest that better patient outcomes could be achieved with regular training and that patients, the public, and whānau would expect health professionals to be competent in performing CPR and managing a medical emergency, however, more research is needed to prove this.

The student narrative of undergoing academic difficulty and remediation in a medical programme: Indigenous Māori and Pacific Admission Scheme (MAPAS) and international student perspectives at The University of Auckland

Simone Watkins, Jill Yielder, Warwick Bagg, Elana Curtis

The University of Auckland Medical Programme has higher rates of academic difficulty and remediation in the International, Māori and Pacific student cohorts. Remediation is a formal repeat opportunity to demonstrate a specific standard (academic or professional) which was not previously met within a clinical or exam setting. Remediation comes at a cost to the student and institution; therefore, a group of at-risk students were interviewed one on one to hear about their lived experience of remediation. The student voice found that tertiary institutions that offer undergraduate medical education can (and should) better support their at-risk medical student cohorts.

Structural disadvantage for priority populations: the spatial inequity of COVID-19 vaccination services in Aotearoa

Jesse Whitehead, Polly Atatoa Carr, Nina Scott, Ross Lawrenson

New Zealand's rollout of the Covid-19 vaccine has failed Māori and at-risk communities by relying on current health services, regardless of their already inequitable distribution. Vaccination services could have been proactively planned to target priority populations, but the rollout relied on current health services regardless of their already recognised inequitable distribution and delivery. Māori and Pacific people, over 65-year-olds, and rural residents had the worst access to vaccination services. Access varied for DHB regions, and those with the best overall access to vaccination services had the most equitable uptake. On the other hand, DHBs providing the lowest levels of service accessibility had the largest inequities in vaccination rates.

Stroke reperfusion treatment trends in New Zealand: 2019 & 2020

Natsuko Fushida-Hardy, Anne Kim, Andrew Leighs, Stephanie G Thompson, Alicia Tyson, P Alan Barber, Annemarei Ranta

Stroke reperfusion therapy is the only effective treatment to reverse stroke symptoms before brain damage occurs. Stroke reperfusion therapy rates in NZ have continuously risen over the past 5 years and this is attributed to important service improvement initiatives at DHBs and supported by MoH through this period. There are areas requiring ongoing work such as onset to treatment times especially for regional patients. We have uncovered a signal that Māori may experience longer in-hospital treatment delays than NZ Europeans and that women experience a lower intervention rate than men. These are preliminary findings and require more exploration, but if confirmed signal significant inequity that needs to be addressed.

Measuring health consumers' engagement at the governance level: development and validation of the Middlemore Consumer Engagement Questionnaire

Karol J Czuba, Christin Coomarasamy, Richard J Siegert, Renee Greaves, Lucy Wong, Te Hao Apaapa-Timu, Lynne M Maher

It is imperative that the voice of the consumer is heard and reflected in healthcare design and delivery. To achieve this, consumers need to feel confident to speak and feel that their experience and insights are heard. The Middlemore Consumer Engagement Questionnaire (MCE-Q) is a new tool that gleans valuable information from consumers to inform consumer-provider partnerships how well healthcare organisations are engaging with their consumers at a governance level.

A five-year retrospective observational study of dental presentations to Waikato Hospital's emergency department

Jamie Mckenzie, Ming Yap, Rebecca Phemister, Thasvir Singh

At Waikato Hospital, males, NZ European, and patients of high deprivation most commonly presented to ED for dental related presentation, which were primarily non-traumatic in origin. Many patients did not require hospital care, and were managed by ED and discharged. Few patients re-presented to ED for further care. Dental presentations to ED are potentially preventable, and may be related to barriers such as cost, access or health knowledge, or an increased need. Further research is required on strategies to reduce ED presentations for dental conditions.

A Critical Tiriti Analysis of the Pae Ora (Healthy Futures) Bill

Ngaire Rae, Heather Came, Maria Baker, Tim McCreanor

The Pae Ora (Healthy Futures) Bill sets out the legislation for the structural reform of the health system. This paper reviews the Bill using Critical Tiriti Analysis which involves considering how the Bill reflects the preamble and the four articles (three written and one verbal) of Te Tiriti o Waitangi (Māori text). The paper found fair engagement with most of the Te Tiriti elements and good commitment to equity. The Bill has potential and there are significant power shifts proposed however these could be further strengthened by a greater engagement with Te Tiriti o Waitangi.

Genomic discrimination in New Zealand health and life insurance. AGenDA: Against Genomic Discrimination in Aotearoa

Andrew N Shelling, Louise S Bicknell, Stefan S Bohlander, Murray P Cox, Sara K Filoche, Harry G Fraser, Kimberley Gamet, Paul Lacaze, Rinki Murphy, Russell G Snell, Andrew Sporle, Ben Te Aika, Rachel V Purcell, Jane M Tiller

Genetic testing to detect risk for conditions like certain cancers, and cardiac or neurological conditions can save lives through early preventative interventions and/or improved targeted therapy. For diseases like inherited breast and ovarian cancers, a single mutation in a *BRCA1/2* gene can run within families and predispose individuals to a high likelihood of developing cancer at a young age. Early screening and detection, and prophylactic surgery, can dramatically reduce cancer risk. As genetic testing becomes more complex, it is often referred to as genomic testing, as we move from testing single genes to include all genes and other types of molecular testing.

Currently, New Zealand insurance companies are legally allowed to ask for and use applicants' genetic test results in underwriting decisions. This often leads to genomic discrimination, where insurers increase premiums or deny cover to applicants on the basis of these results. The professional guidelines applicable to genetic counsellors in New Zealand require that, where relevant, insurance implications are included in discussions with individuals considering genetic testing.[1] There is considerable evidence, internationally, that individuals often decline medical genetic testing or participation in genomic research studies because of fears of genomic discrimination.[2,3] In a US trial of whole-genome sequencing in clinical care, 28% of participants declined involvement due to a concern about insurance discrimination.[4] A recent Australian study also reported that concerns about genetic results being provided to life insurance companies deterred up to 10% of people from undergoing potentially life-saving genetic tests.[5] From an ethical perspective, these studies present troubling evidence about the potential harm from the continued legality of genetic discrimination.

Anecdotal evidence from clinicians, researchers and consumers in New Zealand indicates that this is an ongoing and significant problem, often leading to withdrawal of individuals and whole families from genomic testing and research. For people who are at risk of genetic conditions, choosing not to be tested may have serious health impacts. The fear of genomic discrimination can also hamper recruitment into genomic research studies.[6,7] Genomic research is critical to understanding disease, developing preventions/therapies and improving patient outcomes. If people are afraid to be involved in genomic research because of a lack of protection from genomic discrimination, this will undermine the potential that research offers.[8]

Although insurance providers in New Zealand cannot require individuals to undergo genetic testing, both health and life insurance companies can legally ask for and use previous genetic/genomic test results to discriminate against applicants. The obligation is on the person applying for insurance to provide the genetic test result, not on the medical professional or healthcare service. If an applicant doesn't disclose the result or even the fact that a test was taken, the insurer could void the policy for non-disclosure when a claim is later assessed. New Zealanders who are proactive about their health by having genomic testing, or partaking in genomic research, are at risk of themselves or even their relatives being penalised both financially and medically.

The New Zealand Government has an obligation under Te Tiriti o Waitangi to achieve equitable health outcomes for Māori.[9] Māori have justifiable mistrust and cynicism of the New Zealand healthcare system, and historical concerns around race-based discrimination of Indigenous peoples have the potential to become amplified, as innovative technology, including genomic analysis, enables greater levels of inequity and discrimination.

The Universal Declaration on the Human Genome and Human Rights (UNESCO 1997) states that "no one shall be subjected to discrimination based on genetic characteristics that is intended to infringe or has the effect of infringing human rights, fundamental freedoms and human dignity". Following the ratification of this declaration, many countries have implemented legislation to safeguard people from genomic discrimination in insurance and in the workplace.[10,11] In 2017, Canada introduced a complete ban on the use of genetic test results to discriminate in any area, including insurance and employment. Despite insurer resistance to this legislation, it has withstood a Supreme Court appeal and is now fully implemented. In 2019, the Australian life insurance industry introduced a five-year self-regulated moratorium on the use of genetic tests.[12] Although the New Zealand and Australian Standards regarding the use of genetic test results in life insurance underwriting were previously identical, New Zealand did not follow Australia by implementing a moratorium. Accordingly, a significant disparity now exists on this issue between New Zealand and many other first world countries.

The Financial Services Council (FSC) is the industry body for health and life insurance in New Zealand. As discussed, professional guidelines require genetics professionals to discuss relevant insurance implications of genetic testing with patients, meaning that an understanding of how insurers may use results is important. The Australian version of the FSC publishes its Standard on the use of genetic test results in underwriting on its website.[12] The New Zealand FSC's guidelines for using genetic test results, however, are not available on its website (although they used to be). Members of the author group have made several requests for copies of the guidelines from FSC since 2020. After initially being advised that the guidelines are "for FSC members only", copies of the guidelines applying to life insurers were provided in late 2021. These guidelines confirmed that life insurance companies can use applicants' genetic test results in underwriting. Of note, the accompanying letter advised that "there is no standard documentation for how genetic testing information is currently used by the New Zealand life or health insurance industry". The guidelines are still not available on the FSC website at the time of writing, and this lack of transparency continues to be an ethical concern.

Insurers often cite "information asymmetry" (when a customer holds more information about their risk profile than the insurer) as a reason to request genetic test information from applicants. Despite these claims, there is little, if any, peer-reviewed evidence that information asymmetry leads to insurer disadvantage in practice. For example, research has shown women with pathogenic *BRCA1/2* variants do not generally capitalise on their information advantage by purchasing more life insurance than those women who have not undergone genetic testing.[13] In addition, the availability of risk mitigation strategies for women diagnosed with a *BRCA1/2* variant means that, generally, they undertake risk-reducing behaviours, such as early screening and/or prophylactic surgery, to dramatically reduce their risk of developing or dying from cancer, putting both the woman and life insurer in a better position.[14–16] The idea that banning the use of genetic test results in insurance underwriting will cause financial harm to insurance companies is not supported by the literature. When asked by an Australian Parliamentary Inquiry regarding this issue to produce evidence of the negative effects of such a ban, the Australian FSC did not produce any such evidence.[17] Several independent experts engaged by the Canadian Government, when its legislation was being considered, concluded that banning the use of genetic test results in insurance underwriting would not threaten the insurance industry's economic viability in the medium-term future.[18,19]

In the future, we expect that many types of genomic data will contribute to improved diagnosis and prognosis for a range of disease. Genomic profiling is increasingly used to optimise the efficiency and benefit of therapeutic interventions in a precision or personalised medicine approach. However, analysing and translating genomic data is an ongoing challenge for clinicians and researchers, and knowledge about genomics is still being uncovered. Issues such as variable penetrance (how often a certain gene change leads to disease in an individual), and "variants of unknown significance" (where it is unknown whether variants are harmless or risk factors for disease) are examples of the continued uncertainty associated with genomic research. Given this uncertainty, it is naïve to expect insurance companies to have a complete understanding of this complex area, and inappropriate for insurers to base underwriting decisions on the results of tests which may still be poorly understood by clinicians. Issues such as “incidental findings” create further ethical challenges when considering the right of insurers to use genetic information, that is, when genomic testing unexpectedly reveals health information that is unrelated to the original purpose of the test.

By failing to address genomic discrimination in insurance, New Zealand is falling behind a host of countries against which it would normally benchmark its policy approaches. As a result, a group of New Zealand clinicians, academics, scientists, lawyers, and representatives from Māori, Pasifika, medical charities and patient groups have formed a collaborative alliance, known as “Against Genomic Discrimination Aoteoroa”, or AGenDA (current members are attached), to address these issues. AGenDA recommends that a complete ban on the use of genomic information by insurance companies is necessary for the advancement of genomic medicine and the protection of all New Zealanders.

COMPETING INTERESTS

Nil.

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The economic and health burden of infective endocarditis in Northland, New Zealand

Johanna M Birrell, Thomas Evans, Raewyn Fisher, Alan Davis, Lucille Wilkinson

ABSTRACT

AIM: To explore the epidemiology, presentation, management and healthcare impact of infective endocarditis (IE) in Northland, to guide strategies for prevention and quality improvement.

METHOD: Health records of patients treated for IE in Northland between 2010 and 2019 were analysed retrospectively. Cases were classified using Modified Duke Diagnostic Criteria.

RESULTS: One hundred and forty cases of IE (97 definite, 43 possible) were identified. The incidence of IE in Northland was 8.5 per 100,000-person-years. The highest-risk group were elderly Māori. There was a 44% rate of prosthetic valve endocarditis (PVE) with 27% of these patients having a history of rheumatic heart disease. Organisms causing IE included streptococcal species (43%), *Staphylococcus aureus* (23%) and enterococci (16%). Complications included stroke (24%), systemic embolism (38%), congestive heart failure (30%) and paravalvular abscess (14%). Median length of hospitalisation was 22 days (IQR 14–34) and 32% required valve surgery. The mortality rate at six weeks after diagnosis was 18%. An estimated total of NZ$6,560,470 was spent on direct patient care.

CONCLUSION: IE is causing substantial morbidity and mortality in Northland and consuming considerable healthcare resources. A high index of suspicion for IE is recommended. A high proportion of cases were caused by odontogenic organisms. Preventative investment in oral health promotion and dental care has the potential to be cost-effective.

Infective endocarditis (IE) is a complex condition to diagnose and manage that continues to cause significant morbidity and mortality in New Zealand and internationally.[1–5] There is a trend towards an increasing proportion of IE cases caused by *Staphylococcus aureus* in high-income countries, while streptococcal infections continue to predominate in lower-income settings.[2,6,7] The International Collaboration on Endocarditis-Prospective Cohort Study (ICE-PCS) is the largest prospective cohort study on IE to date, collecting data on 2,781 patients from 58 hospitals across 25 countries (including New Zealand) between 2000 and 2005.[2] The ratio of streptococcal to staphylococcal species causing IE was 0.7. Other studies have demonstrated ratios of 2.5 in Pakistan and South Africa, 1.6 in South America, 1.2 in India, 0.8 in Europe and 0.3 in North America.[5] The higher rate of streptococcal IE in lower-income countries has been attributed to poorer dental health, higher prevalence of predisposing rheumatic heart disease (RHD), and that intravenous drug use (IVDU) and healthcare-associated risk factors for staphylococcal IE are less common.[5,8]

Several previous studies have explored the demographics, clinical features and management of IE in New Zealand.[1,3,4,9] The largest was the New Zealand component of ICE-PCS, which included 337 cases of IE.[3] There is a paucity of IE incidence data internationally and in New Zealand.[5] A systematic review of population-based studies from 1969 to 2000 across seven high-income countries reported an incidence of 1.4 to 6.2 cases per 100,000 persons.[10] Other studies in Hong Kong, Italy and Australia found an incidence of 2.8, 4.4 and 4.7 per 100,000 person-years respectively.[11–13] No previous New Zealand studies have provided population-based IE incidence data or estimated the healthcare cost of IE.

Dental disease can predispose to IE through bacteraemia from oral flora.[14,15] There are inequities in dental health in New Zealand, with higher rates of dental disease observed in the Māori population and among families of lower socio-economic status.[16–19] The Northland Region has some of the highest rates of social deprivation and dental disease in the country.[18–20] Dental care for adults in Northland is predominantly through private practice, other than limited emergency dentistry services for medically compromised and low-income adults in hospitals and community clinics.[21] There is no fluoridation of the water supply in Northland.[21] We hypothesise that the high burden of dental disease in Northland may be contributing to a high incidence of IE from dental organisms such as oral streptococci and enterococci.

RHD, a complication of acute rheumatic fever (ARF), is a condition associated with poverty and overcrowded living conditions that is now rarely encountered in most high-income countries. However, ARF and RHD present an ongoing challenge in Northland. A review of ARF in Northland found an incidence of 7.0 per 100,000-person-years, with 93% of cases occurring in Māori and 87% of patients living in deprived areas.[22] No previous studies have explored the association between RHD and IE in Northland.

This study aimed to define the epidemiology, risk factors, microbiology, presentation, management and healthcare impact of IE in Northland, to guide strategies for prevention and quality improvement.

Method

Setting

The Northland Region is defined in this study based on the 2018 census map boundaries.[23]Northland District Health Board (NDHB) includes five public hospitals, located in Whangārei, Bay of Islands, Kaitaia, Hokianga and Dargaville. All patients fulfilling the Modified Duke Criteria for IE were eligible for inclusion if they received treatment at any of these sites between 1 January 2010 and 31 December 2019. There is no inpatient cardiothoracic surgical service within NDHB. Northland patients requiring cardiothoracic surgical input are routinely transferred to Auckland District Health Board (ADHB).

Study design and data collection

Cases of IE were identified retrospectively using discharge coding data from NDHB hospitals (International Classification of Diseases-10 codes 133, 138, 139). Cases of all ages were included in the study if they met Modified Duke Criteria for ‘definite’ or ‘possible’ IE.[24] Demographic and clinical data were extracted from electronic medical records and entered on an audit tool (Microsoft® Excel (version 16.32)). New Zealand Index of Deprivation 2018 (NZDep2018) deciles were assigned according to each patient’s address at diagnosis. Territorial authority boundaries from Stats NZ were used to define the Far North, Whangārei and Kaipara districts. Nosocomial IE was defined as IE developing in a patient hospitalised for more than 48 hours prior to onset of signs or symptoms of IE.[2] Dental information was extracted from patients’ medical notes and the Titanium® dataset, an information management system that records clinical data from free dental examinations conducted by dental therapists and dentists.[19] Costing data were obtained from the NDHB webPAS® portal and included all admission costs at NDHB and ADHB for management of IE and its complications, inter-hospital transfers, cardiology clinics within 12 months after discharge and community nursing visits within 31 days of discharge.

Data analysis

As population growth occurred in Northland during the study period, population data from the approximate midpoint of the study (the mean of 2013 and 2018 census data) were used for incidence calculations. The incidence of IE was determined by dividing the number of incident cases by the total number of person-years accumulated in the study population. Incidence values and 95% confidence intervals were calculated using Microsoft Excel. Other statistical analyses were performed using IBM® SPSS Statistics (version 25.0.0.0). Continuous variables were reported as medians and interquartile ranges. Categorical variables were expressed as frequencies and percentages of the specified group. Categorical data were compared using the Chi-squared test or Fisher’s exact test. Parametric data were compared using the t-test or ANOVA test and non-parametric data using the Mann–Whitney or Kruskal–Wallis test. The Pearson correlation coefficient was used to calculate the correlation between two continuous variables.

Ethics approval

Ethics approval was sought from the New Zealand Health and Disability Ethics Committees. The study was deemed out of scope and not requiring ethics review.

Results

Incidence and demographics

The Northland population estimate used for incidence calculations was 165,384 and the Māori population was 56,807 (34%). Census data indicate 18% population growth in Northland from 2013 to 2018.[23] Between January 2010 and December 2019, there were 140 episodes of IE identified in 134 patients. Ninety-seven cases (69%) were classified as definite and 43 (31%) as possible IE. Table 1 describes their demographic characteristics.

The overall incidence of IE in Northland was 8.47 (95% CI 7.12–9.99) per 100,000 person-years. The incidence in males was 12.82 per 100,000 person-years, compared to 4.27 in females (p=0.04). The incidence in the New Zealand European (NZE) population was 8.30 and in Māori was 6.51 (p=0.64). Figure 1 illustrates the incidence stratified by age and ethnicity. The population group at highest risk of IE were Māori aged 80–84 years, with an incidence of 72.90 cases per 100,000 person-years compared to 18.77 among non-Māori in the same age group (p <0.001). Rates of IE were also significantly higher among Māori aged 25–29, 30–34, 45–49 and 75–79 years.

One hundred and two patients (73%) lived in areas with NZDep2018 deciles between 7 and 10 (Table 1). A higher proportion of Māori than non-Māori patients lived in decile 9 and 10 areas (58% versus 39%). Supplementary Figure 1 illustrates each patient's domicile at the time of diagnosis.

Risk factors

There were 62 cases of prosthetic valve endocarditis (PVE) (44%) and 78 cases of native-valve endocarditis (56%). In 17 of the PVE cases (27%), the valve had been replaced due to RHD. Twenty-five patients with PVE (40%) had mechanical valves and 37 (60%) had bioprosthetic valves. A history of congenital valve disease was documented in 25 patients (18%) and RHD in 19 patients (14%). There were 13 cases of recurrent IE, of which six were managed for IE twice at NDHB during the study period and seven had a history of IE prior to the study period. Five cases (3%) were classified as nosocomial. Three patients

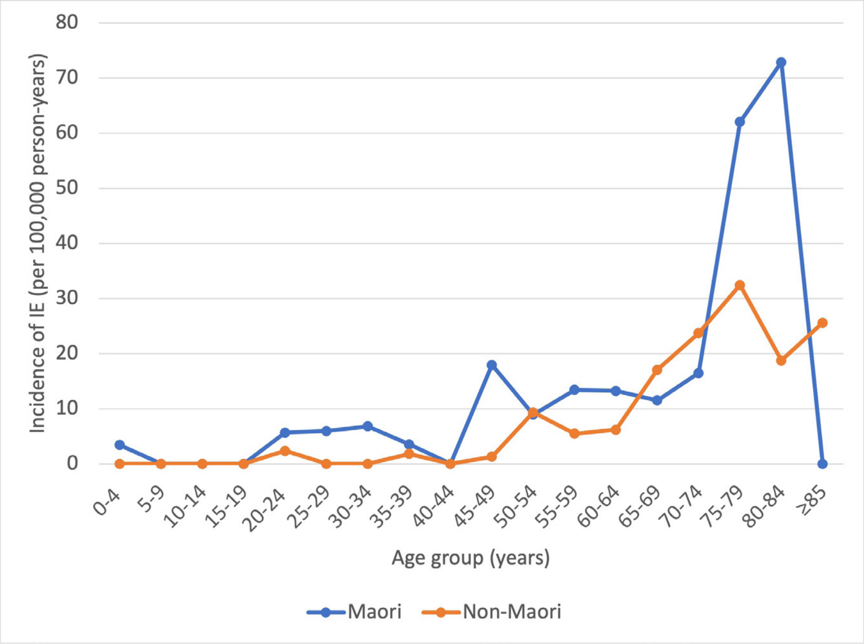
Table 1: Demographics and Modified Duke Criteria of patients treated for IE in Northland, stratified by ethnicity.

	Māori ethnicity **n=36**	**Non-Māori ethnicity** **n=104**	**Total** **n=140**
Gender			
Male, n (%)	24 (67)	80 (77)	104 (74)
Female, n (%)	12 (33)	24 (23)	36 (26)
Age in years			
Median (interquartile range)	55 (42–72)	73 (64–80)	70 (57–79)
0–4	2 (6)	0 (0)	2 (1)
5–14	0 (0)	0 (0)	0 (0)
15–24	2 (6)	1 (1)	3 (2)
25–34	3 (8)	1 (1)	4 (3)
35-44	1 (3)	2 (2)	3 (2)
45–54	9 (25)	9 (9)	18 (13)
55–64	7 (19)	14 (13)	21 (15)
65–74	4 (11)	32 (31)	36 (26)
75–84	8 (22)	30 (29)	38 (27)
≥85	0 (0)	15 (14)	15 (11)

Table 1 (continued): Demographics and Modified Duke Criteria of patients treated for IE in Northland, stratified by ethnicity.

	Māori ethnicity n=36	Non-Māori ethnicity n=104	Total n=140
Address at time of diagnosis, n (%)			
Far North	14 (39)	34 (33)	48 (34)
Whangārei	19 (53)	53 (51)	72 (51)
Kaipara	3 (8)	14 (14)	17 (12)
Overseas resident	0 (0)	3 (3)	3 (2)
NZDep2018 decile, n (%)			
1–2	0 (0	0 (0)	0 (0)
3–4	2 (6)	5 (5)	7 (5)
5–6	4 (11)	23 (22)	27 (19)
7–8	9 (25)	31 (30)	40 (29)
9–10	21 (58)	41 (39)	62 (44)
Not available	0 (0)	4 (4)	4 (3)
Modified Duke Criteria, n (%)			
Definite	27 (75)	70 (67)	97 (69)
Possible	9 (25)	34 (33)	43 (41)

Figure 1: Incidence of infective endocarditis per 100,000-person-years in Northland, stratified by age and ethnicity.



(2%) had a history of injecting drug use. Further patient co-morbidity data can be found in Supplementary Table 1.

Microbiology

Table 2 outlines the microbiology of IE cases according to valve type. Viridans streptococci were the most common causative organism (n=42, 30%), followed by *S. aureus* (n=32, 23%) and *E. faecalis* (n=22, 16%). The ratio of streptococcal to staphylococcal species causing IE was 1.7.

The five cases of nosocomial IE were caused by methicillin-sensitive *S. aureus* (MSSA) (n=1), viridans streptococci (n=1), coagulase negative staphylococci (n=1), non-HACEK group gram-negative bacilli (n=1) and polymicrobial IE (n=1).

Clinical presentation

Table 3 describes clinical and investigation findings. The most frequent clinical signs were fever (n=116, 83%), heart murmur (n=92, 66%) and splinter haemorrhages (n=18, 13%). Other classical signs of IE were rare, with few patients exhibiting Janeway lesions (n=2, 1%), Roth spots (n=2, 1%) or Osler's nodes (n=1, 1%).

In 135 cases (96%) the C-reactive protein (CRP) level was 10mg/L or higher on admission. The median CRP level on admission was 89 mg/L (IQR 52–155).

Blood cultures were positive in 129 cases (92%). Of the 11 cases with no positive blood cultures, eight had received antibiotic therapy prior to cultures being taken. The median number of blood cultures taken per patient was five (IQR 4–8), and the median number of positive blood cultures was two (IQR 1–3).

Transthoracic echocardiography (TTE) was performed in 131 patients (94%) and vegetations were identified in 48 of these (37%). Transoesophageal echocardiography (TOE) was performed in 107 patients (76%) and vegetations were identified in 77 (72%). One hundred patients (71%) underwent both TTE and TOE. Vegetations were identified on both TTE and TOE in 29 of these patients (29%) and vegetations were seen on TOE but not TTE in 48 (48%). The sensitivity of TTE compared to the gold standard of TOE in detecting valvular vegetations was 38% and the specificity was 87%. In cases of pure aortic valve IE the sensitivity of TTE compared to TOE was 45%. In cases of pure mitral valve IE the sensitivity of TTE compared to TOE was 30%. There was no significant difference in rates of TOE by ethnicity (n=25, 72% in Māori; n=81, 78% in non-Māori; p=0.490), or territorial authority (n=33, 87% in Whangārei; n=26, 76% in Far North; n=10, 91% in Kaipara District; p=0.382).

The aortic valve was involved in 79 cases (56%), mitral valve in 49 (35%), tricuspid valve in eight (6%) and pulmonary valve in four (3%). In 12 cases (9%) there were multiple valves affected. In 14 cases (10%) the affected valve(s) were unknown.

Dental history

Ten cases (7%) had a recorded public dental service review in the 12 months preceding diagnosis of IE, of whom six had pre-existing prosthetic valves. Only one of the 19 cases with a history of RHD had a recorded dental review in the 12 months prior to IE diagnosis (5%). Of the 42 cases of viridans streptococcal IE, five had a recorded dental review in the prior 12 months (12%). No patients with IE caused by other streptococci or *E. faecalis* had a recorded dental review in the prior 12 months.

Nineteen cases (14%) underwent dental review during their hospital admission, including 13 of those with viridans streptococcal IE (31%), zero with other streptococcal IE, zero with *E. faecalis* IE and three with *S. aureus* IE. Twenty-one cases (15%) had a dental x-ray during their admission.

Complications

Complications of IE included systemic embolism (n=53, 38%), congestive heart failure (n=42, 30%), stroke (n=33, 24%), paravalvular abscess (n=19, 14%), valvular perforation (n=16, 11%), chordal vegetation or rupture (n=15, 11%), persistent bacteraemia for more than two weeks (n=10, 7%) and death within six weeks of diagnosis (n=16, 21%). There were 14 cases of prosthetic valve regurgitation (23% of all PVE cases) and 11 cases of prosthetic valve dehiscence (18% of PVE cases). An overview of complications stratified by causative organism is provided in the Supplementary Table 2.

Management and outcomes

Valve surgery was performed in 45 cases (32%). Aortic valve surgery was performed in 23 patients (16%), mitral valve surgery in 26 (19%), tricuspid valve surgery in four (3%) and pulmonary valve surgery in two (1%). In 10 cases (7%), multiple valves required intervention. Further detail on types of valve surgery is provided in the Supplementary Table 3. The median time from initial contact with healthcare services to valve surgery was 24 days (IQR 10–58). Valve surgery was required in 41% of *S. aureus* cases (n=13),

Table 2: Microbiology of IE cases according to valve type.

Organism	Native valve IE n=78 (%)	Prosthetic valve IE n=62 (%)	P value	Overall cohort n=140 (%)
Streptococci	40 (51)	20 (32)	**0.027**	60 (43)
Viridans streptococci	30 (38)	12 (19)	**0.016**	42 (30)
Streptococcus gallolyticus	2 (3)	4 (6)	0.406	6 (4)
Other streptococci	8 (10)	4 (6)	0.549	12 (9)
Staphylococcus aureus	22 (28)	10 (16)	0.107	32 (23)
MSSA	21 (27)	8 (13)	0.058	29 (21)
MRSA	1 (1)	2 (3)	0.584	3 (2)
Enterococcus faecalis	9 (12)	13 (21)	0.162	22 (16)
Coagulase-negative staphylococci	1 (1)	2 (3)	0.584	3 (2)
HACEK group	1 (1)	2 (3)	0.584	3 (2)
Non-HACEK group gram-negative bacilli*	2 (3)	3 (5)	0.655	5 (4)
Polymicrobial	0 (0)	2 (3)	0.194	2 (1)
Culture-negative	3 (4)	6 (10)	0.184	9 (6)
Other**	0 (0)	4 (6)	**0.036**	4 (3)

Statistically significant p values (<0.05) are highlighted in bold script.
Abbreviations: MSSA=methicillin-sensitive *S. aureus*, MRSA=methicillin-resistant *S. aureus*, HACEK=*Haemophilus* species, *Aggregatibacter* sp., *Cardiobacterium* hominis, *Eikenella corrodens*, *Kingella* sp.
*Non-HACEK group gram negative bacilli: *Escherichia coli* (n=2), *Klebsiella pneumoniae* (n=1), *Capnocytophaga canimorsus* (n=1), *Stenotrophomonas maltophilia* (n=1).
**'Other' organisms: *Aerococcus urinae* (n=1), *Gemella hemolysans* (n=1), *Propionobacterium* sp. (n=1), *Abiotrophia defectiva* (n=1), *Bartonella* sp. (n=1).

Table 3: Clinical presentation of IE.

Clinical features	Definite cases n=97 (%)	Possible cases n=43 (%)	Total n=140 (%)
Fever (>37.7°C)	81 (84)	35 (81)	116 (83)
Heart murmur	67 (69)	25 (58)	92 (66)
Splinter haemorrhages	14 (14)	4 (9)	18 (13)
Splenomegaly	5 (5)	1 (2)	6 (4)
Janeway lesions	2 (2)	0 (0)	2 (1)
Osler's nodes	1 (1)	0 (0)	1 (1)
Roth spots	2 (2)	0 (0)	2 (1)
Ophthalmitis	1 (1)	0 (0)	1 (1)
Buccal petechiae	1 (1)	0 (0)	1 (1)
Digital infarcts	1 (1)	0 (0)	1 (1)
Elevated C-reactive protein (≥10 mg/L) on admission	94 (97)	40 (93)	134 (96)
Positive blood culture(s)	90 (93)	39 (91)	129 (90)
Vegetations on transthoracic echocardiogram	44 (45)	4 (9)	48 (34)
Vegetations on transoesophageal echocardiogram	69 (71)	8 (19)	77 (55)
CT scan(s) performed (1 or more)	67 (69)	13 (30)	80 (57)
MRI scan(s) performed (1 or more)	25 (26)	4 (9)	29 (21)

26% for viridans streptococci (n=11), 18% for *E. faecalis* (n=4) and 66% for coagulase negative staphylococci (n=2). Nine patients (6%) required non-cardiac surgery. Peripherally inserted central catheters were placed for 115 patients (82%) and 64 patients (46%) received outpatient intravenous antibiotic therapy.

The all-cause mortality rate at six weeks after diagnosis of IE was 18% (n=25), at six months was 22% (n=31), 12 months was 25% (n=35) and five years (or duration of follow up if less than five years) was 36% (n=51). Among patients who underwent valve surgery the six-week mortality rate was 18% (n=9), which was equivalent to the non-operative group (18%, n=16, p=0.974). In those who received ICU-level care the mortality rate was 25% (n=14), compared to 13% (n=11) in those not admitted to ICU (p=0.07). There was no significant difference in rates of ICU admission, valve surgery or death according to patients' home territorial authority (p=0.499, 0.353 and 0.110 respectively).

Healthcare impact

Table 4 outlines the healthcare impact of IE and sites of inpatient treatment. An estimated NZ$6,560,470 was spent on direct patient care for IE during the study period. The median healthcare cost per case of IE was $34,053 (IQR $18,212–69,994).

For streptococcal IE the median cost per case was $29,362, for *S. aureus* was $40,420 and for *E.*

faecalis was $30,265 (p=0.278). Length of hospital stay was directly associated with healthcare cost (correlation coefficient 0.584, p<0.000). At least one inter-hospital transfer was required for 96 of the cases (69%; range 0–6 transfers).

Discussion

This study describes the burden of IE in Northland, identifying the elderly Māori population as being at greatest risk. The overall IE incidence of 8.47 per 100,000 person-years in Northland is higher than has been described in other high-income countries (reported incidence of 1.4 to 6.2 per 100,000 person-years).[10–13] No previous New Zealand incidence data are available for comparison.

The severity of IE cases in Northland is notable, with higher rates of systemic embolism (44% versus 17%), stroke (27% versus 14%) and death (21% versus 6%) than were observed in the New Zealand ICE-PCS cohort.[3] This is despite ICE-PCS only enrolling patients from large hospital centres with a cardiothoracic surgical service, which was expected to select out cases that are more complex and requiring surgical intervention.[3] However, the rate of valve surgery in Northland cases was similar to in the ICE-PCS cohort (34% and 33% respectively). There was a markedly longer duration from initial healthcare contact to surgery in Northland cases than in ICE-PCS (median of 24 days versus 4 days). This may be due to delays in diagnosis and inter-hospital transfer from NDHB to a cardiothoracic surgical centre, or differences in the pathology and acuity of presentation. Ethnicity and deprivation were not described for the ICE-PCS cohort. However, the rate of RHD, an indicator of underlying poverty and overcrowding, was much higher in our study (14% versus 4%) and likely reflects inequities in healthcare access and social determinants of health in Northland.

The microbiology of IE in Northland is more

Table 4: Healthcare impact of IE.

Impact measure	
Length of hospital stay in days (median, IQR)	22 (14–34)
Cumulative length of hospital stay (days)	3,809
ICU admission n (%)	57 (41)
Length of stay in ICU in days (median, IQR)	4 (2–6)
Interhospital transfer (1 or more) n (%)	96 (69)
Total number of interhospital transfers	207
Duration of intravenous antibiotic therapy in days (median, IQR)	42 (28–42)
Site(s) of inpatient treatment	
Whangārei Hospital n (%)	140 (100)
Bay of Islands Hospital n (%)	26 (19)
Kaitaia Hospital n (%)	8 (6)
Dargaville Hospital n (%)	7 (5)
Hokianga Hospital n (%)	2 (1)
Auckland City Hospital* n (%)	77 (55)
Middlemore Hospital* n (%)	2 (1)
Waikato Hospital* n (%)	1 (1)
Multiple hospital sites n (%)	96 (69)

*Tertiary-care hospitals.

consistent with that seen in lower-income countries, with a high proportion of cases caused by streptococci rather than staphylococci (ratio 1.7 in Northland, versus 0.7 in the international ICE-PCS study). This pattern supports our hypothesis of dental disease in Northland contributing to the high burden of IE.

Factors contributing to the higher incidence of IE among those aged over 70 years, particularly Māori, may include a greater prevalence of cardiac valvular disease, dental decay, diabetes and immunocompromising medical conditions within this population. Changes in dental profiles with increasing retention of natural teeth may also predispose to higher rates of dental infection in later life.[24] Elderly people may also have difficulty accessing dental care (both for routine prevention and acute dental infections), due to disability or financial constraints. These inequities may be more pronounced among elderly Māori than non-Māori due to cultural and language barriers, remoteness and higher rates of social deprivation.[20]

This study also highlights the poor sensitivity of TTE (38%) compared to the gold standard of TOE in the diagnosis of IE. A systematic review and meta-analysis published in 2017 found similar results, with fundamental TTE detecting vegetations with a sensitivity of 41% (95% CI 29–55%) compared to the reference standard of TOE.[25] We hypothesise that reduced TOE availability in Northland may have contributed to delayed diagnosis and valve intervention. Within our cohort there was no significant difference in rates of TOE by patient ethnicity or region. However, it would be useful to compare the proportion of patients undergoing TOE and time from admission to TOE for evaluation of endocarditis between district health boards, to assess equity of access at a regional level.

It is possible that cases of IE were missed in this study if no discharge summary was completed (required for hospital coding) or the diagnosis of IE was not included during coding. Therefore, our incidence data may underestimate the true burden of IE. Another limitation of incidence calculations was the use of midpoint population estimates, as significant population growth occurred over the study period. Co-morbidity results and clinical features may be underestimated if medical history or examination was incompletely documented or not included in patients' electronic admission or discharge records.

Only public dental data from free dental examinations were accessed. As dental care for adults in Northland is predominantly through private practice, most dental encounters are likely to have been missed (unless documented in patient notes). However, data on inpatient dental reviews at Whangārei Hospital are expected to be complete as these are routinely performed via the on-site public dental service and recorded on the Titanium database.

If patients were transferred to or from a district health board other than NDHB or ADHB (or overseas), then data from these other sites were not accessible. Assessment of longer-term outcomes such as delayed surgery, recurrence and one- and five-year mortality was not available for all patients as the time had not yet elapsed at the time of data collection.

Cases were included in the cohort if they met Modified Duke Criteria for 'possible IE'. Some of these cases may have been incorrectly diagnosed as IE (such as episodes of bacteraemia without endocarditis). However, cases were excluded if they met Modified Duke Criteria for 'rejected IE' or if IE was not documented as a discharge diagnosis by the treating team.[26]

The calculated total healthcare cost of IE during the study period is likely a significant underestimate as it does not include non-cardiology outpatient clinic follow-up, private healthcare encounters, or the cost of long-term patient disability, interruption to employment and years of life lost. Further studies measuring the burden of disease from IE, including years of life lost and years lived with disability, would be valuable in quantifying the broader societal cost of the disease.

As a high proportion of IE cases were caused by odontogenic organisms, a review of factors contributing to dental disease and further investment in oral health promotion in Northland is recommended. The New Zealand Promoting Oral Health guideline provides a comprehensive framework for based on Ottawa Charter principles.[27] Community fluoridation of reticulated water supplies supplying populations over 500 has been assessed as a highly cost-effective strategy for prevention of dental caries in New Zealand.[28] Research indicates that populations living in deprived areas may show the greatest reduction in dental ambulatory sensitive hospitalisations as a result of community water fluoridation.[29] At present, no reticulated water supplies in Northland are fluoridated.[30] Consideration should be given to water fluoridation for dental protection in Northland, a position which is supported by NDHB.[28,30]

There is limited evidence that oral health education alone can improve dental hygiene.[31] However, a multi-component approach including oral health promotion in schools, provision of fluoride-containing toothpaste, oral health training of non-dental professionals and limitations on marketing and sale of high-sugar food and beverages may be beneficial.[31] Further study is currently underway to develop and evaluate interventions to reduce oral health disparities for Māori.[32]

Previous research suggests that improvement in oral hygiene by regular dental scaling is associated with a significant decrease in risk of IE.[33] Access to affordable dental care is particularly important for high-risk groups such as elderly Māori and patients with prosthetic valves, RHD, congenital valve disease or previous IE. International guidelines recommend that high-risk patients undergo dental follow-up twice a year.[34,35] This could be logged on a registry to facilitate auditing and reminder systems. It would also be informative to audit antimicrobial prophylaxis for the prevention of IE against national guidelines.

It is recommended that clinicians in Northland maintain a high index of suspicion for IE and have a low threshold for performing pre-antibiotic blood cultures and TOE. A diagnosis of IE should be considered in all patients presenting with stroke or systemic emboli, particularly in the presence of fever or elevated CRP. Development of an NDHB clinical practice guideline for investigation and management of suspected IE (including indications for transfer to ADHB and inpatient dental review) and improved local access to TOE may facilitate earlier diagnosis and valve intervention. We support previous recommendations to establish a systematic New Zealand IE registry under the auspices of the Ministry of Health.[9] A registry would allow monitoring of IE incidence, management and outcomes at a national and district health board level and provide extensive opportunities for further auditing and quality improvement in New Zealand.

This study highlights that IE is causing alarming morbidity and mortality in Northland and consuming significant healthcare resources. Further qualitative and quantitative research into the barriers to dental care and to early diagnosis and treatment of IE in Northland may help to guide strategies for prevention and healthcare equity. Investment in equitable expansion of community water fluoridation, oral health promotion and publicly funded dental services in Northland has the potential to be cost effective for preventing IE, in addition to the marked other health benefits of improved dental health for patients.

COMPETING INTERESTS

Nil.

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Variability of CPR training requirements among New Zealand health professionals

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ABSTRACT

AIM: To audit cardiopulmonary resuscitation (CPR) training and certification requirements of registered healthcare professionals in New Zealand.

METHOD: An enquiry-based policy audit of all regulatory bodies under the Health Practitioners Competence Assurance Act 2003 (HPCA Act 2003), and vocational medical training and recertification providers accredited by the Medical Council of New Zealand (MCNZ).

RESULTS: All the organisations approached (*n*=37) responded to the audit. Six of the 17 health professional regulatory bodies have some form of mandatory CPR certification requirement for initial registration, ongoing registration, or continuing professional development. The Midwifery Council, Dentistry Council, Podiatrists Board, and Pharmacy Council have the most comprehensive requirements. Twelve of the 20 vocational medical colleges specify some form of CPR training. The Royal New Zealand College of Urgent Care is the only one to require annual recertification.

CONCLUSION: This audit revealed a wide variety of CPR training and certification requirements across health professions in New Zealand. Future studies should investigate whether mandating CPR training improves outcomes from cardiac arrest and consider patient, public, and whānau expectations regarding the ongoing certification of healthcare professionals in resuscitation and emergency care.

Cardiopulmonary resuscitation (CPR), as it is known today, was first developed in 1960 when physicians combined chest compressions with rescue breathing and applied this to people in cardiac arrest. CPR aims to temporarily maintain a circulation sufficient to preserve brain function and oxygenation to the heart until a defibrillator and specialised care are available.[1,2] In New Zealand, five people per day are treated by the ambulance service for out-of-hospital cardiac arrest (OHCA). Of these, only 13% survived to hospital discharge.[3] In comparison, data from a large New Zealand hospital showed the incidence of cardiac arrest was 14.75 per 1,000 admissions, with resuscitation attempted in 12% of cases. Of those patients where CPR was performed, 27% survived to discharge.[4]

Health professionals may be called upon to perform CPR in the community and clinical settings. A recent survey of New Zealand podiatrists found that 16% of respondents had used CPR in an emergency, and of these, 50% of the patients had been successfully resuscitated.[5] Similarly, a survey of New Zealand physiotherapists found that 19% had used CPR in an emergency with a survival rate of 56%.[6] While the setting (clinic versus community), number of events, and long-term survival of patients described in these studies are unknown, these rates are somewhat surprising as neither profession is typically involved with the management of cardiac arrest in a hospital setting. Data on the incidence of applying CPR by other allied health professionals in New Zealand is not known. However, these studies suggest that it is not uncommon for health professionals to be called upon to perform resuscitation at some point in their careers.

Evidence supporting the effectiveness of CPR in reducing mortality and morbidity continues to grow.[1,2,7] The latest resuscitation guidelines from the United Kingdom state that accredited life support courses can also improve patient outcomes.[7] There is clear evidence, however, that CPR skills and knowledge deteriorate over time.[8–10] The Australia and New Zealand Committee on Resuscitation (ANZCOR) suggest that “ALS [advanced life support] training programmes include 6 to 8 hours of instructor-led training time…[and]… frequent manikin-based refresher training… to maintain competence compared with standard retraining intervals of 12 to 24 months”.[11]

Health professionals have a legal and moral obligation to provide medical assistance whether on duty or not.[12,13] The Health Practitioners Competence Assurance Act 2003 (HPCA Act 2003) strives to maintain public safety by providing legislative mechanisms to ensure life-long competence for healthcare professionals.[14] Under the HPCA Act 2003, 17 individual regulatory bodies are responsible for ensuring the clinical competence of all registered healthcare professionals in New Zealand. Furthermore, 13 Australasian and seven New Zealand vocational medical training providers are accredited by the Medical Council of New Zealand (MCNZ). Each organisation is governed by their education policies, including initial and ongoing CPR training and certification. Some professional bodies impose and enforce strict regulations, whereas others have no policy on this. It is the variability of these requirements that is the focus of this study.

Aim

To audit CPR training and certification requirements of registered healthcare professionals in New Zealand.

Methods

Study design

An enquiry-based policy audit. Data were collected between March 2021 and July 2021.

Participants

We invited the 17 regulatory bodies of the HPCA Act 2003, 13 Australasian colleges of medicine, and seven New Zealand vocational medical training and recertification providers accredited by the MCNZ to participate in this audit.

Audit questions

We asked each organisation the following four questions: (1) Is CPR certification mandatory for registration with the organisation; (2) Is CPR certification mandatory for ongoing yearly registration (annual practising certificate); (3) Is CPR certification mandatory as part of continual professional development requirements; (4) If CPR training is mandatory, how often is training required.

Procedure

The lead author Daniel Harvey emailed the registrar of each of the 37 organisations and explained the purpose of the audit along with the four questions. If no response had been received, a follow-up email was sent 14 days after the initial contact.

Reporting and analysis

Responses from the 37 organisations were tabulated into the three professional groups of HPCA Act 2003 regulatory bodies, Australasian medical colleges, and New Zealand medical colleges. Given the nature of the questions, responses were categorised as “Yes,” “No,” or “Not Applicable” (N/A). Where the answer required further clarification (i.e., when the requirement was only applicable to a subset of the group’s members), these were included as a footnote to the table.

Results

All 37 organisations approached responded to the audit questions. Table 1 shows the responses received from the 17 regulatory bodies of the HPCA Act (2003). Most of the organisations (11) answered “No” or “N/A” to all four audit questions. Four organisations (Midwifery Council, Dentistry Council, Podiatrists Board, and Pharmacy Council) answered “Yes” to all four questions.

Table 2 shows that the Royal Australasian College of Physicians, Australia and New Zealand College of Anaesthetists, and College of Intensive Care Medicine of Australia and New Zealand were the only organisations where CPR certification was mandatory for fellowship among the Australasian medical colleges. However, the Australasian College of Emergency Medicine and Australasian College of Sports and Exercise Physicians indicated that CPR certification was compulsory for continuing professional development (CPD) requirements. As medical colleges do not issue annual practising certificates, this question did not need to be answered.

Table 3 shows that five of the seven New Zealand vocational medical training and recertification providers described CPR certification as mandatory for fellowship. The Royal New Zealand College of Urgent Care was the only provider to require annual recertification.

Table 1: CPR training requirements for HPCA Act 2003 regulatory bodies.

Regulatory body	Is CPR certification mandatory for registration?s	Is CPR certification mandatory for ongoing yearly registration (APC)?	Is CPR certification mandatory as part of CPD requirements?	If CPR training is mandatory, how often is it required?
Chiropractic Board	No	No	No	N/A
Dental Council	Yes	Yes	Yes	Biennially
Dietitians Board	No	No	No	N/A
Medical Sciences Council	Yes*	Yes*	N/A	Biennially*
Medical Radiation Technologists Board	No	No	No	N/A
Medical Council	Yes**	No	No	N/A
Midwifery Council	Yes	Yes	Yes***	Annually
Nursing Council	No	No	No	N/A
Occupational Therapy Board	No	No	No	N/A
Optometrists and Optical Dispensing Board	No	No****	No	N/A
Osteopathy Board	No	No	No	N/A
Paramedic Council	No	No	No	N/A
Pharmacy Council	Yes	Yes	Yes	Triennially
Physiotherapy Board	No	No	No	N/A

Table 1 (continued): CPR training requirements for HPCA Act 2003 regulatory bodies.

Regulatory body	Is CPR certification mandatory for registration?s	Is CPR certification mandatory for ongoing yearly registration (APC)?	Is CPR certification mandatory as part of CPD requirements?	If CPR training is mandatory, how often is it required?
Podiatrists Board	Yes	Yes	Yes	Biennially
Psychologists Board	No	No	No	N/A
Psychotherapists Board	No	No	No	N/A

APC = Annual practising certificate; NZRC = New Zealand Resuscitation Council; CORE = Certificate of Resuscitation and Emergency Care.
* Only for anaesthetic technicians who must hold a current NZRC CORE Immediate.
** Certification in advanced cardiac life support at the standard of NZRC CORE Advanced is required for initial general scope registration only.
*** Maternal resuscitation and newborn resuscitation are all part of the recertification programme for midwives.
**** From 1 April 2022, all Optometry and Optical Dispensing Board practitioners need CPR certification before renewing their annual practising certificate.

Table 2: CPR training requirements for Australasian medical colleges

Australasian College	Is CPR certification mandatory for registration or fellowship?	Is CPR certification mandatory a s part of CPD requirements?	If CPR training is mandatory, how often is it required?
Royal Australasian College of Medical Administrators (RACMA)	No	No	N/A
Australasian College for Emergency Medicine (ACEM)	No	Yes	Relevant annual and 3-yearly CPD procedural skills requirement
Royal Australian and New Zealand College of Ophthalmologists (RANZCO)	No	No	N/A
Royal Australasian College of Dental Surgeons (RACDS)	No	No	N/A
Royal Australasian College of Physicians (RACP)	Yes *	No	N/A
Royal College of Pathologists of Australasia (RCPA)	No	No	N/A
Royal Australia and New Zealand College of Obstetricians and Gynaecologists (RANZCOG)	No	No	N/A
Australasian College of Sports and Exercise Physicians (ACSEP)	No	Yes	Triennially
Royal Australasian College of Surgeons (RACS)	No	No	N/A
Australia and New Zealand College of Anaesthetists (ANZCA)	Yes**	Yes	Two emergency response activities per triennium
College of Intensive Care Medicine of Australia and New Zealand (CICM)	No	Yes	N/A

Table 2 (continued): CPR training requirements for Australasian medical colleges

Australasian College	Is CPR certification mandatory for registration or fellowship?	Is CPR certification mandatory a s part of CPD requirements?	If CPR training is mandatory, how often is it required?
Royal Australian and New Zealand College of Psychiatrists (RANZCP)	No	No	N/A
Royal Australian and New Zealand College of Radiology (RANZCR)	No	No	N/A

ALS = Advanced Life Support.
* ALS course or equivalent at initial registration only.
** An ALS course is condition of completion in each of the four core units of the training programme.

Table 3: CPR training requirements for New Zealand medical colleges.

New Zealand vocational medical training and recertification provider	Is CPR certification mandatory for registration or fellowship?	Is CPR certification mandatory as part of CPD requirements?	If CPR training is mandatory, how often is it required?
Royal New Zealand College of Urgent Care (RNZCUC)	Yes*	Yes	Annually
The New Zealand College of Public Health Medicine (NZCPHM)	Yes**	No	N/A
The Royal New Zealand College of General Practitioners (RNZCGP)	Yes***	Yes	Triennially
Division of Rural Hospital Medicine (of the RNZCGP)	Yes ****	Yes	Triennially
New Zealand Dermatological Society (NZDSI)	No	No	N/A
New Zealand Association of Musculoskeletal Medicine (NZAMM)	Yes*****	Yes	Triennially
The New Zealand College of Sexual and Reproductive Health (NZCSRH)	No	No	N/A

NZRC = New Zealand Resuscitation Council; CORE = Certificate of Resuscitation and Emergency Care; ACLS = Advanced Cardiac Life Support.
* NZRC CORE Advanced every three years, with a 4-hour refresher in the intervening years.
** NZRC CORE Immediate certification for initial registration.
*** Assessed ACLS certificate of at least 6-hours duration not older than 3 years. Thereafter, an ACLS course of at least 4-hours duration every three years.
**** NZRC CORE Advanced, then an ACLS course of at least 4-hours duration every three years.
***** NZRC CORE Immediate.

Table 4: New Zealand Resuscitation Council Rescuer Framework.

Rescuer	Characteristics	People who may be represented	Suggested skills and knowledge	NZRC training
Untrained rescuer	Can send for help and respond under guidance	Adults and children with no training in resuscitation	Recognise unresponsiveness and absence of breathing Know to call 111 Recognise emergency signage Follow instructions to do CPR and use an AED	
Basic trained rescuer	Can initiate basic resuscitation and provide first aid	Workplace first aiders, managers, or those otherwise accountable for first aid in the workplace	**As above plus:** DRSABCD Simple airway management, including choking First Aid skills	Emergency Care Instructor assessment that uses NZRC guidelines
First responder	Has a duty to respond and is likely to be involved with the initial delivery of resuscitation	Police officers, fire service, security officers, lifeguards, airline crews, volunteers	**As above plus:** Simple airway adjuncts Suction Bag-mask ventilation Supplementary oxygen	CORE Level 3 (no longer offered)

Table 4 (continued): New Zealand Resuscitation Council Rescuer Framework.

Rescuer	Characteristics	People who may be represented	Suggested skills and knowledge	NZRC training
Health Professional – responder	Holds a formal tertiary qualification in a health-related discipline and is relatively new to their area of practice May encounter resuscitation events in their occupation or workplace with rapidly-available backup by advanced rescuers	Graduate nurses and midwives Graduate anaesthetic technicians Radiographers Other trained support staff in hospitals and community health Dentists Emergency medical technicians	**As above plus:** Recognition of the deteriorating patient Teamwork Advanced life support for adults and children Understand “shockable” and “non-shockable” rhythms Supraglottic airway adjuncts Awareness of adrenaline and amiodarone in resuscitation	CORE Immediate–Adult or CORE Immediate–Adult and Child
Health Professional – early management	**As above plus:** Is expected to manage resuscitation events until advanced rescuers arrive	Experienced nurses and midwives Experienced anaesthetic technicians General practitioners in metropolitan areas Paramedics	**As above plus:** Manual defibrillation Awareness of Waveform capnography Awareness of intra-osseous access	CORE Advanced

Table 4 (continued): New Zealand Resuscitation Council Rescuer Framework.

Rescuer	Characteristics	People who may be represented	Suggested skills and knowledge	NZRC training
Professional – advanced rescuer	**As above plus:** Is expected to manage and supervise resuscitation events as an advanced rescuer	Hospital nursing supervisors Senior nursing staff in units where resuscitations are common or expected (such as Critical Care Unit or Cardiac Intensive Care Unit) Intensive care paramedics Anaesthetic technicians on resuscitation teams	**As above plus:** Leading teams Management of peri-arrest conditions Advanced airway management in teams Consider and correct (4Hs, 4Ts) Awareness of prognostication following cardiac arrest Awareness of post-resuscitation care	CORE Advanced
Medical provider	**As above plus:** Holds a formal qualification in medicine	Registrars and specialists who do not work in emergency medicine, trauma, anaesthesia, or intensive care General practitioners in rural settings Trainee interns	**As above plus:** A more complex understanding of conditions that lead to cardiac arrest, and post-arrest management	CORE Advanced
Specialist medical provider	**As above plus:** Specialises in providing resuscitation and emergency care	Doctors working in emergency medicine, trauma, anaesthesia, and intensive care	**As above plus skills and knowledge that may include:** Advanced airway management Cardioversion and pacing Other advanced specialist skills	CORE Advanced plus extra training not offered by NZRC

CPR = Cardiopulmonary Resuscitation; AED = Automated External Defibrillator; DRSABCD = Danger, Responsive?, Send for help; Open Airway, Breathing?, Start CPR, Attach Defibrillator; CORE = Certificate of Resuscitation and Emergency Care.

Discussion

This is the first audit to investigate the CPR training requirements among New Zealand registered healthcare professionals. Our results showed considerable variability requirements across the professions. We discuss the implications of this variability in the context of current literature, practice, public expectation, and policy guidelines, and suggest potential changes.

The New Zealand Resuscitation Council (NZRC) is the standard-setting body for resuscitation and first aid in New Zealand. It uses a rescuer framework to distinguish eight types of responders from the untrained rescuer to the specialist medical provider (Table 4). In addition to prescribing rescuer-types for non-health professionals, it differentiates between health professional responders (new graduates and staff with access to rapidly-available backup); health professional early management (expected to manage resuscitation events until advanced rescuers arrive); through to professional advanced rescuers and medical providers (expected to manage and supervise resuscitation events as advanced practitioners or team leaders).[15] The results of this audit appear to be at odds with the NZRC rescuer framework, which states that all health professionals are expected to respond to and manage resuscitation events until advanced help arrives.[15] Our interpretation of this framework is that all responders are current in their CPR training, and especially those patients under the care of health professionals should expect to receive timely and competent resuscitation delivered by certified staff following the latest guidelines.

The MCNZ recently completed a stakeholder consultation process to gain feedback on their statement on a doctor's duty to help in a medical emergency. Doctors have an ethical obligation to respond promptly if asked to attend a medical emergency, which in some situations "may be limited to basic first aid".[13] If doctors choose not to attend, they must be able to justify their decision.[12,13] ANZCOR recommends that all health professionals (either on or off-duty) assist in an emergency if requested.[12] Furthermore, research into New Zealand allied health professionals demonstrated that 97% of physiotherapists surveyed and 95% of podiatrists agreed with the statement, *"At work, I consider it my duty to perform CPR in an emergency"*.[5,6] Although a duty of care for New Zealand health professionals to respond to emergencies exists, there are inconsistencies and disparities in CPR training and certification levels between the various professional bodies.[16-18] There is also an apparent discrepancy that workplaces must have a trained first aider under health and safety regulations, but the same need not apply in a clinical setting.[19]

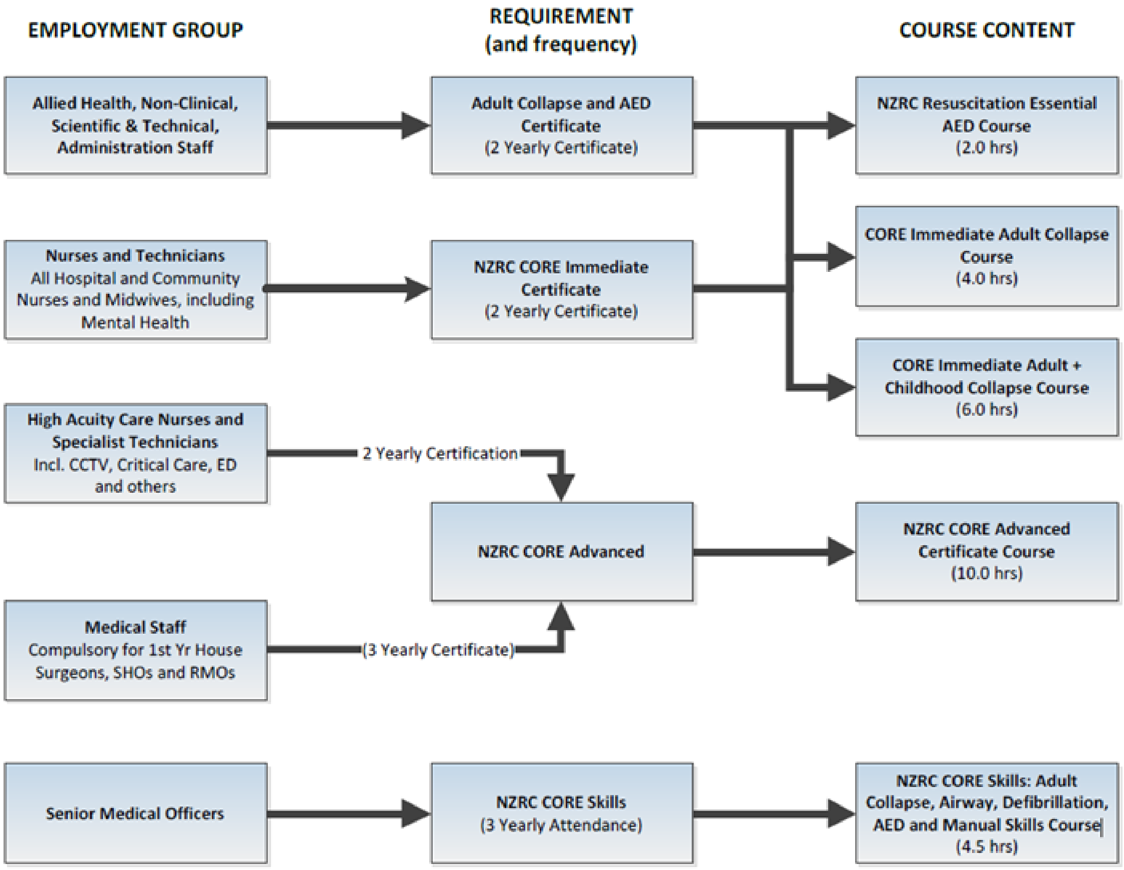
Studies have also demonstrated that CPR skills and knowledge decline within three to six months of formal training sessions.[8–10] While some organisations have introduced *just-in-time* CPR training in the workplace to provide staff with more frequent opportunities to maintain some technical skills, for example, chest compressions, these sessions typically do not provide an opportunity to develop non-technical skills like scene management and communication.[20] These skills are critical, as more than 70% of errors in medicine can be attributed to problems associated with human factors rather than knowledge or technical ability.[21] A recent study investigating the impact of perceived authority on delivery of care among paediatric resuscitation teams showed that 50% of participants were prepared to follow an incorrect drug order given by a medical superior.[22] Most accredited resuscitation courses have for decades, therefore, included scenario-based training in teams to practise both technical and non-technical skills. There is emerging evidence that this training can improve patient safety and reduce morbidity and mortality.[23] Another benefit is that, unlike just-in-time training, these courses are intended to be multi-disciplinary to reflect the real world where doctors and nurses, for example, do not work in isolation during a medical emergency.

The time required to train and upskill all New Zealand health professionals in CPR is not without significant economic and logistical costs, though. The capacity to deliver courses, the cost of training, and the need to cover staff away from work make providing formal CPR training every six to 12 months prohibitive for most organisations. It is also unknown how many more lives would be saved if all health professionals were mandated to complete this training. Most resuscitation training within District Health Boards (DHBs) is provided free of charge, and some health professionals have entitlements to paid leave for CPD. Others have their time, course fees, or both covered by the employer. However, some nurses and allied health professionals do not have these allowances, despite generally being first on-scene to resuscitation events. Furthermore, health professionals working in private or non-DHB settings do not have access to a cardiac arrest team and rely on the ambulance service as their primary backup. As the prompt initiation of CPR and early application of a defibrillator have been shown to save lives, it could be that these groups should be prioritised for training.[1–6] This does not address patient, public, and NZRC expectations that all health professionals should be competent in essential (basic) life support at a minimum, regardless of their work setting.[15]

Another reason given for not mandating CPR training is that health professionals working in high-acuity clinical settings such as emergency medicine, intensive care, and anaesthesia encounter a higher cardiac arrest incidence rate than other locations in the hospital and the community. Therefore, they are already well versed in resuscitation protocols. Making these staff take time off work to complete CPR training would be wasteful in terms of human and financial resources. While this may be true, it is not this group of health professionals that we are most concerned about. It is those health professionals with no training requirement and limited backup, or where cardiac arrest is an uncommon event. Despite this, the Australasian College for Emergency Medicine and Australia and New Zealand College of Anaesthetists still has emergency response/resuscitation CPD requirements for their fellows (Table 2).

In the only New Zealand-based study on in-hospital cardiac arrest, survival was reduced twofold if the event occurred after-hours.[4] Possible explanations were a lack of senior medical cover and staffing at these times; cardiac arrest team leadership, teamwork, and skill mix between rostered periods; and the mental and physical demands of shift work. The hospital cardiac arrest team is typically based in acute settings like intensive care and respond to emergencies in other areas. Given that these health professionals interface with and lead those working in low acuity settings, this further reinforces the need for all staff to be competent in resuscitation skills appropriate to their role. Additional training and widening staff's scope of practice, for example, standing orders for nurses to administer drugs, may be appropriate in settings where no cardiac arrest team or medical cover is available onsite.

Figure 1: Waikato District Health Board resuscitation education model.



Despite the inconsistencies among healthcare professions identified in this audit, good examples of best-practice employers delivering CPR training and certification in New Zealand exist. The Waikato DHB has a resuscitation education model based on the NZRC rescuer framework (Figure 1).[24] All health professionals and non-clinical staff are trained to a specified level based on their likely exposure to resuscitation events. For example, all nurses and midwives complete a CORE Immediate course biennially, while nurses in acute settings and resident medical officers complete a CORE Advanced course every two or three years respectively, and senior medical officers a CORE Skills update triennially.

The Dental Council of New Zealand has developed the *Medical Emergencies Practice Standard (DCNZ)* to set minimum standards for registered oral health practitioners to effectively manage a medical emergency in dental practice within their training (Figure 2). The council makes it clear that an oral health practitioner has an ethical and legal obligation to attend to a medical emergency, and the public expects “that [they] will be able to assist them in a medical emergency within their training and until an emergency response team arrives.” [25] The training is standardised and must be completed biennially. There are eight standards that oral health practitioners must meet, and written guidance describing the actions and behaviours required is provided to enable practitioners to meet them.

These examples of policy and practice highlight current mechanisms to support ongoing proficiency in CPR for healthcare professionals in New Zealand. We believe healthcare regulatory bodies and employers should use these as best practice models of resuscitation training and certification to improve the safety of their patients, staff, and the public. However, the inconsistency of resuscitation training requirements identified in this audit may be limiting this potential benefit. We recommend, therefore, that the regulatory bodies of the HPCA Act 2003 and all vocational medical training and recertification providers accredited by the MCNZ consider mandating initial and ongoing resuscitation training requirements appropriate to their clinical setting. These changes could improve CPR competency among health professionals and lead to better patient outcomes.

Conclusion

This audit revealed a wide variety of CPR training and certification requirements across healthcare professions in New Zealand. Future studies should investigate whether mandating CPR training improves outcomes from cardiac arrest and consider patient, public, and whānau expectations regarding the ongoing certification of healthcare professionals in resuscitation and emergency care.

Figure 2: Dental Council of New Zealand medical emergencies practice standards.

1. You must ensure a concise and relevant medical history is included in the clinical record of every patient and that it is regularly updated.
2. You must successfully complete the minimum level of resuscitation training prescribed for your profession every two years. *(Refer to page 7 for details.)*
3. You must have evidence available of the most recent resuscitation training you have completed.
4. If required to complete a Certificate of Resuscitation and Emergency Care (CORE) Immediate or equivalent course, you must ensure that it contains the modules specified in the table below. *(Refer to page 8 for details.)*
5. You must read Appendices A and B of this practice standard before attending a CORE Immediate or equivalent course.
6. Appendix A: *Medical emergency situations: specific responses, pg. 12.*
7. Appendix B: *Emergency situations: quick reaction guide, pg. 24.*
8. You must have ready access to the equipment specified for your profession that is age-appropriate for your practice and fully operational. *(Refer to page 9 for details.)*
9. You must have ready access to the medicine specified for your profession in dosages that are easy to administer and are not beyond their expiry date. *(Refer to page 10 for details.)*
10. You must have written procedures for managing emergencies where each staff member’s role is clearly defined and review these regularly as a team to ensure staff members know and understand their role.

COMPETING INTERESTS
As a member of the executive and a resuscitation training advisor for the New Zealand Resuscitation Council, Dr Webber receives non-financial support and personal fees. He also receives personal fees to deliver resuscitation courses within a university and for private training establishments. All other authors declare that they have no competing interests.

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The student narrative of undergoing academic difficulty and remediation in a medical programme: Indigenous Māori and Pacific Admission Scheme (MAPAS) and international student perspectives at The University of Auckland

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ABSTRACT

AIMS: To understand the medical student perspective and experiences of academic difficulty and remediation in years' 2–6 at The University of Auckland (UoA), Aotearoa New Zealand, who were admitted via the Indigenous Māori and Pacific Admission Scheme (MAPAS) and international student pathways.

METHODS: A qualitative study which undertook one-on-one, semi-structured interviews using case study as the research method within Kaupapa Māori and Pacific research frameworks. Two student groups were interviewed during 2017: MAPAS and international medical students. An email invitation was sent to all students, inviting those who had failed a year, or at least one examination, assessment, module or domain in UoA Medical Programme during 2014–2016 to participate in the study. Interview transcripts were thematically analysed with an inductive approach.

RESULTS: Fourteen medical students at UoA were included in the study, with ten from MAPAS and four from the international student admission pathway. There were six major themes identified. Three themes related to academic difficulty: the set curriculum, the hidden clinical curriculum and life complexities. Three related to the student perspectives of remediation: the impact of MAPAS support, enhanced resilience (particularly the MAPAS cohort) and stigmatisation from failing.

CONCLUSIONS: This study has investigated the MAPAS and international medical student experience of academic difficulty and remediation at UoA. The student dialogue offered a rich insight to deepen our understanding into the remediation process to ensure it is not only culturally safe but also fit for purpose. Tertiary institutions that offer undergraduate medical education can (and should) better support their at-risk medical student cohorts.

Students who under-achieve in medical school are more likely to struggle academically and professionally as graduate doctors.[1,2] The University of Auckland's (UoA) Medical Programme in Aotearoa New Zealand offers remediation to students who have failed to demonstrate that they can achieve the required academic standard. Globally, remediation practices vary. In UoA setting, remediation is defined as a formal repeat opportunity to demonstrate the specific standards (academic or professional) which were not previously met within a clinical or examination setting. Remediation may include a few weeks of additional study and assessment, repeating a single test, or an entire year, with additional academic and pastoral support. Further, if a medical student within UoA is identified as being in academic difficulty but is not required to undertake additional assessments they are identified by a "tag". A student who is "tagged" is offered additional resources and assistance to support academic success.

During 2013 and 2014, 17.7% of medical students in years 2–5 were offered remediation at the UoA, with internationally admitted and Indigenous Māori and Pacific Admission Scheme (MAPAS) students most at-risk.[3] UoA has focused recent efforts on improving the health and wellbeing of medical students, including reducing the need for high-stakes assessments (which are associated with poor psychological wellbeing).[4,5] With this in mind, the student experience of how the medical curriculum is delivered, assessed and remediated within high-risk groups at UoA is vital to optimise their educational experiences, maintain their health and produce competent doctors.[6,7]

In New Zealand, development of the health workforce to reflect society is necessary to improve health equity for Indigenous Māori and Pacific peoples.[8] UoA continues to support equitable health workforce training through Vision 20:20, in which at least 30% of students are admitted to their Medical Programme from Indigenous Māori or Pacific ancestry through a social justice/equity pathway called MAPAS.[5,9–11] MAPAS is more than a selection pathway, as it offers culturally appropriate academic and pastoral student support to promote student success. MAPAS students are generally admitted with a lower Grade Point Average (GPA), come from higher deprivation and are more likely to be the first in their family to attend tertiary education, comparative to their non-MAPAS counterparts.[3,12–14]

International students are also more likely to require remediation in the UoA Medical Programme, particularly in their clinical years.[3,12,13] Within the UoA international student cohort in 2013–2014, 81% had English as a second language which may influence academic outcomes.[3] Furthermore, international students encounter other difficulties when training in medicine, including social isolation and financial pressures, which may contribute to their higher rates of remediation comparative to domestic students at UoA.[15]

Remediation is a well-researched area, however the at-risk medical student narrative of what helps and hinders the remediation journey is largely absent.[7,13] The aim of this study was to understand the medical student perspectives and experiences of academic difficulty and remediation in years' 2–6 at UoA who were admitted via the MAPAS and international student pathways.

Methods

A qualitative, semi-structured interview approach was utilised.[16,17] As it relates to Māori and Pacific students, Kaupapa Māori and Pacific research paradigms were incorporated into a case study framework.[16–18] Case studies, as a research method, are useful when the focus is on a contemporary phenomenon within a real life context, as it seeks to understand phenomena using inductive reasoning.[19,20] Kaupapa Māori aims to ensure that the research is "safe" for Māori and is likely to lead to a positive benefit for Māori whānau and communities. [9–11] This approach is explicit in the inclusion of Māori leadership, and in the need to address issues of power within the research process.[9–11] This study included an experienced Kaupapa Māori researcher with an academic leadership role in MAPAS (initialled EC). The Pacific research paradigm of Talanoa was broadly incorporated into the study design via the inclusion of a Pacific researcher (SW) in the leadership of the overall study.[18] We expect this approach to be beneficial for international students, although not specifically targeted, due to the methodological focus on addressing structural factors associated with power, privilege and racism.

It is acknowledged that this research was led by a female insider (emerging) researcher (SW), who is of Pacific (Samoan) ancestry, and who graduated from UoA medical programme via the MAPAS entry pathway in 2011. The authors of this study were staff of the Faculty of Medical and Health Sciences at UoA at the time of data collection leading to the mutual interest in this topic, and experience on the board of examiners may have led to preconceptions of international and MAPAS remedial students. Ethics for the study was granted from the UoA Human Participants Ethics Committee (UAHPEC) in 2017 prior to data collection.

The participants in the study were recruited by an email invitation for a one-on-one interview that was offered to the total medical student cohort at UoA during 2017. Students who responded to the invitation were checked for inclusion criteria: all students who had failed a year or at least one examination, assessment, module or domain during 2014–2016. Exclusion criteria included a student with personal or professional affiliation with either interviewer (initialled hereafter as SW or SS) or any students who were not admitted via the MAPAS or international pathways.

The interview was confidential, voluntary, and located in a private room on the university campus. Participation or non-participation had no influence on eligible participants' clinical teaching or assessment. Two interviewers were used, either SW or SS (of Middle Eastern ancestry). A series of open-ended questions as per a semi-structured approach were used to guide the interview focused on experiences of medical education (including their experience of failure and remediation). See Appendix 1 for the specific question series. The interview process included whakawhanaungatanga (a Māori process of establishing relationships), with a prayer and koha (gift) offered to participants. The interview was audio-recorded with permission.

The audio interview recordings were transcribed verbatim by the lead researcher (SW) manually. The typed transcripts were de-identified to maintain confidentiality and offered to participants for member checking. SW then undertook the three-step process of thematic analysis with an inductive approach.[19,20] Firstly, SW familiarised herself with the data by reading and re-reading the transcripts. Secondly, SW manually assigned preliminary codes to describe the data content and further categorised these into a coding tree. Patterns and themes across the codes within the 14 interviews were analysed, resulting in the naming of the initial themes. The initial themes were then reviewed and refined by a secondary researcher (JY) before being brought to the full research team (WB, EC, JY and SW) for rigorous assessment and analysis. A commitment to meaningful and respectful dialogue among the co-authors was undertaken during the data interpretation and analysis, which required multiple robust discussions. As both Kaupapa Māori and Talanoa perspectives require a non-victim blaming approach and culturally appropriate conclusions to be drawn from the data, a secondary thematic analysis of the MAPAS student transcripts were completed by EC who, with data coding, identified patterns in the resultant codes. The patterns and themes EC identified were then used to refine and restructure the initial themes. Finalised themes were defined and named collaboratively within the research team.

Results

Twenty students responded to the email invitation. Six were excluded due to not meeting the eligibility criteria or subsequently not responding to contact. The remaining 14 were made up of four international students, five Pacific and five Māori MAPAS students with differing remediation requirements (Table 1). Interview times ranged between 21–66 minutes, with an average of 44 minutes.

Thematic analysis identified six major themes and eleven sub-themes. There were three major themes that related to academic difficulty: the set curriculum, the hidden clinical curriculum, and the student life complexities outside of medical school (Figure 1). The final three themes related to the student perspectives of remediation: the impact of MAPAS support, enhanced resilience, and stigmatisation (Figure 2). The emerging themes and sub-themes are discussed further in the subtitles below.

Experience of Academic difficulty

The set curriculum was a factor contributing to student academic difficulty. This encompassed the high workload (including difficulty with learning medical jargon) and a perceived lack of clear expectations. For example, the students stated:

> *I like thought first year was hard, second year was even more harder. And I think somebody described med [set curriculum] as being like a funnel and like a hose of information at you that pours on your face. I don't know, that's how it felt. – Participant 11 (MAPAS – Pacific)*
>
> *…The language is very challenging for me. In my first lecture, musculoskeletal, there was so many terminologies. Trying to concentrate on screen, on the lecture what they are saying, the notes, it was just too much for me. And they were like saying these jargons and I was trying to spell them. I just put my pencil down. I realised I need to put lots of time into my studies, I need to go back and listen to lecture. Read the notes and that didn't help my depression at all. – Participant 8 (International)*
>
> *You don't really know what the test is going to be like because each module is different and because there is no past test we can look at, we can't get a good gauge of what they are expecting. – Participant 2 (MAPAS – Māori)*
>
> *I think in terms of being in a hospital, I didn't really have any idea what that was like I didn't know what my role was. – Participant 12 (MAPAS – Māori)*

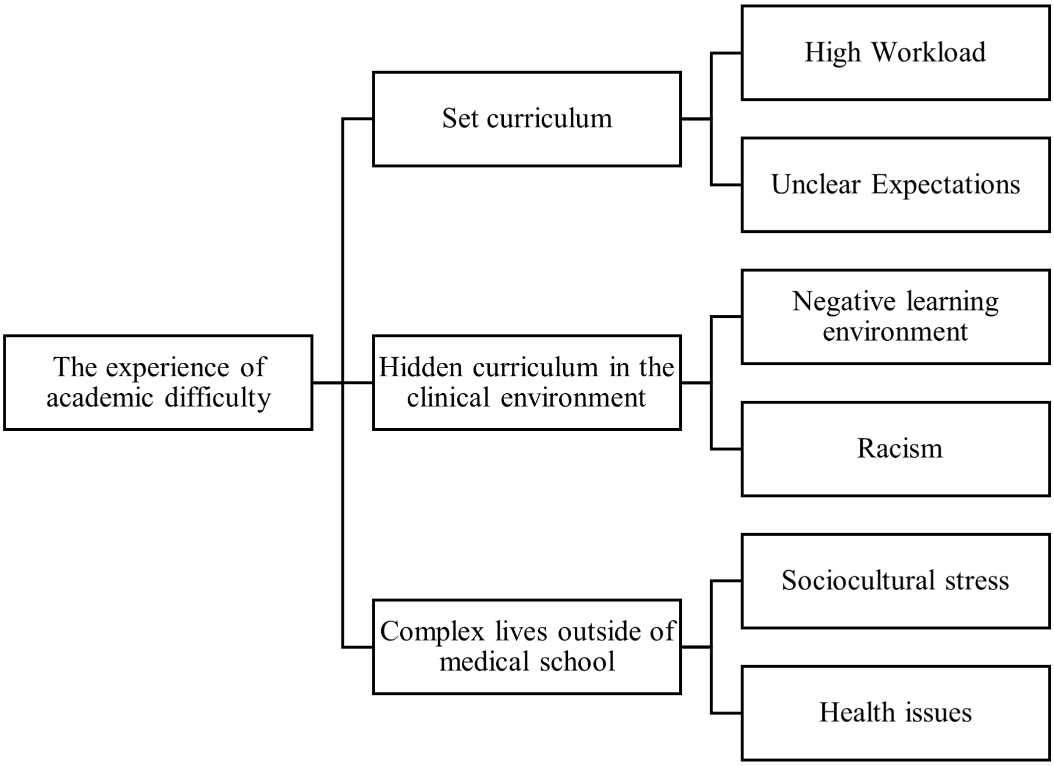
The hidden curriculum within the clinical environment, described as the untaught curriculum, which is culturally and environmentally learnt, was discussed by the students.[21] There was mention of

Table 1: Summary of included participants.

	Māori (n=5)	**Pacific (n=5)**	**International (n=4)**
Sex female (n)	2	4	3
Repeat single test (n) (Year 2–3)	2	0	0
Repeat entire year (n) (Year 2–3)	0	3	0
Repeat entire year (n) (Year 4–6)	3	2	4
Total	5	5	4

The UoA medical programme is completed during years 2–6 with potential entry into this pathway through meeting the year 1 undergraduate or postgraduate student requirements.
Year 2 and 3 students are predominately based at the university campus.
Year 4–6 students are predominately based in clinical settings in primary and secondary care.

Figure 1: Themes relating to academic difficulty.



hierarchy, negative learning environments and racism within the clinical environment.

> *I found if I spoke up in one to one or one to two interaction was easy but not in the crowd… I was obviously in the bottom of the hierarchy [on the ward round]. – Participant 5 (International)*

> *I didn't know how to prepare for things, no real role models to show me how to go down this path, so learnt the hard way, lot of sleepless nights, had chemistry assignments, worth 1% assignments, stay up all night working on those. Lots of sleepless nights. Now I realise a waste of time, I could have left it. Always stressful… what is the point and only worth 1%, should have focused more on the bigger, things, time management, knowing the most effective way I learn, I tried a whole bunch of different things. – Participant 7 (MAPAS – Pacific)*

> *After gen med [clinical rotation] where I had a bad experience, it was quite antagonistic, almost hostile, not a place I could go and learn medicine but had to put up a front so they wouldn't see me as stupid. – Participant 9 (MAPAS – Māori)*

Experiences of prejudice and discrimination (in the form of personally mediated racism)[22] was also mentioned, particularly by international students with respect to the clinical environment:

> *I have been in situations where they prefer a local student or a native speaker to do or say something instead of like be happy for everyone to talk… Once one consultant, I was in a team with two different students, so the three of us. They would usually rotate the students between the consultants, one consultant picked the other two and never picked me to be with him. I felt that was because I wasn't speaking much because of my language, and I don't know, I felt because of my second language that he didn't want me to be part of his team. – Participant 8 (International)*

> *I would really appreciate if the university staff, the supervisors, like understand the situation of international students doing medicine in English because it is their second language. I haven't had this personally but a couple of my friends who have been failed, failed their CSR [clinical supervisor report] or they got some reservations and the only comment is the student speaks English as a second language. I feel like this is unfair. – Participant 10 (International)*

> *I don't feel supported, I don't feel encouraged. In fact, I feel prejudiced upon and that is very real. – Participant 1 (International)*

> *I think probably within the first one or two weeks [of the General Medicine clinical rotation] there was a bad impression of me, he asked me questions, I didn't answer, he was like look at this liver function test and he would shake his head no, so it was quite bad… He just stopped asking me questions, and the registrar started to do the same. Essentially, I felt the whole team didn't like me, said I shouldn't do medicine as a life role. Yeah, so he said I shouldn't be a doctor at all. So, when I sat down with him to do my CSR [clinical supervisor report] he told me – 'I don't think you're dumb but I don't think you understand medicine that well and if you wanted to maybe you should consider another career path'. That is exactly what he said. – Participant 9 (MAPAS – Māori)*

The complexity of each student's unique circumstances, within which were multiple stressors, was apparent. These included sociocultural stressors such as family complexities, social isolation, assimilation due to acculturation, and financial stressors. Student psychological health was also affected. For example, within the sociocultural domain students mentioned:

> *Everything that was happening in my family, my parents, had issues, I went to stay with my partner's family. Really affected me. Culturally I had to do things for the family and couldn't study and stuff like that. I tried, I should have been honest in my reflection of how I was doing. – Participant 7 (MAPAS – Pacific)*

> *There is not much understanding about the international student culture. – Participant 5 (International)*

The international student group expressed:

> *Also coming here, my views of life and the way I see things now are different from when I was back was home. So, this kind of widened the gap between me and my family. Like, I found it was hard to connect with my family again. Like they are really strict and religious [Muslim], and conservative, so, and I've grown out of that. I have views for myself now. They are different. For example, I don't wear my headscarf anymore. I'm not telling them that. – Participant 8 (International)*

> *When I repeated fourth year it was very dark. I was very lonely. I was very lonely for many reasons. One of them was, I was away from home, I had no one… I just felt like I lost that social support [from peers], and I couldn't keep in contact with them because I felt like I was very inferior. Every time I contact them, I remember that I have repeated a year in medicine, so it is very hard for me to keep in touch with them… Plus I feel like for me it was very important that I didn't want to disappoint my family… – Participant 10 (International)*

Due to some students coming from lower socio-economic backgrounds, financial difficulties were often discussed:

> *Year four [of medical school] I had to work two jobs. – Participant 2 (MAPAS – Māori)*

> *Being there [living at home] I just couldn't focus on my studies or anything. So, I ended up moving out, so there was less emotional stress, but more financial stress… I spoke to [MAPAS staff] about it, he was able to get me that financial hardship scholarship where I got a weekly payment and that helped a lot. – Participant 3 (MAPAS – Pacific)*

> *We had the exact amount of money to get to my final year. So last year was really, really stressful in terms of financial situation because extending one year in medical school means that we might not have any money left to continue my final year… If I fail again it places a lot of [financial] burden on my parents. – Participant 5 (International)*

Psychological health was a key area associated with difficulty within the medical programme:

> *I pretty much stopped turning up to hospital and then somewhere on the way maybe three or four weeks into general medicine is probably when I started to become depressed and I can't exactly remember when, it was sort of on and off for a bit and then at some stage it became a daily thing where I really struggled to get out of bed and find motivation to do things. I was basically not in a position or mindset to even go to hospital and I didn't really know what I was doing with medicine and whether I wanted to do it. I think I had some ideas in my head that medicine wasn't all my decision and that I had kind of felt the pressure to do it… I was going to counselling at the time. I found it difficult to let people know… probably just the shame hindered [seeking help]. – Participant 12 (MAPAS – Māori)*

> *It just makes me very stressed to do another OSCE [Objective Structured Clinical Examination] I guess. It placed definitely lots of stress on me from day one and now everyone in my group knows I am a very, very anxious person and very stressed person… There was a suggestion that I should go see a psychologist but I didn't go… But I see that I need to see a psychologist because I just feel there is too much trauma, there is too much stress deep inside and I just feel like it is definitely affecting my life. It is affecting the way I deal with people, so I guess like most people I talk to immediately pick up that I am very hard on myself, that I am very stressed, and I am very anxious, and I worry that people would judge me… They say I have performance anxiety. – Participant 10 (International)*

Remediation experience

The stigma associated with remediation and the way students were identified as needing extra attention was emphasised by the students in the following quotes:

> *So why would you tag me, I know that they are tagging students and telling consultants so they can help them but to be honest I didn't feel like I was even helped by any of my consultants, they didn't even offer to even sit with me to see how I communicate with patients or do different to support me so I just thought what is the point of embarrassing me and tagging me… I decided that I actually wanted nothing to do with the university. – Participant 10 (International)*

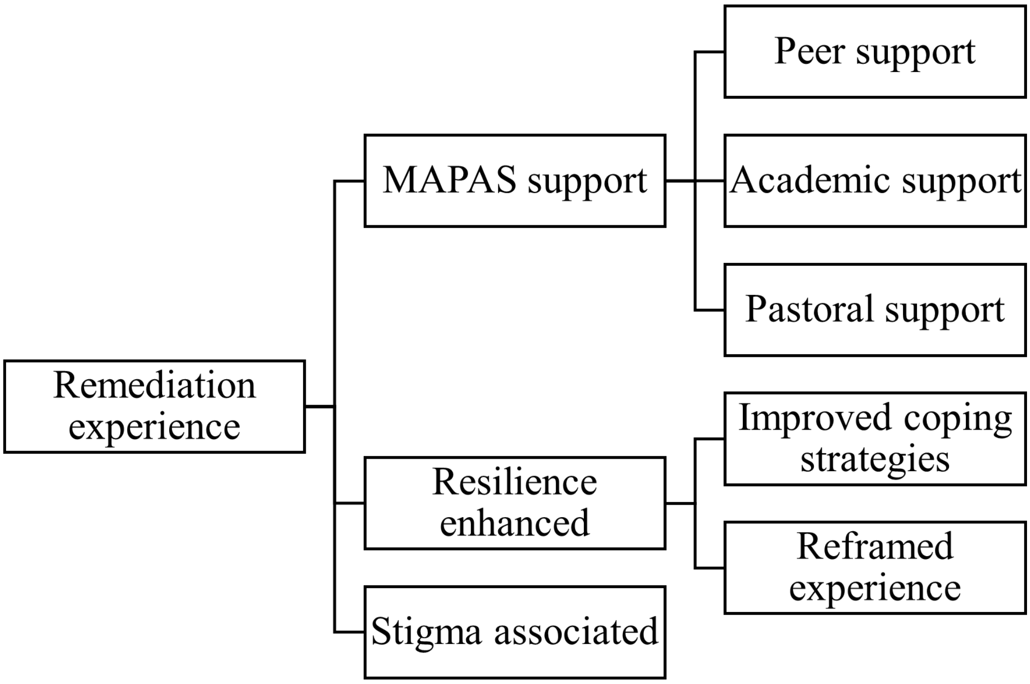
> *I had so many interruptions. People just come and talk to me, I would walk away… They knew nothing about me. Students didn't really talk to me [before requiring remediation], then they would come and talk to me [after experiencing academic difficulty], it was stigmatising. To be honest, I tried to be humble about the whole thing, a learning thing, avoid people that were like that. – Participant 7 (MAPAS – Pacific)*

> *Tag not that helpful it doesn't make sense, in my mind it doesn't make sense as I didn't get any extra support from the consultants. Difficult to have that conversation, did you know I've got a tag, what's that mean, it's confusing, oh I'm a really bad student from last year. So, it's confusing, and it doesn't feel reliably rolled out. – Participant 9 (MAPAS – Māori)*

When it came to remediation practices, having an individual who was honest and cared about them and invested in their learning was beneficial. For example:

> *Wanting to teach you. Wanting to make you be a better doctor… I really like that, that they are passionate about teaching, they want you to get better, not kind of test you on how much you know before they teach you. – Participant 6 (MAPAS – Māori)*

Figure 2: Themes relating to remediation.



Peer support from others in similar circumstances appeared to increase motivation and morale. In retrospect participants often reported the benefits of their time in remediation, including academic and clinical skill progression alongside personal development. Positive resiliency traits apart from reframing included exhibiting gratitude, positive attitudes, and improved coping mechanisms. Individualised coping strategies included peer support, outside hobbies and gaining perspective via religion/spirituality. Personal mentors were also said to be important:

> *There was something I did last year where I found out there was quite a big group of MAPAS students that had repeated where those that had already repeated talked to those who were repeating. I thought that was really good. – Participant 3 (MAPAS – Pacific)*

> *Now I see a lot of lot of doctors we have been around, doctors, my supervisor, four or five, have mentioned they had to repeat years. That opened discussion a bit more, getting past that fear of failure. – Participant 4 (MAPAS – Māori)*

MAPAS was highlighted as a positive support system shaping the students' reflective and resilient response to academic hardship.

> *MAPAS has been very helpful, at times, I think there is nothing they can do, they are always open. – Participant 14 (MAPAS – Pacific)*

> *Really grateful I had a lot of MAPAS tutorials, MAPAS help, older MAPAS students gave a lot of extra stuff support. [MAPAS] understand where you are coming from, for example when you say it's just family, they know it's not just for the night. They understand the customs and the traditions with it…they are great, they give out that house, they feed us, they have a separate study place for us, really nice. – Participant 13 (MAPAS – Pacific)*

> *[MAPAS staff] helped me connect to one other person doing one special [remediation exam] that we were both doing. It meant we could sit down and study together, and it was nice to be around other people studying as well, it helps with motivation for each other… and because we were all discussing that how before we repeated, we saw people that had repeated, and we didn't think of them any less. So, people are a lot harder on themselves. In the group setting we could all discuss that and see that we are not the only ones having a hard time. – Participant 2 (MAPAS – Māori)*

The need for clearer communication on available support (unknown to this student) was apparent:

> *Well, tutorials would have been good, just to recap because it is very self-driven for specials [repeat test attempts] you just have to go over the recordings. I don't know, even if it's just an hour session each week to go over each topic, to ask questions, it would have been really helpful. – Participant 2 (MAPAS – Māori)*

Communication breakdown was also linked to a loss of trust in the university as an institution:

> *The communication between staff, in terms of helping students supporting remediating, that needs to be a lot better than what it is now. These days I try not to get any support from the medical school because of my experience with them… because any form of support really would just be adding to their bias and prejudice against me. – Participant 1 (International)*

Discussion

This study adds important insights into how at-risk MAPAS and international medical students experience academic difficulty within UoA, New Zealand. The main themes emerging from the student narrative of academic difficulty and remediation are the set and hidden curricula (including racialised environments) and complex social circumstances. The experience of remediation had both positive and negative aspects. While students expressed feelings of stigmatisation, they also noted the emergence of resilience and particularly valued MAPAS support.

The set curriculums high workload and unclear expectations were discussed by study participants. This study highlights the fact that despite the additional support offered to students requiring remediation it is not always communicated effectively, and there may be institutional factors contributing to negative student experiences and outcomes. At UoA, a “tag” is a way of identifying a student at academic risk (in order to support success), but once a student is identified as needing remedial work, there was stigma and perceived negative stereotyping associated with being identified in this way. In turn, this led to poor emotional and psychological health, which at the extreme, resulted in a disconnect and distrust of the institution. To ensure student trust in tertiary institutions, emotional and psychological wellbeing of students needs to be prioritised by destigmatising remedial labels and practices.

The hidden curriculum is a universal area of concern in medical training.[23–25] The hidden curriculum, a punitive workplace culture resulting in student humiliation, negatively impacts student learning and mental health. [23–25] This study supports the known association of poor mental health and student perceptions of discrimination and negative stereotyping. [4,26–28] Also identified was the shame associated with accessing mental health treatment. Healthier management of the hidden curriculum is required globally, with the development of tools to better manage shortfalls within the current hidden curriculum under investigation.[21,29–31]

Narratives of student experiences of prejudice and discrimination due to ethnicity, in the form of racism, were emphasised in this study. As defined by Jones, racism occurs on four levels: institutionalised racism (defined as differential access to the goods, services and opportunities of society due to one’s ethnicity); personally mediated racism that includes both prejudice (different beliefs about one’s abilities and motives due to ethnicity) and discrimination (differential treatment towards a person due to their ethnicity); internalised racism (where a person takes on society’s negative messages about their self-worth and abilities due to their ethnicity).[22] Racism, as experienced by international and MAPAS medical students in the clinical environment, urgently needs to be addressed.[32–34] Mistreatment of medical students by ethnicity, as well as sexual orientation and gender, is of international concern.[35] Razack describes how hidden biases (ethnic, sex, class) may influence teacher–student interactions, making staff equity checks for hidden biases essential.[36]

Students displayed numerous life complexities and stressors within this study. The current literature supports this finding that student performance results from a complex interplay of factors.[37,38] This includes external influences out of the students’ immediate control that affect academic outcomes such as life events and financial hardships.[39] Another key factor in how students perform academically and cope with difficulties is their level of social connectedness with peers and parents.[15,39] In this study, alongside social isolation, cultural differences led to acculturative stress, particularly within the international student cohort physically distanced from their support system. This acculturation and the resultant stress imposed on international students remains a collective challenge.[15,27]

Remediation may be preventable for some at-risk students if identified early and supported effectively. Of benefit to the student experience was the pastoral support and mentoring—with evidence of student resilience post-remediation, particularly apparent in the MAPAS student group.[40] A comprehensive framework of culturally appropriate support, as provided by MAPAS, may provide an exemplar for other tertiary institutions.[14] Academic success for at-risk medical students requires a multi-faceted, inclusive, and culturally responsive approach delivered by diverse and self-aware staff. This study highlights the moral obligation to support international students to the level they require to succeed in medical programmes. Practically, this includes improved funding, resources, and representation for the international students within universities.

The limitations of this study include the heterogeneity of the cohort groups analysed (ie international and MAPAS students). Although there are commonalities in the perspectives and experiences related to academic difficulty and remediation of medical students of all backgrounds, we acknowledge that the experiences of international students and MAPAS students may differ significantly, making the combining of these student groups less ideal overall. Strengths of the study include a student-centred, in-depth analysis that builds upon previous quantitative work using mixed methods.[3] The inclusion of the lead researcher who had insider status is seen as a positive contribution to the overall study as she was able to contextualise the experiences shared by the participants, which may have aided analysis.

Conclusion

This study has investigated the MAPAS and international medical student experience of academic difficulty and remediation at UoA. Navigating academic difficulty and remediation is a complex process for Indigenous Māori, Pacific and international medical students. Consideration of the impact of curriculum delivery, and improving student communication in a non-stigmatising way was highlighted by students. Exploring how to successfully identify, educate and eliminate the complexities of the hidden curriculum remains a barrier, especially racism during clinical training. Evidence of resilience within the study participants was apparent, especially within the MAPAS cohort. It remains important for culturally appropriate student support (especially for English as a second language students) to be provided. Universities have a moral obligation to ensure equity in access to and outcomes from medical training are available to all students.

COMPETING INTERESTS

Nil.

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Appendix 1

Introduction/hui process

- Mihimihi/ Whakawhānaungatanga and offer prayer where appropriate
- Interviewer introduces themselves and explains the purpose of the meeting and format of the questions

Background and context

Please tell me about your background and journey into the medical programme.
Prompts:

- High school attended
- Previous academic history and grade point average (GPA) on admission
- Previous degree or bridging course
- Year of the medical programme
- What is your living situation currently?
- What is your financial situation like currently?
- Where are your family and how is your relationship with them?
- Is spirituality or religion important to you and why?

Academic difficulty

Please tell me about your experience with academic difficulty.
In what area(s) did you have academic difficulty?
Prompts:

- What are the factors that you believe lead you to have academic difficulty?
- In which ways did the programme curriculum contribute to your academic outcome?
- In which ways did the teaching and assessment contribute to your academic outcome?
- What helped or hindered you during the time you experienced academic difficulty (financial, study technique, work, family, geographical, access, academic background, medical issues, language or cultural barriers)?

Remediation and support

What was your experience with remediation?
Prompts:

- What element required remediation?
- Specifically, how were you assisted during your remediation period?
- How did you access supports?
- What were your limiting factors (if unable to access supports)?

What supports did you access?
Prompts:

- What was your experience with the international student support/Māori and Pacific Admission Scheme team during your time being remediated?
- Pastoral care
- One-on-one mentoring
- Help with study techniques
- Time management

Remediation areas of improvement

- What are the strengths and limitations of the current remediation process?
- What would make the current remediation system better?

Thank you and koha

- Do you have anything else you would like to share?
- Would you like to sum-up your important points?
- Would you like a referral for any further supports?

Structural disadvantage for priority populations: the spatial inequity of COVID-19 vaccination services in Aotearoa

Jesse Whitehead, Polly Atatoa Carr, Nina Scott, Ross Lawrenson

ABSTRACT

AIM: To examine the spatial equity, and associated health equity implications, of the geographic distribution of COVID-19 vaccination services in Aotearoa New Zealand.

METHOD: The distribution of Aotearoa's population was mapped, and the enhanced two-step floating catchment method (E2SFCA) applied to estimate spatial access to vaccination services. The Gini coefficient and spatial autocorrelation measures assessed the spatial equity of vaccination services. Additional statistics included an analysis of spatial accessibility for priority populations, and by District Health Board (DHB) region.

RESULTS: Spatial accessibility to vaccination services varies across Aotearoa, and appears to be better in major cities than rural regions. A Gini coefficient of 0.426 confirms that spatial accessibility scores are not shared equally across the vaccine-eligible population. Furthermore, priority populations including Māori, Pasifika, and older people have statistically significantly lower spatial access to vaccination services. This is also true for people living in rural areas. Spatial access to vaccination services also varies significantly by DHB region as does the Gini coefficient, and the proportion of DHB priority population groups living in areas with poor access to vaccination services. A strong and significant positive correlation was identified between average spatial accessibility and the Māori vaccination rate ratio of DHBs.

CONCLUSION: COVID-19 vaccination services in Aotearoa are not equitably distributed. Priority populations, with the most pressing need to receive COVID-19 vaccinations, have the worst access to vaccination services.

Aotearoa New Zealand's (hereafter Aotearoa) management strategy against COVID-19 put the country in a good position internationally with relatively few deaths or active COVID-19 cases for most of 2020 and 2021.[1] The Government's vaccination delivery programme has become increasingly important to save morbidity and mortality. The community outbreak of the Delta variant of COVID-19 on 17 August 2021 highlights that, until the vaccination rollout is complete, there is a continued risk. Achieving the equitable and universal delivery of a vaccine is therefore essential to help protect all residents of Aotearoa, and particularly priority populations who are at greatest risk of risk of infection, and most vulnerable to COVID-19 severity. Achieving equitable health outcomes means prioritising some populations with better access and resourcing.[2]

In its vaccination rollout[3,4] (see Text Box 1) the Government has prioritised border and MIQ workers, frontline healthcare workers, older people, and those with 'relevant' underlying health conditions. However, internationally, arguments have been made for the allocation of COVID-19 vaccines according to not only individual risk, but also social vulnerabilities—such as socio-economic status, occupation, housing and living conditions, ethnicity, and other factors that limit access to healthcare.[5] Indigenous populations must also be prioritised.[6] The health impact of COVID-19 is likely to be higher among Māori and other Indigenous populations.[7,8] There are stark, persistent, and increasing health inequities in Aotearoa experienced particularly by Indigenous Māori, that occur across the life course and are well documented.[2,9,10] Māori are disproportionately impacted by poorer access to the social determinants of health, including housing, quality healthcare,[11] and racism in the health system and wider society.[12–15]

Achieving equitable immunisation necessarily involves balancing the logistical constraints of distributing and administering the time and temperature sensitive COVID-19 vaccine, with minimising barriers for those who wish to receive it. There are various ways of conceptualising 'fairness' and prioritising vaccine delivery,[5,16] which in turn can have different impacts on COVID-19 related deaths, hospitalisations, and ICU admissions.[17] A major priority should be to immunise people who might otherwise die if they contract COVID-19, while a secondary aim is to reduce admissions to hospital and to protect the health system. In this paper, priority populations therefore include Māori, Pasifika, people aged 65 and over, people with comorbidities and those living in areas of high socio-economic deprivation.[18] As noted, the vaccine rollout in Aotearoa has taken a phased approach, grouping populations according to priority and risk.[19]

The Pfizer vaccine has been offered across Aotearoa at a range of locations acting as vaccination services, including some general practitioner (GP) clinics and pharmacies. It has also been offered at a range of new 'pop-up' clinics at sports grounds, marae, and stadium mega-clinics.[20] Decision-making and the implementation of the vaccine rollout has been devolved to District Health Boards (DHBs) who are responsible for the health of the populations in their region.

Spatial accessibility and spatial equity

The racialised inequitable access to and uptake of COVID-19 vaccination seen internationally,[5,21,22] could occur in Aotearoa, where access to healthcare is inequitable.[23–25] Additional barriers to accessing healthcare, particularly for Māori, include the (in)appropriateness, (un)availability, (in)acceptability and poorer quality care provided by many services.[26–29] Māori and Pasifika people report experiencing racism from healthcare providers,[12–15] and are disproportionately affected by cost and transport as barriers to accessing GP services.[30] Barriers to vaccine access that disproportionately affect priority populations—with the

Text Box 1: Priority groups in the Government's COVID-19 vaccination rollout.

In March 2021, the following priority groups in the Government's COVID-19 vaccine rollout were outlined in the phased approach to vaccination:[2]

Group 1 included border and Managed Isolation and Quarantine (MIQ) workers, their household contacts and the people they live with. This began in February 2021.

Group 2 included frontline healthcare workers and people living in high-risk settings. This began in February 2021.

Group 3 included three sub-groups of priority populations: (a) people aged 75+; (b) people aged 65+; and (c) people with relevant underlying health conditions or disabilities. This began in May 2021.

Group 4 included the remainder of the population aged 16 and over. Within **Group 4**, a staggered approach was initially taken, with the older ages within this group becoming eligible for the vaccine first. Those aged 60 and over could book their appointments from 28 July 2021, and two weeks later the invitation was extended to people aged 55 and above.

On 17 August 2021 Aotearoa went into Alert Level 4 after a case of the Delta variant of COVID-19 was identified. By 31 August 2021 the following changes to the vaccine rollout had been made: [3]

Vaccination became mandatory for workers at MIQ facilities, ports, and airports.

Group 2 was expanded to also include frontline staff who interact with customers and transport and logistic services directly supporting the vaccination programme.

Additional populations were included in **Group 3** such as those eligible for a publicly funded influenza vaccine, pregnant people, people with a disability or those caring for a person with a disability, severely obese people, people with high blood pressure requiring control with two or more medications, and people diagnosed with severe mental illness.

The age-based sequencing within **Group 4** was removed and from 1 September 2021 everyone aged 12 years or older was eligible for vaccination.

most risk of COVID-19 severity—will exacerbate key inequities. Health authorities should aim for an equitable and universal vaccine rollout which ensures spatial equity—giving priority populations appropriately higher access to vaccination services and opportunities for vaccination. This paper examines the spatial equity of the vaccine rollout in Aotearoa with a particular focus on priority populations.

Methodology

Key steps

Four key steps were taken in the assessment of the spatial equity of COVID-19 vaccination services (see Figure 1).

Data gathering

The population data is based on 2018 census data at the Statistical Area 1 (SA1) level, which includes information on the usually resident population, age, and Ethnicity of Residents in each SA1.[31] The population aged 15 and over was used to represent the 'vaccine eligible' population at the time of analysis. Socio-economic constraint was estimated with the 2018 New Zealand Index of Socioeconomic Deprivation (NZDep18).[32] The Geographic Classification for Health (GCH)[33] was used to define rural and urban areas of Aotearoa. Travel times were estimated using Beere's road network layer.[34] COVID-19 vaccination services locations were downloaded on 18 August 2021 from the Healthpoint[20] website. Vaccination services were linked to the Ministry of Health Facilities dataset,[35] which includes XY coordinates for all health facilities in Aotearoa. Since no service volume data were available it was assumed in all calculations that service volume is equal at all sites.

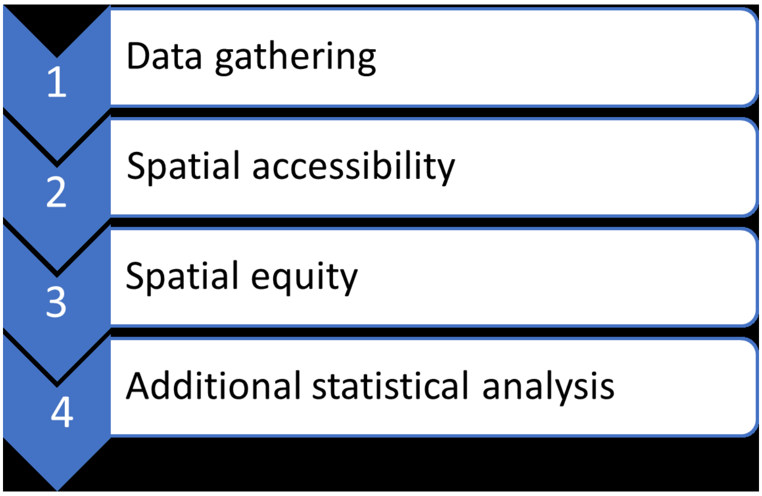
Spatial accessibility

Geographic Information Systems (GIS) were used to quantify the spatial equity of COVID-19 vaccination services. The three steps to spatial equity analysis involve defining, estimating and quantifying spatial equity.[36] Spatial equity usually refers to a fair distribution of resources relative to need.[37] In order to achieve equitable health outcomes, some populations should be prioritised and have better access to services.[2] Floating Catchment Area (FCA) techniques estimate accessibility by considering service availability relative to population size and the distance between populations and services to produce an accessibility score for each small area unit within a study area. This paper applied the enhanced two-step floating catchment area method (E2SFCA)[38] to estimate accessibility to COVID-19 vaccination services in Aotearoa, using the 30-minute drivetime catchments originally proposed.[39]

Spatial equity

Once overall levels of accessibility have been estimated, the Gini coefficient can be used to quantify equality. The Gini coefficient assesses the distribution of resources (such as income, or in this case, accessibility) across a population, and provides an equality score between zero and one, with zero representing a perfectly equal distribution and one indicating a completely unequal

Figure 1: Key steps in assessing the spatial equity of COVID-19 vaccination services.



distribution.[40] To examine the equality of spatial access to COVID-19 vaccination services, the population weighted Gini coefficient was calculated in R.

Although the Gini coefficient gives an indication of whether the distribution of spatial accessibility to vaccination services is equal, it does not indicate whether such a distribution is *equitable*. For instance, in a system where the entire vaccine eligible population has the same level of access to vaccination services, access would be inequitable for priority populations. Therefore, it is important to examine which locations and populations have high or low levels of access to services. The presence of statistically significant clustering of spatial accessibility scores was tested using Global Moran's I measure of spatial autocorrelation. Anselin's Local Indicator of Spatial Autocorrelation Moran's I (LISA) was also calculated to map the locations of statistically significant clusters of high and low access.

Additional statistical analysis

Additional statistical tests were undertaken to determine whether spatial access to vaccination services varied for priority populations—particularly for Māori, Pasifika, older people, and those living in areas of high socio-economic deprivation. Differences in spatial access to vaccination services between rural and urban areas of Aotearoa were also examined. To establish whether median spatial accessibility scores, as estimated by the E2SFCA, vary significantly for different population groups, Mann-Whitney tests were performed. A Kurskal-Wallis test and Mann-Whitney test were also used to determine whether there was a statistically significant difference in the median spatial accessibility scores for each DHB region. The proportion of each priority population group living in areas with poor vaccination access was calculated for each DHB region.

Results

Spatial accessibility

In total 447 vaccination services were identified, of which 212 (47%) were GP clinics, 91 (20%) were pharmacies, 50 (11%) appeared to be DHB-run dedicated vaccination centres, and 28 (6%) appeared to be iwi led, or run by Māori or Pasifika providers. Figure 2 shows the locations of these vaccination services and indicates the geographic distribution of spatial accessibility scores across Aotearoa. Scores were sorted into quintiles, with Quintile 1 (Q1—best access) represented in light red and Quintile 5 (Q5—worst access) in dark red. While access to COVID-19 vaccination services in large cities is generally good, there are large parts of rural Aotearoa with poor access. Of the major centres, Ōtautahi appears to have the worst access, while Te Whanganui-a-Tara and Ōtepoti have good levels of access to vaccination clinics.

Spatial equity

Gini coefficient

A Gini coefficient of 0.426 was calculated, suggesting an unequal distribution of vaccination services.

Spatial autocorrelation

Global Moran's I returned a statistically significant result (I=0.349, p<0.00), indicating that spatial accessibility scores were clustered. The LISA analysis results (Figure 3) indicate where those clusters are. Dark green represents high-high clusters, which are statistically significant clusters of areas of high accessibility surrounded by other high access areas. Areas in light green are high-low outliers, which have high accessibility but are surrounded by areas with low access. Similarly, the dark blue regions represent low-low clusters, while light blue areas are low-high outliers. Clusters of high accessibility tend to be in major cities, while rural and remote areas of Aotearoa have clusters of poor access to vaccination services.

Additional statistical analysis

Further statistical analysis indicates that differences in access to vaccination services negatively affect priority populations, and are therefore inequitable. Table 1 displays the median spatial accessibility scores of different types of neighbourhoods. Higher spatial accessibility scores indicate better spatial access to vaccination services. Spatial accessibility scores across Aotearoa ranged from 0.0 to 382.4, with an average score of 13.6, a median score of 11.1, and an interquartile range (IQR) of 12.2.

Mann-Whitney tests revealed statistically significant differences in the median spatial accessibility scores of some types of neighbourhoods. Areas with a higher proportion of Māori residents (>15%) had statistically significantly worse access to vaccination services than neighbourhoods with a lower proportion of Māori residents (p<.001). Access to vaccination services was also worse in neighbourhoods with a high proportion of Pasifika residents (>8%) compared to areas with a

Figure 2: Spatial accessibility of COVID-19 vaccination services in Aotearoa

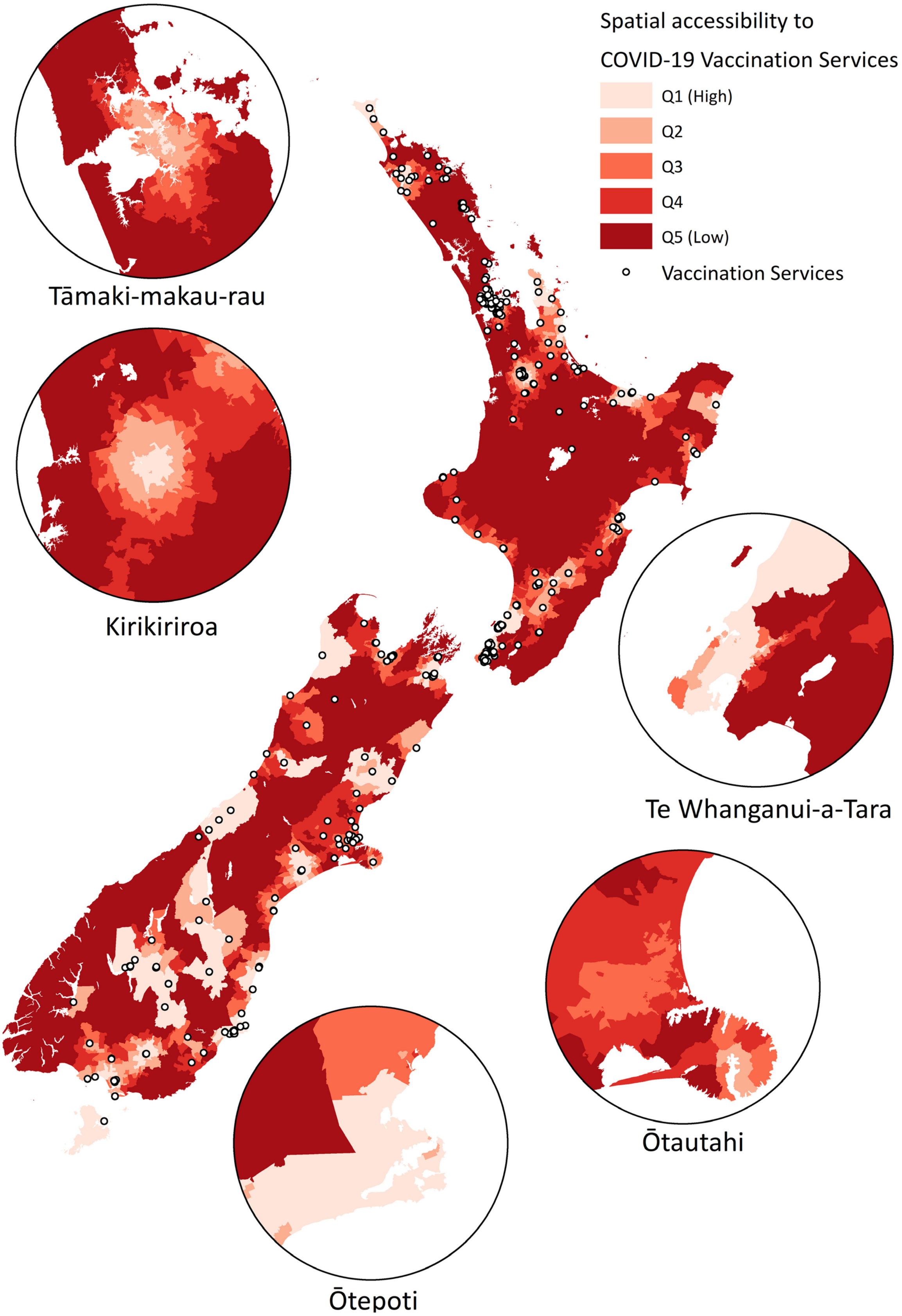
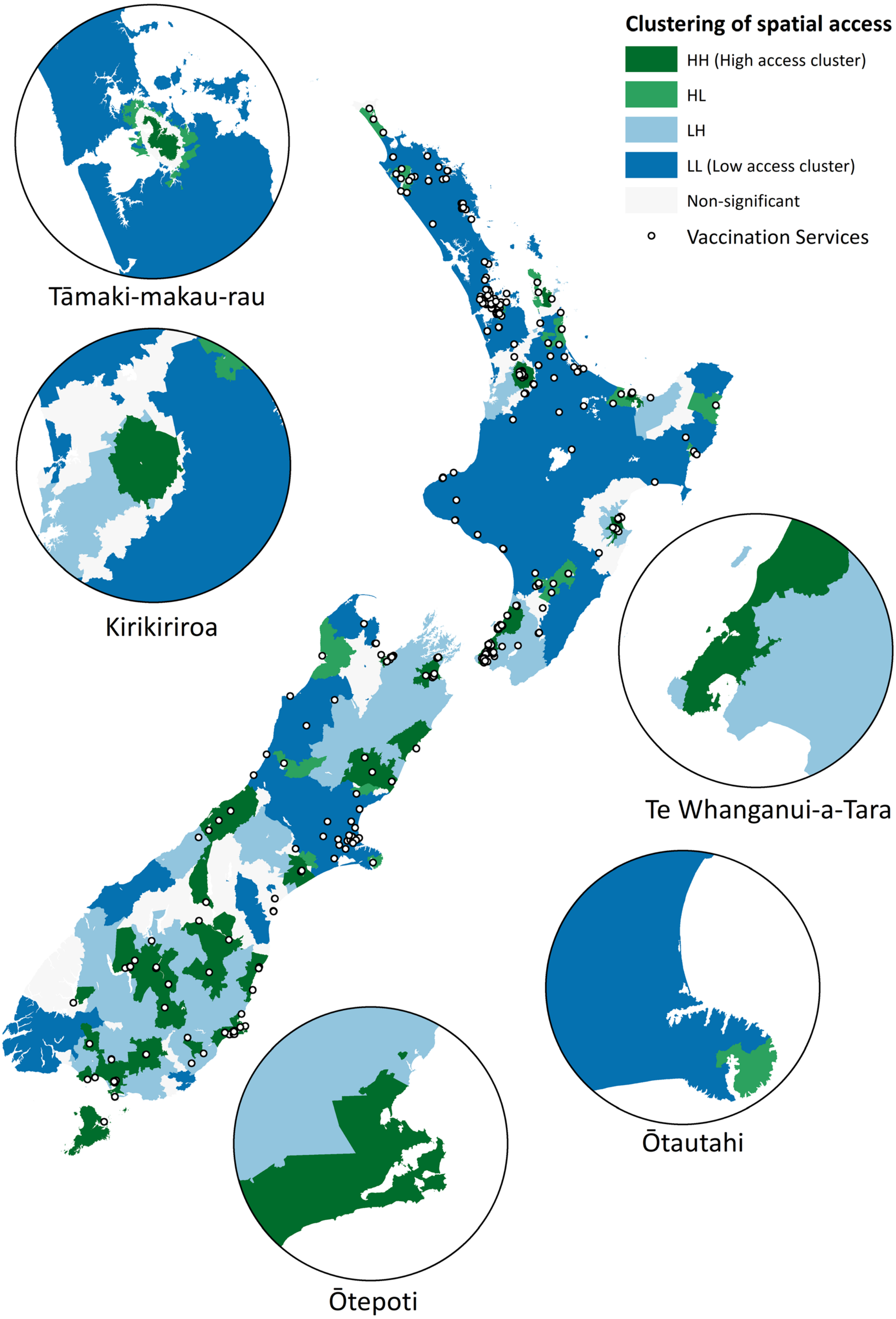


Figure 3: Spatial clustering of COVID-19 vaccination services in Aotearoa.



low proportion of Pasifika residents ($p<.001$). Similarly, neighbourhoods with a higher proportion of over 65-year-olds (>15%) had worse access to vaccine services than areas with a lower proportion of over 65-year-olds ($p<.001$). Rural residents also had worse access to vaccination services than residents of urban areas ($p<.001$). A Kruskal-Wallis rank sum test also revealed a statistically significant difference between accessibility scores across the five quintiles of socio-economic deprivation. Neighbourhoods with high levels of socio-economic deprivation had higher median access scores than neighbourhoods in NZDep18 quintiles 1–4 ($p<.001$).

A statistically significant difference between median DHB levels of spatial accessibility was determined by a Kruskal-Wallis rank sum test ($H^2=17643.3$, $p<.001$). Table 2 shows, for each DHB region, the median spatial accessibility score, Gini coefficient, and the proportion of each priority population group (and total eligible population) living in an area with poor spatial access (Q5) to vaccination services. Table 2 also displays vaccination rate ratios for Māori and Pasifika residents of each DHB region, indicating the relative proportion of Māori and Pasifika people who have received two vaccine doses, as compared to non-Māori and non-Pasifika residents. DHBs with higher levels of average spatial accessibility appear to have more equitable vaccine uptake for Māori and Pasifika people. A strong and statistically significant correlation was identified between DHBs' median levels of spatial accessibility and vaccination rate ratios for Māori ($r=.69$, $p<.001$) but not Pasifika ($r=.36$, $p=.112$) as at 20 August 2021. The median DHB levels of spatial accessibility (estimated in this paper at 18 August 2021) continued to be associated with vaccination rate ratios for Māori on 6 November 2021, with a moderate correlation identified ($r=0.47$, $p<0.05$).

Table 1: Differences in average spatial accessibility by neighbourhood type.

Neighbourhood type	Median spatial accessibility
High % Māori	10.4
Low % Māori	11.6
High % Pacific	10.4
Low % Pacific	11.6
High % over 65 years	10.1
Low % over 65 years	12.3
NZDep18 Q1	10.6
NZDep18 Q2	10.5
NZDep18 Q3	10.4
NZDep18 Q4	10.8
NZDep18 Q5	13.0
Rural	6.8
Urban	12.3
Total Aotearoa	11.1

NZDep18: New Zealand Index of Socioeconomic Deprivation 2018.

Strong and statistically significant negative relationships were also identified between the proportion of Māori living in areas of low spatial access to vaccination services, and the vaccination rate ratios for Māori at both 20 August 2021 (r=-.68, p<.001) and 6 November 2021 (r=-.60, p<.01). This indicates that DHB regions with a higher proportion of Māori living in areas with poor access to vaccination services are likely to also have more inequitable vaccination uptake, with lower rates for Māori than non-Māori residents. Weak and non-significant correlations were identified between DHBs' Gini coefficients and vaccination rate ratios for Māori (r=-.08, p=.75) and Pacific (r=-.15, p=.52)

Discussion

This work has some limitations. The E2SFCA uses drive-time-based catchments to calculate spatial accessibility to services. One key limitation of this approach is the inherent assumption that all residents of an SA1 have access to a private vehicle (with a current warrant of fitness) and are able to afford petrol. Residents in neighbourhoods with higher levels of socio-economic deprivation (who are disproportionately Māori and Pasifika) are less likely to have access to a motor vehicle or be able to cover additional or unplanned transportation costs. Likewise, the E2SFCA does not assess the wider, non-spatial, domains of access. Vaccination services listed on the Healthpoint website are likely to be accurate and reflective of the actual services available on 18 August 2021, but will not reflect additional clinics that have been added in response to the COVID-19 Delta variant outbreak. This analysis does not include any vaccination services that are not listed on the Healthpoint website. No information was available on the capacity of vaccination services, the availability of appointments, or the different service models that may have been used by vaccination services. This may have resulted in an underestimate of accessibility in some urban areas, and an overestimate of accessibility in some rural areas—potentially further exacerbating inequities in vaccination accessibility. While data availability and quality is beyond the control and scope of this paper, it highlights the importance of strong public health intelligence, including the collection and maintenance of information on service delivery. Issues with the implementation of the 2018 census[42] mean that the quality of the ethnicity variable has been independently rated as 'moderate'.[43] Additionally, other census variables may have impacted on the quality of NZDep18. Furthermore, ethnicity data in the 2018 census are not prioritised, so individuals who report multiple ethnicities are counted more than once.[44] Therefore the results presented in this paper are population estimates using the best available data.

Despite these limitations, this analysis indicates that, as predicted previously,[18] spatial access to vaccination services across Aotearoa is inequitable. Māori, Pasifika people, over 65-year-olds, and rural residents have worse access to vaccination services. Given the higher burden of disease, and increased likelihood of severe COVID-19 infection outcomes in these groups, priority populations must have opportunities to become vaccinated as soon as possible. Health authorities have had opportunities to work with priority communities to ensure an equitable vaccination rollout. Vaccination services locations could have been proactively planned to target priority populations and maximise access opportunities for these groups. The fact that more than two-thirds of vaccination services were run from health facilities such as GP clinics, pharmacies, and hospitals suggest that authorities have relied on current health services, regardless of their inequitable distribution already highlighted in the research literature.[18,25,29] This decision appears to have resulted in a disproportionately poor access to COVID-19 vaccination for older people, Māori, Pasifika, and rural people, all groups who are at risk of severe outcomes from COVID-19 infection.

These findings add to the body of research describing spatial inequities in the Aotearoa health system, across a range of health services,[29,45,46] and provides additional context that may be relevant to recent findings of geographic variation in childhood immunisation rates.[47] It also highlights that even when new health services (such as COVID-19 vaccination services) are added to the health system there is no guarantee that they will be equitably distributed. If there is no clear planning, guidance, or monitoring for pro-equity service distributions, the result is inevitably inequitable access that compounds existing health inequities. Although health services are only one component of the social determinants that shape the distribution and equity of health outcomes, they are an aspect that health authorities are theoretically able to influence. Ensuring the fair distribution of health services, to improve access for populations with the highest health needs and risk of severe outcomes, is one action that health authorities can take to improve health equity in Aotearoa. It is becoming increasingly important that the Māori Health Authority and Health NZ monitor, and improve, the spatial equity of all health services in Aotearoa. These research findings emphasise the importance of and need for national strategies that make use of both geospatial and public health intelligence to guide a national vaccination rollout—and the equitable delivery of health services in general. As the health system in Aotearoa reforms, this research can inform approaches to monitor and improve the spatial equity of a wide range of health services.

The finding of significantly lower spatial access to COVID-19 vaccination services for communities with a higher proportion of Māori residents, and that more than a quarter of Māori live in areas with low access to vaccination services, indicates structural racism in Aotearoa New Zealand's COVID-19 vaccination rollout. In combination with an age-based prioritisation for vaccinations that has held back a large proportion of the structurally younger Māori population,[48] and individual experiences of racism within the health system,[12–15] this has left a disproportionate number of Māori unvaccinated against COVID-19. International evidence indicates that geographic and ethnic targeting of vaccination services results in more equitable uptake and avoids more deaths than age-based prioritisation alone.[49] This underlines that the COVID-19 vaccination rollout has failed to protect Māori, and reinforces the urgent need for an independent Māori Health Authority, with a service commissioning mandate, to design and deliver effective and equitable services for Māori.

The results also highlight significant variation in levels of access—and inequity of access between DHBs. This is not surprising, as localised decision-making around the delivery of COVID-19 vaccinations has been devolved from the Ministry of Health to DHBs, which are likely to have followed different vaccine rollout plans, had different levels of partnership with iwi, and relied on the existing distribution of health facilities—which already provide differing levels of access to services across DHBs. These differences in access and spatial equity between DHBs appears to be associated with the equity of vaccine uptake for Māori. As at 20 August 2021, Capital & Coast DHB had both the highest average level and most even distribution of spatial access to vaccination services, and high relative vaccination rates for Māori living in the region. Similarly, Southern DHB had high levels of average access to services, and the highest relative vaccination rate for Māori. On the other hand, DHBs which are providing low levels of spatial access to vaccination services, such as Lakes, Northland, Bay of Plenty and Whanganui, all had low vaccination rate ratios for Māori (0.48–0.52).

Improving the spatial equity of COVID-19 vaccination services, by offering additional services in areas with high priority populations and low access to current vaccination services, will be important for improving the equity of vaccination uptake and protecting priority populations. Previous research suggests that vaccinations delivered at schools would offer good access to 99.9% of the total population.[18] School-based vaccinations could contribute to a more equitable paediatric vaccine rollout, and may also reach as-yet-unvaccinated adults. While many rural and socio-economically constrained populations are at high risk of severe outcomes from COVID-19 infection,[50] the Ministry of Health has not at the time of writing reported vaccination rates according to area-level socio-economic deprivation, or rural-urban status. However, independent analysis suggests that the overall vaccination rollout for rural people is also inequitable.[51] While a flurry of additional vaccination sites has appeared since the start of the Delta outbreak in Aotearoa, ongoing monitoring suggests that access has not substantially improved in rural areas.[52] Additional research examining *changes* in spatial access and equity throughout the Delta outbreak is currently underway. Before Aotearoa can consider loosening international and internal border restrictions, or removing protective public health measures, it is essential to achieve high vaccination rates among priority populations who will experience the most severe health outcomes from COVID-19 infection.

Table 2: Average spatial access, Gini coefficient and % of priority populations living in areas with poor access to vaccination services for each DHB region.

DHB region	Median spatial access	Gini	% Māori in low access areas	% Pasifika in low access areas	% 65+ in low access areas	% Eligible in low access areas	Māori vaccine rate ratio‡	Māori vaccine rate ratio§	Pasifika vaccine rate ratio‡	Pasifika vaccine rate ratio§
Auckland	14.8	0.131	3.2	0.6	4.0	2.2	0.63^	0.70^	0.77^	0.80^
Bay of Plenty	5.3	0.392	25.3	25.2	23.1	26.3	0.52	0.62	1.04	1.15
Canterbury	9.54	0.247	3.3	1.2	3.3	3.4	0.78	0.73	0.96	0.85
Capital and Coast	32.5	0.089	0.0	0.0	0.0	0.0	1.04^^	0.73^^	1.29^^	0.80^^
Counties Manukau	14.8	0.208	8.8	1.4	10.9	8.3	0.63^	0.70^	0.77^	0.80^
Hawke's Bay	15.3	0.208	5.8	1.7	3.7	4.9	0.58	0.63	1.29	1.10
Hutt Valley	18.7	0.290	1.2	0.6	3.6	3.3	1.04^^	0.73^^	1.29^^	0.80^^
Lakes	1.88	0.237	99.3	99.5	99.4	99.5	0.48	0.63	0.69	0.85
MidCentral	13.6	0.191	3.0	1.3	3.9	4.1	0.61	0.68	0.65	0.86
Nelson Marlborough	14.8	0.233	4.7	2.1	5.0	5.1	0.61	0.70	1.47	1.94
Northland	2.1	0.478	88.6	90.8	93.0	92.6	0.51	0.66	0.56	0.83
South Canterbury	13.5	0.284	12.0	11.9	17.1	17.1	0.71	0.71	0.45	0.99
Southern	25.0	0.287	3.4	1.4	3.2	3.8	1.21	0.74	0.81	0.95
Tairāwhiti	12.3	0.157	11.2	4.8	6.9	8.7	0.55	0.67	0.69	0.92
Taranaki	5.8	0.136	10.8	5.7	7.3	10.1	0.60	0.67	0.99	0.90

Table 2 (continued): Average spatial access, Gini coefficient and % of priority populations living in areas with poor access to vaccination services for each DHB region.

DHB region	Median spatial access	Gini	% Māori in low access areas	% Pasifika in low access areas	% 65+ in low access areas	% Eligible in low access areas	Māori vaccine rate ratio‡	Māori vaccine rate ratio[§]	Pasifika vaccine rate ratio‡	Pasifika vaccine rate ratio[§]
Waikato	15.3	0.298	21.4	22.7	18.4	17.0	0.67	0.67	0.93	0.89
Wairarapa	4.8	0.197	39.5	40.9	31.6	35.1	0.56	0.66	1.09	0.88
Waitematā	4.0	0.358	53.0	41.0	59.4	56.8	0.63^	0.70^	0.77^	0.80^
West Coast	6.9	0.675	11.2	10.1	10.2	11.7	0.59	0.78	0.86	0.92
Whanganui	10.1	0.276	32.4	37.2	26.2	29.5	0.50	0.66	0.52	0.82
Total Aotearoa	11.1	0.426	25.3	11.4	20.0	19.6	0.64	0.67	0.86	0.87

‡Rate ratios are reported by the Ministry of Health.[41] The data represented in this table was reported on 20 August 2021, and represents vaccination rates for Māori and Pasifika, relative to rates for Non-Māori-non-Pasifika as at 19 August 2021.

[§] Dose 2 rate ratios reported by the Ministry of Health on 6 November 2021.

^ The Ministry of Health reports rate ratios for Auckland, Waitematā, and Counties Manukau DHBs together as 'Auckland Metro'.

^^ The Ministry of Health also reports rate ratios for Capital & Coast and Hutt Valley DHBs together as 'Capital & Coast and Hutt Valley'.

COMPETING INTERESTS

Nil.

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Stroke reperfusion treatment trends in New Zealand: 2019 & 2020

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ABSTRACT

AIM: This study assessed stroke reperfusion treatments trends in 2019 and 2020 with comparison back to 2015. Additional analyses looked at differences by sex and ethnicity.

METHOD: The National Stroke Register contains data on all stroke patients who received reperfusion therapies since 2015. Outcomes included treatment rates, delays, mortality and complications by year, sex, and ethnicity. Continuous variables were compared using the Wilcoxon Rank-Sum Test and presented as p-values. Rate-based results were compared using incidence rate comparison and presented as p-values +/- 95% confidence intervals.

RESULTS: In 2020, 11.3% (828/7333) received intravenous thrombolysis (IVT) and 5.5% (404/7333) underwent stroke clot retrieval (SCR), increasing from 6.5% (389/5963) and 0.5% (30/5963) in 2015, respectively. Among reperfused patients (IVT, SCR, both), 8.3% had died at seven days and 3.0% (29/959) experienced sICH. Door-to-treatment time was stable between 2019 and 2020, with median (IQR) of 61 (44–84) and 61 (41–87) minutes, respectively. Initial presentation to a SCR centre was associated with shorter onset-to-reperfusion time of 286 (206–566) minutes, compared with 403 (295–550) minutes ($p<0.001$). While onset-to-door time was shorter for Māori (72 (44–112) minutes, $p<0.001$) and Pacific patients (70 (48–105) minutes, $p=0.03$) compared with NZ Europeans, door-to-needle time was longer in Māori (66 (48–88) compared to 59 (41–83) minutes ($p=0.001$). Female (73.7+/15.3 years) patients were on average 4.4 years older than males (69.3+/-14.6 years) and less likely to receive thrombolysis (12.7% vs 14.9%, $p=0.02$).

CONCLUSION: Reperfusion therapy rates continue to rise, now driven by increasing rates of SCR. Longer door-to-needle time in Māori and lower reperfusion rates in women require further exploration and attention.

Stroke is now the third most common cause of death and the leading cause of serious adult disability in New Zealand.[1] The annual number of people with strokes is expected to rise by a further 40% over the next decade.[2]

Following an ischaemic stroke, brain tissue may be rescued if blood flow is restored rapidly. Intravenous thrombolysis (IVT) and stroke clot retrieval (SCR) using stent retrievers significantly improve the odds of disability-free recovery.[3,4]

In New Zealand, IVT is provided at all 28 acute stroke hospitals, of which 16 receive remote Telestroke support.[2] SCR is provided at three of these stroke centres.[2] SCR treatment is limited to a subset of patients with large vessel occlusion (LVO) and consequently more patients qualify for IVT compared to SCR. However, in patients with LVO, SCR offers greater absolute treatment benefit because these are the most severely affected patients and SCR is more effective in clearing large clots than IVT. The pivotal SCR clinical trials all used SCR preceded by IVT treatment, although trials are ongoing to explore SCR without IVT.[3]

Stroke thrombolysis rates have varied between centres in New Zealand with key barriers including poor access to experienced stroke physicians in regional settings.[5] National and regional initiatives to address these inequalities have included regular audit and reviews, service model changes to reduce treatment delays, public education campaigns to improve community stroke recognition, and the introduction of Telestroke.[6–8]

Unfortunately, some population groups in New Zealand appear consistently more vulnerable. Between 1983 and 2003, NZ Europeans have seen a 19% decrease in total stroke incidence, while Pacific patients have seen a 66% increase and Māori a 2% increase.[9] Furthermore, while age-adjusted stroke incidence rates in NZ Europeans have declined by 19%, these rates have increased by 16% in Māori and 21% in Pacific peoples.[9] The high stroke incidence in Māori and Pacific peoples, combined with the comparatively young onset of strokes in these populations, creates significant burdens on Māori and Pacific stroke survivors, their whānau, communities and society. Reperfusion access by ethnicity has previously been explored in the Northland Region of New Zealand and did not find significant differences.[10] Comprehensive data on reperfusion metrics for the entire country have not been previously published.

Women often experience poorer post-stroke outcomes than men due to sex-related differences in presentation and risk factors. Women are more likely to present with strokes at an older age and have worse pre-stroke functionality compared with men.[11] Studies have also found that women are less likely to receive IVT than men; the cause of which remains unclear.[12] To date, potential sex differences in stroke reperfusion therapy in New Zealand have not been explored.

This study reports on the reperfusion therapy rates in 2019 and 2020 to assess the impact of service improvements on temporal trends, along with the identification of areas that require further improvement. We also explored the association of demographic factors, specifically ethnicity and sex, with reperfusion therapy access and quality metrics.

Design and methods

This is a registry-based prospective observational study including all adult patients (age >16) who received reperfusion therapy in New Zealand between 1 January 2015 and 31 December 2020. All stroke patients who receive reperfusion therapy (IVT and/or SCR) in New Zealand are routinely entered into a national online database using the open source REDCap platform. Data is entered by staff at the primary stroke centre or by a member of the central database administration team. The data in the register was cleaned manually and scrutinised for missing values, data entry errors and notable outliers. Duplicate entries were identified using the National Health Index number. Hospital staff nationwide were contacted for further information where necessary. In cases where important information was missing or missing values could not be reconciled, the patient in question was excluded from both numerator and denominator to complete specific analyses.

The primary patient efficacy end point for the National Stroke Register is day seven vital status with optional reporting of modified Rankin Scale (mRS) at three months. The mRs is a seven point scale with zero normal and six dead, and where independence is defined as a score of 0,1 or 2. The primary safety end point is the rate of symptomatic intracerebral haemorrhage (sICH).[13] IVT and SCR rates are calculated using denominator data supplied by the Ministry of Health based on recorded discharge coding. The denominator data includes all patients with ischaemic stroke (ICD 10-AM I63) and strokes “unspecified” (ICD 10-AM I64). Strokes “unspecified” have been included as internal audits have found that most cases represent miscoded ischaemic strokes.

In 2020, we became aware that Ministry of Health data includes multiple duplicates, where patients transferred between hospitals are counted as multiple discharges, despite all discharges referring to a single stroke event. We have now removed all duplicates dating back to 2017. Data for 2015 and 2016 were not available for this reanalysis. This means some of the denominators and intervention rates presented in this paper differ slightly from previously published reports raising historical intervention rates. As we were unable to retrospectivity amend data prior to 2017, this needs to be borne in mind when comparing trends from pre-2017 with post-2017. Due to the slightly inflated denominator for these years the actual thrombolysis rates will have likely been approximately 0.5% higher for thrombolysis and 0.2% higher for stroke clot retrieval than the figures displayed and previously published.[2]

Continuous variables were non-normally distributed and were thus analysed and reported as the median value, with additional values denoting IQR of 25th to 75th percentiles. Comparative differences were analysed using Wilcoxon rank sum test and presented as p-values. Rate-based results were presented as incidence rates. Comparative differences were analysed using incidence rate comparison and presented with p-values +/- 95% confidence intervals. A p-value less than 0.05 was considered statistically significant. Data analysis was completed in StataIC 16.0

Results

Between 1 January and 31 December 2020, there were 7333 patients with acute ischaemic stroke (n= 7021) or “stroke unspecified” (n= 312). Of this number, 828 (11.3%, 11.8% excluding “stroke unspecified”) were treated with IVT and 404 (5.5%, 5.6% excluding “stroke unspecified”) were treated with SCR. A total of 201 patients were treated with both IVT and SCR (24.3% of all IVT patients). None of these patients were confirmed positive for COVID-19. Baseline characteristics are listed in Table 1.

For IVT in 2020, the median (IQR) door-to-needle time was 61 (41–87) minutes (Table 2). sICH occurred in 24 patients (2.9%). At day seven, 66 (8.1%) patients had died and at three months, 224 (61.7%) of 363 patients where this information was recorded were functionally independent (mRS 0–2). For SCR in 2020, the median (IQR) arrival-to-groin time was 55 (22–113) minutes, sICH rate was 1.2% and 141 of 286 (49.3%), where this information was recorded, were independent at three months (Table 3).

IVT rates have increased from 6.5% in 2015 to 11.3% in 2020 (p=<0.001), but have remained unchanged since 2019 (11.3% both years). The median (IQR) door-to-needle time has reduced from 74 (55–102) in 2015 to 61 (41–87) in 2020, but has remained stable since 2019 when it was 61 (44–84) minutes. The percentage of patients treated with IVT under 60 minutes has also remained stable between 2019 and 2020 (49.1% to 49.7%; p= 0.99). There has been no significant change observed in the number of patients who have died by day seven between 2015 and 2020 (6.7% to 8.1%; p= 0.45). Post-IVT sICH rates have reduced (6.2% in 2015 to 2.9% in 2020; p= 0.01) (Table 2).

SCR rates have increased substantially from 2015 to 2020 (0.5% to 5.5%; p<0.001), but only modestly across the last two years (4.8% in 2019 to 5.5% in 2020; p= 0.08). Arrival-to-groin time remains stable at (median (IQR)) 52 (16–109) minutes in 2019 to 55 (22–113) minutes in 2020 (p=0.45), as has onset-to-reperfusion time; (median (IQR)) 335 (235–522) minutes in 2019 to 365 (245–550) minutes in 2020 (p=0.27). There have been no statistically significant changes between 2019 and 2020 with regard to sICH rates (2.9% to 1.2%; p=0.12), day seven mortality rates (9.1% to 7.5%; p= 0.47), and the number of independent patients at three months (44.6% to 49.3%; p=0.44) (Table 3). NZ European patients residing in DHBs that are SCR centres experienced shorter onset-to-reperfusion times than those in a non-SCR centre DHB of domicile; 286 (206–566) and 403 (295–550) minutes (p<0.001) respectively.

Ethnicity did not have a significant impact on IVT rates in 2020 with 11.7% in NZ Europeans compared with 10.1% in Māori (95% CI 0.92, 1.45; p= 0.20) and 11.6% in Pacific patients (95% CI: 0.75, 1.36; p= 1.00). Variation in SCR rates among different ethnic groups also did not differ with 5.4% of NZ Europeans compared to 5.3% of Māori (95% CI 0.75, 1.43; p= 0.88) and 6.8% of Pacific patients (95% CI: 0.54, 1.19; p= 0.23). Reperfusion rates with IVT and or SCR were 13.3% in NZ Europeans, compared to 12.3% in Māori (95% CI: 0.89, 1.34; p= 0.42), and 13.9% in Pacific patients (95% CI: 0.74, 1.26; p= 0.73) (Table 4).

Looking at a two-year cohort (2018–2020) Māori and Pacific patients were significantly younger than their NZ European counterparts

Table 1: Baseline characteristics of patients undergoing reperfusion therapy in 2020

	Thrombolysis (IVT) cohort	**Thrombectomy (SCR) cohort**
IVT patients, n	828	195
SCR patients, n	201	404
Age, mean (SD)	71.2 (14.8)	68.4 (14.9)
Male, n (%)	431 (52.0)	209 (51.7)
Female, n (%)	392 (47.3)	192 (47.5)
Ethnicity, n (%)		
European	639 (77.2)	297 (73.5)
NZ Māori	99 (12.0)	50 (12.4)
Pacific	42 (5.1)	30 (7.4)
Asian	30 (3.6)	27 (6.7)
Other	7 (0.80)	2 (0.5)
Presented out-of-hours, n (%)	459 (55.4)	229 (56.7)

Table 2: National IV thrombolysis (IVT) data, time delays, and patient outcomes 2015–2020

	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Thrombolysed, n	389	500	618	719	805	828
Total strokes[1], n	5963	6068	6549*	6753	7153	7333
IVT Rates, %	6.5%	8.2%	9.4%	10.7%	11.3%	11.3%
SCR in those thrombolysed, n (%)	23 (5.9)	33 (6.6)	77 (12.5)	120 (16.7)	162 (20.1)	201 (24.3)
Reperfusion Rate, n (%)	-	-	-	873 (12.2)	985 (14.5)	1023 (14.0)
Presented out of hours, n (%)	207 (53)	276 (55)	320 (57)	411 (57)	468 (58.4)	459 (57.2)
Onset-to-door time, median (IQR) minutes	69 (50–103)	71 (50–105)	76 (52–117)	75 (47–118)	77 (53–112)	81 (55–128)
Door-to-needle time, median (IQR) minutes	74 (55–102)	64 (47–92)	65 (47–89)	59 (40–84)	61 (44–84)	61 (41–87)
Door to needle time, n < 60 min (%)	119 (30.6)	201 (40.2)	250 (40.5)	366 (50.9)	395 (49.1)	406 (49.7)
Door to CT time, median (IQR) minutes	31 (21–42)	28 (19–40)	25 (17–39)	23 (15–37)	22 (13–35)	23 (16–36)
CT to Needle time, median (IQR) minutes	39 (23–61)	31 (17–51)	33 (20–54)	31 (19–51)	35 (22–54)	34 (20–53)
Onset-to-needle time, median (IQR) minutes	154 (120–195)	142 (111–189)	150 (115–195)	145 (110–198)	145 (114–195)	157 (115–210)
sICH, n (%)	24 (6.2)	25 (5.0)	25 (4.0)	26 (3.6)	37 (4.6)	24 (2.9)
Deceased at day seven, n (%)	26 (6.7)	42 (8.4)	43 (7.0)	61 (8.5)	73 (9.1)	66 (8.1)

[1] This figure includes ischaemic strokes (I63) and stroke unspecified (I64) but excludes intracerebral haemorrhage (I61).

* Stroke volumes for 2017 and 2018 have been updated from 6549 and 6753, respectively, to the displayed figures, after duplicates have been removed and thus displayed rates will differ from prior publication.[2] No updated data was available for 2015 and 2016 and thus these values re unchanged and likely underestimate thrombolysis rates by about 0.5% and SCR rates by about 0.2% extrapolating from 2017–2020 data.

Table 3: Endovascular Stroke Clot Retrieval (SCR) data 2011–2020

	2011–2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Stroke clot retrieval events, n	28	30	49	134	252	346	404
Stroke patients treated with SCR, n	28	39	49	134	243	342	402
SCR rate, n/N (%)	-	30/5693 (0.5)	49/6068 (0.8)	134/65499 (2.1)	243/6753 (3.6)	346/7153 (4.8)	404/7333 (5.5)
Thrombolysed SCR patients, n (%)	17 (61)	23 (77)	33 (67)	77 (57)	116 (48)	161 (46)	195 (48)
Arrival-to-groin time, median (IQR) minutes	129 (71.5–203.5)	115.5 (50–180)	72 (24–107)	68 (20–97)	45 (15–100)	52 (16–109)	55 (22–113)
Groin-to-reperfusion time, median (IQR) minutes	110 (72.5–165)	61 (55–80)	67 (40–90)	50 (35–83)	45 (30–65)	47 (28–76)	43 (28–69)
Onset-to-reperfusion time, median (IQR) minutes	337.5 (293–422.5)	270 (235–350)	258 (222–320)	275 (225–365)	285 (225–435)	335 (235–522)	365 (245–550)
sICH, n/N (%)	1/28 (3.6)	3/30 (10.0)	4/49 (8.2)	8/134 (6.0)	12/242 (4.9)	10/342 (2.9)	5/401 (1.2)
Deceased at day seven, n/N (%)	4/28 (14.2)	5/30 (16.7)	8/49 (16.3)	23/134 (17.2)	19/239 (7.9)	31/342 (9.1)	30/399 (7.5)
mRS 0–2 at 3 months, n/N (%)	14/27 (51.8)	17/29 (58.6)	33/49 (67.3)	63/122 (51.6)	114/201 (57.8)	108/242 (44.6)	141/286 (49.3)

Table 4: IVT and SCR data in NZ European, Māori and Pacific peoples 2018–2020.

	2018			2019			2020		
	NZ European	**Māori**	**Pacific**	**NZ European**	**Māori**	**Pacific**	**NZ European**	**Māori**	**Pacific**
Total strokes	5134	825	390	5351	865	415	5474	889	438
IVT rate, n (%)	520 (10.1)	125 (15.2)	49 (12.6)	594 (11.1)	122 (14.1)	39 (9.4)	639 (11.7)	90 (10.1)	51 (11.6)
SCR rate, n (%)	168 (3.3)	45 (5.5)	19 (4.9)	241 (4.5)	53 (6.1)	22 (5.3)	297 (5.4)	47 (5.3)	30 (6.8)
Re-perfusion rate, n (%)	610 (11.9)	146 (17.7)	57 (14.6)	719 (13.4)	146 (16.9)	51 (12.3)	729 (13.3)	109 (12.3)	61 (13.9)
Age (years)	74.0	60	65	74	61	63	74	60	61
Onset-to-door time median (IQR) minutes	79 (48–125)	71 (44–101)	72 (46–110)	80 (55–115)	70 (44–115)	65 (48–103)	85 (57–130)	75 (46–117)	70 (55–98)
Door-to-needle time, median (IQR) minutes	57 (40–82.5	67 (49–86)	56 (31–78)	61 (43–81)	63 (47–91)	61 (47–98)	59 (40–85)	66 (49–91)	67 (53–97)
Onset-to-needle time, median (IQR) minutes	145.5 (110–198)	146 (106–198)	127 (105–187)	148 (115–195)	143 (112–189)	151 (103–205)	159 (115–210)	151 (113–210)	153 (114–226)
Onset-to-reperfusion time, median (IQR) minutes									
SCR centre	259.5 (211–513)	289 (195–489)	225 (155–413)	297 (215–522)	374 (235–589)	442 (230–1520)	286 (206–566)	318 (213–380)	362.5 (250–560)
Regional centre	292.5 (242.5–415)	265 (195–385)	277 (245–325)	365 (285–525)	342.5 (270–495)	277.5 (210–375)	403 (295–550)	401 (312.5–485)	270 (210–445)
Onset-to-groin time, median (IQR) minutes	245 (176–400)	206.5 (172.5–407.5)	230 (190–325)	275 (194–456)	280 (200–471)	270 (175–425)	302 (195–483)	315 (205–415)	235 (185–400)

Table 4 (continued): IVT and SCR data in NZ European, Māori and Pasifika peoples 2018–2020.

	2018			**2019**			**2020**		
	NZ European	**Māori**	**Pacific**	**NZ European**	**Māori**	**Pacific**	**NZ European**	**Māori**	**Pacific**
Telestroke rate, n/N (%)	96/259 (37.0)	24/69 (34.8)	2/11 (18.2)	147/654 (22.5)	26/143 (18.2)	3/49 (6.1)	156/610 (25.6)	23/82 (28.0)	2/44 (4.5)
mRS 0–2 at 3 months, n/N (%)	146/263 (55.5)	21/44 (47.7)	17/29 (58.6)	186/322 (57.8)	33/55 (60.0)	20/31 (64.5)	226/374 (60.4)	32/51 (62.7)	15/30 (50.0)
Presented out of hours, n/N (%)	349/609 (57.3)	79/136 (58.1)	38/67 (56.7)	412/717 (57.5)	95/146 (65.1)	28/51 (54.9)	404/711 (56.8)	66/108 (61.1)	30/56 (53.6)
Deceased at 7 days (%)	60 (9.8)	10 (6.8)	1 (1.8)	58 (8.1)	14 (9.6)	6 (11.8)	63 (8.6)	6 (5.5)	5 (8.2)
sICH (%)	24 (3.9)	9 (6.2)	1 (1.8)	25 (3.5)	8 (5.5)	1 (2.0)	23 (3.2)	3 (2.8)	6 (9.8)

(60.3 years vs 74 years; p<0.001, and 63 years vs 74 years; p<0.001, respectively). Onset-to-door time was significantly higher in NZ European patients (median (IQR)) 81 (54–123) minutes compared with Māori; 72 (44–112) minutes (p<0.001), and Pacific patients; 70 (48–105) minutes (p= 0.03). Door-to-needle time in 2018–2020 was longer in Māori patients compared with NZ Europeans; (median (IQR)) 66 (48–88) minutes compared to 59 (41–83) minutes (p=0.001). A sensitivity analysis explored whether the difference in slower door-to-needle time for Māori could be due to a higher proportion residing rurally, with previous reports showing slower door-to-needle time in non-urban settings.[2,9] Indeed, the sensitivity analysis found that door-to-needle time for NZ Europeans residing in non-urban DHBs was significantly longer than for urban NZ European door-to-needle time: (median (IQR)) 62 (44–86) minutes compared to 57 (40–82) minutes (p= 0.02), respectively. The same trend was observed among Māori. However, this was not statistically significant. Māori non-urban door-to-needle time (median (IQR)) 70 (51–92) minutes compared to Māori urban door-to-needle time (median (IQR)) 63 (42–87) minutes (p=0.11). However, Māori also had longer door-to-needle time in the urban setting when compared to urban NZ Europeans: (median (IQR)) 63 (42–87) minutes compared to 57 (40–82) minutes (p=0.048). Similarly, non-urban Māori had a significantly longer door-to-needle times compared to their non-urban NZ European counterparts; (median (IQR)) 70 (51–92) minutes compared to 62 (44–86) minutes (p= 0.012). There was no significant difference between NZ European and Pacific patients in door-to-needle time (p= 0.28). Overall onset-to-needle time was similar across ethnic groups (NZ European vs Māori; p= 0.16, NZ European vs Pacific; p= 0.37, Māori vs Pacific; p= 0.99).

In 2019, there were overall more men than women who experienced ischaemic events (3661 males versus 3492 females). Female stroke patients were on average 4.4 years older than males upon presentation (73.7 years versus 69.3 years respectively, p<0.001). The rate of IVT performed in females (10.2%) was lower than that in males (12.2%); p= 0.01. However, there was no significant difference in the rate of SCR (female 4.6%; male 5.1%; p= 0.29). The overall reperfusion rate was lower for females than males (12.7% vs 14.9% p= 0.02). Median door-to-needle, onset-to-needle, and onset-to-groin times, sICH and day seven mortality were similar between females and males (Table 4).

Discussion

IVT and SCR rates have risen considerably since 2015. IVT rates have seen a steady rise from 6.5% to 11.3% and SCR rates have risen even more dramatically, from 0.5% to 5.5%. This is likely related to increasing implementation of SCR following the publication of seven pivotal trials on SCR efficacy in 2015 and 2016.[3] Since this initial jump, SCR rates have continued to increase more modestly.

The acute stroke reperfusion therapy rate with IVT and or SCR reached 14.0% in 2020 (14.6% when “stroke unspecified” patients are excluded). Eight hundred and twenty-eight patients were treated with IVT and 404 with SCR (201 received both) in a population of 5.1 million people. This equates to an IVT rate of 162 per million people and an SCR rate of 79 per million people. A number of quality improvement initiatives have led to the progress seen in stroke service provision. The implementation of the National Stroke Reperfusion Register in January 2015 has allowed for regular quality-control audits and has provided a focus for annual meetings to discuss national stroke reperfusion data and quality.[2] Such registers have also been shown to drive improvement in stroke service provision overseas.[14] Other initiatives include expanding Telestroke networks, regular Ministry of Health FAST campaigns, and hospital stroke service improvement projects. [6–8]

Our study found that IVT and SCR pre-hospital delays were higher in 2020 compared to 2019. While this was not statistically significant, it does follow an upward trend seen in the last six years. This is presumed to be, at least in part, a paradoxical finding secondary to an increased acceptance of treatment in extended time windows and increased treatment volumes at smaller centres. A drop-in pre-hospital care pathway performance is less likely.

SCR delays continue to improve which is unsurprising given SCR services continue to actively evolve. More work is ongoing under the recently launched Ministry of Health National Stroke Clot Retrieval Service Improvement Programme.[15] It is also encouraging to see stable complication rates for both IVT and SCR.

Despite many improvements, areas requiring continued effort have been identified. One such area is the door-to-needle time for IVT, which remains far from the recommended 30-minute target. Further, concerns are raised by the 2019 reduction in reported rate of three-month mRS (0–2) after SCR. Some fluctuation of results may be explained by the inconsistency in mRS data reporting. However, mRS had remained fairly stable between 2011 and 2018. It is possible that genuinely more complications were encountered in the past two years, and this will need to be further explored at the individual SCR centres, although the stable sICH rate provides some reassurance. A potential contributing factor may be that boundaries are being pushed with more patients referred for SCR with poorer baseline health status who do not entirely meet trial criteria. This is supported by the finding that over 50% of SCR patients did not receive IVT, suggesting they had IVT contraindications and may also be borderline SCR cases ("mercy cases"). Finally, with slowly increasing referrals from regional centres it is possible that significant transport delays mean more patients reach the angiography suite too late to benefit from the procedure. This area requires urgent attention and is a focus of the National SCR Programme.[15] To monitor SCR time delays and complications more effectively, we have recently introduced additional SCR time metrics and details around procedural complications that will be monitored over time.

The disproportionate burden of stroke and post-stoke complications on Māori and Pacific peoples have long been documented. Previous studies have shown a striking difference in the average age of stroke onset in Māori and Pacific peoples compared with NZ Europeans.[9] The results of our study align with existing literature in that Māori and Pacific stroke patients were 13.7 and 11 years younger on average than NZ Europeans.

Pacific and Māori presented faster to hospital suggesting good stroke awareness and pre-hospital transport access in these populations. However, there were greater in-hospital delays for Māori. A higher proportion of Māori reside in rural areas compared with NZ Europeans and thus slower door-to-needle times at regional hospitals may disproportionally affect Māori. [2,8,16] However, a sensitivity analysis exploring the impact of hospital location found that Māori had slower door-to-needle times compared to NZ Europeans even when limiting the analysis to either urban or non-urban settings. While we were unable to adjust for other potential confounders in this study, the recently published REGIONS Care ethnicity analysis was fully adjusted for age, baseline morbidity, risk factors, stroke severity, and geography and identified additional areas of in-hospital stroke care inequities.[17] Such findings raise concern about potential racial discrimination within New Zealand stroke services. This will require careful consideration to plan potential interventions and should be monitored going forward.

As part of the 2019 analysis, we also explored sex-related differences in reperfusion therapy. It is well-known in the literature that women tend to present with stroke at an older age than men and with a different profile of risk factors.[15] Previous studies have also found that women are less likely to receive IVT despite gaining more net clinical benefit than men, especially at an older age.[18] While older age may make some clinicians more reluctant to treat and may thus provide a potential explanation, other studies have also found that suitable female candidates are more likely to be labelled stroke mimics and can inadvertently miss out on treatment.[18] This may be due to more frequent atypical presentations or unconscious bias. One study found that when age was corrected for, there were no significant sex-related differences in quality of care.[18] As our data were not adjusted for age, it should be viewed as explorative and interpreted with a degree of caution. Further analysis adjusting for age, severity, and baseline morbidity is important.

Our study has several limitations. Firstly, it is difficult to validate all data entered into the clinical register by up to 60 front line clinicians across the country. Therefore, despite the thorough and meticulous system of manual data checking and cleaning that has been implemented to mitigate any errors, it is possible that some mistakes remain. Secondly, the crude outcome measure of "alive or discharged at day seven" does not represent the long road of rehabilitation undertaken by stroke patients. To improve this, reporting of three-month mRS became mandatory in 2019. Despite this, only 50.1% of records included this information in 2020 (down from 54.3% in 2019). To fairly represent the New Zealand post-stroke experience, we must work to increase these numbers. While the main outcomes of interest were intervention rate, sICH and seven-day mortality, we conducted multiple additional analyses. Due to the number of comparisons conducted, there is a possibility that some significant results occurred based on chance alone and these secondary comparisons should thus be interpreted with caution. The inability to update denominator data for 2015 and 2016 will have impacted the precision of historical intervention rate comparisons, however; given the substantial increases in intervention rates over time it is very unlikely that the subtle changes in denominator values will have impacted the overall conclusions. Finally, the analyses by ethnicity and sex were not adjusted for potential confounders such as age, stroke severity, risk factors and time delays and should thus be viewed as primarily exploratory and interpreted with a degree of caution. A sample size was not prospectively determined, and we cannot exclude that significant findings were missed due to the lack of study power.

Despite these limitations, the completeness of data in our register—which includes every patient who underwent reperfusion in New Zealand—strengthens our observations. This minimises selection bias and allows for the accurate analysis of trends in stroke service provision over time.

Conclusion

Reperfusion therapy rates and treatment delays continue to improve although appear to gradually plateau. Complications and mortality have remained stable. The reduction in favourable outcomes following SCR over the last two years is likely related to widening inclusion criteria for patient selection and/or greater delays for more patients due to rising regional transfers. Both require further investigation and mitigation. Ethnic disparities identified include the longer door-to-needle time observed in Māori not explained by geographic factors. Women accessed reperfusion therapy less frequently, potentially explained by older age at presentation. Both require further exploration and action.

Table 5: Differences in rates of reperfusion in males and females (2019)

	Female	**Male**	**p-value**
Strokes, n	3492	3661	
Age, mean (SD)	73.7 (15.3)	69.3 (14.6)	<0.001
IVT rate, n/N (%)	357/3492 (10.2)	448/3661 (12.2)	0.007
SCR rate, n/N (%^)	159/3492 (4.6)	187/3661 (5.1)	0.33
Reperfusion Rx, % (n/N)*	445/3492 (12.7)	544/3661 (14.9)	0.007
Onset-to-door time, median (IQR) minutes	81 (54–120)	80 (52–120)	0.42
Door-to-needle time, median (IQR) minutes	59 (45–85)	62 (44–83)	0.55
Onset-to-needle time, median (IQR) minutes	146 (113–190)	145 (114–200)	0.63
Onset-to-groin time, median (IQR) minutes	270 (198–435)	275 (182–459)	0.62
sICH, n (%)	19/445 (4.3)	21/544 (3.9)	0.75
Deceased at 7 days, n/N (%)	45/445 (10.1)	44/544 (8.1)	0.27
Telestroke rate, n/N (%)	86/357 (24.1)	94/448 (21.0)	0.29
Presented out of hours, n/N (%)	244/442 (55.2)	331/540 (61.3)	0.67
mRS 0–2 at 3 months, n/N (%)	104/198 (52.5)	153/249 (61.4)	0.22

COMPETING INTERESTS

Nil.

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Measuring health consumers' engagement at the governance level: development and validation of the Middlemore Consumer Engagement Questionnaire

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ABSTRACT

AIM: To develop and validate a questionnaire to measure health CE at governance level.

METHOD: This study used qualitative and quantitative methods (including focus groups, cognitive interviews and an international survey), and consisted of two phases. In Phase 1, an initial list of items was generated and refined with feedback from health consumer representatives. In Phase 2, a draft survey was distributed to n=227 consumers from New Zealand, Australia and Canada. The benefit and relevance of using the questionnaire was explored through face-to-face interviews with five CE leaders from New Zealand healthcare organisations.

RESULTS: The proposed questionnaire comprises 25 statements relating to CE. Respondents indicate their level of agreement with the statements on a five-point Likert-type scale. Focus group and cognitive interview participants found the questionnaire relevant and easy to understand. The questionnaire scores correlated with the PPEET, another instrument measuring consumer engagement, and showed excellent internal consistency (Cronbach's alpha=0.97), unidimensionality and test-retest reliability (r=0.84).

CONCLUSION: The proposed questionnaire measures CE at governance level and can be used for international comparisons and benchmarking. It showed sound psychometric properties and its value and relevance was recognised by health consumer representatives and leaders with CE roles in New Zealand healthcare organisations.

A growing body of evidence suggests that improved consumer engagement (CE) can lead to better health outcomes, and contribute to improvements in health service quality and patient safety.[1,2] CE has been recognised globally as one of the key priorities within health systems' continuous development and a requirement for patient-centred care.[1–5] The Health Quality & Safety Commission (HQSC) and Ministry of Health (MoH) of New Zealand identifies CE as one of their key priorities and recognises it as central to improving quality across the national healthcare system.[2,6]

CE in health focuses on consumers and care providers working together to promote and facilitate active patient, whānau (family) and public involvement at all levels of health systems.[1,7] An important part of CE, recognised as a right of all people by the World Health Organisation (WHO),[8] is engaging patients in health systems governance to inform the design and implementation of healthcare services.[1] Health systems governance level engagement may include, for example, being a member of a project team, steering group, consumer group or board.[9] Specifically, CE at governance level is characterised by bi-directional flow of information and shared power and responsibility, with consumers being active partners in defining agendas and making decisions.[1]

To facilitate CE many healthcare organisations have established consumer groups. Within the New Zealand health context these are typically called consumer councils, consumer advisory groups or consumer boards. HQSC describes consumer councils as:

> *key mechanisms through which consumers can participate in how health and disability services are delivered in different communities. In this way,*

> *consumer representatives can provide feedback on current services and tell providers what is important to them. They can give advice and input into strategic direction and planning of services. Consumer councils are made up entirely of consumer representatives and have slightly different ways of working, with some having a strong relationship with clinical governance and reporting to the board.*[1]

The increased commitment to improving CE in New Zealand and globally has necessitated the need for robust CE evaluations.[11] This includes the recently announced reforms of health services within New Zealand which signals a priority outcome as 'partnership at all levels of the system and empowering consumers of care to design services which work for them', and a strong focus on partnering with Indigenous Māori community.[6]

An effective evaluation tool enables assessing outcomes of CE, learning from current practices, and demonstrating the impact of new policies and investments. However, a recent systematic review of questionnaires to measure CE at governance level[11] found that most of the identified tools lacked scientific rigour, were not proven to be reliable, and were not easy to read or understand. Many of the tools were developed for a single project or not made publicly available. In light of these findings, there is an urgent need to develop a psychometrically sound questionnaire to measure CE at governance level.

The overall aim of the current project was to develop and validate a questionnaire to measure health consumer representatives' CE at governance level named the Middlemore Consumer Engagement Questionnaire (MCE-Q). This mixed methods study used a range of qualitative and quantitative methods and consisted of two phases. The aims for each phase were:

1. To develop an instrument to measure CE at governance level (Phase 1).
2. To demonstrate the reliability and validity of this instrument (Phase 2).

We aimed to explore if consumers felt enabled and supported to contribute to improving healthcare systems. We partnered with the Counties Manukau (CM) Health Consumer Council (the Consumer Council) to bring together a team of health researchers, consumers, practitioners and statisticians, with expertise in consumer experience, psychometrics, co-design and Indigenous issues across a wide array of settings. The questionnaire we planned to develop and validate aimed to measure the self-perceived level of engagement of consumers contributing at governance level, and to facilitate continuous healthcare systems improvement, decision-making processes and international comparisons relating to CE.

The purpose of this paper is to describe the development of the MCE-Q. In the next section, methods and findings from Phase 1 are reported, as they informed the subsequent data collection and analysis in Phase 2. This is followed by a section reporting methods and findings from Phase 2. Finally, an integrated discussion of the projects findings, limitations and conclusion are provided.

PHASE 1

Phase 1 focused on generating candidate items relevant to CE and developing the questionnaire. We first established an advisory group, which supported the project team, providing expertise in areas including CE, Māori health and Pasifika health.

Phase 1 methods

Study design

Phase 1 was guided by recommendations by Churchill[12] and Streiner et al,[13] for developing outcome measures. It consisted of multiple steps, including domain specification, item generation, a focus group, cognitive interviews, and an in-depth review of the proposed questionnaire. Figure 1 presents the steps of Phase 1.

Setting and location

The study was conducted in Auckland, New Zealand, between July and October 2020. This time scale included a range of disruptions caused by the global COVID-19 pandemic, but the conduct of this study was not interrupted.

Data collection

Content domain specification

The first step was to define the content domain of the proposed questionnaire. This process was based on published literature relating to CE, previously completed work of the Consumer Council and project team, and the team's expertise in consumer experience, and measurement. Our focus was also on aligning our working definition with the CE-related components identified by the HQSC and WHO.[2,8] We also aimed to identify any potential subdomains which could then be psychometrically assessed in Phase 2.

Item generation

We included multiple data sources to generate potential items for the MCE-Q. First, a list of initial items was formulated during a workshop with the Consumer Council. Next, a literature review was conducted to identify any relevant scientific publications and existing tools. As a result, a further set of candidate items were identified and included in the item list. Finally, the item list was reviewed and refined by the project team, who focused on deleting any duplicate or otherwise redundant items, and on item readability.

Focus group with health consumer representatives

We conducted a workshop-style focus group including participants who were current or former Consumer Council members. The Consumer Council was established to represent the interests of consumers and bring an inpatient and ambulatory consumer and family perspective to development of the Counties Manukau Health plans, policies, publications, and operational decisions and to raise issues being identified in the community. It includes people from a variety of backgrounds who have a strong consumer understanding of the healthcare system and represent the voices of their communities. Potential participants were invited to take part via an invitation email sent out by the Consumer Council's secretariat. There were no exclusion criteria. The focus group lasted approximately two hours, was facilitated by three members of the project team (LM, TA, KC), and was audio-recorded. The purpose of the focus group was to review the questionnaire instructions, proposed items, recall period and response format, and potentially generate further items. Recognition of time and expertise, in the form of koha (gift), and support with transportation was provided to all consumer participants of the focus groups. Basic demographic data were collected.

Cognitive interviews

Following analysis of the focus group data, two members of the project team conducted cognitive interviews[14] with a purposively selected sample of current and former members of the Consumer Council. We used cognitive interviewing to evaluate whether the survey respondents interpreted the survey instructions and items as they were intended, and whether the survey format enabled the respondents to select responses that matched their answers.[14]

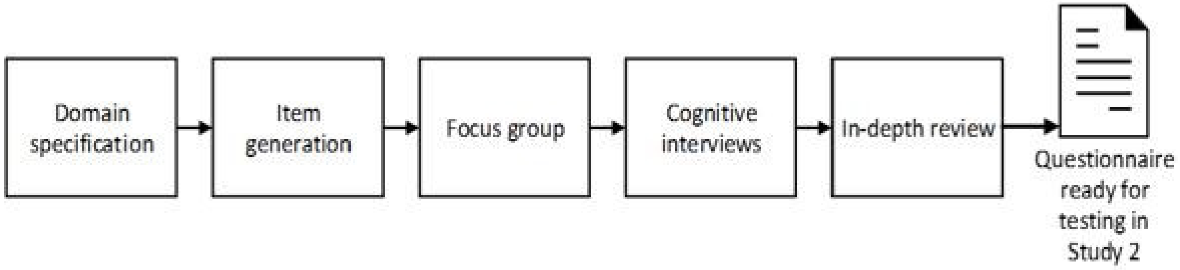
Consumer representatives were invited to take part via an invitation email. Our sampling strategy focused on ensuring gender, ethnicity and length of Consumer Council service representation. There were no exclusion criteria.

Consumer participants were interviewed individually, face-to-face. They were asked to 'think-aloud'[15] as they completed a refined version of the proposed questionnaire. The interviewer explored any potential issues as participants responded to items. All interviews were audio-recorded. Basic demographic data were collected.

In-depth review

Our project team met regularly throughout the data collection period to review the transcripts and refine the questionnaire. The questionnaire instructions and items were reviewed for clarity and redundancy. Any issues were resolved by discussion.

Figure 1: Phase 1 steps.



Data analysis

The focus group discussion was transcribed verbatim and analysed using Directed Content Analysis,[16] focusing specifically on defining CE, any items with perceived lack of clarity, and on generating new candidate items. The proposed items and instructions were refined to improve comprehension by participants and to elicit experiences related to CE at governance level.

Cognitive interviews were transcribed, and analysed using Directed Content Analysis, focusing specifically on identifying items that were not easily understood, and on the acceptability of the proposed response categories.

We used the Flesch Reading Ease score[17] to test the readability of the questionnaire instructions and items.

Ethics

Ethical approval for the study (Phase 1 and 2) was received from the Auckland Health Research Committee (AH3350).

Phase 1 findings

Content domain specification

The content domain of the proposed questionnaire is health CE at governance level. For the purpose of this study, we employed the following definition of CE at governance level (adapted from Abelson et al[18] and Baker et al[19]):

> *Consumer engagement at governance level is characterised by shared power and responsibility, with consumers being active partners in defining agendas and making decisions. Information flows bi-directionally throughout the process of engagement, and decision-making responsibility is shared.*

This definition suggests there may be some subdomains within the overall domain of CE, for example, shared power, responsibility, active participation and decision-making. We planned to explore any potential subdomains in Phase 2.

Item generation

In our prior work which initiated the current project, the Consumer Council and project team generated a set of 27 candidate items relating to CE that were included in the initial item bank for the proposed CE questionnaire. These items considered consumers' experiences of being involved in governance groups, for example, *I feel that my views are heard* and *I feel confident when challenging views expressed by other members of the group*. Next, a literature review conducted by a trained academic librarian, generated a further set of items. In total, the initial list included 112 candidate items.

The project team iteratively reviewed the initial list of items and selected 36 that appeared to represent the content domain of CE most strongly. All items were then reviewed for readability, ensuring they used brief and plain language and had consistent item valence (positive versus negative wording).

We intended to use a Likert-type scale to indicate the level of agreement with each of the items. The proposed response categories ranged from 'strongly disagree' (scored '1') to 'strongly agree' (scored '5'). We planned to explore the preference for using the middle response category ('neither agree, nor disagree) with the focus group and interview participants. Scores for each item would be summated to give the total score.

The list of 36 items was then formatted into a prototype draft of the questionnaire. This included questionnaire instructions (formulated by the project team) and the proposed response categories. This draft was then discussed with consumer representatives during a focus group.

Focus group with the Consumer Council members

Six participants took part in the focus group (Table 1).

Participants found the questionnaire instructions to be generally easy to understand. However, they thought more clarity was needed around the meaning of 'a health consumer in general' versus 'a health consumer at governance level'. Some participants noted that the difference between the two referred to the level of responsibility and argued that a health consumer at governance level represents not only their own lived experience, but also their community's. Participants also argued that it was important to set the context as clear as possible in the instructions, for example: *Rate each item thinking about your engagement in [group] over the last [number] months.*

Next, participants reviewed all 36 candidate items. Overall, participants all agreed that the questions were relevant and that most should be included in a measure of CE at governance level. They noted similarities between some items (for example, 'My opinions are listened to and valued' and 'I feel that my views are heard'), and argued for rewording and/or clarification of some of them (for example, replacing barriers with challenges in ‘There are barriers that impact my ability to contribute in meetings’). Furthermore, participants argued that the questionnaire must consider respondents’ cultural background, with one of the participants stating that ‘cultural sensitivity is universal’. Finally, as most participants thought that the use of a five-point Likert-type response scale was appropriate, we decided to include the middle response category ‘neither agree, nor disagree’.

The project team read and discussed the focus group transcripts, and iteratively reviewed the questionnaire draft. A number of refinements were made, that included clarifying the instructions and item wording, providing examples where appropriate, incorporating the principle of partnership into some of the items, and further improving the readability of the questionnaire. No items were deleted following the focus group.

Cognitive interviews

Next, the prototype questionnaire was tested through cognitive interviews with five participants (Table 2).

Participants found the questionnaire instructions and majority of items easy to understand. They suggested rephrasing some of the items to avoid unnecessary ambiguity, which resulted in further improvements to the questionnaires readability. Overall, participants thought that the questionnaire was easy to complete and that it covered a broad spectrum of areas relating to CE at governance level.

Drafting the questionnaire

After a number of revisions incorporating findings from the focus group and cognitive interviews, the project team prepared a further questionnaire draft for psychometric performance testing in Phase 2. The questionnaire included 36 CE items using a five-point Likert-type response format (Supplementary Table 1) and nine demographic ques-

Table 1: Demographic characteristics of the focus group participants.

Age	Gender	Ethnicity
55	M	Tongan
45	F	Chinese
64	F	Samoan
58	F	NZ European
83	M	NZ European
52	F	Māori

Table 2: Demographic characteristics of cognitive interviews participants.

Age	Gender	Ethnicity
55	M	Tongan
27	M	Māori
54	F	European
45	F	Chinese
79	F	NZ European

tions (Supplementary Table 2). The Flesch Reading Ease score was 61, suggesting the questionnaire was written in Plain English and easily understood, on average, by a student aged 13–15 years.

The proposed questionnaire was then uploaded to REDCap database[20] to enable an anonymous, online distribution to health consumer representatives in Phase 2.

PHASE 2

Phase 2 focused on testing the following psychometric properties of the proposed questionnaire: construct and concurrent validity, internal consistency and test-retest reliability.

Phase 2 methods

Study design

Phase 2 consisted of a main CE survey study with health consumer representatives and a qualitative interview study with CE leaders conducted concurrently. This was followed by an additional test-retest survey study.

Setting and location

The project team was based in Auckland, New Zealand. The survey was conducted online with participants from New Zealand, Australia and Canada between December 2020 and July 2021.

Data collection

Main CE survey

The proposed questionnaire was administered via the REDCap database[20] and completed anonymously. The work of Comrey and Lee[21] and Hair et al[22] suggests that having a sample size of 200 and above would be sufficient for carrying out a reliability analysis. The survey was distributed by invitation via district health boards Consumer Council chairpersons from around New Zealand, the HQSC, the Consumer Health Forum of Australia, and the British Columbia Patient Safety & Quality Council in Canada.

To test the proposed questionnaires concurrent validity, we selected a similar questionnaire, the Patient and Public Engagement Evaluation Tool (PPEET).[18] PPEET was developed at McMaster University (Canada) by public and patient engagement experts and is widely used in Canada and other countries by healthcare organisations.[23] PPEET includes 13 items and takes about two to three minutes to complete. A consecutive sub-sample of participants were invited to complete the validation measure, PPEET.

CE leaders' interviews

We interviewed New Zealand CE leaders (for example, chairs, managers) of organisations/groups formally involving health consumer representative at governance level, with at least three years of experience in a leadership role. They were purposively selected from within the project lead's (LM) professional network and invited via email to take part. There were no exclusion criteria.

CE leaders were interviewed individually, face-to-face. The interviewer (LW) used an interview guide to explore participants' perspectives on measuring CE and how such data could be used in the future. The interviews were audio-recorded and transcribed verbatim. We expected to interview between 5–10 people, depending on the depth and richness of the collected data.[24]

Test-retest CE survey

Following the initial survey, the proposed questionnaire was refined based on statistical analysis and then underwent an evaluation of its test-retest reliability. We aimed to recruit a sample of n=30 participants to complete the refined version of the proposed questionnaire on two occasions, approximately one week apart.

Data analysis

All statistical analyses were performed using R,[25] SAS/STAT software version 9.4[26] and SPSS version 26.0 (SPSS Inc., Chicago, IL). Respondents with over 10% missing values were removed from the analysis dataset. The data entries were double checked to ensure accuracy.

The demographics of the respondents and the response profiles were presented descriptively in terms of counts and proportions.

Principal Component Analysis (PCA)[27] was performed to confirm construct validity. PCA is a method for factor extraction and a variable-reduction technique. It is used to reduce the number of variables (ie questionnaire items) while retaining as much of the original variance as possible.[27] It was also used to test whether the underlying construct (ie CE) loads onto all or only some of the variables. Pearson's correlations were produced for all the 36 items. Both Kaiser–Meyer–Olkin (KMO) Test and Bartlett's Test of Sphericity were conducted to confirm the appropriateness of conducting the PCA. The KMO statistic varies between 0 and 1.0. Values >0.5 are considered 'barely acceptable,' and >0.9 are deemed most suitable.[28] For Bartlett's Test, a significant statistic

($P \leq 0.05$) means it can efficiently perform a PCA on the dataset.[28] For the PCA, an oblique rotation was chosen as the underlying items are related. The number of components to be retained was determined using a scree plot with parallel analysis. Items that were strongly correlated (above 0.7) with the other items were removed from the survey.

Concurrent validity was evaluated using Pearson's correlation coefficient to assess the correlation between the proposed questionnaire and PPEET. For both test-retest reliability and construct validity, the agreement at the individual item level was assessed. The relative reliability was determined by calculating the two-way random Intraclass correlation coefficient (ICC) for absolute agreement of single measures. The 95% confidence interval (CI) was calculated for each ICC. Reliability was considered poor for ICC values <0.40, fair for values between 0.40–0.59, good for values between 0.60–0.74, and excellent for values between 0.75–1.00.[29] ICC values above 0.75 were considered acceptable for test-retest reliability.[30] Cronbach's alpha coefficient was utilised to test internal consistency, which ranges from 0–1.0. Streiner et al considered an alpha value of >0.7 as acceptable.[13]

Interviews with CE leaders were analysed using Directed Content Analysis, focusing specifically on participants' perceptions of what constitutes CE at governance level, and the usefulness of the proposed questionnaire in measuring and improving CE.

Phase 2 findings

Main CE survey results

Two hundred and twenty-nine participants from three countries completed the anonymous CE survey (Table 3 and Table 4). Most participants were 45 years or older (84.3%), and approximately two thirds identified as female. The highest scored items were item 3 ('I am able to express my views freely'), 4 ('participation in this group is important to me'), and 10 ('I feel safe to speak from my personal perspective, for example, my cultural perspective, my community's perspective', etc). Items with the lowest scores were item 22 ('I was well oriented to the work of this group'), 24 ('the work achieved by this group has met my expectations'), 33 ('I would not change anything about this group'), and the reverse-scored item 12 ('there are things that reduce my ability to contribute in meetings, for example, related to my cultural background or use of jargon').

Construct validity

Out of the 229 participants, there were 208 responses that had all the items completed; hence factor analysis was carried out on the 208 sample. Based on principal component analysis (Supplementary Table 3 and Figure 2), all items fitted under one dimension, which explained 53% of the total variance. All items with correlations above 0.75 were reviewed for potential redundancy. As a result, 11 items were removed (Supplementary Table 4). The KMO and Bartlett's test confirmed that all items were intercorrelated ($r=0.96$, $P<0.0001$) and the sample size was adequate.

Concurrent validity

A sample of 87 participants completed both the proposed survey and PPEET survey. Pearson's correlation coefficient between total scores from the two surveys was high (0.93).

Internal consistency

Cronbach's alpha for the initial 36-item scale was 0.97. For the final 25 items Cronbach's alpha was 0.96 and all corrected item-total correlations ranged from 0.42 to 0.85, suggesting satisfactory internal consistency.

Test-retest reliability

Thirty-four participants took part in the test-retest evaluation. The results for both ICC (0.84) and Cronbach's alpha (0.91) met the criterion, indicating that the proposed tool has high test-retest reliability (Supplementary Table 5).

CE leaders interviews

We interviewed five CE leaders (Table 5).

Consumer engagement was unanimously viewed as a 'unique partnership' with an organisation to 'amplify the voice of the communities', especially for populations who experience health inequities such as Māori, Pasifika and those living with disabilities. One participant argued it was important to engage consumers 'in a way that meets their needs [and the community's]'; the community should be 'part of the solution, or [part of] the process to getting a solution'. There appeared to be a strong desire for consumer engagement to be 'part of [the] organisational structure … built in [to processes] and in everything we do.' Participants thought that health consumers have the potential to be involved in strategic decision-making, but currently had little involvement from the start and throughout any such initiatives.

Participants argued that there is currently

Table 3: Participant demographics in CE survey.

Demographics	**NZ (n=137)**	**Australia (n=60)**	**Canada (n=32)**	**Total (n=229)**
Age group				
23–44	24 (17.5%)	11 (18.3%)	3 (9.7%)	38 (16.7%)
45–64	79 (57.7%)	23 (38.3%)	20 (64.5%)	122 (53.5%)
>=65	34 (24.8%)	26 (43.3%)	8 (25.8%)	68 (29.8%)
Gender				
Male	48 (35%)	24 (40%)	8 (25%)	80 (34.9%)
Female	89 (65%)	36 (60%)	24 (75%)	149 (65.1%)
Years since governance group established				
<3 years	48 (35%)	24 (41.4%)	10 (31.3%)	82 (36.1%)
3-5 years	36 (26.3%)	14 (24.1%)	6 (18.8%)	56 (24.7%)
>5 years	53 (38.7%)	20 (34.5%)	16 (50%)	89 (39.2%)
Number of governance group members				
4 or less	6 (4.4%)	2 (3.5%)	3 (9.4%)	11 (4.8%)
5–9	46 (33.6%)	19 (32.8%)	4 (12.5%)	69 (30.4%)
10–19	71 (51.8%)	20 (34.5%)	14 (43.8%)	105 (46.3%)
20 or more	14 (10.2%)	17 (29.3%)	11 (34.4%)	42 (18.5%)
Governance group’s meeting frequency				
Weekly	5 (3.7%)	2 (3.5%)	3 (9.4%)	10 (4.4%)
Monthly	87 (63.5%)	30 (51.7%)	15 (46.9%)	132 (58.1%)
Quarterly	31 (22.6%)	21 (36.2%)	6 (18.8%)	58 (25.6%)
Other	14 (10.2%)	5 (8.6%)	8 (25%)	27 (11.9%)
Years as member of the governance group				
<1 year	35 (25.6%)	12 (20.7%)	10 (31.3%)	57 (25.1%)
1–3 years	54 (39.4%)	18 (31%)	13 (40.6%)	85 (37.4%)
>3 years	48 (35%)	28 (48.3%)	9 (28.1%)	85 (37.4%)
Years of experience as consumer representative				
<1 year	24 (17.7%)	6 (10.3%)	4 (12.5%)	34 (15%)
1–3 years	29 (21.3%)	14 (24.1%)	8 (25%)	51 (22.6%)
>3 years	83 (61%)	38 (65.5%)	20 (62.5%)	141 (62.4%)

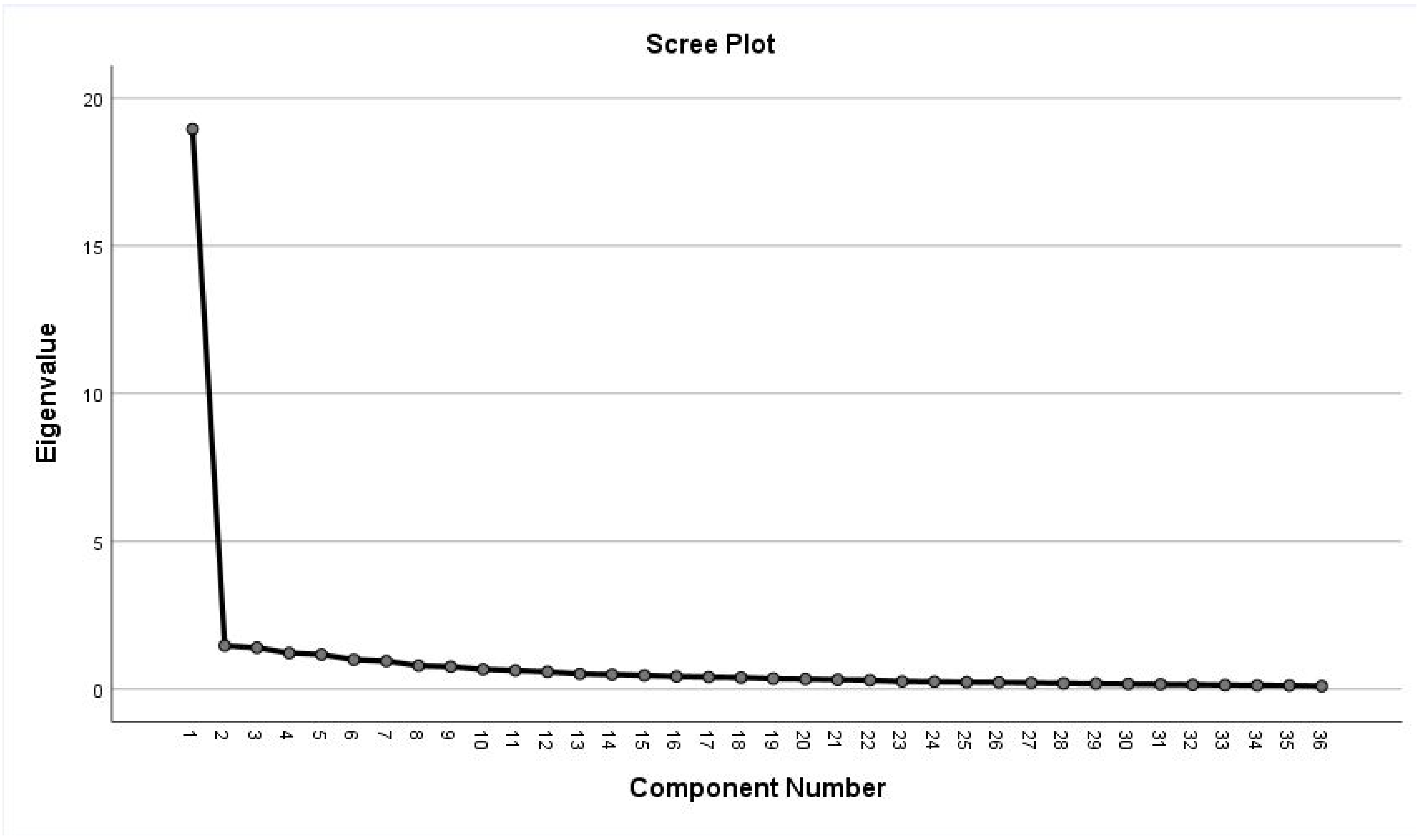
Table 4: Participant ethnicities across the three countries.

New Zealand (n=137)		**Australia (n=60)**		**Canada (n=32)**	
NZ European	87 (63.5%)	Australian	44 (73.3%)	English/Welsh/Scottish/British	20 (62.5%)
Māori	36 (26.3%)	North-west European	7 (11.7%)	European	8 (25.0%)
Chinese	8 (5.8%)	New Zealand Peoples	3 (5%)	Inuit/Metis	2 (6.3%)
Samoan	5 (3.6%)	Australian Aboriginal	2 (3.3%)	Chinese	2 (6.3%)
Tongan	5 (3.6%)	South-east Asian	3 (5.0%)	South Asian	1 (3.1%)
Cook Island Māori	2 (1.5%)	North African and Middle Eastern	1 (1.7%)	Black	1 (3.1%)
Other	12 (8.8%)	Southern and Central Asian	1 (1.7%)	West Asian	1 (3.1%)
		Sub-Saharan African	1 (1.7%)		

Table 5: CE leaders demographic characteristics.

Gender	**Age [years]**	**Ethnicity**
M	40	Australian
F	56	NZ European
F	54	NZ European
F	57	NZ European
F	51	NZ European

Figure 2: Scree plot of the number of components in the principal components analysis.



limited exploration into the experience of consumers at governance level beyond regular group meetings/hui or individual reflection and feedback sessions with their managers. Reportedly, there was no 'formal evaluation' process used to consistently review consumer's experiences of working at governance levels in their organisations. However, all managers acknowledged that monitoring consumer experience was a necessary 'mechanism for improvement' and thought that the proposed questionnaire would be useful in facilitating this on an annual or bi-annual basis.

The managers felt that the tool could help to identify gaps in understanding, relating to orientation and organisational expectations and highlight whether consumers were working in the most appropriate spaces within an organisation. It also provided a 'platform' for less vocal members of the group to share their opinions and made '[the consumer's] needs better known to [the managers] … and therefore the [consumer] contribution is more effective'. Gathering feedback from consumers was seen as important, with one participant proposing that feedback from any survey tool should be 'shared openly with consumers,' and that an 'action plan' should be formed and then enacted appropriately.

> *I think with anything, you can do a survey, but it's about what you do with it… what sort of action plan will come from those results?*

DISCUSSION

In this paper we report findings from a study developing and validating a novel questionnaire to measure CE at governance level. We built and expanded on the strengths of previously published CE-related measures by working closely with consumer representatives and CE leaders from a wide range of backgrounds, and focusing on psychometric performance of the proposed tool. The MCE-Q comprises 25 items (Supplementary Table 6) representing one domain, uses a five-point Likert-type response format, and can be completed in approximately 10 minutes. It can be downloaded by copying the link below*. The MCE-Q showed face, construct and concurrent validity, and excellent internal consistency and test-retest reliability. It can be used by healthcare organisations to monitor how well they engage their consumer representatives at governance level, identify areas for improvement and make national and international comparisons.

Healthcare providers' focus, relating to health consumers' engagement, has been primarily on consultation.[1] The mounting evidence showing that healthcare outcomes (including patient outcomes) can be improved by greater CE[2,5] made many providers realise the need to create partnerships with the consumers and engage them across all levels of healthcare systems, including at the governance level.[1] The results of our survey, specifically the relatively low ratings for two items relating to consumer group orientation/onboarding and consumers' expectations, suggest that the current processes for creating consumer–provider partnerships may be insufficient. The proposed questionnaire can serve as a tool to better understand the processes of developing and maintaining the consumer-provider partnerships, and to monitor how well healthcare organisations are engaging with their consumers at governance level. This questionnaire could also supplement existing organisational performance quality and safety indicators such as the New Zealand HQSC's Quality Safety Marker for Consumer Engagement, as it provides the consumers at governance level perspective on how well healthcare organisations perform in this area.

Limitations and future work

In this project, we developed a questionnaire with and for health consumers and groups that form the general population. We did not focus on the preferences of any specific groups or communities, but rather on developing a tool that can be used by all for benchmarking and making national and international comparisons. Inadvertently, the proposed questionnaire may not be sensitive to the needs and preferences of such groups or communities, some of whom experience relentless health inequities and whose voices are pertinent to healthcare improvement. The MCE-Q can highlight a need for improvements around cultural safety for a particular group. If such need was identified, we recommend a more nuanced exploration of the issue for the specific group using methods that offer high cultural responsiveness and are informed, for example, by Talanoa or kaupapa Māori methodology. One example of such a group are the Indigenous Māori peoples of New Zealand. Indeed, the legal obligations of Te Tiriti o Waitangi

*https://koawatea.countiesmanukau.health.nz/co-design/tools-and-resources reinforce the necessity to develop and validate a CE at governance level tool specific to Māori. The undertaking of an Indigenous tool would be best led and developed in the New Zealand context by Māori. We recommend that future research be conducted to enable Māori to exercise their rights as Indigenous peoples and as partners through Te Tiriti o Waitangi.

Another limitation is that only New Zealand based CE leaders were interviewed. We interviewed people in senior management roles who are currently involved in a range of CE initiatives in New Zealand. The dialogue quality during the interviews was high and we found that participants' views aligned with the current international CE research: the improvement of CE being one of the key priorities for healthcare systems, the lack of a psychometrically sound CE measure, and the need to better understand how to effectively engage consumers in the development and delivery of care services.[3,5,31] As we were engaging with Australian and Canadian health consumer organisations, we found there was a clear recognition of the role of CE in healthcare systems. CE organisations from both countries supported us with the distribution of the proposed survey. While there are undoubtedly differences between the New Zealand and those two (and likely other) countries' healthcare systems, the role of CE in the delivery and quality improvement of these systems is recognised globally. Thus, we believe that this sample provided sufficient information power[24] for understanding participant's perspectives on measuring CE and the proposed tool could be used in the future in New Zealand and other countries.

Notably, our focus was on recruiting a sample size sufficient to carry out the necessary psychometric analysis of the proposed questionnaire and not on measuring CE per se. As such, the Phase 2 survey was not powered to produce generalisable results relating to the state of CE at governance level in the three participating countries. Nevertheless, the questionnaire we developed can now be used for monitoring CE by individual organisations, and also at national and international level.

Finally, we only used Classical Test Theory methods to develop the MCE-Q. We are planning to apply Item response theory and use Rasch Analysis to further improve the psychometric performance of the questionnaire.

CONCLUSION

The MCE-Q is a novel instrument to measure CE at governance level. It showed sound psychometric properties and its value, and relevance was recognised by both health consumer representatives and decision-makers representing healthcare organisations in New Zealand. It can be used by healthcare organisations around the world for benchmarking, making national and international comparisons, and to drive the quality of health services to better meet the needs of the people they serve.

COMPETING INTERESTS

Nil.

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A five-year retrospective observational study of dental presentations to Waikato Hospital's emergency department

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ABSTRACT

AIM: Within New Zealand (NZ) there is limited research concerning demographics and utilisation of the Emergency Department (ED) for dental-related conditions. The aim of this research was to identify the prevalence of dental presentations to Waikato Hospital ED, defining patient demographics, discharge diagnoses, management, and re-presentation rates.

METHODS: Patients who presented to the Waikato Hospital ED from 2015 to 2019 with ICD-10 dental diagnoses were included in the study. Data collected included patient demographics, discharge diagnosis and management of these presentations. Statistical analysis was completed using IBM SPSS Statistical Version 26.0.

RESULTS: Over the five-year study period, 4030 presentations to Waikato Hospital ED were dentally related, making up 0.98% of all ED presentations. Patients were primarily male (54%), NZ European (45%) or Māori (42%), from regions of high deprivation, presenting outside of work hours (68%). Seventy-three percent of dental presentations were non-traumatic. Ninety percent of patients were discharged with symptomatic management. Of patients admitted only 4% required management under general anaesthesia (GA). Representation occurred in 6% of patients, primarily for non-traumatic dental disease (89%). Fifty-one percent of re-attenders were male, 42% Māori and 50% of patients had a deprivation index of 9 or 10. Forty-one percent of patients re-presented within a week.

CONCLUSION: At Waikato Hospital, males, NZ European, and patients of high deprivation most commonly presented to ED for dental related presentation, which were primarily non-traumatic in origin. Many patients did not require hospital care, and were managed by ED and discharged. Few patients re-presented to ED for further care. Dental presentations to ED are potentially preventable, and may be related to barriers such as cost, access or health knowledge, or an increased need. Further research is required on strategies to reduce ED presentations for dental conditions.

Within New Zealand (NZ) there is limited research concerning the demographics and utilisation of the Emergency Department (ED) for dental-related conditions. Media reports and anecdotal evidence suggests that a large number of patients are presenting to NZ ED with non-traumatic dental disease, believed to be associated with accessibility barriers and the cost of oral health care in NZ.[1] International literature has found that dental presentations account for 1–3% of all ED presentations, with 80–90% not requiring hospital level care.[2–5] The most common ED dental presentations are for pain, infections, and dental trauma. These are associated with a reduced level of education, unemployment, lack of municipal water fluoridation, and chronic disease.[4,6–8]

Significant oral health disparities exist in NZ. NZ Māori, Pasifika people, and individuals of low socio-economic status (SES) have higher rates of untreated decay, periodontal disease, and missing teeth.[9] ED is a well-recognised point of entry into the healthcare system, particularly for individuals who have difficulty accessing routine preventative services.[10,11] However, in NZ, hospital dental provisions are limited, and medicine and dentistry exist largely as entities independent from one another.[10] Emergency physicians have reported low levels of training and confidence in the management oral health. Commonly symptomatic treatment strategies are implemented such as analgesics and antibiotics.[6,12] Due to the lack of definitive dental care, patients may re-present to ED due to deterioration on outpatient antibiotics, spread of infection and/or airway compromise.[4]

This study aims to describe the demand experienced in Waikato Hospital ED for dental-related conditions. We aim to identify patients' epidemiology, management and re-presentation rates for dental related ED presentations. The authors' hypothesis based off anecdotal findings and experience, is that individuals of high deprivation, and Māori and Pasifika peoples' ethnicity, will be over-represented. Furthermore, the authors believe there will be high rates of non-traumatic dental disease that is managed symptomatically, with high rates of recidivism.

Methods

The authors present a retrospective observational study assessing dental presentations to Waikato Hospital ED, Hamilton, NZ from 1 January 2015 to 31 December 2019. Waikato Hospital is an urban tertiary referral centre, with the Dental and Oral and Maxillofacial Surgery (OMS) department serving a population of up to 500,000 people, with 82,000 ED presentations on average annually. The study was granted ethics exemption and approved in writing by the NZ Health and Disability Ethics Committee, Waikato District Health Board (DHB), with Māori Health and Research consent.

All presentations to the Waikato Hospital ED were entered into the ED Information System from 2015 to 2019. The study's inclusion criteria were patients who presented with International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) dental diagnostic codes on discharge.[13] Patients' discharge diagnoses were allocated by clinical nurse specialists, emergency physicians, paediatricians or from staff within the OMS Department. Patients were excluded if presentations were beyond the general scope of dental practice as outlined by the NZ Dental Council defined as: "The maintenance of health through assessment, diagnosis, management, treatment and prevention of any disease, disorder or condition of the orofacial complex and associated structures."[14] Examples of excluded presentations included facial fractures, orofacial or cervical pathology and non-odontogenic or cervical infection. Data collected included patient sociodemographic details (age, sex, ethnicity), reasons for presentation, consultation and discharge time and date, diagnostic modalities, diagnosis, patient management, and re-presentation. SES was obtained from the patients' residential addresses, which was converted to a Statistics NZ meshblock 2018 number. The meshblock number was then converted to SES using the 2018 NZ Index of Socioeconomic Deprivation. Values are ranked into deciles ranging from one (lowest deprivation) to ten (highest deprivation). [15]

All data was de-identified on extraction and was categorised by the research team. Age was classified between 0–18 years (includes patients eligible for the Community and Adolescent Oral Health Services), 18–65 years (NZ's working class) and 65 years and over (patients eligible for superannuation). Ethnicity data was classified as NZ European, Māori and Pasifika people (Individual of Pacific Island heritage) due to their prevalence in the NZ population. Other ethnicities included Asian, Middle Eastern, Latin American and African. Categories included abscess, soft tissue injury, toothache, dental trauma, cellulitis, ulceration and complications referred by community dentists e.g., post-operative bleeding. General anaesthesia (GA) was used as a surrogate marker for severity of the condition. Data underwent descriptive statistical analysis with IBM SPSS Statistics Version 26.0. Normality was assessed with Shapiro–Wilk Tests. An alpha value of $P \leq 0.05$ was considered significant. Normally distributed statistics were represented with parametric statistics including means and 95% confidence intervals (CI). Data not normally distributed was presented with medians and interquartile range (IQR).

Results

Over the five-year study period, there were 409,291 presentations to the Waikato Hospital ED, of which 4030 (0.98%) were for dental presentations. Seventy-two percent (2902/4030) of presentations were non-traumatic in nature. Non-traumatic presentations consisted primarily of toothache (1476/2902, 51%) and dental abscesses (1072/2902, 37%). Traumatic dental presentations (1128/4030, 28%) were composed of soft tissue injury (852/1128, 76%) and dental trauma (276/1128, 24%). Data relating to discharge diagnosis is presented in Table 1.s

Fifty-four percent (2185/4030) of patients were male, with a median age of 26 years (IQR=11–39), while 46% (1845/4030) of patients were female, with a median age of 28 years (IQR=19–40). Patients aged 19 to 65 years had the highest incidence of presentation (2694/4030, 67%) and highest rate of non-traumatic dental presentations (2164/2902, 75%). Conversely, patients 0 to 18 years had the highest incidence of traumatic dental presentations (636/1134, 56%). Data relating to age and discharge diagnosis is shown in Table 1.

There were 1841/4030 (45%) NZ European patients and 1679/4030 (42%) Māori patients. The SES Deprivation Index was not normally distrib-

Table 1: Patient demographics, presentation characteristics and management by discharge diagnosis.

	Total	Abscess	Soft tissue injury	Toothache	Dental trauma (α)	Cellulitis	Ulceration	Complica-tions (β)
Total patients (n)	4030	1072 (27%)	852 (21%)	1476 (37%)	282 (7%)	207 (5%)	27 (1%)	114 (3%)
Median age (years)	4030	30 (IQR=22–42)	9 (IQR=3–28)	29 (IQR=22–40)	18 (IQR=5–31)	36 (IQR=14–55)	16 (IQR=3–30)	34 (IQR=24-53)
Age (years)								
0–18	1118	193 (17%)	495 (44%)	209 (19%)	141 (13%)	56 (5%)	14 (1%)	10 (1%)
19–65	2694	837 (31%)	310 (12%)	1204 (45%)	122 (5%)	123 (5%)	10 (< 1%)	88 (3%)
65+	218	42 (19%)	47 (22%)	63 (29%)	19 (8%)	28 (13%)	3 (<1%)	16 (7%)
Sex								
Male	2185	542 (25%)	570 (26%)	717 (33%)	176 (8%)	114 (5%)	13 (1%)	52 (2%)
Female	1845	530 (29%)	282 (15%)	759 (41%)	106 (6%)	93 (5%)	14 (<1%)	62 (3%)
Ethnicity								
NZ European	1841	453 (25%)	437 (24%)	629 (34%)	145 (8%)	98 (5%)	10 (<1%)	69 (4%)
Māori	1679	501 (30%)	301 (18%)	662 (39%)	92 (5%)	78 (5%)	12 (<1%)	33 (2%)
Pasifika people	194	58 (30%)	30 (15%)	76 (39%)	14 (7%)	12 (6%)	2 (1%)	2 (1%)
Other (χ)	316	60 (19%)	84 (27%)	109 (34%)	31 (10%)	19 (6%)	3 (<1%)	10 (3%)
Day of presentation								
Weekday	2671	721 (27%)	313 (12%)	998 (37%)	169 (6%)	152 (6%)	17 (<1%)	85 (3%)
Weekend	1359	351 (26%)	539 (40%)	488 (36%)	113 (8%)	55 (4%)	10 (<1%)	29 (2%)
Hours of presentation								
In hours (0700–1630)	1980	661 (33%)	397 (20%)	611 (31%)	125 (6%)	120 (6%)	13 (<1%)	53 (3%)
After hours (1630–0700)	2050	411 (20%)	455 (22%)	865 (42%)	157 (8%)	87 (4%)	14 (<1%)	61 (3%)

Table 1 (continued): Patient demographics, presentation characteristics and management by discharge diagnosis.

	Total	Abscess	Soft tissue injury	Toothache	Dental trauma (α)	Cellulitis	Ulceration	Complications (β)
Treating specialty								
Emergency Department	3056	633 (21%)	722 (24%)	1285 (42%)	208 (7%)	112 (4%)	23 (<1%)	73 (2%)
OMS Department	884	407 (46%)	129 (15%)	176 (20%)	73 (8%)	59 (7%)	0 (0%)	40 (5%)
Paediatrics	90	32 (36%)	1 (1%)	15 (17%)	1 (1%)	36 (40%)	4 (4%)	1 (1%)
Median time to assessment (minutes)	53 (IQR=20–110)	59 (IQR =26–111)	52 (IQR =22–113)	46 (IQR =15–102)	59 (IQR=24–126)	54 (IQR=23–106)	69 (IQR =5–117)	45 (IQR =18–114)
Median time in ED (minutes)	148 (IQR=72–148)	167 (IQR=102–239)	157 (IQR=80–261)	118 (IQR=43–203)	173 (IQR=95–291)	172 (IQR=113–258)	161 (IQR=65–237)	148 (IQR= 76–258)
Admission (total)								
Admitted to ward	387	180 (47%)	48 (12%)	66 (17%)	20 (5%)	65 (17%)	2 (<1%)	6 (2%)
Discharged	3643	892 (24%)	804 (22%)	1410 (39%)	262 (7%)	142 (4%)	25 (<1%)	108 (3%)
Management general anaesthetic (total)	169	72 (43%)	38 (22%)	24 (14%)	16 (9%)	15 (8%)	0 (0%)	4 (2%)
Examination								
Bloods	1029	587 (57%)	62 (6%)	263 (26%)	46 (4%)	120 (11%)	6 (<1%)	47 (5%)
Imaging	1341	622 (46%)	122 (9%)	387 (29%)	127 (9%)	49 (4%)	1 (<1%)	33 (2%)
Prescription (δ)	1837	664 (36%)	334 (18%)	504 (27%)	139 (8%)	136 (7%)	7 (5%)	53 (3%)

(α) Physical injury to the enamel, dentine, cementum or surrounding periodontium.
(β) Complication following dental procedure including post-operative bleed, infection, air emphysema and displaced tooth roots.
(χ) Includes Indian, Asian, Middle Eastern, Latin American and African.
(δ) Discharge prescription including analgesia and topical or systemic antibiotics.

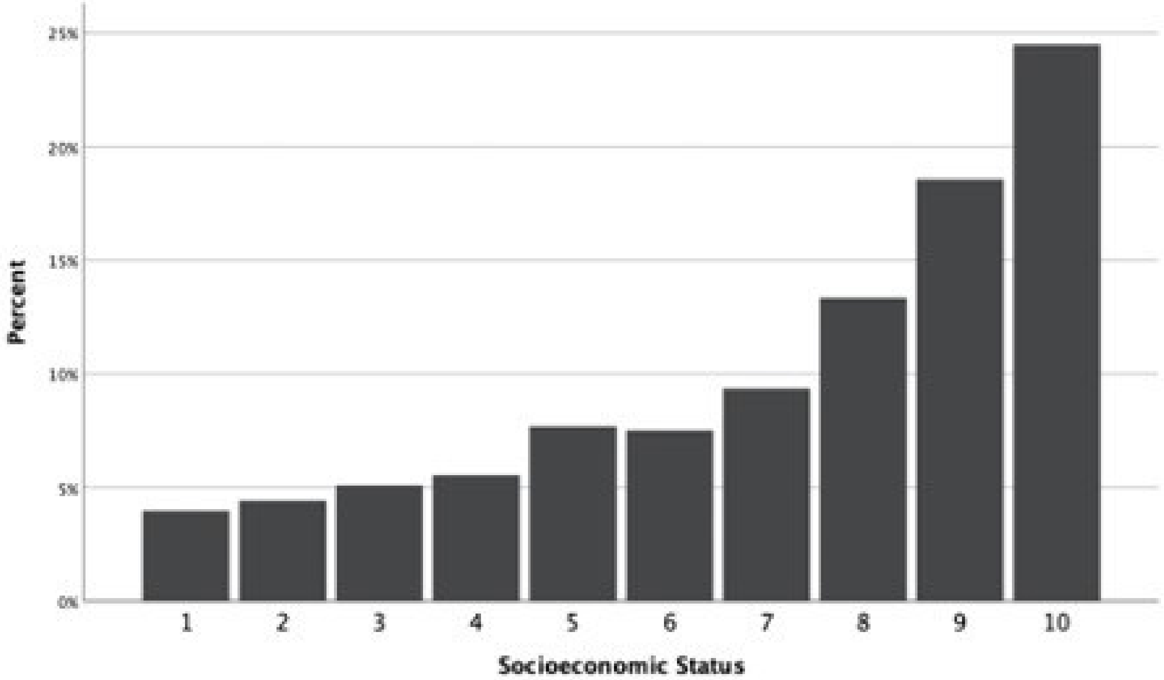
uted with a median of 8 (IQR=5–9). Data relating to ethnicity and discharge diagnosis is shown in Table 1. The most deprived patients (Deprivation Index 8–10) comprised 51% (2055/4030) of all patients (Figure 1).

The time patients waited in ED to see a clinician was not normally distributed with a median time of 53 minutes (IQR=20–110 minutes). The total time patients spent in ED was not normally distributed with a median time of 148 minutes (IQR=72–236 minutes). Patients with ulceration (median=69 minutes, IQR=5–117 minutes) and abscess (median=59 minutes, IQR=26–111 minutes) waited the longest for a clinician. Patients with dental trauma (median=173 minutes, IQR=95–291 minutes) and ulceration (median=161 minutes, IQR=65–237 minutes) spent the longest total time in ED. Time spent in ED ranged from 1 minute to 1346 minutes (22 hours), for a patient who required intravenous antibiotics and fluids for dental pain. Seventy-six percent (3056/4030) of patients were seen by emergency physicians, the OMS Department reviewed 22% (884/4030) and pediatricians reviewed 2% (90/4030). The OMS Department primarily reviewed dental abscesses (407/1072, 38%), soft tissue injuries (129/852, 15%), and toothache (176/1476, 12%). Investigations used in ED included blood tests (1029/4030, 26%) and radiographs (1341/4030, 36%), comprising of plain films (1243/1341; 93%) and computer tomography (CT) (98/1341, 7%). Data relating to wait times, treating specialty and investigations is shown in Table 1.

The total number of ED presentations per year had a mean of 806, ranging from 749 in 2015 to 877 in 2017. January (460/4030, 11%) was the most common month of presentation, August (298/4030, 7%) was the least common. Summer (1154/4030, 29%) was the most common season of presentation, with winter (920/4030, 23%) the least common. Sixty-eight percent (2740/4030) of patients presented outside of working hours, combining both weekends (1359/2740, 50%) and after hours (1630 to 0730) on weekdays (1381/2740, 50%).

Ten percent (387/4030) of dental presentations were admitted to hospital, with 4% (169/4030) requiring treatment under GA. Eighty-eight percent (342/389) of patients admitted were diagnosed with non-traumatic disease, staying a mean of three nights. One patient stayed for 37 days with necrotising fasciitis of odontogenic cause. Fourteen percent (53/387) of patients presented with life-threatening odontogenic infections with deep neck space involvement and airway com-

Figure 1: Total patient presentations stratified by socio-economic status.



promise. All of these patients (53/53, 100%) were managed under GA, 46% (24/53) were of Māori or Pasifika descent. Post-operatively, 92% (49/53) remained intubated with transfer to the ICU, 8% (4/53) were extubated and transferred to the high dependency unit (HDU). Patients spent a mean of three nights in ICU/HDU.

Ninety percent (3643/4030) of patients were discharged from ED with a discharge summary and instructions to follow up with their general dental practitioner regarding definitive management of their dental condition. Thirty-six percent (1311/4030) were discharged with a prescription. Six percent (256/4030) re-presented, comprising 14% (562/4030) of presentations. Eighty-six percent (219/256) re-presented once, and one patient presented 13 times with dental pain. The majority of patients that re-presented were male (51%), Māori (42%) with a median age of 31 years (IQR=23–48). Non-traumatic dental disease accounted for 89% (228/256) of re-presentations. At re-presentation, 11% (29/256) of patients required admission and 9% (23/256) required a procedure under a GA. All patients on re-presentation that were admitted and required management under GA had the discharge diagnosis of dental abscess. Management under GA involved incision and drainage. The median time between presentations was 22 days (IQR=2–286) following discharge from ED. Forty-one percent (104/256) of re-presentations occurred, within a week of discharge. Eighteen percent (19/104) of patients who re-presented within a week were admitted, with 57% (11/19) requiring a GA. No patients required post-operative care in HDU or ICU. Fifty percent (128/256) of patients who re-presented were SES Deprivation Index 9 or 10. Data relating to representation is shown in Table 2.

Discussion

This research was undertaken to give an objective measure of dental presentations to Waikato Hospital ED, their discharge diagnoses, patient epidemiology, management and representation. In total, dental presentations comprised 0.98% of all ED presentations. Dental presentations to ED are considered avoidable through appropriate preventative and primary care. Patients presenting to ED for dental disease represent health inequalities, poor functioning of primary health care, or inappropriate use of the hospital system due to greater need (Yap et al, 2018). Although dental presentations to ED represent a small proportion of hospital presentations, they should not be underestimated, as they are resource intensive, and can cause significant morbidity, and potential mortality to patients. Within our study, 4030 patients spent cumulatively 497 days in ED, with 842 days of admission, requiring 169 GA procedures. Fifty-three patients were admitted and treated under GA for life-threatening non-traumatic odontogenic disease, requiring inpatient stay in HDU and ICU. These resources could have been better utilized for emergent health concerns, and funding better distributed to primary care of dental disease.

Confirming the authors hypothesis, the majority of patients presenting to ED had a discharge diagnosis of non-traumatic dental presentations (72%) from areas of high deprivation (51%, SES Deprivation Index 8–10). Patients were most commonly NZ European (45%) and Māori (42%), with few Pasifika patients (5%). Presentation for Māori were over-represented, when compared to 2018 census data, where 28% of the population identified as Māori.[16] High presentation rates for Māori may be related to lack of dental health policy addressing oral health and a maldistribution of dental practitioner in Māori communities.[17,18] Further barriers to seeking dental care include cost, access, prioritisation, and the lack of oral health knowledge.[1,4] In NZ the cost of oral health services is high, with adults paying a fee for service. Many adults report the cost of private dental care as prohibitive, yet are not financially eligible for funding.[9] Low-income adults may be eligible for $300 of government funding through Work and Income NZ (WINZ) for emergency dentistry yearly. However, based on the NZ Dental Association Fee Survey 2020, $300 would not cover the cost of an examination and simple extraction.[19] Cost and access barriers are reflected in this study's findings, with the majority of ED presenters living in areas of high deprivation and presenting out of hours.

At Waikato Hospital dental presentations to ED were primarily managed by ED (76%), without the requirement of surgical intervention, indicating low acuity of their presentation. The low acuity of dental presentations to ED in NZ has also been highlighted by Smith et al 2021 where 77.3% of patients recorded an Australasian Triage Score (ATS) of four or five. Within our study, this lack of acuity is further represented with few patients requiring specialist OMS review (22%), admission (10%) or treatment under GA (4%). Patients experienced long wait times for conditions such as dental trauma and ulceration, which would be

Table 2: Patient representation demographics, diagnosis and management.

	Total (n)
Total (n)	256 (100%)
Sex	
Male	123 (48%)
Female	133 (52%)
Ethnicity	
European	103 (40%)
New Zealand Māori	130 (51%)
Pasifika people	11 (4%)
Other	12 (5%)
SES Deprivation Index	
1	5 (2%)
2	8 (3%)
3	9 (3%)
4	14 (6%)
5	25 (10%)
6	20 (8%)
7	19 (7%)
8	27 (11%)
9	51 (20%)
10	76 (30%)
Number of representations	
1	219 (86%)
2	29 (11%)
3	6 (2%)
4	1 (<1%)
5	0 (0%)
6	0 (0%)
13	1 (<1%)

Table 2 (continued): Patient representation demographics, diagnosis and management.

	Total (n)
Presentations	
Abscess	83 (32%)
Soft tissue injury	18 (7%)
Toothache	120 (47%)
Dental trauma	10 (4%)
Cellulitis	16 (16%)
Ulceration	1 (<1%)
Complications	8 (3%)
Admission at repeat presentation	
Yes	29 (11%)
No	227 (89%)
General anaesthetic at repeat presentation	
Yes	23 (9%)
No	233 (91%)

more appropriately managed in a primary dental care setting. Furthermore, international literature highlights concerns that non-urgent dental presentations do not receive definitive treatment in ED.[2,4,20] Treatment of acute odontogenic disease is primarily through operative intervention such as extraction or pulp therapy. However, in many EDs this cannot be facilitated due to the lack of resources and expertise.[1] This leads to management with pain relief and antibiotics, which can lead to postponement of definitive treatment, potentially contributing to serious odontogenic disease sequelae requiring invasive surgical management. [2,4,20]

Literature from NZ and Australia further support the findings of this study. Smith et al 2021 conducted a mixed-method study identifying dental presentations and epidemiological data from four urban and provincial EDs within NZ. In accordance with our findings there were high rates of ED attendance for non-traumatic dental disease in males, Māori, and adults. The majority (70%) of patients were treated and then discharged, with few (<10%) requiring specialist management. Health practitioners believed there were high presentation rates of non-traumatic dental disease to ED with a range of severity, adding further resource strains on ED. Clinicians believed the knowledge and skills in ED for managing non-traumatic dental presentations were limited, and they concluded dental care would be more suitably treated outside the hospital setting, to reduce ED presentations.[1] Verma et al 2014 conducted a one-year retrospective audit of dental presentations in ED in a comparative population of Tasmania, Australia. Similar to our study, dental presentations comprised of 0.91% of all presentations, dental abscesses and toothache was the most common diagnosis (66%), with the majority of patients being male (60%) under 30 years of age and presenting out of hours (68%). Consistent with our study 6% represented to hospital.[1] This low rate of presentation may indicate recidivism outside of the hospital setting or accessing funding for definitive dental management, however this was not ascertained from our or Verma et al 2014 studies.

Although outside the scope of research the authors would encourage research into the effect of relief of pain clinics, established subsided dental clinics for ED referrals, and primary prevention strategies such as fluoridation and oral health education programs on ED presentations for dentistry. Reducing dental presentations to ED is going to require a multi-modal approach with changes in policy, funding and the development of services for vulnerable populations. This study provides insight into the patients presenting to ED for dentistry and provides a starting point for discussion and actioning change.

Conclusion

Over the five-year study period, 4030 presentations to Waikato Hospital ED were dental-related, making up 0.98% of all ED presentations. Patients were primarily male, NZ European or Māori, from regions of high deprivation presenting outside of work hours. Dental presentations were primarily low acuity and non-traumatic in origin, not requiring specialist review, admission or management under GA. Few patients represented to ED. Dental presentations to ED are potentially preventable, and may be related to barriers such as cost, access or health knowledge, or an increased need. Further research is required on strategies to reduce ED presentations for dental conditions.

Data

Research data used for this research, is available upon request.

COMPETING INTERESTS

Nil.

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URL

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A Critical Tiriti Analysis of the Pae Ora (Healthy Futures) Bill

Ngaire Rae, Heather Came, Maria Baker, Tim McCreanor

ABSTRACT

AIM: The Pae Ora (Healthy Futures) Bill is the framework for a reformed health system intended to embed Te Tiriti o Waitangi and centre equity. The Bill is informed by the Wai 2575 Health Kaupapa Waitangi Tribunal Inquiry and the Health and Disability System Review, both of which established an urgent mandate to transform the health sector. This desktop review explores to what extent the proposed Bill is likely to uphold Te Tiriti.

METHODS: This paper uses Critical Tiriti Analysis to review the Pae Ora Bill. The analysis involves five phases: (i) orientation; (ii) close reading; (iii) determination; (iv) strengthening practice and (v) Māori final word. As part of that, a determination is made whether the Bill is silent, poor, fair, good or excellent in relation to the Preamble and the four articles (three written, one verbal) of te Tiriti o Waitangi (Māori text).

RESULTS: The desktop analysis showed fair engagement with most of the Te Tiriti elements; but with good commitment to address equity issues. The Bill was silent in relation to wairuatanga (spirituality) and there is no evidence of Māori values informing it.

CONCLUSION: The dominant Crown narrative that interprets kāwanatanga as the right to govern over all peoples pervades this legislation. There are significant power sharing shifts within this Bill and these are welcomed, but whilst the Crown maintains ultimate power and authority only a partial fulfilment of Te Tiriti will be evident within the health system.

The health system in Aotearoa has been restructured by successive governments.[1] The last major reforms (early 2000s) had an explicit equity aim.[2] Māori have consistently advocated for change and documented the systemic failure of the health system to address the health needs of Māori.[3] The Wai 2575 health hearings to investigate Te Tiriti breaches remain active.

Entrenched health inequities[4] prove the failure of previous reforms to fulfil Te Tiriti responsibilities. Stage one Wai 2575 report[5] found Māori health was underfunded, and for over a decade the Crown knew and did not act. Māori were unable to "exercise tino rangatiratanga in the design and delivery of primary health care".[5] The Waitangi Tribunal recommended the transformation of health policy, practice and restructuring the sector including establishing an independent Māori Health Authority (MHA).

Evidence from Wai 2575 influenced the Health and Disability System Review,[6] hereafter referred to as the Review. Instead of furthering the opportunity to address Māori health inequities, the Review created additional Te Tiriti breaches.[7] The Review Panel rejected the Māori Expert Advisory Group recommendation for an independent MHA with commissioning functions, which was "the defining moment of the Simpson-led review" (p.79). This pivotal decision blocked Māori expressions of tino rangatiratanga.

Minister of Health Andrew Little has articulated the aim of the health reforms is to create an equitable health system.[8] The reforms will retain the Ministry of Health to lead the system. Health New Zealand (HNZ) will consolidate all DHBs, and the MHA will be charged with commissioning Māori health services and monitoring HNZ. Geographically defined localities will be created and with the MHA will work alongside Iwi–Māori partnership boards.

Currently, we have a unique window to advance Māori health, reduce inequities and move towards a Tiriti based system.[9] However, Māori have been hopeful about past health reforms only for those hopes to be dashed. Reid[10] has argued that many of the functions proposed for the new MHA, such as monitoring and holding the health system to account for inequitable health outcomes, already exist, albeit ineffectively, within the system.

This paper will add to informed discussions on the health reforms. It examines to what extent the Bill is in alignment with Te Tiriti.

Methods

Critical Tiriti Analysis (CTA)[11] is a methodology to ascertain policy alignment with Te Tiriti. Specifically, CTA examines engagement with the preamble, the three written articles of kāwanatanga (honourable governance), tino rangatiratanga (unfettered authority) and ōritetanga (equity), and the oral article, wairuatanga (spirituality). A CTA has five distinct stages of analysis. The first stage is orientation. It asks high level questions about how does the Bill represent Māori health? Does it refer to Te Tiriti (the Māori text), the Treaty (the English version) or the Treaty principles? The second stage is a close reading against the five elements of Te Tiriti.

In the third stage a determination is made in relation to the five indicators (see Table 1). The determination makes an informed desktop judgement of whether the policy is silent, poor, fair, good or excellent in relation to each Te Tiriti element. Each author made their own independent CTA determination on the Bill and then a final consensus determination was negotiated. The fourth stage focusses on providing practical suggestions to strengthen the Bill. Māori leadership, engagement and critique are inherent to CTA. The final stage is a Māori overall assessment of Te Tiriti alignment.

CTA pertains only to what is written in the Bill; it does not capture the intentions of the writers. The CTA process does not in any way seek to diminish the mana of the policymakers. This particular CTA has been carried out by Māori and Pākehā critical scholars with a background in public health and a commitment to racial justice and Te Tiriti. No ethical approval was required for this study.

Results

Stage one: Orientation

Phase one of the CTA involves a consideration of the orientation of the Bill to Te Tiriti. The explanatory note confirms: "The Bill is intended to give effect to the *principles* of Te Tiriti o Waitangi (the Treaty of Waitangi)" (p.1). It is noted that the Bill's proposed "health system principles" are based on the recommendations from the Wai 2575 inquiry.[5] The intent of setting out these principles is for "Tiriti/Treaty-informed decision-making at the heart of the system" and to "support system-wide accountability for Māori health outcomes" (p.2). The Bill sets out nine ways in which it will give effect to the principles.

Stage two: Close reading

Preamble

Within the Bill, the Crown acknowledges that historically the health system has not operated in partnership nor fulfilled its Te Tiriti obligations. Māori are described as a priority group within the Bill due to their poor health outcomes. Health system strategic accountability and monitoring documents are required to include consideration of outcomes and performance for Māori.

Kāwanatanga

HNZ is the new proposed Crown agency to lead system operations, planning, commissioning, and delivery of health services with the MHA.

The MHA will drive improvement in hauora Māori. They will be an independent statutory entity with clear accountabilities to both Māori and the Crown. They will co-commission and plan services with HNZ and commission kaupapa Māori services, prepare national strategies and provide advice to the Minister. The MHA is responsible to ensure that planning and service delivery respond to the aspirations of whānau, hapū, iwi and Māori in general.

Alongside the MHA, will be a Hauora Māori Advisory Committee and Iwi–Māori partnership boards for each region. The Advisory Committee will advise the Minister on matters related to the MHA including consultation on membership of the MHA board, although final appointment decisions remain with the Minister.

Tino Rangatiratanga

There are two mechanisms for enabling Māori decision-making within the Bill: the MHA and the Iwi–Māori partnership boards. The former will function nationally and the latter at a regional or locality level.

The Iwi–Māori partnership boards are described as a vehicle to represent Māori perspectives on health needs and aspirations, feedback on health system performance and to inform the design of services. They are represented within the Bill as a mechanism for Māori to exercise tino rangatiratanga and mana motuhake (autonomy) within localities (p.2).

The Bill asserts Tiriti/Treaty-informed decision-making will be at the heart of the new health system due to the incorporation of Wai 2575 principles. The Tribunal recommended: "the guarantee of tino rangatiratanga which provides for Māori self-determination and mana motuhake in the design, delivery and monitoring of primary health care".[5] Within the Bill this appears to be reinterpreted to read: "the health system should provide opportunities for Māori to exercise decision-making authority on matters of importance to Māori and for that purpose, have regard to both (i) the strength or nature of Māori interests in a matter; and (ii) the interests of other health consumers and the Crown in the matter" (p.9).

Ōritetanga

An explicit focus on equity is evidenced in the Bill through the stated purpose: "achieve equity by reducing health disparities among New Zealand's population groups, in particular for Māori". This is aligned to the Tribunal[5] principle of "equity which requires the Crown to commit to achieving equitable health outcomes for Māori". The centrality of equity is reinforced whereby the Bill states no direction may be given to the MHA unless it relates to improving equity of access and outcomes for Māori.

Wairuatanga

Wairua or wairuatanga is not mentioned in the Bill.

Stage three: Determination

HNZ is represented as the lead Crown agency who must work with the MHA. However, there appears to be limited authority and autonomy in the MHA to have reach across other Crown health and social entities. Although it is clear what the MHA will work on with HNZ, there is no information on whether the MHA will work with other health entities, including PHARMAC, Health Quality & Safety Commission, or groups that have an influence on Māori health. The Iwi–Māori partnership boards have tino rangatiratanga authority at a local level; there are potential implications for mana motuhake of hapū and iwi who are not part of these boards locally. Noticeably, the key term 'Pae Ora' within the title of the Bill is never explained, nor is it evident how this holistic hauora model will be embedded across the Bill. A commitment to equity is explicit throughout the Bill, but it is worth noting this rhetoric was also explicit within the New Zealand Public Health and Disability Act 2000. Wairua, rongoā and tikanga are invisible within the Bill.

Discussion

Stage four: Strengthening practice

Te Tiriti o Waitangi (the Māori text) and the Treaty of Waitangi (the English version) are distinct documents with different meanings.[12] It is problematic to use the terms 'Te Tiriti' and 'the Treaty' interchangeably. Under the international legal doctrine of *contra proferentem* Te Tiriti is the authoritative text; Te Tiriti reaffirmed Māori tino rangatiratanga as previously declared in the 1835 He Whakaputanga o te Rangatiratanga Nū Tīreni (the Declaration of Independence). Te Tiriti is the text that the overwhelming majority of rangatira (chiefs) and Captain Hobson signed, and is further reinforced by the findings of the Waitangi Tribunal[13] which ruled Ngāpuhi never ceded sovereignty.

Misinformation about Te Tiriti and the Treaty is a longstanding tradition within the public sector. O'Sullivan et al,[14] in a critique of the 2019 Cabinet Circular[15] on the Treaty and Te Tiriti note the Circular unashamedly privileges the English version. This has the effect of making Māori political authority subservient to the Crown in ways that Te Tiriti did not intend. O'Sullivan et al argued the rangatira agreed to the British Crown establishing government over their own (non-Māori), people

Table 1: Critical Tiriti Analysis determination Pae Ora (Healthy Futures) Bill against indicators

	Silent	Poor	Fair	Good	Excellent
Māori are lead or equal partners			X		
Equitable Māori leadership in setting priorities, resourcing, implementation and evaluation		X			
Evidence of inclusion of Māori values influencing and holding authority		X			
Māori exercising their equitable citizenship				X	
Acknowledge wairuatanga, rongoā and tikanga	X				

but did not agree to the colonial relationship which may be read into the English version. It seems this problematic cabinet circular has informed this Bill.

The introduction of Treaty principles into this Bill remains problematic. Important Māori scholars such as Durie, Jackson and Mutu have always maintained Māori are more concerned with what is in the Māori text, rather than the Treaty principles. The principles have often diluted the meaning and substance of Te Tiriti. Certainly, the Waitangi Tribunal[5] have described the three Ps—participation, partnership and protection—as reductionist and out of date. It is unclear yet whether the new Wai 2575 principles will deepen engagement. These important but technical issues could easily be remedied by the Bill consistently referring to the Māori text and recognising Māori as sovereign Tiriti partners.

Intriguingly, the Bill explicitly identifies nine ways it will give effect to the Treaty principles. Although this provides an explicit acknowledgement of the principles within the Bill, it also limits their potential application through this ring fence. The application of the principles is limited by statements within the Bill that make engagement with them optional. The Ministry of Health and listed health entities must be guided by these Treaty principles only "as far as reasonably practicable, having regard to all the circumstances, including any resource constraints". Of note PHARMAC has been exempted from two of the five health system principles.

Te Tiriti compliance would be strengthened by the removal of reference to Treaty principles and critically, the removal of all opt-out clauses. It is an outright breach of Te Tiriti to legislate for Crown agencies to opt out of Tiriti responsibilities.

A regulatory impact statement on the organisational form, governance and accountability arrangements for the MHA informed the Bill development.[16] This asserted that the "Māori Health Authority is not the Treaty partner for the purpose of the health and disability sector, and it does not hold or exercise tino rangatiratanga or mana motuhake – this authority resides with iwi and hapū". This view denies that Māori are entitled to express tino rangatiratanga from both inside and outside of the Crown.[14]

The regulatory statement goes on to note that the MHA "will operate in the space where the exercise of kāwanatanga and rangatiratanga overlap", and is seen as a mechanism for the Crown to meet its obligations of partnership and accountability to Māori.[16] If the MHA is operating in the relational space[17] and is viewed by the Crown as a mechanism to meet Treaty obligations but is not the Treaty partner—then who is the Crown partnering with? Is it Iwi–Māori partnership boards? Their remit has been confined to a locality level. Te Tiriti responsibilities must extend to every level of the health system.

A review of the policy papers informing the Bill reveals strong equity intent to transform the system. However, this all sits within a frame of ultimate power and decision-making residing with the Minister and the Crown. This reflects a Crown understanding that privileges the Treaty and incorrectly interprets the kāwanatanga granted to non-Māori to apply across all New Zealanders.

The absence of any mention of wairuatanga reflects the worldview that this Bill was written from. The requirement for the development of a New Zealand health charter which aims to provide common values, principles and behaviours for organisations and workers has potential to shape cultural change. A Bill review and rewrite are required to ensure Māori worldviews are centred.

Conclusion

Stage five: Māori final word

There is optimism around the proposed health reforms. Nonetheless, there are limitations to the Pae Ora Bill in its current form at conceptual and procedural levels. The Bill currently does not live up to its Māori name. The Bill should provide an explanation of Pae Ora and the clarification of how Pae Ora will shape the health system, including how it will aid good governance, relationships, capacity and accountability with Māori and relevant Crown entities. There is a need for broader public policy that engages Māori by helping to give a public profile to priority Māori health areas, and recognise that Māori have the right to a health and disability system that will fulfil their holistic health needs and aspirations.

A Te Tiriti approach is something Māori and the Crown agree on. Considering the concerns of the Review and Wai 2575, the Bill needs to centre Māori health priorities and aspirations.

Many Māori individuals, organisations and communities may share common values, but they may differ on priorities. Although, it is expected that Māori will hold perspectives of wellbeing as more than physical health or the absence of disease and will include a holistic view that balances the physical, emotional, mental and spiritual elements of life.

Māori need to decide who represents Māori locally and nationally and it will be problematic if this remains a Crown decision. The presence of opt-out clauses proposed within the Bill demonstrates extraordinary patch protection from Crown entities that will only be accommodated by status quo positioning of current policy. All of which raises fundamental Te Tiriti concerns about Te Tiriti compliance and authentic Māori and Crown partnerships. The Bill needs to be reworked so that Māori are not structurally the junior Tiriti partner. The Bill does not engage Māori tino rangatiratanga. Transformation needs to occur within the health system, but also in how the Crown engages with Māori in system design. The Pae Ora Bill has the potential to be an influential policy instrument in support for a Te Tiriti centred health and disability system in Aotearoa.

COMPETING INTERESTS

Nil.

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Learning is what happens between seeing patients: defining clinical access

Pete M Ellis, Tim J Wilkinson

ABSTRACT

The inability to access clinical placements during the COVID-19 pandemic stimulated us to reflect on key elements of the experience, beyond history taking and examination. We were also mindful of concerns about work readiness of new graduates. We identified seven aspects of clinical experience distinct from those requiring direct patient contact. These are: recognise and contribute to the collective competence of multidisciplinary teams; apply project management principles to the complexities of clinical care; integrate personal and team-based clinical reasoning; deliver patient-centred collaborative care; achieve an integrated perspective of clinical care; demonstrate adaptability to health systems; consolidate professional identity formation. We consider that making these aspects explicit in learning objectives and assessments in medical schools is likely to improve the work-readiness of new graduates and should also be reflected in accreditation standards.

Clinical experience is the *sine qua non* of medical education. Teachers and students often assume this is synonymous with "seeing more patients." We wish to highlight what else it might be. The COVID-19 pandemic limited clinical access for many students and raised concerns about the consequences for students' training. Since we often only appreciate things when they're gone, the lack of clinical access prompted us to consider what it was that students missed out on. Was it just seeing patients? Clinical access and experience have a diversity of meanings to different observers.

At the 2015 conference of the Association for Medical Education in Europe, Jonas Nordquist extended an architectural maxim that "communities are what happen between buildings"[1] to "learning is what happens between lecture theatres." We posit that "learning is what happens between seeing patients." Although interviewing and examining patients is central to achieving basic clinical competence in recognising both the normal and the abnormal, generic clinical competence requires more than this. Current medical school accreditation ensures that new graduates are well prepared, as individuals, to assess single patients presenting with uncomplicated presentations of common conditions, but these standards do not necessarily ensure that graduates are prepared for the messy reality of working as part of a team to treat multiple patients simultaneously, often with complex presentations of varying acuities, at unpredictable times.[2] Dealing with multiple patients simultaneously within a team is not an innate skill. Rather, it is learned by observing and participating in team activities and team discussions, many of which are "between patients." Given this, and through mutual discussion and drawing on our interests in workplace learning[3,4] and work readiness,[2,5] we propose an extended set of competencies afforded by clinical access, beyond those related to direct patient contact. We hope this makes explicit the tacit skills that could be lost if there is insufficient clinical contact.

- **Recognise and contribute to the collective competence of multidisciplinary teams.** Being a participant/observer in a clinical team enables us to learn how the collective competence of the team delivers care[6] and how interdisciplinary and interpersonal challenges are overcome.
- **Apply project management principles to the complexities of clinical care.** Aspects of clinical practice such as discharge planning or complex coordination of care require balancing multiple competing priorities against the changing availability of resources.[3] Understanding how the team addresses this requires a sophisticated

understanding of the principles of project management.
- **Integrate personal and team-based clinical reasoning.** Listening to team discussions about diagnostic and management dilemmas and how evidence-based guidelines are modulated to each patient’s sociocultural context assists students to learn real-life clinical reasoning.
- **Deliver patient-centred collaborative care.** Seeing how a management plan is developed collaboratively with the patient and all members of a multidisciplinary team models interprofessional skills and patient-centred practice.
- **Achieve an integrated perspective of clinical care.** Understanding a whole episode of clinical care clarifies the contribution, and importance, of the component parts.
- **Demonstrate adaptability to health systems.** Learning to operationalise patient care under time pressure in heterogenous health systems, such as a variety of IT systems, prepares students to work effectively in a variety of clinical workplaces.
- **Consolidating professional identity formation.** Meaningful interactions with other team members allow them to observe and imitate role models and to “act” as future professionals.[7]

The pandemic highlighted how effective simulation can partially compensate for more limited direct clinical access and the importance of stimulating reflective discussions between students about their clinical experiences. However, simulation often focuses on the direct student-patient interaction. The competencies highlighted above go beyond this. Although these competencies can be proactively planned into simulations, they should also become explicit outcomes of clinical contact. Clearly direct engagement as a participant in a junior apprentice role in clinical teams could provide excellent preparation to acquire these competencies. It will require development of appropriate objectives, and valid assessments, related to the themes we have identified above.

Most of these skills are generic across medicine. Effective embedding in an apprentice-style role requires attachments of significant duration, and this means that not every student would be able to have such an experience in every discipline. The pandemic highlighted that experiences in one discipline are often close enough to those in another to allow students to meet global competencies and graduate. This may provide an uncommon opportunity to change how students rotate through different disciplines, at least in their final year.

We see such developments as critical to improving the work-readiness of our graduates. This requires refinement of medical school and accreditation bodies’ definitions of “clinical experience” to incorporate the suggested competencies.

COMPETING INTERESTS

Nil.

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Some unusual cases of multiple-victim, multiple-offender child sexual abuse (1980–2020)

Mark WI Webster

ABSTRACT

AIM: To assess the pattern of some unusual cases of child abuse, including their trial and subsequent appeal outcomes, over the last 40 years.

METHOD: Cases of multiple-victim, multiple-offender child abuse, occurring in a pre-school or similar setting, without physical evidence of abuse, from developed, English-speaking countries were collected.

RESULTS: Thirty cases fulfilled the study criteria: 26 from the US and one each from Australia, New Zealand, Canada and the UK. The first was in 1983 and the most recent in 1994. Of 81 people accused, 43 (53%) were female. One or more defendants were convicted in 19 of the 30 cases (63%). The verdict was subsequently overturned in 13 of 19 (69%) convictions, up to 30 years later. Three additional cases occurred in Europe between 1992 and 2006

CONCLUSION: These cases, relying upon children's testimony and evidential interviewing techniques overseen by law enforcement officers, occurred in a cluster from the early 1980s until the mid-1990s, with almost none since. This highly unusual pattern, combined with two thirds of convictions being overturned, supports doubts regarding whether abuse occurred in these children.

Some very unusual cases of suspected child sexual abuse were first reported in the US in the early 1980s.[1] Young children, often after intensive questioning by parents, caregivers, social workers and law enforcement officials, accused multiple alleged perpetrators of sexual abuse, and also of carrying out other bizarre activities. A subset of these cases arose in a childcare, pre-school or similar setting, with multiple people employed by or linked to the childcare being accused, many of whom were women. There was no physical evidence of abuse, so determining the innocence or guilt of the alleged offenders relied completely upon the testimony of the children. The cases often had a high media profile and resulted in long and complex court proceedings.

One case with these features occurred in New Zealand. In 1991, Peter Ellis, a pre-school teacher at the Christchurch Civic Crèche, was accused, and subsequently convicted, of abusing children under his care. Opinions on whether abuse occurred remain divided.[2,3]

This study describes the pattern of these cases over the last 40 years, where they occurred, the trial verdict, and any changes to that verdict from subsequent appeals.

Methods

Child sexual abuse cases from the US, Canada, UK, Australia and New Zealand were included in the analysis if they fulfilled the following specific criteria:

1. Abuse occurring in a childcare, pre-school, crèche, kindergarten or Sunday school setting
2. Multiple children describing abuse
3. All children <6 years old at the time of the alleged abuse
4. Multiple people accused of abuse (including those instances in which only one person was eventually charged)
5. No physical evidence of child abuse
6. Description of associated bizarre or implausible events by the children
7. No physical evidence supporting the bizarre or implausible events

Cases were identified from books, journal articles, and online searches, including newspaper archives, using combinations of the search terms "sex abuse," "pre-school," "day care," "child care," "multiple victim," multiple offender" and "children's testimony"

Cases were included if one or more people were arrested and charged with a sex abuse offence. The court case outcome was determined, along with whether those convicted successfully appealed their conviction. Case inclusion was not determined by the symptoms that the children described. Cases were also included where a supposed physical sign of sexual abuse, such as reflex anal dilatation, was subsequently discredited because the sign was shown to lack sensitivity and specificity for diagnosing abuse.

Additional cases from European countries, fulfilling the same criteria, that emerged during the search were added. These were not included in the primary analysis because a comprehensive search of all European countries and of non-English language sources was not undertaken, making capture of all eligible cases uncertain.

Results

The 30 cases identified from the US, UK, Canada, Australia and New Zealand that fulfilled the study criteria are listed in Table 1.

Of the 30 cases, 26 were from the USA. All these cases occurred during the nine years from 1983 to 1991. Four cases in the main analysis were from outside the USA; the first was from Australia in 1989, and the last from the UK in 1994. Forty-three of 81 people accused (53%) were female.

One or more defendants were convicted in 19 of the 30 cases (63%). Charges were dropped in six, and the defendants were acquitted in the other five cases. Of all those accused, 36 of 81 (44%) were convicted; of those 36, 21 (68%) were male. The most recent conviction was from a 1991 case.

With regard to longer-term outcomes, the verdict was overturned (although some remained on parole) in 13 of 19 convictions (68%). Another three were paroled without their convictions being overturned, and two completed their prison sentences. Only one of those convicted remains in prison. In those whose verdicts were overturned, the time taken ranged from four to 30 years (median eight years). The two cases from Texas were both overturned, after 26 and 28 years, respectively.

Of the three additional European cases, the earliest was in 1992, and the most recent, in 2006, is the only one from this century. None resulted in a conviction

Discussion

Child sexual abuse is, unfortunately, common in New Zealand. The Christchurch Health and Development Study found that 6% of participants had suffered severe abuse before the age of 16.[4] Multiple-victim, multiple-offender child abuse, with no physical evidence of abuse and bizarre testimony from the children, is a very narrow subset of child sex abuse. Cases were first reported from Kern County, California, in 1982.[1] The first case in a pre-school setting, an even narrower subset, was from Manhattan Beach, Los Angeles, a year later.[5,6] Hundreds of children were thought to have been abused. The court proceedings took seven years and cost US$15 million (at the time the most expensive case in US legal history), and ultimately led to acquittal of the defendants. Over the next eight years, there were 25 further similar USA cases from 16 different states, with at least one person convicted in 19 of them.

The first case outside of the US was not until 1988 in Australia, followed by more in New Zealand in 1991, Canada in 1992 and the UK in 1994. The European cases were also among the most recent, occurring in Germany in 1992, Norway in 1994 and Italy in 2006. The only non-US case resulting in a conviction is that from Christchurch, New Zealand. The Christchurch case was also the most recent one with a conviction.

The passage of time clearly shows the case pattern, something not able to be appreciated when they were occurring (Figure 1). These cases appeared to arise out of nowhere, rapidly increase in number within one to two years, wane over the next decade and then almost disappear by this century. The distribution of cases has similarities to an infectious disease outbreak—starting in California, spreading around the US, heading to other developed English-speaking countries, and then on to Europe.[7]

One unusual feature of these cases is that over half of those accused were women. This proportion differs markedly from usual child sex abuse, in which over 90% of perpetrators are male.[8]

Another unusual feature is the outcome of appeals in those convicted. Two thirds of the convictions were subsequently overturned. Some of the successful appeals took a very long time: in three of the cases, between 26 and 30 years. For comparison, a study from Victoria, Australia, found that in all criminal trials just over half were convicted, that 38% of the convictions were appealed, and that half of those appeals were

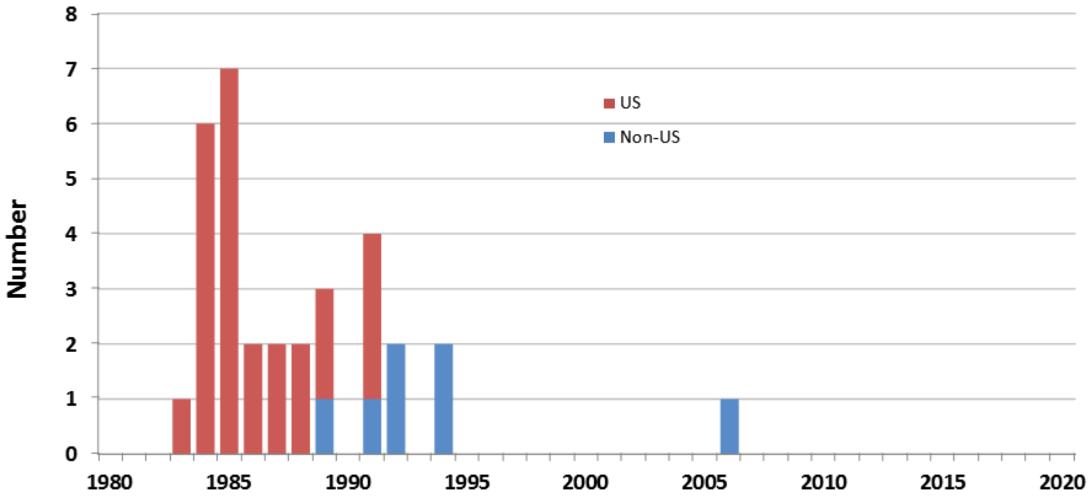
Table 1: Cases of multiple-offender, multiple-victim sex abuse occurring in pre-school settings.

Year	Place	Charged	Trial outcome	Subsequent outcome
1983	McMartin Pre-school, Manhatten Beach, CA, USA	1M, 1F	Acquitted	
1984	Country Walk Day Care, Miami, FL, USA	1M, 1F	Convicted	1M still in prison, 1F completed sentence
1984	Rogers Park Day Care, Chicago, IL, USA	1M	Acquitted	
1984	Early Childhood Development Center, Pittsfield, MA, USA	1M	Convicted	Overturned 2014
1984	Praca Day Care Westchester, NY, USA	4M, 1F	Convicted	Overturned 1996
1984	Small World Pre-school, Niles, MI, USA	1M, 1F	1M convicted	Overturned 1990. Pled guilty to one lesser charge in lieu of retrial
1984	Fells Acres, Malden, MA, USA	1M, 2F	Convicted	2F Overturned 1995, reinstated and overturned 1997. 1F died, 1F paroled 1997. 1M paroled 2004
1984	Georgian Hills Baptist, Memphis, TN, USA	1F	Convicted	Overturned 1991. Exonerated 1998
1985	Wee Care, Maplewood, NJ, USA	1F	Convicted	Overturned 1993
1985	Multiple church day care centers, Bronx, NY, USA	3M, 1F	3M Convicted	Overturned 1989, 1990
1985	Jubilation Day Care Center, Fort Bragg, CA, USA	2F	Charges dropped	
1985	Craig's Country, Clarkesville, MD, USA	1M, 1F	1F convicted	Overturned 1991
1985	Kiddie Kastle, Coos Bay, OR, USA	1M, 2F	Charges dropped	
1985	Felix's, Carson City, NV, USA	1M, 1F	Convicted	Overturned 1993
1985	East Valley YMCA, El Paso, TX, USA	2F	Convicted	Overturned 2013
1986	Presidio army base child care, San Francisco, CA, USA	2M	Charges dropped	
1986	Home day care, Sequim, WA, USA	1M, 1F	Charges dropped	

Table 1 (continued): Cases of multiple-offender, multiple-victim sex abuse occurring in pre-school settings.

Year	Place	Charged	Trial outcome	Subsequent outcome
1987	Gallup Christian Roseburg, OR, USA	2M, 1F	Convicted	Overturned (1) 1991, paroled (2)
1987	Rainbow Christian Vancouver, WA, USA	1F	Convicted	Paroled
1988	Sunshine, Edgewood, IA, USA	1F	Convicted	Paroled (10 of 25 years)
1988	Home day care, Smithfield, NC, USA	1M, 1F	1M Convicted	Completed 10-year sentence
1989	Little Rascals Edenton, NC, USA	2M, 5F	1M, 2F Convicted	Overturned 1995
1989	Seabeach kindergarten, Sydney, NSW, Australia	1M, 3F	Charges dropped	
1989	Breezy Point Day School, Langhorne, PA, USA	1M, 2F	Charges dropped	
1991	Fran’s, Oak Hill, TX, USA	1M, 1F	Convicted	Overturned 2017
1991	First Presbyterian, Mansfield, OH, USA	1M	Convicted	Paroled (9 of 14 years)
1991	Faith Chapel Sunday School, Spring Valley, CA, USA	1M	Acquitted	
1991	Christchurch Civic Creche, Christchurch, NZ	1M, 4F	1M Convicted. Charges dropped 4F	Completed sentence
1992	Home day care babysitting, Martensville, Sask, Canada	7M, 1F	Acquitted	
1994	Shieldfield Nursery, Newcastle, UK	1M, 1F	Acquitted	
1992	Montessori nursery, Muenster, Germany	1M	Acquitted	
1994	Botnegård kindergarten, Bjugn, Norway	1M	Acquitted	
2006	Olga Rovere nursery school, Rignano Flamingo, Italy	1M, 4F	Acquitted	

Figure 1: Number of cases, by year, between 1980 and 2020. The majority of cases were from the US, and US cases largely preceded those from other countries.



successful. Of the child sexual abuse cases which were appealed, half of the appeals were also successful, although most of those resulted in a new trial, with only 6% acquitted of all charges.[9]

The main study limitation is that it is not possible to be certain regarding the completeness of eligible case capture. Cases before 1983 may have been missed, as some newspaper archives have less easily searched older records. The assessment of European cases was not comprehensive, as it was not undertaken country by country, and some may have been only reported in foreign language publications. On the other hand, these cases tended to attract a high media profile, with many reported in multiple sources. It is extremely unlikely that the almost complete disappearance of these cases over the last 25 years is due to them being missed.

The study findings should only be applied to those cases fulfilling the narrow inclusion criteria. There is ongoing disagreement regarding the likelihood of abuse having occurred, particularly in cases with some but not all features of those included in this analysis.[10]

This study does not address reasons for the decline in the number of these cases from the early 1990s onwards. It has been proposed that scientific studies on suggestibility in pre-school aged children published from the late 1980s onwards[11–16] led to improved evidential interviewing techniques.[11–14] The 1992 US Federal Bureau of Investigation ‘Investigator’s Guide to Allegations of “Ritual” Child Abuse,’ following an investigation finding no evidence of widespread ritual child abuse over the previous decade,[17] may have led to improved US law enforcement investigation of initial complaints.

In summary, a cluster of apparent multiple-victim, multiple-offender day-care child abuse cases occurred in the 1980s and early 1990s. Convictions depended upon the children’s testimony and the reliability of the techniques used to elicit that testimony. The very unusual epidemiologic pattern of these cases, almost disappearing by this century, along with the high proportion of convictions which were subsequently overturned, support doubts about whether abuse occurred in these children.

COMPETING INTERESTS

Nil.

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An unusual case of *Mycobacterium tuberculosis* peritonitis at Waitematā District Health Board

Luke Hawley, Josh Narayan, Suheelan Kulasegaran, Richard Harman,
Jamie-Lee Rahiri, Teresa M Holm

Tuberculosis (TB), an infectious disease caused by *Mycobacterium tuberculosis*, is estimated to infect one-third of the world's population. TB generally affects the lungs. However, it can have extrapulmonary manifestations.[1–2] New Zealand has had a declining incidence of community-acquired TB since the 1960s.[3] The decline in TB cases is largely due to increased living standards, control of bovine TB and treatment advances. Patients diagnosed in recent years are often recent immigrants and/or from low socioeconomic groups with overcrowded housing.[2–3] The abdominal manifestation of TB is infrequent with diverse symptoms ranging from non-localised abdominal pain to ascites and fevers.[4] This case highlights the difficulties in diagnosing peritoneal TB requiring PCR-based testing.[5,6]

Case report

A 35-year-old Indian female with a background of a previous splenectomy for idiopathic thrombocytopenic purpura presented to hospital with a two-week history of fevers/rigors and worsening diffuse generalised abdominal pain. Important clinical and investigative findings are presented below.

Due to ongoing abdominal pain and the development of peritonism, the patient proceeded to diagnostic laparoscopy. Intraoperative observations included multiple peritoneal and omental nodules with widespread peritonitis without purulent or enteric contamination. Large volume serous ascites was present, and a methylene leak test showed no evidence of perforation. Appendicectomy, peritoneal and omental biopsies, ascitic fluid sampling was performed. Analysis of biopsies and ascitic samples was carried out with haematoxylin and eosin staining and PCR TB testing.

Post-operative inflammatory markers continued to rise with ongoing fevers. A subsequent serial chest X-ray showed evidence of pneumonia with dense opacities visible in the left lower lobe. No organisms were isolated from surgical, PBC, mid-stream urine cultures. A diagnosis of peritoneal tuberculosis with a superimposed hospital-acquired pneumonia was made. Treatment was initiated and comprised rifampicin plus isoniazid, ethambutol and pyrazinamide. The patient was then referred to Public Health and Infectious Diseases services for ongoing follow-up and underwent weekly laboratory tests.

Discussion

This case highlights the challenges in diagnosing atypical TB infections. TB is rare in developed countries, with only 350 cases reported in 2018 compared to the estimated 10 million cases worldwide.[7] Abdominal TB comprises 0.1% to 0.7% of all cases and the resulting peritonitis it can cause is primarily spread throughout the body hematogenously from an original pulmonary infection or due to reactivation of latent TB in the peritoneum.[5,6] Progression of abdominal TB can lead to ulceration, bleeding and perforation.[8,9] Due to New Zealand's small population and the low numbers of abdominal TB, there is a paucity of information regarding the incidence in this country.[4]

Current literature suggests that long-standing symptoms make the diagnosis of peritoneal TB more likely. However, in this case the patient presented with a two-week history of abdominal pain. This case demonstrates that a longitudinal history is not always expected, and the combination of a short history and non-specific symptoms of peritoneal TB made this infection difficult to distinguish from other acute abdominal pathologies. In addition, the development of PCR testing is a common tool for the rapid diagnosis of TB. Providing a reliable sensitive augmentation to culturing samples.[10] In this case, numerous sam-

Figure 1: A computed tomographic scan of the abdomen and pelvis with contrast shows extensive stranding and diffuse, nodular peritoneal thickening and enhancement (Panel A) and a large amount of ascites as noted by the arrow (Panel B).

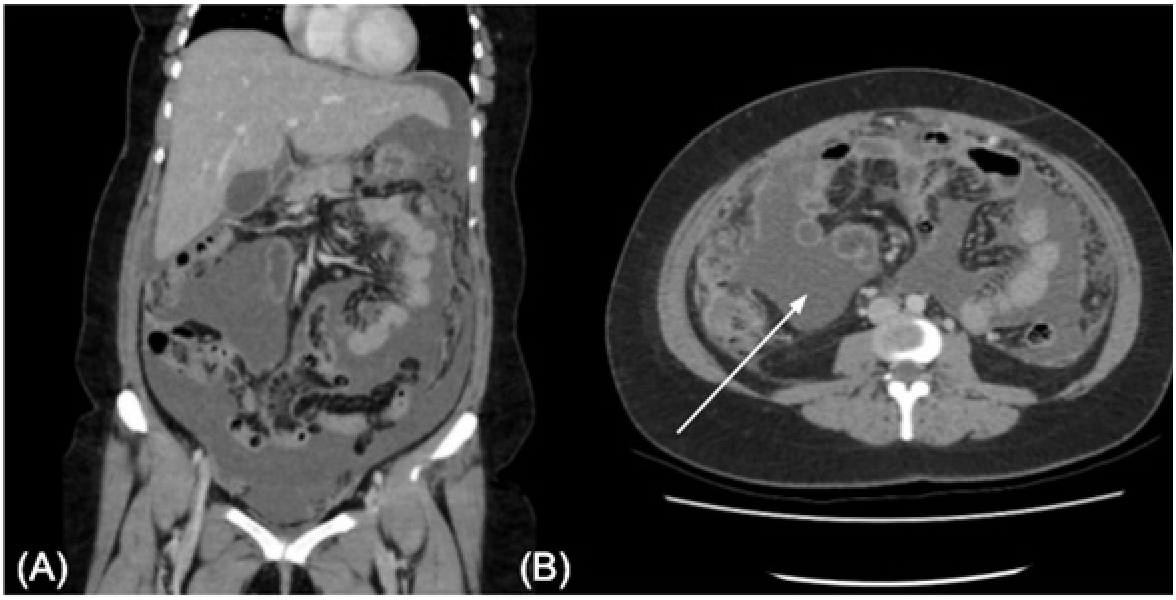

Table 1: Relevant clinical and Investigative findings.

History and examination	Investigations

• Temperature 38.5°C
• Heart rate 101
• Abdominal distension with generalised tenderness without peritonism
• No lymphadenopathy
• History
  • No TB contacts or family members that had ever contracted TB
  • Born and raised in India and moved to New Zealand in 2010
  • Recently returned from a two-month visit to urban India
  • Non-smoker
  • Nil alcohol use
	• COVID-19 screen negative
	• HIV screen negative
	• Bloods
	  • WBC 12
	  • CRP 170
	  • Normal liver function tests
	  • Normal renal function tests
	  • Normal PBC
	• Normal stool cultures
	• CXR—unremarkable
	• CT abdomen (Figure 1)—moderate ascites with extensive stranding and diffuse, nodular peritoneal thickening and enhancement. There was additional evidence of mild bowel thickening and a right bulky ovary
	• USS pelvis—unremarkable (normal ovaries)

ples were cultured and were TB negative. However, TB PCR effectively showed *M. tuberculosis* in samples from the diagnostic laparoscopy. This report reminds clinicians that, although it is rare, undiagnosed abdominal tuberculosis has a mortality rate of 8% to 50%, and therefore should be a diagnostic differential in patients with abdominal pain, fever and ascites of any duration, especially if the patient has known epidemiological risk factors.[9] In addition, reliable diagnostic screening for TB should include PCR of all patient samples.

Table 2: Pathology results.

Specimen	**Results**
Appendix	Reactive inflammation
Peritoneal biopsies	Granulomatous tissue with lymphocytic inflammatory infiltrate Positive TB PCR
Omental biopsies	Granulomatous tissue with lymphocytic inflammatory infiltrate Positive TB PCR
Ascitic sample	Positive TB PCR
Bronchial washings	Negative TB PCR

COMPETING INTERESTS

Nil.

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We would like to thak our patient who has provided written consent for medical information to be published in this manuscript.

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Cheap alcohol at the cost of health equity

Esther U, Nicki Jackson

The price of alcohol and its affordability are major drivers of alcohol use and harm in Aotearoa New Zealand.[1] In 2020, alcohol products were found to be more affordable than ever before,[2] driven by the high availability of cheap alcohol from off-licences (eg supermarkets, bottle stores, online sales) where at least 80% of all alcohol is now sold.[3] The preference for low-price alcohol by heavy drinkers,[4] daily drinkers,[4] and Pasifika and Māori drinkers[5] contributes to substantial inequities in the burden of alcohol harm.

This letter summarises the findings of an exploratory audit of prices for the cheapest alcohol for sale from off-licences across Tāmaki Makaurau Auckland.[6] In brief, findings revealed that most beverage types had a budget-end range of products available for less than $1 per standard drink, and many of New Zealand's most popular alcohol brands across a range of beverage types could be purchased for less than $1.30 per standard drink.

Low prices are facilitated by the low rates of tax applied to New Zealand's most harmful drug, and the absence of a minimum unit pricing policy (that sets the lowest price a standard drink can be sold). Despite the lifelong, wide-ranging and serious externalities from alcohol use, excise tax comprises a relatively small proportion of the retail price. Approximately 15–25% of the price of an average off-licence beer, wine and Ready-to-Drink (RTD), and ~50% of the price of spirits, is excise tax. In comparison, excise tax comprises more than 60% of the price of cigarettes. New Zealand's excise structure represents a hybrid approach, whereby beverage types are taxed according to their ethanol content (eg beer, spirits) or by beverage volume (eg wine, higher-strength ciders and RTDs). Goods and Services Tax and the Health Promotion Agency Levy are also imposed on all alcohol products sold in the domestic market.

Population-based policies that address the price and affordability of alcohol represent the strongest, most cost-effective measures to reduce alcohol use and harm.[7] Higher prices can delay alcohol intitation among adolescents[8] and support drinkers to purchase less alcohol, thus hindering the progression from moderate drinking to heavy drinking to dependent drinking. All this adds up to less harm to the drinker and others, and more healthy life years gained given the duration of an alcohol use disorder for many New Zealanders is long-lasting.[9]

Increasing the overall price of alcohol by 10% is estimated to reduce annual consumption by 5%,[10] representing an absolute reduction in consumption in New Zealand of around 25 million litres of alcoholic beverages.[11] Previous Government-commissioned reviews, by the Law Commission and the Government Inquiry into Mental Health and Addiction, have strongly recommended alcohol price increases to address the rising affordability of alcohol.[12–13] The Ministry of Justice has also modelled the effects of excise tax increases, showing annual reductions in health loss and crime, improved productivity, and substantial increases in Government revenue from excise tax in the order of hundreds of millions of dollars.[14]

To investigate the low price of alcohol products, we conducted an exploratory audit of alcohol prices at off-licences across Tāmaki Makaurau Auckland. From 25 March to 5 May 2021, we collected online price data of 743 alcohol products from 22 off-licences (12 bottle stores and 10 licensed supermarkets) located in, or near, deprived areas (data zones in quintiles 4–5 of the New Zealand Index of Multiple Deprivation 2018[15]). The aim was to identify up to five of the cheapest products for sale, across 11 beverage types. As supermarkets are only permitted to sell beer, wine (cask and bottled red/white) and cider, the analysis for these outlets was restricted to these five beverage types. In total, 498 of the cheapest alcohol products and 245 of the cheapest, most popular products (ie products that belonged to brands with high brand share in New Zealand) were identified. This comprised cask wine (42/12), bottled red (28/30) and white (16/30) wine, beer (80/62), cider (53/60), light spirits (16/0), RTDs (73/30) and four types of spirits (190/21). The total count of the cheapest and most popular products is shown in parentheses, respectively. For each product, the price per standard drink (10g pure alcohol) was calculated. Further details are published elsewhere.[6]

In relation to the cheapest alcohol products, we found that five of the 11 beverage types had one product or more being sold for less than $1 per standard drink (US$0.66, GDP£0.49). Cask wine was the cheapest product available, sold for 77c per standard drink, followed by bottled red wine (85c), bottled white wine (88c), light spirits (91c), beer (98c), and cider ($1.08). The cheapest spirits and RTDs were sold for $1.20 or less per standard drink. Of the five lowest price products for each beverage type, all five cask wines were for sale at less than $1 per standard drink, followed by beer (four of the five lowest price products), red wine (three products), white wine (two products) and light spirits (one product). Based on the lowest price in the current study, a woman would only need to pay $3.85 and a man $4.62, to exceed the Health Promotion Agency's low-risk drinking advice for a single drinking occasion.[16]

In relation to New Zealand's most popular alcohol brands, the study found that the lowest price to purchase any top five (by brand share) cask wine, bottled red or white wine, beer, cider, RTDs, gin, vodka and bourbon was less than $1.30 per standard drink. Of particular concern, three of the five lowest price popular beers were sold in large quantities, ie as a 24 pack.

Almost all of the five lowest price beers, wines and ciders (budget end and most popular) were sold by supermarkets. Across all off-licences, more than one third (35%) of the 498 cheapest alcohol products were being sold using some form of price-based promotion, most commonly being sold at a consistently low price (eg 'Everyday Low Price'). Wine had the highest proportion (89% and 94% for white and red wine, respectively) of products on promotion. In relation to the most popular alcohol products, one half (50%) were found to be on promotion. Although multi-buy promotions were relatively rare (only 5% of the cheapest products were also sold in this way), they offered the lowest prices per standard drink found in the study (81c for wine and 85c for beer).

The results of the audit represent online prices only, from a selection of off-licences in New Zealand's largest city. It is likely possible that lower prices can be found for products on promotion in-store, especially from bottle store franchises that are known to sell very cheap alcohol but are not currently located in Tāmaki Makaurau Auckland. Further studies are required to examine the variability in prices across the country, and in particular, to identify inequities in the distribution of cheap alcohol sales across communities.

In 2010, the Law Commission noted that the budget end of the alcohol retail market had witnessed only minimal price increases over the previous two decades.[12] Given the very low price of wine in the current study (in part due to it being under-taxed compared to other beverage types), it should be of no surprise that New Zealand research found that almost one half of a sample of dependent drinkers exclusively consumed wine,[17] and that cheap wine was a key beverage consumed in very heavy drinking occasions.[5]

In 2021, the Minister of Justice Hon Kris Faafoi announced that a review of the Sale and Supply of Alcohol Act 2012 will take place, to be scoped this parliamentary term. Failure to address the high affordability of alcohol in this review will compromise the effectiveness of any future amendments to the Act and therefore maintain the unacceptably high levels of, and inequities in, alcohol harm. The recommended increase to excise rates by 50% would see $3 added to the price of a 12 pack of beer, $1.35 to a bottle of wine, and $12 to a bottle of spirits. As excise tax comprises a greater proportion of the price of the cheapest alcohol products, these products will be most affected by higher excise rates. It is likely that tax increases will need to be complemented by minimum unit pricing to sufficiently raise the price of the cheapest alcohol products in the market. An increasing number of countries and jurisdictions have mandated a minimum price, showing pro-equity impacts on alcohol use and health harms.[18,19]

The benefits from New Zealanders drinking less are vast, not the least being greater child wellbeing, safer homes, roads and communities, improved physical and mental health, and higher productivity and economic wellbeing. The communities that experience the greatest inequities will benefit the most from reduced harm. This includes New Zealanders living in the most deprived neighbourhoods, where 30% of adults do not drink.[20] This large group of non-drinkers will experience safer communities for their children to thrive at no additional cost. For drinkers, the regressive financial effects of higher alcohol taxes and minimum pricing are negligible, and concentrated among the heaviest drinkers.[21] These drinkers stand to gain substantial health benefits from reductions in consumption. Beyond health benefits, reduced consumption can also alleviate the negative financial harms from drinking that are reported by more than one in twenty New Zealand drinkers (including 14% of Māori drinkers).[22] To mitigate regressive effects, we recommend that the increased revenue generated from excise increases be directed to alcohol harm reduction and addiction services, particularly Māori-led programmes and services to honour the Crown's commitment to Te Tiriti o Waitangi and provide active protection of Māori health.

The costs of alcohol harm have hefty personal, collective and economic price tags, paid by every member of society in this generation and the next. Addressing the affordability of alcohol is a public health necessity—not an option—in our efforts to lift inter-generational wellbeing and eliminate health inequities.

COMPETING INTERESTS

Nil.

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History of Medicine [extract from February1922 editorial]

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A CORRESPONDENT whose learning and wisdom are of a high order has written to say that the attention of our readers should be kept alive to out great British medicine men of the past, and we hope as occasion offers to continue the sketches of historical figures in medicine. Our calling is peculiar in this respect, that many of our practitioners know little or nothing of the landmarks in the progress of our art, and its interdependence on the natural sciences. Our correspondent justly says that a knowledge of the work of the medical reformers is a most valuable incitement to a higher tone in the professional life of the present and future. He thinks that our young New Zealand graduates have a poor sense of proportion and little reverence for history. This is a hard saying, and, if correct, should receive the attention of the medical faculty at the Otago Medical School. We suggest that they should initiate a course of six lectures of "The History of Medicine" for senior students, on the lines of Prof. Lindsay's lectures at Queen's College, Belfast. On this subject the Continent leads, and the British medical schools have begun to follow. Dr. Singer, Sir Clifford Allbutt, and others, have influenced the London Medical Schools to makeup much leeway, and questions involving a knowledge of medical progress less recent than the last decade or so are even put in the examinations occasionally. We fear that laboratory teaching has a tendency to develop too much at the expense of clinical teaching in some medical schools, with very unsatisfactory results, but that, as Kipling would say, is another story.