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Time for action, not words: the urgent rebuilding of New Zealand's mental health workforce

The impact of COVID-19 restrictions on acute hospital presentations due to alcohol-related harm in Waitematā Auckland, New Zealand

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This paper explores socio-demographic factors associated with health professionals' understanding of the End of Life Choice Act (the Act), support for assisted dying (AD) and willingness to provide AD in New Zealand. This association is determined by a secondary analysis of the two Ministry of Health workforce surveys conducted in February and July 2021. Results show that several socio-demographic factors, including age, gender, ethnicity and professional background, are significantly associated with health professionals' support and willingness to provide AD with likely consequences for the AD workforce availability and service delivery in New Zealand.

Hypospadias, cryptorchidism and breast cancer in children born to New Zealand servicemen who served in Malaya and may have had exposure to dibutyl phthalate: review of a previous study and updated review of international literature

J Mark Elwood

A previous report published in 2012 stated that some male genital abnormalities in boys and breast cancer in adult females were increased in the children of New Zealand veterans who served in Malaya and were exposed to dibutyl phthalate from its use on clothing. This report was based on a small survey with incorrect calculations of results. In the time since, extensive reviews of the human health effects of phthalates have been conducted overseas, and show no consistent evidence of associations with these conditions. There is no consistence scientific evidence which supports the concept of health effects in children being affected by previous exposures of the fathers to dibutyl phthalate or other phthalates. If the study published in 2012 has created anxiety or misinformation for veterans and their families, this should be corrected.

Aotearoa New Zealand Deaf women's perspectives on breast and cervical cancer screening.

Deborah A Payne, Agnes Terraschke, Karen Yoshida, Victoria A Osasah

Little or no information is gathered about women who use New Zealand Sign Language's (NZSL) engagement with cervical or breast cancer screening. Interviews with a group of women who use NZSL found that having a NZSL interpreter or staff who were aware of their communication needs made the women's first experience of cervical or breast screening more comfortable. Finding out which forms of communication the woman prefers before her appointment, and allowing extra time, may improve women who use New Zealand Sign Language's experiences of breast and cervical cancer screening.

The impact of COVID-19 restrictions on acute hospital presentations due to alcohol-related harm in Waitematā Auckland, New Zealand

Cameron Schauer, Joshua Quon, Pravin Potdar, Ashwin Singh, Dean Croft, Michael Wang

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Dora Blair, Evelyn Lamble, Graeme van der Meer, Edward Toll, Craig McCaffer, Colin Barber, Nikki Mills, Michel Neeff

A review of the incidence of juvenile onset recurrent respiratory papillomatosis (JRRP) treated at Starship Children's Hospital. The incidence rates before and after the implementation of a national vaccination programme were compared. Contrary to international results showing a significant decline, the incidence is statistically unchanged in our cohort. This may be linked to the poor uptake of the HPV vaccination.

The ownership elephant is becoming a mammoth: a policy focus on ownership is needed to transform Aotearoa New Zealand's health system

Johanna Reidy, Don Matheson, Rawiri Keenan, Peter Crampton

Primary Health Care (PHC)—this refers to health services provided in community settings. A large portion is made up of general practice and it also includes community pharmacy, physiotherapy, community health work, midwifery etc.

Time for action, not words: the urgent rebuilding of New Zealand's mental health workforce

James A Foulds, Ben Beaglehole, Roger T Mulder

A mental health workforce in crisis

There is overwhelming agreement that New Zealand faces a health workforce crisis,[1,2] although one might argue that, like our workforce, the word "crisis" is getting worn out from overuse.

A recent editorial in the *New Zealand Medical Journal* lamented the government's response to the problems in New Zealand's health sector, with a transparent approach to rationing healthcare seen as the most viable short-term solution.[3] Rationing is already happening across the health system, including in mental health. However, mental healthcare rationing is being done in an *ad hoc* way, mostly by individual clinicians and strained services. A lack of transparency about rationing of mental healthcare risks worsening inequities, disproportionally affecting Māori because of existing systemic biases.[4] Rationing will inflict moral injury on clinicians[5] and it might also breach human rights. For example, workforce pressures are lowering the quality of mental healthcare provided to people in prisons, leading to breaches of the United Nations Optional Protocol to the Convention Against Torture.[6]

In response to concerns about New Zealand's mental health and addiction services, the New Zealand Government conducted a national inquiry in 2018. *He Ara Oranga*, the inquiry report, recommended publicly funded mental health and addiction services expand to improve care across the whole spectrum of illness severity.[7] Expanding services before first ensuring the needs of people with the most severe problems can be met seems absurd. Furthermore, while *He Ara Oranga* noted the burnout and trauma being experienced by mental health staff,[7] its recommendations gave no specific plans to address workforce issues beyond brief mention of workforce modelling (recommendation 6) and setting "*workforce development and […] wellbeing priorities*" (recommendation 10).

The current situation reflects the slow demise in secondary mental health services over the past 60 years[8] since de-institutionalisation began. Allison et al. noted that the *He Ara Oranga* report continued a tradition of rhetoric promoting community care, but it overlooked the fact that psychiatric inpatient bed numbers in New Zealand were already low by high-income country standards.[8] This lack of inpatient beds is a major source of stress for clinicians in both inpatient and outpatient settings.[9] Inpatient staff wellbeing is affected by high acuity, pace of work and exposure to violence. Those working in outpatient settings have caseloads of people who are more unwell than in the past. In many cases these patients cannot access good quality housing due to stigma and cost. Healthy food is also out of reach for many. The lack of ability to alter these social determinants makes it harder for clinicians to address patients' mental illness, and this is likely to produce a sense of powerlessness that fuels burnout.[10] Options for management of outpatients who pose serious risks to themselves or other people are more and more limited, leaving clinicians to carry a heavy burden.

The strain in the mental health workforce is evident in recent reports published by Te Pou (New Zealand's centre for mental health workforce development)[11] and the Health Workforce Advisory Board.[2] Promisingly, Te Pou report that the funded mental health workforce grew by over 10% between 2018 and 2022 against a background of a 7% increase in the New Zealand population.[12] However, closer scrutiny of the data from Te Pou is more alarming. First, more than 10% of funded positions are vacant, implying those in the workforce are doing at least 10% more work than they should be. Second, the lowest rate of growth was among nurses—the largest and arguably the most vital part of the mental health workforce. In contrast the highest growth was in advisors, managers and administrators. Third, the mental health workforce is aging rapidly, with around

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half aged over 50 and one fifth over 60. This suggests the workforce shortages will get worse as that cohort retires. Fourth, progress has been made with increasing workforce participation by Māori, but the proportion of Māori in the workforce—around 14%—still needs to double to match the ethnic profile of those accessing care.

Like *He Ara Oranga*, the *Mental Health and Addiction Workforce Action Plan 2017–2021*[13] was flush with aspirational goals but short on concrete solutions. For example, the *Action Plan* noted that the number of nurses in New Zealand per 100,000 population was already falling and was expected to fall further. However, the plan provided virtually no practical plans to attract, train or retain more nurses. In contrast, recent work by the Health Workforce Advisory Board has at least produced tangible outputs such as lowering the barriers to people with specialist skills entering the country.[2]

Solutions

We do not have all the solutions to New Zealand's mental health workforce problems, but we can point to some directions where the answers may lie.

First, clinicians with a tertiary degree in the health sciences still make up most of Te Whatu Ora's mental health and addiction workforce.[11] This is no longer a sustainable option. There is an increasing need to recruit people without a tertiary degree-level health qualification but with other desirable attributes, including lived experience of mental illness and a deep understanding of tikanga Māori and Pasifika culture. This workforce would initially function at the level of healthcare assistants or support workers but with a defined pathway for career progression via an apprenticeship model. Universities and polytechnics should remain involved in training this workforce, but they will need to adapt and be more responsive to its needs. For example, training would be delivered flexibly online during paid work hours rather than via traditional classroom-based models.

Second, there is a need to recruit people with existing tertiary health science qualifications who are not currently in the workforce. Funded refresher training is already in place to help bring nurses back into the workforce, and this is a worthwhile initiative.[2] As the mental health workforce is two thirds female, recruitment and retention efforts should be focussed on women. Recent changes to employment conditions for nurses have begun to address gender pay equity. However, despite years of industrial negotiations there is still some way to go, with nursing pay still the subject of litigation in the Employment Court.[14]

Third, strategies to retain existing staff are urgently needed. Much has been written on this issue, but seemingly little has been done about it. Burnout is a major barrier to retention. It has been described as a global crisis for doctors[15] and is highly prevalent among psychiatrists in New Zealand.[9] For nurses, factors reported to improve retention include more autonomy, participation in governance activities, good leadership, adequate resources and good interdisciplinary communication.[16] Well-designed financial incentives would also help staff retention and morale.

Conclusions

A strong and healthy secondary care workforce is the foundation of New Zealand's mental health system. Currently, this system and the people working in it are on the brink of collapse. The workforce is not going to be rebuilt via more inquiries, blueprints or strategy documents. It is now time for action, not words.

COMPETING INTERESTS
Nil.

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Health professionals' understanding and attitude towards the End of Life Choice Act 2019: a secondary analysis of Manatū Hauora – Ministry of Health workforce surveys

Aida Dehkhoda, Rosemary Frey, Melissa Carey, Xuepeng Jing, Susan Bull, Frederick Sundram, Nicholas R Hoeh, David Menkes, Jacqualine Robinson, Gary Cheung

ABSTRACT

AIM: To determine socio-demographic factors associated with health professionals' understanding of the End of Life Choice Act (the Act), support for assisted dying (AD), and willingness to provide AD in New Zealand.

METHOD: Secondary analysis of two Manatū Hauora – Ministry of Health workforce surveys conducted in February and July 2021.

RESULTS: Our analysis showed (1) older health professionals (age>55) had a better overall understanding of the Act than their young colleagues (age<35), (2) female health professionals were less likely to support and be willing to provide AD, (3) Asian health professionals were less likely to support AD compared to their Pākehā/European counterparts, (4) nurses were more likely to support AD and be willing to provide AD when compared to medical practitioners, and (5) pharmacists were more willing to provide AD when compared to medical practitioners.

CONCLUSION: Several socio-demographic factors, including age, gender, ethnicity, and professional background, are significantly associated with health professionals' support and willingness to provide AD, with likely consequences for the AD workforce availability and service delivery in New Zealand. Future review of the Act could consider enhancing the roles of those professional groups with higher support and willingness to assist in providing AD services in caring for people requesting AD.

As of January 2023, Aotearoa New Zealand is among the 25 jurisdictions/countries that have legalised assisted dying (AD).[1–3] The New Zealand End of Life Choice (EOLC) Act 2019 (the Act) came into force in November 2021 following a twelve-month implementation process. In New Zealand, AD practice encompasses euthanasia and physician-assisted dying, allowing a person with a terminal illness to request medication to end their life if they meet strict criteria.

As a recent addition to New Zealand health services, AD has implications for all health professionals. The Act stipulates that a health practitioner is entitled to conscientiously object to providing AD (Section 8[1] of the Act).[4] Such practitioners are not legally required to disclose their conscientious objection; however, they do have a duty of care to respond when AD is raised. This duty includes informing the patient of their right to seek a replacement practitioner and providing them with information about AD (Sections 9[2] and 10[2] of the Act).[4] This requirement highlights the necessity for all health professionals to be familiar with (1) the AD service and its care pathways, (2) the Act and its regulatory framework, eligibility criteria, and key safeguards, and (3) the three statutory roles established under the Act, including the Registrar (AD), the Support and Consultation for the End of Life in New Zealand Group, and the Review Committee.[5]

The availability of a workforce to provide AD is partly contingent on health professionals' competency and knowledge of the Act and AD services. International studies have highlighted the emotional and psychological burdens of providing AD on health professionals and the impact of these burdens on workforce availability if left unaddressed.[6–8] Given that health professionals in New Zealand will increasingly encounter patients requesting AD, it is important to gain insight into their knowledge and attitudes towards the Act. This insight would help with the provision of AD services by ensuring support is available and minimising the burdens on the workforce.

Manatū Hauora – Ministry of Health (the Ministry) oversees the implementation of AD services in New Zealand and conducted two workforce surveys prior to the implementation of the Act. The purpose of these surveys was to gather baseline national workforce data in relation to the provision of AD. In this study, we analysed survey data to determine the socio-demographic factors associated with health professionals' understanding of the Act, support for and willingness to provide AD.

Methods

Research design

This study is a secondary analysis of two surveys conducted by the Ministry in February 2021 and July 2021. Ethics approval was obtained from The University of Auckland Human Participants Ethics Committee (Reference Number UAHPEC24110).

Participants and setting

The Ministry used snowballing sampling and distributed the two anonymous online surveys to a range of organisations with a request to disseminate the invitation to their health professional members and other relevant networks. These organisations included district health boards, hospices, medical colleges (e.g., general practice, palliative care, and psychiatry), New Zealand Nurses Organisation, education providers (e.g., medical schools), allied organisations (e.g., Cancer Control Agency), government agencies (e.g., Department of Corrections, Te Puni Kōkiri, Disability Support Services, Health Quality & Safety Commission, and the Health and Disability Commissioner), Māori health services and associated organisations, disability organisations, and advocates for aged care (e.g., Age Concern). The first survey was open for four weeks and the second for three weeks.

Workforce surveys

The Ministry developed both surveys. Surveys One and Two contained 14 identical questions collecting respondents' age, gender, ethnicity, health profession, work setting, and location, as well as their understanding of the Act, education/training preference, and areas of interest. The surveys also contained disparate questions. Survey One asked respondents about their support for and willingness to provide AD. Survey Two asked questions on whether respondents had completed and found the Ministry training modules and webinars useful. A combination of "Yes"/"No" answers, Likert Scales, and free-text answers were used, and each survey took approximately 10 minutes to complete. This study analysed responses to the subset of questions listed in Table 1 that were most relevant to the research objectives.

Data cleaning and analysis

We used Microsoft Excel 365 (Version 2202) to re-categorise and re-code some variables to allow comparisons across the two surveys, and Statistical Package for Social Sciences (SPSS) software, Version 28.0 (IBM), for data analysis. We performed Spearman's rank correlation analyses for questions related to the "understanding of the Act" section (Table 1): overall understanding, understanding of eligibility criteria, and understanding of obligations and the right of conscientious objection. We found significant correlations ($p \leq 0.05$) between the responses to these three questions and decided to use only "overall understanding" as the overarching question in subsequent analyses. Descriptive statistics (number and percentages) were calculated to describe socio-demographic information with respect to three main outcomes: overall understanding of the Act, support for, and willingness to provide AD.

Logistic regression was used to assess associations between the socio-demographic variables (independent variables) and the three main outcomes of interest (dependent variables). We dichotomised the responses to the questions on "overall understanding of the Act" and "willingness to provide AD" (refer to Table 1 for details). Odds ratios were reported with a 95% confidence interval. Statistical significance was set at the 5% level.

Results

Survey One received 1,980 responses. Most respondents were older than 45 years (58.1%), female (62.6%), Pākehā/European (81.4%), and worked as medical practitioners (73.4%) in a hospital setting (44.2%). There were 27 (1.4%) and 12 (1.4%) Māori respondents in Survey One and Two respectively. Survey Two had 859 responses and a notably higher proportion of nurses and nurse practitioners (Survey One: 11.1%, Survey Two: 26.4%). All 20 district health boards were represented in both surveys. Table 2 shows the socio-demographic details of the respondents.

Table 3 and Table 4 show the results of "Overall understanding of the Act" in Survey One and Survey Two, respectively. In Survey One, 14.2% of health professionals reported having a very good understanding of the Act. While 52.3% reported

a good understanding, 31.8% reported limited understanding, and 1.7% had no understanding of the EOLC Act (Table 3). Table 4 shows a similar distribution of these responses in Survey Two. Seventy-four point one percent of Māori participants had a good or very good understanding of the Act in Survey One and 33.3% in Survey Two.

Table 5 shows the results of "Support for AD" in Survey One, while Table 6 shows the results of "Willingness to provide AD" in Survey One. We found 46.9% of health professionals supported AD, while only 9.8% would "definitely" provide AD services. Sixty-six point seven percent of Māori participants supported AD in Survey One, but only 3.7% would "definitely" be willing to provide AD services.

Table 7 shows the results of the logistic regression analyses. In Survey One, health professionals aged 55–65 years (OR=1.46, 95% CI=1.06–2.00) and over 65 years old (OR=3.17, 95% CI=1.83–5.48) were more likely to have a good or very good understanding of the Act when compared to those aged under 35 years. In addition, health professionals working in hospice (OR=9.68, 95% CI=1.68–55.70) were more likely to have a good or very good understanding of the Act compared to aged residential care. Similar logistic regression results on "Overall understanding of the Act" were found in Survey Two, which shows consistency across the two surveys.

Several factors were found to be associated with lower support for AD: female gender (OR=0.79, 95% CI=0.64–0.97), health professionals in the South Island (OR=0.78, 95% CI=0.62–0.97), and Asian (OR=0.59, 95% CI=0.42–0.84) and 'other' ethnicities (OR=0.58, 95% CI=0.35-0.95) when compared to Pākehā/European. Conversely, nurses (OR=1.83, 95% CI=1.24–2.69) and 'other' health professionals such as allied health professionals, physio/occupational therapists, and psychologists (OR=4.76, 95% CI=2.38–9.49) were more likely to support AD than medical practitioners.

Women (OR=0.52, 95% CI=0.37–0.74) were less likely to be willing to provide AD than men. In contrast, nurses (OR=4.24, 95% CI=2.47–7.29), pharmacists (OR=4.12, 95% CI=1.68–10.08), and 'other' health professions (OR=4.32, 95% CI=2.14–8.75) were more likely to be willing to be part of providing AD services than medical practitioners who can directly provide AD.

Discussion

This is the first New Zealand study describing socio-demographic factors associated with health professionals' understanding of the Act, support for and willingness to provide AD services in the year before the implementation of voluntary AD. In New Zealand, several studies[9–15] were conducted before the AD legislation was passed to investigate public and health professional support for AD and socio-demographic factors that may influence this attitude. Support for AD in the past 20 years has been relatively stable, averaging about 68% among the New Zealand public.[16] The key findings of this study were: (1) older health professionals (age>55) had a better overall understanding of the Act than younger health professionals (age<35), (2) female health professionals were less likely to support AD and be willing to provide AD, (3) Asian and 'other' health professionals were less likely to support AD when compared with Pākehā/European professionals, (4) nurses were more likely to support and be willing to play a role in AD provision when compared with medical practitioners who can directly provide AD, and (5) pharmacists were more likely to be willing to provide AD when compared with medical practitioners.

Age, understanding of the Act, and support for AD

We found older health professionals had a better understanding of the Act. Older health professionals may have a higher AD literacy because they have been exposed to AD debates for longer, since the first AD Bill was introduced in New Zealand in 1995. Over the 26 years between introducing the first bill and legislation coming into effect, these debates addressed topics such as what should be included in AD legislation, the decision-making process, and the level and legitimacy of the authorities given to those involved in the practice.[17] Similarly, health professionals working in hospices were found to have a better understanding of the Act, probably because they would have been exposed to the AD debate in their workplace due to the nature of their work caring for terminally ill people.[18] In terms of age, a systematic review of physicians' and nurses' motivations to practice AD shows older practitioners are more inclined to provide AD.[19] Although we did not find any association between age and support for or willingness to provide AD among health professionals in our study, our results are consistent with a previous New Zealand study which found age having a negligible association with acceptance of AD among the public,[9] while mixed results about the correlation between age and support for AD

Table 1: Key questions in workforce surveys in February 2021 and July 2021.

Sections	Survey	Likert scale	Dichotomous categories[1]
Understanding of the Act			
1. How well do you think you understand the End of Life Choice Act overall?	1 & 2	a. Not at all b. I have a limited understanding c. I have a good understanding, but there are some gaps d. I have a very good understanding	• a & b • c & d
2. (i) How well do you think you understand the eligibility criteria outlined in the Act?	1		
(ii) How well do you think you understand the eligibility criteria and circumstances where the process must end, as outlined in the Act?	2		
3. How well do you think you understand specific obligations on health practitioners as outlined in the Act, including the right of conscientious objections?	1 & 2		
Attitudes towards the Act			
Support for assisted dying 1. With your current understanding of the Act, please select from one of the following options.	1	a. I support AD in principle b. I oppose AD in principle	
Willingness to provide assisted dying services 2. With your current understanding of the Act, how willing are you to consider providing assisted dying services?	1	a. Unwilling b. Unlikely c. Possibly d. Definitely	• a, b, & c • d

[1] Dichotomous in statistics refers to the division of variables into two groups/values to conduct a Binary Logistic Regression to determine the reason-result relationship of independent variable(s) with the dependent variable.

Table 2: Respondent characteristics in workforce surveys in February 2021 and July 2021.

Socio-demographic details		Survey One (N=1980) n (%)	Survey Two (N=859) n (%)
Age[1]	Under 25	18 (0.9)	15 (1.7)
	25–35	312 (15.8)	131 (15.3)
	35–45	484 (24.4)	159 (18.5)
	45–55	557 (28.1)	233 (27.1)
	55–65	468 (23.6)	254 (29.6)
	Over 65	126 (6.4)	62 (7.2)
	Missing	15 (0.8)	5 (0.6)
Gender	Male	710 (35.9)	251 (29.2)
	Female	1239 (62.6)	601 (70)
	Gender diverse	4 (0.2)	1 (0.1)
	Missing	27 (1.4)	6 (0.7)
Ethnicity	Pākehā/European[2]	1635 (82.6)	696 (81)
	Asian[3]	174 (8.8)	63 (7.3)
	MELAA[4]	32 (1.6)	13 (1.5)
	Māori	27 (1.4)	12 (1.4)
	Pacific	10 (0.5)	7 (0.8)
	Other	42 (2.1)	37 (4.3)
	Missing	60 (3.0)	31 (3.6)
District health boards	North Island	1498 (75.66)	632 (73.57)
	South Island	482 (24.34)	227 (26.43)
Health profession	Medical practitioner	1454 (73.4)	442 (51.5)
	Medical practitioner (psychiatrist)[6]	132 (6.7)	26 (3.0)
	Nurse practitioner	64 (3.2)	40 (4.7)
	Nurse	157 (7.9)	186 (21.7)
	Pharmacist	116 (5.9)	63 (7.3)
	Other[7]	57 (2.9)	102 (11.9)

Table 2 (continued): Respondent characteristics in workforce surveys in February 2021 and July 2021.

Socio-demographic details		Survey One (N=1980) n (%)	Survey Two (N=859)n (%)
Work setting	Aged residential care	22 (1.1)	55 (6.4)
	Community	46 (2.3)	32 (3.7)
	General practice	568 (28.7)	202 (23.5)
	Hospice	64 (3.2)	78 (9.1)
	Hospital	875 (44.2)	409 (47.6)
	Pharmacy	83 (4.2)	32 (3.7)
	Specialist practice	264 (13.3)	9 (1.0)
	Other[8]	58 (2.9)	42 (4.9)

1 Age groups listed in the surveys overlapped: 35–45, 45–55, and 55–65, where they should have been discrete: 35–44, 45–54, and 55–64.
[2] Pākehā refers to white/European New Zealanders. European refers to other Europeans.
[3] Asian in this study refers to Chinese, Indian, Filipino, Sri Lankan, Malaysian, South East Asian, etc.
[4] MELAA: Middle Eastern/Latin American/African.
[5] Three respondents were working in two DHB locations.
[6] The Ministry had presented 'psychiatrist' as a distinct category in both surveys.
[7] Other health professionals included academics, allied health, clinical managers, mental/social health workers, midwives, etc.
[8] Other work settings included educational institutions, urgent care, prison/corrections, non-government organisations, government agencies, etc.

Table 3: Overall understanding of the Act and respondent characteristics in Survey One (February 2021).

Socio-demographic details		**Not at all N (%) 34 (1.7) n (%)**	**Limited N (%) 629 (31.8) n (%)**	**Good N (%) 1036 (52.3) n (%)**	**Very good N (%) 281 (14.2) n (%)**
Age[1]	Under 35[4]	5 (1.5)	124 (37.6)	178 (53.9)	23 (7.0)
	35–45	12 (2.5)	171 (35.3)	242 (50.0)	59 (12.2)
	45–55	13 (2.3)	178 (32.0)	282 (50.6)	84 (15.1)
	55–65	4 (0.9)	133 (28.4)	252 (53.8)	79 (16.9)
	Over 65	0 (0.0)	21 (16.7)	75 (59.5)	30 (23.8)
Gender[2]	Male	13 (1.8)	218 (30.7)	366 (51.5)	113 (15.9)
	Female	21 (1.7)	404 (32.6)	656 (52.9)	158 (12.8)
	Gender diverse	0 (0.0)	0 (0.0)	3 (75.0)	1 (25.0)
Ethnicity[3]	Pākehā/European[5]	25 (1.5)	526 (32.2)	858 (52.5)	226 (13.8)
	Asian[6]	3 (1.7)	65 (37.4)	86 (49.4)	20 (11.5)
	Māori	0 (0.0)	7 (25.9)	16 (59.3)	4 (14.8)
	Pacific	1 (10.0)	1 (10.0)	7 (70.0)	1 (10.0)
	Other[7]	5 (6.8)	15 (20.3)	40 (54.1)	14 (18.9)
District health board[8]	North Island	29 (1.9)	469 (31.3)	796 (53.1)	204 (13.6)
	South Island	5 (1.0)	160 (33.2)	240 (49.8)	77 (16.0)
Health profession	Medical practitioner	24 (1.7)	469 (32.3)	756 (52.0)	205 (14.1)
	Medical practitioner (psychiatrist)[9]	2 (1.5)	38 (28.8)	78 (59.1)	14 (10.6)
	Nurse practitioner	1 (1.6)	17 (26.6)	32 (50.0)	14 (21.9)
	Nurse	3 (1.9)	43 (27.4)	81 (51.6)	30 (19.1)
	Pharmacist	2 (1.7)	48 (41.4)	52 (44.8)	14 (12.1)
	Other	2 (3.5)	14 (24.6)	37 (64.9)	4 (7.0)

Table 3 (continued): Overall understanding of the Act and respondent characteristics in Survey One (February 2021).

Socio-demographic details		**Not at all N (%) 34 (1.7) n (%)**	**Limited N (%) 629 (31.8) n (%)**	**Good N (%) 1036 (52.3) n (%)**	**Very good N (%) 281 (14.2) n (%)**
Work setting	Aged residential care	0 (0.0)	5 (22.7)	14 (63.6)	3 (13.6)
	Community	1 (2.2)	12 (26.1)	25 (54.3)	8 (17.4)
	General practice	9 (1.6)	188 (33.1)	293 (51.6)	78 (13.7)
	Hospice	0 (0.0)	2 (3.1)	34 (53.1)	28 (43.8)
	Hospital	15 (1.7)	282 (32.2)	481 (55.0)	97 (11.1)
	Pharmacy	2 (2.4)	38 (45.8)	34 (41.0)	9 (10.8)
	Specialist practice	6 (2.3)	84 (31.8)	126 (47.7)	48 (18.2)
	Other	1 (1.7)	18 (31.0)	29 (50.0)	10 (17.2)

Missing data: [1] n=15, [2] n=27, [3] n=60
4 The two categories of 'under 25' and '25–35' were combined into one category of 'under 35' for data analysis due to the small number. Age groups listed in the surveys overlapped: 35–45, 45–55, and 55–65, where they should have been discrete: 35–44, 45–54, and 55–64.
[5] Pākehā refers to white/European New Zealanders. European refers to other Europeans.
[6] Asian in this study refers to Chinese, Indian, Filipino, Sri Lankan, Malaysian, South East Asian, etc.
[7] MELAA (Middle Eastern/Latin American/African) was grouped under the 'Other' category due to the small number.
[8] North Island district health boards were combined under the new category of 'North Island,' and South Island district health boards were combined under the new category of 'South Island' for data analysis due to the small number in each district health board.
[9] The Ministry had presented 'psychiatrist' as a distinct category in both surveys.

Table 4: Overall understanding of the Act and respondent characteristics in Survey Two (July 2021).

Socio-demographic details		**Not at all N (%) 26 (3.0) n (%)**	**Limited N (%) 304 (35.4) n (%)**	**Good N (%) 384 (44.7) n (%)**	**Very good N (%) 145 (16.9) n (%)**
Age[1]	Under 35[4]	10 (6.8)	66 (45.2)	61 (41.8)	9 (6.2)
	35–45	5 (3.1)	71 (44.7)	60 (37.7)	23 (14.5)
	45–55	6 (2.6)	71 (30.5)	111 (47.6)	45 (19.3)
	55–65	3 (1.2)	75 (29.5)	118 (46.5)	58 (22.8)
	Over 65	2 (3.2)	18 (29.0)	33 (53.2)	9 (14.5)
Gender[2]	Male	7 (2.8)	86 (34.3)	115 (45.8)	43 (17.1)
	Female	19 (3.2)	216 (35.9)	266 (44.3)	100 (16.6)
	Gender diverse	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)
Ethnicity[3]	Pākehā/European[5]	17 (2.4)	248 (35.6)	308 (44.3)	123 (17.7)
	Asian[6]	4 (6.3)	23 (36.5)	32 (50.8)	4 (6.3)
	Māori	1 (8.3)	7 (58.3)	4 (33.3)	0 (0.0)
	Pacific	0 (0.0)	3 (42.9)	4 (57.1)	0 (0.0)
	Other[7]	3 (6.0)	13 (26.0)	24 (48.0)	10 (20.0)
District health board[8]	North Island	20 (3.2)	230 (36.4)	280 (44.3)	102 (16.1)
	South Island	6 (2.6)	74 (32.6)	104 (45.8)	43 (18.9)
Health profession	Medical practitioner	19 (4.3)	149 (33.7)	190 (43.0)	84 (19.0)
	Medical practitioner (psychiatrist)[9]	0 (0.0)	9 (34.6)	14 (53.8)	3 (11.5)
	Nurse practitioner	0 (0.0)	9 (22.5)	19 (47.5)	12 (30.0)
	Nurse	4 (2.2)	62 (33.3)	91 (48.9)	29 (15.6)
	Pharmacist	2 (3.2)	32 (50.8)	24 (38.1)	5 (7.9)
	Other	1 (1.0)	43 (42.2)	46 (45.1)	12 (11.8)

Table 4 (continued): Overall understanding of the Act and respondent characteristics in Survey Two (July 2021).

Socio-demographic details		**Not at all N (%) 26 (3.0) n (%)**	**Limited N (%) 304 (35.4) n (%)**	**Good N (%) 384 (44.7) n (%)**	**Very good N (%) 145 (16.9) n (%)**
Work setting	Aged residential care	0 (0.0)	20 (36.4)	26 (47.3)	9 (16.4)
	Community	0 (0.0)	12 (37.5)	13 (40.6)	7 (21.9)
	General practice	10 (5.0)	80 (39.6)	87 (43.1)	25 (12.4)
	Hospice	0 (0.0)	14 (17.9)	38 (48.7)	26 (33.3)
	Hospital	14 (3.4)	146 (35.7)	184 (45.0)	65 (15.9)
	Pharmacy	1 (3.1)	18 (56.3)	11 (34.4)	2 (6.3)
	Specialist practice	0 (0.0)	1 (11.1)	4 (44.4)	4 (44.4)
	Other	1 (2.4)	13 (31.0)	21 (50.0)	7 (16.7)

Missing data: [1] n=5, [2] n=6, [3] n=31
4 The two categories of 'under 25' and '25–35' were combined into one category of 'under 35' for data analysis due to the small number. Age groups listed in the surveys overlapped: 35–45, 45–55, and 55–65, where they should have been discrete: 35–44, 45–54, and 55–64.
[5] Pākehā refers to white/European New Zealanders. European refers to other Europeans.
[6] Asian in this study refers to Chinese, Indian, Filipino, Sri Lankan, Malaysian, South East Asian, etc.
[7] MELAA (Middle Eastern/Latin American/African) grouped under the 'Other' category due to the small number.
[8] North Island district health boards were combined under the new category of 'North Island,' and South Island district health boards were combined under the new category of 'South Island' for data analysis due to the small number in each district health board.
[9] The Ministry had presented 'psychiatrist' as a distinct category in both surveys.

Table 5: Support for assisted dying and respondent characteristics in Survey One (February 2021).

Socio-demographic details		**No** **N (%)** **1051 (53.1)** **n (%)**	**Yes** **N (%)** **929 (46.9)** **n (%)**
Age[1]	Under 35[4]	178 (53.9)	152 (46.1)
	35–45	249 (51.4)	235 (48.6)
	45–55	294 (52.8)	263 (47.2)
	55–65	249 (53.2)	219 (46.8)
	Over 65	70 (55.6)	56 (44.4)
Gender[2]	Male	364 (51.3)	346 (48.7)
	Female	670 (54.1)	569 (45.9)
	Gender diverse	3 (75.0)	1 (25.0)
Ethnicity[3]	Pākehā/European[5]	852 (52.1)	783 (47.9)
	Asian[6]	107 (61.5)	67 (38.5)
	Māori	9 (33.3)	18 (66.7)
	Pacific	6 (60.0)	4 (40.0)
	Other[7]	46 (62.2)	28 (37.8)
District health board[8]	North Island	778 (51.9)	720 (48.1)
	South Island	273 (56.6)	209 (43.4)
Health profession	Medical practitioner	814 (56.0)	640 (44.0)
	Medical practitioner (psychiatrist)[9]	65 (49.2)	67 (50.8)
	Nurse practitioner	31 (48.4)	33 (51.6)
	Nurse	66 (42.0)	91 (58.0)
	Pharmacist	61 (52.6)	55 (47.4)
	Other	14 (24.6)	43 (75.4)

Table 5 (continued): Support for assisted dying and respondent characteristics in Survey One (February 2021).

Socio-demographic details		**No** **N (%)** **1051 (53.1)** **n (%)**	**Yes** **N (%)** **929 (46.9)** **n (%)**
Work setting	Aged residential care	8 (36.4)	14 (63.6)
	Community	19 (41.3)	27 (58.7)
	General practice	330 (58.1)	238 (41.9)
	Hospice	43 (67.2)	21 (32.8)
	Hospital	445 (50.9)	430 (49.1)
	Pharmacy	41 (49.4)	42 (50.6)
	Specialist practice	142 (53.8)	122 (46.2)
	Other	23 (39.7)	35 (60.3)

Missing data: [1] n=15, [2] n=27, [3] n=60
4 The two categories of 'under 25' and '25–35' were combined into one category of 'under 35' for data analysis due to the small number. Age groups listed in the surveys overlapped: 35–45, 45–55, and 55–65, where they should have been discrete: 35–44, 45–54, and 55–64.
[5] Pākehā refers to white/European New Zealanders. European refers to other Europeans.
[6] Asian in this study refers to Chinese, Indian, Filipino, Sri Lankan, Malaysian, South East Asian, etc.
[7] MELAA (Middle Eastern/Latin American/African) grouped under the 'Other' category due to the small number.
[8] North Island district health boards were combined under the new category of 'North Island,' and South Island district health boards were combined under the new category of 'South Island' for data analysis due to the small number in each district health board.
[9] The Ministry had presented 'psychiatrist' as a distinct category in both surveys.

Table 6: Willingness to provide assisted dying and socio-demographic information of respondents in Survey One (February 2021).

Socio-demographic details		**Unwilling N (%) 1019 (51.5) n (%)**	**Unlikely N (%) 372 (18.8) n (%)**	**Possibly N (%) 395 (19.9) n (%)**	**Definitely N (%) 194 (9.8) n (%)**
Age[1]	Under 35[4]	163 (49.4)	69 (20.9)	59 (17.9)	39 (11.8)
	35–45	248 (51.2)	98 (20.2)	97 (20.0)	41 (8.5)
	45–55	285 (51.2)	113 (20.3)	108 (19.4)	51 (9.2)
	55–65	250 (53.4)	73 (15.6)	97 (20.7)	48 (10.3)
	Over 65	64 (50.8)	16 (12.7)	31 (24.6)	15 (11.9)
Gender[2]	Male	349 (49.2)	124 (17.5	151 (21.3)	86 (12.1)
	Female	653 (52.7)	245 (19.8)	236 (19.0)	105 (8.5)
	Gender diverse	2 (50.0)	0 (0.0)	2 (50.0)	0 (0.0)
Ethnicity[3]	Pākehā/European[5]	825 (50.5)	322 (19.7)	318 (19.4)	170 (10.4)
	Asian[6]	98 (56.3)	23 (13.2)	42 (24.1)	11 (6.3)
	Māori	7 (25.9)	6 (22.2)	13 (48.1)	1 (3.7)
	Pacific	6 (60.0)	3 (30.0)	1 (10.0)	0 (0.0)
	Other[7]	46 (62.2)	10 (13.5)	11 (14.9)	7 (9.5)
District health board[8]	North Island	756 (50.5)	283 (18.9)	309 (20.6)	150 (10.0)
	South Island	263 (54.6)	89 (18.5)	86 (17.8)	44 (9.1)
Health profession	Medical practitioner	806 (55.4)	280 (19.3)	254 (17.5)	114 (7.8)
	Medical practitioner (psychiatrist)[9]	55 (41.7)	30 (22.7)	37 (28.0)	10 (7.6)
	Nurse practitioner	30 (46.9)	10 (15.6)	21 (32.8)	3 (4.7)
	Nurse	64 (40.8)	26 (16.6)	37 (23.6)	30 (19.1)
	Pharmacist	48 (41.4)	14 (12.1)	30 (25.9)	24 (20.7)
	Other	16 (28.1)	12 (21.1)	16 (28.1)	13 (22.8)

Table 6 (continued): Willingness to provide assisted dying and socio-demographic information of respondents in Survey One (February 2021).

Socio-demographic details		Unwilling N (%) 1019 (51.5) n (%)	Unlikely N (%) 372 (18.8) n (%)	Possibly N (%) 395 (19.9) n (%)	Definitely N (%) 194 (9.8) n (%)
Work setting	Aged residential care	7 (31.8)	2 (9.1)	11 (50.0)	2 (9.1)
	Community	18 (39.1)	10 (21.7)	10 (21.7)	8 (17.4)
	General practice	317 (55.8)	98 (17.3)	110 (19.4)	43 (7.6)
	Hospice	46 (71.9)	9 (14.1)	7 (10.9)	2 (3.1)
	Hospital	437 (49.9)	179 (20.5)	169 (19.3)	90 (10.3)
	Pharmacy	32 (38.6)	9 (10.8)	25 (30.1)	17 (20.5)
	Specialist practice	137 (51.9)	55 (20.8)	50 (18.9)	22 (8.3)
	Other	25 (43.1)	10 (17.2)	13 (22.4)	10 (17.2)

Missing data: [1] n=15, [2] n=27, [3] n=60
4 The two categories of 'under 25' and '25–35' were combined into one category of 'under 35' for data analysis due to the small number. Age groups listed in the surveys overlapped: 35–45, 45–55, and 55–65, where they should have been discrete: 35–44, 45–54, and 55–64.
[5] Pākehā refers to white/European New Zealanders. European refers to other Europeans.
[6] Asian in this study refers to Chinese, Indian, Filipino, Sri Lankan, Malaysian, South East Asian, etc.
[7] MELAA (Middle Eastern/Latin American/African) grouped under the 'Other' category due to the small number.
[8] North Island district health boards were combined under the new category of 'North Island,' and South Island district health boards were combined under the new category of 'South Island' for data analysis due to the small number in each district health board.
[9] The Ministry had presented 'psychiatrist' as a distinct category in both surveys.

Table 7: Logistic regression of overall understanding of the Act, support for and willingness to provide assisted dying.

Socio-demographic details		Overall understanding of the Act				Support for AD		Willingness to provide AD	
		Survey One		Survey Two		Survey One		Survey One	
		OR[1] (CI[2] 95%)	*P* value	OR (CI 95%)	*P* value	OR (CI 95%)	*P* value	OR (CI 95%)	*P* value
Age	Under 35[3]	REF	0.000**	REF	0.001**	REF	0.702	REF	0.564
	35–45	1.05 (0.78–1.42)		1.19 (0.73–1.92)		1.16 (0.86–1.56)		0.74 (0.45–1.21)	
	45–55	1.19 (0.88–1.60)		2.01 (1.28–3.16)		1.01 (0.76–1.36)		0.71 (0.44–1.14)	
	55–65	1.46 (1.06–2.00)		2.27 (1.43–3.59)		0.97 (0.71–1.32)		0.71 (0.43–1.16)	
	Over 65	3.17 (1.83–5.48)		2.14 (1.08–4.25)		0.95 (0.61–1.48)		0.93 (0.47–1.86)	
Gender[4]	Female (versus male)	0.91 (0.73–1.13)	0.395	0.97 (0.68–1.39)	0.906	0.79 (0.64–0.97)	0.025*	0.52 (0.37–0.74)	0.000**
Ethnicity	Pākehā/European[5]	REF	0.595	REF	0.407	REF	0.005**	REF	0.169
	Asian[6]	0.91 (0.64–1.28)		1.05 (0.59–1.90)		0.59 (0.42–0.84)		0.49 (0.25–0.96)	
	Māori	1.38 (0.56–3.40)		0.30 (0.08–1.09)		1.75 (0.73–4.21)		0.21 (0.02–1.65)	
	Pacific	2.34 (0.48–11.33)		1.44 (0.29–7.04)		0.60 (0.16–2.20)		0.00 (0.00)	
	Other[7]	1.27 (0.74–2.18)		1.21 (0.64–2.30)		0.58 (0.35–0.95)		0.82 (0.36–1.88)	

Table 7 (continued): Logistic regression of overall understanding of the Act, support for and willingness to provide assisted dying.

Socio-demographic details		Overall understanding of the Act				Support for AD		Willingness to provide AD	
		Survey One		Survey Two		Survey One		Survey One	
		OR[1] (CI[2] 95%)	*P* value	OR (CI 95%)	*P* value	OR (CI 95%)	*P* value	OR (CI 95%)	*P* value
District health board[8]	South Island (versus North Island)	0.98 (0.78–1.24)	0.903	1.20 (0.85–1.70)	0.284	0.78 (0.62–0.97)	0.029*	0.92 (0.63–1.34)	0.669
Health profession	Medical practitioner	REF	0.962	REF	0.125	REF	0.000**	REF	0.000**
	Medical practitioner (psychiatrist)[9]	1.11 (0.73–1.68)		1.10 (0.42–2.87)		1.14 (0.77–1.67)		0.81 (0.39–1.69)	
	Nurse practitioner	1.11 (0.62–2.01)		1.95 (0.85–4.45)		1.55 (0.90–2.65)		0.86 (0.25–2.88)	
	Nurse	0.97 (0.63–1.48)		0.87 (0.56–1.35)		1.83 (1.24–2.69)		4.24 (2.47–7.29)	
	Pharmacist	1.07 (0.48–2.34)		0.66 (0.30–1.45)		0.85 (0.40–1.78)		4.12 (1.68–10.08)	
	Other	1.27 (0.68–2.40)		0.58 (0.35–0.97)		4.76 (2.38–9.49)		4.32 (2.14–8.75)	

Table 7 (continued): Logistic regression of overall understanding of the Act, support for and willingness to provide assisted dying.

Socio-demographic details		Overall understanding of the Act				Support for AD		Willingness to provide AD	
		Survey One		Survey Two		Survey One		Survey One	
		OR[1] (CI[2] 95%)	*P* value	OR (CI 95%)	*P* value	OR (CI 95%)	*P* value	OR (CI 95%)	*P* value
Work setting	Aged residential care	REF	0.009**	REF	0.002**	REF	0.184	REF	0.453
	Community	0.83 (0.24–2.82)		0.87 (0.32–2.32)		0.75 (0.24–2.30)		1.80 (0.32–10.02)	
	General practice	0.61 (0.21–1.79)		0.55 (0.26–1.15)		0.63 (0.23–1.69)		1.46 (0.30–7.06)	
	Hospice	9.68 (1.68–55.70)		2.60 (1.11–6.12)		0.35 (0.12–1.05)		0.32 (0.04–2.59)	
	Hospital	0.65 (0.22–1.90)		0.89 (0.45–1.77)		0.74 (0.28–1.97)		1.70 (0.36–8.03)	
	Pharmacy	0.31 (0.08–1.26)		0.47 (0.13–1.65)		1.08 (0.29–3.93)		1.17 (0.18–7.54)	
	Specialist practice	0.59 (0.20–1.77)		3.69 (0.39–34.60)		0.69 (0.25–1.88)		1.67 (0.33–8.43)	
	Other	0.53 (0.16–1.72)		1.04 (0.40–2.65)		0.87 (0.29–2.63)		2.22 (0.41–11.90)	

*< 0.05, **< 0.01

[1] OR = Odds Ratio, [2] CI = Confidence Interval

3 The two categories of 'under 25' and '25–35' merged into one category of 'under 35' for data analysis due to the small number.

[4] The 'gender diverse' category was excluded from the analysis due to the small number.

[5] Pākehā refers to white/European New Zealanders. European refers to other Europeans.

[6] Asian in this study refers to Chinese, Indian, Filipino, Sri Lankan, Malaysian, South East Asian, etc.

[7] MELAA (Middle Eastern/Latin American/African) grouped under the 'Other' category due to the small number.

[8] North Island DHBs were combined under the new category of 'North Island,' and South Island DHBs were combined under the new category of 'South Island' for data analysis due to the small number in each DHB.

[9] The Ministry had presented 'psychiatrist' as a distinct category in both surveys.

were reported in other New Zealand studies.[10,16,20]

Gender, support for and willingness to provide AD

Our study found female health professionals were less likely to support or be willing to provide AD compared to their male counterparts. This finding is consistent with previous international reviews where male physicians and nurses are more likely to support AD.[19,21] By contrast, several studies of the New Zealand public have reported support for AD is similar in both genders.[10–12,16] It appears that the relationship between gender and support for AD varies between the public and health professionals in New Zealand. Given that we could not identify any literature exploring this difference, future studies are needed to examine this potentially important finding.

Ethnicity and support for AD

Compared to the predominant European ethnicity, support for AD was significantly lower among Asian and 'other' ethnicities. Previous studies of the New Zealand public have also found Asian and Pacific people were less supportive of AD.[10–12] There has been no previous New Zealand research focussed on Asian health professionals' perspectives on AD, and international literature on this matter is scant. The limited international literature on exploring culture-specific attitudes towards AD has concluded that some non-White ethnic groups, such as Asians, tend to show more humility and accept that not all parts of one's life can be controlled or decided by humans.[22] Of note, no Asian countries have yet legalised AD, which provides an additional indication of possible cultural factors in Asian attitudes towards AD.

Previous New Zealand studies on the general population have shown mixed results regarding support for AD amongst Māori, with some studies reporting very high support at or above 65%,[10,11] or lower support than expected compared to other ethnicities.[12] However, our study did not find any association between Māori health professionals and their support for AD or willingness to provide AD services. Further research into the perspective of Māori public and health professionals on AD and the Act is needed. While mana motuhake (autonomy and self-determination) is important for Māori, this must be balanced against wairua (spiritual) and wider whānau responsibilities. Previous research has raised concerns about the potential harm to Māori if AD is practiced without a full and meaningful understanding of the relationship between mātauranga Māori and AD.[13] Regardless, Māori health professionals have welcomed the opportunity to debate AD kaupapa (agenda), and those who participated in the survey have shown relatively high support for AD. There is a gap in knowledge regarding the link between understanding and willingness to be involved in AD from Māori health professionals' perspective.

Professional background, support for and willingness to provide AD

Nurses in this study were more likely to support AD and be willing to provide AD when compared with medical practitioners. Existing studies suggest that there is a difference between nurses' and physicians' opinions about AD.[15] Other New Zealand studies have also shown nurses are more likely to support AD than physicians,[12,14–16] which is consistent with research elsewhere.[23,24] Nurses are often intimately involved in the care of patients seeking AD and are often the first point of contact in AD requests.[24] Motivations to support AD have arisen from caring for people at the end of life prior to the introduction of the Act and witnessing suffering, despite best efforts in palliative care and sedation. However, the statutory and professional guidelines provide limited information on nurses' scope of practice regarding AD.[14,26]

Given the implications for registered nurses under the Act, New Zealand nurses' regulatory authorities and professional organisations need to support government policy statements ensuring appropriate support is given to those requested AD regardless of the nurses' stances on AD.[14,26] In the Act's statutory framework, only the role of attending nurse practitioners has been recognised as a practitioner who can legally prescribe and administer AD medication. However, this must take place under the instruction of an attending medical practitioner (Section 4[b] of the Act).[4] However, nurse practitioners are not legally allowed to assess AD eligibility despite evidence suggesting they have the competency to do so.[27]

Registered nurses' (RN) roles and responsibilities are, on the other hand, unclear. RN responsibilities may include involvement in practical activities for AD preparation and administration, such as inserting intravenous lines and drawing up medications. The pressure felt by nurses to participate in AD to uphold their duty of care, even though conscientious objection is legally allowed, coupled with a lack of clarity around their obligations and protection, has raised con-

cerns that need to be addressed.[28] Results from this study show that nurses and those identified as 'other' health professionals were more likely to support AD. In contrast, nurses, pharmacists, and 'other' health professionals were more willing to be involved in providing AD when compared to medical practitioners who have a direct role in relation to the AD provision. To better understand the contribution to AD services from various health professionals, further evidence must be generated. For example, under the Act regulation, pharmacists are involved in AD services by dispensing lethal medication. Pharmacists' willingness for a more active role in AD services could be facilitated by reforming the practice and medication protocols preparing for this role through education and resources provided for practice and continuing professional development.[29] Application of these potential changes may, in turn, improve the provision of AD services.

Strengths and limitations

This is the first national large-scale study specifically of health professionals' views regarding the Act in New Zealand. It may provide the foundation for future research on attitudes and workforce data yet to be included in the New Zealand literature. A primary limitation is related to secondary data analysis where the Ministry developed and administered the two surveys; the research team was not responsible for survey content, sampling methods, or how information was collected and recorded. In addition, some issues were found concerning the design of the surveys. For example, the age groups listed in the surveys overlapped: e.g., 35–45, 45–55, and 55–65, rather than being discrete.[30] There were also inconsistencies in some socio-demographic variables and their response categories between the two surveys. For example, Survey One had greater granularity of professional groups and work settings than Survey Two. We used survey documentation and a consultation session with the Ministry's staff to address these issues.

A second limitation is that we were unable to assess changes in the attitudes to AD implementation over time due to the cross-sectional nature of the surveys. Future studies can be conducted, ideally by researchers independent of the Ministry, to assess changes in health professionals' attitudes to AD after the implementation of the Act, along with a community sample for comparison. A further limitation concerns the representativeness of the results; the Ministry did not provide a complete list of organisations to which the surveys were distributed. Thus, survey response rates could not be determined. Finally, New Zealand ethnic groups were unequally distributed in both surveys, notably including Māori (both surveys: 1.4%) and Pacific people (0.5% and 0.8% in Survey One and Two, respectively). This contrasts with the 2021 Medical Council of New Zealand workforce (Māori 4.3% and Pacific peoples 2.1%),[31] 2018 New Zealand Census (Māori 16.5% and Pacific peoples 8.1%),[32] and the 2018–19 Nursing Council of New Zealand workforce (Māori 8%).[33]

Conclusion

This secondary analysis of Manatū Hauora – Ministry of Health EOLC Act workforce surveys shows that socio-demographic factors such as age, gender, ethnicity, and professional background moderate health professionals' support for and willingness to provide AD. Furthermore, an overview of the availability of an AD workforce and delivery of AD services is provided. Since AD has implications for health professionals, there is a need for all health professionals to be familiar with the Act and the AD services. Findings from this study have highlighted that certain health professionals (e.g., younger health professionals) could benefit from continuing education and professional development on these matters. Future research is needed to better understand the lower support for and/or willingness to provide AD among female and Asian health professionals. Future studies could further explore the roles of nurses and pharmacists in AD services, and future review of the Act could consider enhancing the roles of nurses and pharmacists in caring for people requesting AD, given that these professional groups are more likely to support and/or be willing to assist in providing AD services. Future research on health professionals' experiences of being involved in AD would be beneficial to improve our knowledge as the Act is implemented.

COMPETING INTERESTS
AD, RF, MC, XJ, SB, FS, NRH, and DM declare no competing interest. GC and JR are members of Support and Consultation for the End of Life in New Zealand Group. This research is funded by the Auckland Medical Research Foundation.

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Hypospadias, cryptorchidism and breast cancer in children born to New Zealand servicemen who served in Malaya and may have had exposure to dibutyl phthalate: review of a previous study and updated review of international literature

J Mark Elwood

In 2012, it was reported that the children of male New Zealand soldiers who served in Malaya between 1948 and 1960 and used dibutyl phthalate (DBP) on their clothing showed increased risks of hypospadias, cryptorchidism, and breast cancer.[1] This was claimed to be the first report of a multigenerational development effect of DBP exposure in men. Since then, a great deal of research has been done on the effect of DBP and related chemicals, and New Zealand veterans still have concerns about the topic, so an updated review may be useful.

The New Zealand study

New Zealand soldiers serving in the "Emergency" in Malaya in 1948–1960 painted the seams of their uniforms, made of cotton, with a liquid containing dibutyl phthalate (DBP) to prevent them being bitten by trombiculid mites (chiggers, e.g., *Eutrombicula hirsti*), which carry the scrub typhus pathogen (*Orientia tsutsugamushi*).[1] In the New Zealand study,[1] the authors sent questionnaires to 252 New Zealand army veterans who had served in Malaya. They were asked whether they or their children or grandchildren suffered from any of eight conditions: cryptorchidism, defects of the penis (respondents were asked to specify, e.g., hypospadias), precocious puberty (female offspring only), low sperm count, reduced fertility, disorders of the ovary or uterus, and breast cancer.

The results were reported as showing significant increased risks of cryptorchidism and of hypospadias in male children, and of breast cancer in females. Thus, the study showed something never reported before: that a time-limited exposure to DBP in adult men could result in effects to their children, both male and female, born at various times after that exposure ceased. The authors claimed the study to be the first report of a multigenerational developmental effect following DBP exposure in human males.[1] They hypothesised that this was due to an effect on sperm, possibly by epigenetic gene regulation. These dramatic results and interpretations, if correct, would be of worldwide biological importance, and require that the evidence underlying them is rigorous and valid.

Methods

The New Zealand study was reassessed, and published comments and citations of the study were identified and reviewed.

For the literature review, the extensive review by the US Environmental Protection Agency on male and female reproductive effects of phthalates[2] was accepted as reviewing literature published up to January 2017, and the systematic review by Liu et al.[3] was accepted as reviewing literature on phthalates and breast cancer published up to November 2020. More recent literature was searched for on Medline from January 2017 to November 2022, for human studies indexed as phthalate and hypospadias, cryptorchidism, testis, or breast cancer; 85 papers were identified, from which 17 new studies and 11 reviews were assessed in detail. The other studies had

been already included in the major reviews or were of mechanisms or experimental studies. This is not a comprehensive systematic review, and only the relevant studies are discussed in this paper.

Critique of the New Zealand study

The evidence presented in the 2012 paper is from a weak epidemiological study which was incorrectly analysed. The study was based on questionnaires sent in 2010 to 252 New Zealand army veterans whose military records showed that they had served in the Malayan emergency between 1948–1960, and who were members of the Canterbury branch of the Malaysian Veterans Association. Only 85 subjects (34%) responded, of whom 13 reported that they had not used DBP and were excluded from the analysis. One other was excluded with no reason given, leaving 71 veterans, of whom 58 reported having children, all born after their fathers returned to New Zealand. There were 155 children (79 male, 76 female).

In the 79 male children, two cases of hypospadias (2.5%) and four cases of cryptorchidism (5.1%) were reported (Table 1). These were compared to expected rates of 0.3% and 1% respectively, thus showing substantial excesses. However, the comparison results are incorrect, perhaps being based on total populations rather than males.[4] The expected frequencies in New Zealand male births can be only approximate, as the years of birth of the cases are not given, but are about 0.65% for hypospadias and 1.8% for cryptorchidism.[4] The correct comparisons still show an excess, but close to the margin of statistical significance at the 5% level[4] (Table 1). However, the main issue is that veterans who know about these conditions in their children would be more motivated to respond to the questionnaire. With only a 35% response to a questionnaire that specifically indicated these diseases as topics of interest, the result based only on the respondents is very likely to over-estimate the rate in all veterans sent the survey.[5] There was only a very limited validation of the disease reported. Thus, the study should have reported, at the most, that an apparent excess of these conditions was reported by the respondents, but this could be due to selective response.

Amongst the 76 females, there were three cases of breast cancer reported (4.0%). This was compared to a 0.48%, which is the annual incidence of breast cancer in a US source.[4] However, three cases are the number which occurred up to the time of the survey and needs to be compared with the cumulative incidence of breast cancer expected up to the ages attained at the time of the survey. As these ages are not given, an exact comparison cannot be made. The cumulative risk of breast cancer in the general population in New Zealand reaches 4% at age 50 to 55[4], so the finding of three cases is similar to expectations.

The paper also had estimates of the effects of the estimated absorbed dose of DBP, but these were criticised as they were based on studies of rats,[5] while absorption of DBP across rat skin can be up to 130 times greater than across human tissue.[6]

Given the dramatic claim of this being the first study to show an intergenerational effect, it might be expected to gain worldwide attention. The paper has not been discussed in any other publication, apart from the two critical assessments. It has been cited in one paper with the comment that it was "based on a very small cohort,"[7] and the paper was identified for the major review discussed later,[2,8] but not included as the exposure information was based on self-report. Of more concern is that five other papers report the findings as factual without further comment.[9–13]

Thus, in considering the evidence that DBP could be associated with hypospadias, cryptorchidism, or breast cancer in the children of men exposed, the New Zealand study shows only weakly suggestive evidence of associations, which are likely to result from selective reporting.

Phthalates and health effects

Phthalic acid diesters (phthalates) are a class of manmade and multifunction chemicals used in many consumer and industrial products; for example, as plasticisers in polyvinyl chloride plastics, excipients in some medications, and scent retainers in some personal care products.[14] Human exposure is ubiquitous across the lifespan. Routes of exposure include exposure in utero through maternal exposures, ingestion, inhalation, and absorption through the skin.[14] After exposure, phthalate diesters are rapidly metabolised to monoester metabolites and excreted in the urine.

A detailed review of many health effects of phthalate exposure has been performed by the US Environmental Protection Agency in the United States, resulting in a series of papers published in 2018 and later.[2] This is a very detailed review, using internationally accepted methods, and therefore represents the best assessment of scientific literature up to that time. Scientific

studies published up to January 2017 were assessed. For male reproductive effects, 5,651 publications were identified, 445 were assessed in detail, and 100 regarded as relevant and included in the published review.[2]

The group of phthalates encompasses a variety of compounds with different structures, properties, and use. The six phthalates assessed in the EPA review are: dibutyl phthalate (DBP) (the compound used in the New Zealand Vietnam veterans' studies), di(2-ethylhexyl) phthalate (DEHP), diisononyl phthalate (DINP), di-isobutyl phthalate (DIBP), butyl benzyl phthalate (BBP), and diethyl phthalate (DEP). Of these, all except DEP can produce the "phthalate syndrome" of male reproductive effects in rats,[15] which includes cryptorchidism, hypospadias, other reproductive tract malformations, infertility, and decreased sperm count.

Phthalates, hypospadias, and cryptorchidism: literature review

Associations with maternal exposures in pregnancy

The most direct studies of reproductive effects of phthalates, as reviewed by the EPA, relate to maternal exposure during the relevant pregnancy, assessed by phthalates measured in the urine of the mothers at that time.[2] This accords with the mechanism accepted, that phthalates act as endocrine disruptors and have an anti-androgen effect during fetal development. It is distinct from a mutagenic effect, which would affect DNA and subsequent pregnancies.

The EPA review[2] identified 14 epidemiological studies with results on hypospadias, cryptorchidism, or incomplete testicular descent. The only studies accepted as having adequate assessments of exposure were three studies based on measurements of phthalate metabolites from a urine sample from the mother during pregnancy,[16–18] and one study based on an amniotic fluid sample from the mother.[19]

Only two of the studies had results for dibutyl phthalate (DBP), relating to its metabolite mono-butyl phthalate (MBP) (Table 2). Chevrier et al.[16] in France used two cohorts of pregnant women with male babies in which a single urine sample was taken between six and 30 weeks of pregnancy. From these cohorts, 19 cases of hypospadias and 50 cases of undescended testis assessed at birth were identified, along with three matched controls per case. Risks were calculated by tertiles of measured phthalate metabolite, adjusted for gestational age at urine collection, residence area, and other variables. No significant associations were seen, with the odds ratios in the highest tertile being 0.19 (95% confidence interval, CI, 0.02–2.3) for hypospadias, and 0.67 (CI 0.2–1.9) for cryptorchidism.

In a small study, Sathyanarayana et al.[17] studied a group of 371 women in the United States with male births, with a single urine sample collected. There were three cases of hypospadias and five of undescended testis, so these eight cases were assessed together. The odds ratios in relationship to higher levels of DBP metabolite was not significant (OR 1.81, CI 0.24–13.8).

Both these studies were assessed as "medium" confidence in the EPA assessment. A further study by Swan,[18] regarded as having "low" confidence, assessed incomplete testicular descent assessed from 1–36 months after birth in relationship to urine collected during pregnancy, and showed no association with DBP. Overall, the EPA assessment of the associations of maternal DBP and hypospadias and/or cryptorchidism was "slight".

These studies and one other[19] also assessed the other five phthalates considered by the EPA. The overall evidence was considered "indeterminate" or "slight" for these phthalates.

Paternal and maternal occupational exposures

To assess paternal exposures, a relevant study would measure phthalates in the urine of fathers, prior to the conception of the male children. No such study has ever been done.

Some studies assess long-term phthalate exposure, estimated in terms of occupation and the use of a job-exposure matrix linking occupational titles to likely phthalate exposures. There are two large studies of this nature.

In Denmark,[20] 45,341 male singleton births in the Danish National Birth Cohort in 1997–2009 were identified, with fathers' phthalate data on 929 cases of cryptorchidism (2.2%), and 244 of hypospadias (0.6%). For paternal exposures to phthalates, there was an increased risk of hypospadias for "probable exposure," although this was not statistically significant, relative risk (RR) 1.7 (CI 0.9–2.5). There was no association with possible exposure. There was no association with cryptorchidism, RR 1.1 (CI 0.6–1.6). There was a similar non-significant increase of hypospadias associated with maternal occupational probable exposure, RR 2.3 (0.9–3.7), and no association with cryptorchidism.

In Western Australia, 1,145 males with hypospadias born in 1980–2000 were compared to 2411 male controls.[21] No significant increased risk was seen with paternal exposure to phthalates (OR 1.16, 95% limits 0.93–1.46). The results for maternal exposure were similar.

In a smaller study in Nice, France, 102 males with cryptorchidism were identified in 6,246 male births (1.6%).[22] The authors concluded that phthalates could be a risk factor, whereas eating fruits daily seemed protective; however, there were only three cases and one control exposed, which gives a calculated odds ratio of OR 6.3, limits 0.6–60.1 (not given in the paper). The study is clearly too small to support valid conclusions.

Conclusions

An association between DBP exposure in males and hypospadias or cryptorchidism in children born subsequently seems highly unlikely. The detailed EPA review has assessed in detail a much more direct relationship between maternal phthalate exposure in the pregnancy and these effects on male children, with the conclusion that the association is unlikely.[2] One study shows a suggestive association of hypospadias, but not cryptorchidism, with paternal occupational exposure to phthalates, but this would reflect chronic long-term exposure applying at the time of conception. To produce this type of effect, with a time-limited exposure to DBP producing effects on male offspring born considerably later, would require a remarkable biological mechanism, such as an epigenetic mechanism. While such mechanisms have been suggested, and are supported by some animal studies, no such mechanism has been demonstrated in humans with respect to phthalates or other similar pollutants.[23]

The effect of phthalates would be expected to be short-term. Phthalates entering the body by any route are rapidly metabolised, and the metabolites excreted in the urine. The half-life of phthalates in the body is estimated at 3–18 hours.[14] There is no evidence of long-term accumulation in the body, or long-term persistence after the cessation of exposure.

Breast cancer

A detailed systematic review and meta-analysis was published by Liu et al. in March 2021.[3] This reviewed studies published on the associations between breast cancer and phthalates, and also bisphenol A, identified in three major databases: Pubmed, Web of Sciences, and Embase, from 1990 to November 2020. Two-thousand, three hundred and eighty-eight potentially relevant articles were identified, and 311 assessed in detail. From these, six studies with results on phthalates were identified.

The six studies were all case-control studies, based on urine samples from the breast cancer patients and controls, so the data applies to phthalate levels after the diagnosis of breast cancer. To interpret these in regard to the causes of breast cancer, we must assume that these measurements are a valid proxy for phthalate levels at the times relevant to the causation of the breast cancer, which is likely to be months or years before diagnosis.

Only three studies give results for the metabolites of DBP. All three give non-significant but negative associations, with relative risks of 0.66, 0.85 and 0.85. These are derived respectively from case-control studies in 75 women with breast cancer in Alaska,[24] 91 cases in the National Health and Nutrition Examination Survey (NHANES) in the United States,[25] and 233 breast cancer cases in northern Mexico.[26] The meta-analysis gives an overall non-significant odds ratio of 0.80, 95% confidence limits 0.55–1.15. For the other phthalates, significant negative associations were seen for two, and for all the other phthalates no significant associations were seen. Thus, this meta-analysis shows no evidence suggesting an increase of breast cancer related to phthalates, and some suggestive evidence of a possible decrease in risk.

There have been two other major studies, each using a measure of phthalate exposure which may be a better indicator of long-term exposure than a single urine sample.[27] An important cohort study in Denmark[28] assessed phthalates in drugs prescribed. In a nationwide cohort of 1.12 million women, prescriptions for drugs were linked from the national prescription registry, and phthalate content of the drugs assessed. The highest category of DBP exposure was associated with an increased risk of estrogen receptor positive breast cancer (relative risk 1.9, limits 1.1–3.5), based on 13 cases in this group. There was no dose–response relationship, the risk in the next highest group being 0.7, limits 0.4–1.2. There was no association with estrogen receptor negative breast cancer. There were no associations seen with other phthalates assessed. The authors comment that the restriction to estrogen receptor positive breast cancer is consistent with an estrogenic effect of DBP.

Within the Women's Health Initiative cohort

study in the United States, comparisons were made between 419 women with invasive breast cancer and 838 unaffected controls, using measures of phthalates in three urine samples per participant collected over 1–3 years before breast cancer diagnosis. Several phthalates were assessed, none showing any significant associations. For DBP metabolites, the odds ratio in the highest dose group was 1.35, limits 0.94–1.94, and was lower, 1.28, in estrogen positive cancers than an estrogen negative cancer (1.53). Although some increased risks were seen in subgroup analyses (for example, estrogen positive breast cancer diagnosed within three years of the last biomarker measurement), such subgroup results may well be due to chance variation.

Thus, the Danish cohort study of medications suggests a possible increased risk of breast cancer, despite the numerous studies showing no associations. But this is still assessing the most direct effect: ingestion of phthalates by the woman herself prior to breast cancer diagnosis. The more indirect hypothesis that exposure of fathers could increase risk of breast cancer in their daughters after many years has no empiric evidence to support it.

Conclusions

The essential conclusion from this review is that the report that hypospadias, cryptorchidism, and breast cancer are increased in the children of New Zealand Malaysian veterans who served in Malaya and were exposed to dibutyl phthalate from its use on clothing,[1] is based on a small and weak study with incorrect calculations of results. The study itself, when correctly analysed, shows no excess of breast cancer, and only small apparent increases in hypospadias and cryptorchidism based on two and four cases, respectively. These could be due to chance, and are very likely produced by selective reporting, as only 34% of the subjects approached responded to the questionnaire. This study should be dismissed as being of very poor quality and unlikely to be valid.

In the time since, extensive reviews of the human health effects of phthalates have been conducted, using studies worldwide relating to DBP and also to other phthalates. There is no consistent evidence of associations with breast cancer. There are many studies that have assessed hypospadias and cryptorchidism, most relating to phthalate exposure of the mother during pregnancy; these studies are inconclusive.[2] There has also been one large study of fathers' occupations, showing no effect on cryptorchidism, but a small non-significant excess of hypospadias, which is also seen in regard to mothers' occupation. However, the studies relate to long-term chronic exposure which would apply around the time of conception, and not to the situation in veterans with a time limited exposure. There is no scientific evidence that supports the concept of health effects in children being affected by previous exposures of the fathers to dibutyl phthalate or other phthalates.

If the study published in 2012 has created anxiety or misinformation for veterans and their families, this should be corrected. The Veterans' Association should consider if it needs to give guidance to its members and others to show that concerns of these issues are inappropriate.

Table 1: Results of the New Zealand study with updated comparisons.

Disorders	**Prevalence in children of DBP-exposed veterans (number of cases)**				**General population comparison**	**Source**
	Number of cases	Subjects	Prevalence observed %	95% confidence limits d	Prevalence %	
Cryptorchidism	4	79	5.1	2.0–12.3	1.78	a
Hypospadias	2	79	2.5	0.7–8.8	0.65	b
Breast cancer	3	76	3.9	1.4–11.0	4.0	c

a), b) New Zealand national birth defects monitoring 2000–2005; prevalence at birth, males
c) Cumulative incidence by age 55. Ages of subjects not given
d) 95% confidence limits for observed proportion, exact method [29]

COMPETING INTERESTS
Nil.

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Aotearoa New Zealand Deaf women's perspectives on breast and cervical cancer screening.

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ABSTRACT

AIMS: Since the introduction of both cervical and breast screening programmes in Aotearoa New Zealand, mortality rates have dropped. Both screening programmes track women's engagement, but neither capture the level of engagement of Deaf women who are New Zealand Sign Language users or their experiences in these screening programmes. Our paper addresses this knowledge deficit and provides insights that will benefit health practitioners when providing screening services to Deaf women.

METHODS: We used qualitative interpretive descriptive methodology to investigate the experiences of Deaf women who are New Zealand Sign Language users. A total of 18 self-identified Deaf women were recruited to the study through advertisements in key Auckland Deaf organisations. The focus group interviews were audiotaped and transcribed. The data was then analysed using thematic analysis.

RESULTS: Our analysis indicated that a woman's first screening experience may be made more comfortable when staff are Deaf aware and a New Zealand Sign Language interpreter is used. Our findings also showed that when an interpreter is present, extra time is required for effective communication, and that the woman's privacy needs to be ensured.

CONCLUSION: This paper provides insights, as well as some communication guidelines and strategies, which may be useful to health providers when engaging with Deaf women who use New Zealand Sign Language to communicate. The use of New Zealand Sign Language interpreters in health settings is regarded as best practice, however their presence needs to be negotiated with each woman.

Aotearoa New Zealand was one of the first signatories of the United Nations Convention on the Rights of Persons with Disabilities,[1] which identified access to the highest attainable standard of health without discrimination as a right. This right is echoed in Aotearoa New Zealand's Disability 2016–2023 Strategy.[2] Even though internationally Deaf communities identify themselves as a linguistic and cultural minority group and not as disabled,[3] Aotearoa New Zealand policy includes them under the umbrella of disabled.

Since the introduction of the cervical and breast screening programmes in Aotearoa New Zealand, mortality rates have dropped for cervical cancer[4] and breast cancer.[5] While both programmes track women's engagement, neither capture details regarding Deaf women who are New Zealand Sign Language users.

The New Zealand Disability Survey[6] identified that 380,000 people reported having a hearing impairment, which includes both Deaf and hard of hearing. New Zealand Sign Language (NZSL) is one of Aotearoa's official languages and according to the 2018 Census, NZSL was used by approximately 23,000 people. Of these, approximately 4,599 use NZSL as their main means of communication.[7] While this indicates that screening service providers may rarely encounter these women, such infrequency does not justify ignoring their rights to dignity, respect, full communication and informed consent. Little is known about women who use NZSL's experiences of Aotearoa New Zealand's screening programmes; hence, our study aimed to provide some insights into this knowledge deficit.

In consultation with a Deaf-identified academic and others from the Auckland Deaf community, and in accordance with Deaf Aotearoa, our use of the word 'Deaf' with a capital 'D' refers to those people who identify as being part of a Deaf community with a shared culture, beliefs and values and language. From this perspective deafness is not a disability or disease, but rather a difference in human experience.[8]

Literature review

International studies identify that women with disabilities have a higher cancer mortality rate than other groups, especially with regards to breast cancer.[9–11] They are less likely to participate in regular

preventative cancer screenings[12] as the financial, structural and attitudinal barriers often prove too much.[9,10,13–15] These barriers include: lack of funds to pay for non-urgent medical care,[9,14] and medical practices' inaccessibility to disabled or Deaf people.[9,11,16,17] Most of these studies either focus on women with physical disabilities or do not differentiate between women with physical and sensory disabilities. As a result, there is a lack of knowledge about the experiences with preventive screening among Deaf women.

Deaf people are reported as often less satisfied with their healthcare provision than hearing patients.[18,19] The reported main issue was communication barriers, as most practitioners were not aware of Deaf culture or trained to communicate with patients who identify as Deaf.

Deaf women may experience educational disadvantage and may have lower literacy levels than hearing people.[20,21] These factors may impact on their health literacy[22] and their ability to fully comprehend information being communicated to them by forms other than NZSL. An Aotearoa New Zealand study[22] investigated both Deaf NZSL users' access to general, mental health and addiction secondary healthcare and health professionals' experiences of communicating with Deaf NZSL users. Authors found the following communication issues: inconsistent interpreter provision, problems with informed consent, and decreased access to general health information. These systemic issues contributed to Deaf people's inability to understand and hence consent to treatment.

Deaf women's knowledge about breast[23] and cervical cancer is generally insufficient. A study[24] found fewer than half of their Deaf women participants were able to explain what a PAP smear was. While there is research on some of the difficulties Deaf women experience with general healthcare and some access issues in cancer screening, there is minimal research on Aotearoa New Zealand Deaf women's experiences with the two screening procedures. As well, there is little research on the complexities of NZSL interpreter provision in both cervical and breast screening encounters. Our paper aims to address these gaps and to provide insights that may benefit health practitioners providing screening services to Deaf women who use NZSL.

Methods

The study's objectives were to investigate the experiences of women living with a physical/sensory disability when engaging breast and/or cervical cancer screening services in Aotearoa New Zealand, and to identify any barriers encountered. Mixed methods were used—a questionnaire that was distributed nationally[25] and an Auckland-based qualitative component.

The research team consisted of a: Deaf researcher, Māori researcher who lives with a physical disability, research officer, women's health researcher and an international disability studies researcher.

Participants for the qualitative component were recruited through advertisements in Auckland organisations: Te Roopu Waiora, Auckland Deaf Society and Deaf Aotearoa, CCS Disability Action, and Blind Low Vision NZ. All participants were provided with an information sheet prior to making their decision to participate.

The inclusion criteria were women between 20 and 69 years, who lived with a physical or sensory disability and could converse in English or NZSL. We wanted to determine if these women faced barriers when engaging with the screening services. We invited women who met the screening criteria but had not been screened and those who had accessed breast and/or cervical screening services.

The qualitative component employed an interpretive descriptive approach.[25] Data were generated through semi-structured focus groups. Six focus groups with women (n=31) living with physical or sensory disabilities were held. Of the Deaf or disabled women who participated, 18 identified as Deaf. Two focus groups consisted solely of Deaf women (n=14). In one other group, which included women with a mix of different sensory and physical disabilities, four women identified as Deaf (n=4). Of the 18 Deaf women, one identified as Māori, two as Asian and 15 as Pākehā/European. All three focus groups had NZSL interpreters to ensure clear communication between the moderators and the women.

For the two focus groups solely with Deaf women, the moderator was the Deaf researcher. The third group was moderated by the Māori disability researcher. The first author was the note taker for all groups. Ethical approval was obtained from the Auckland University of Technology's Ethics Committee. Written consent was obtained from all participants and their agreement to maintain confidentiality and to not divulge the identity and any personal information of fellow participants.

The moderators used a semi-structured interview guide, asking participants who had engaged

with cervical or breast screening services to discuss their experiences and any barriers encountered (see Appendix 1). Women who had not been screened were asked to discuss their experiences and reasons for not engaging with services. All focus groups' interviews were audio recorded, and data was transcribed verbatim. Data analysis focussed on recurring themes following the process set out by Braun and Clarke.[27] The researchers familiarised themselves with the transcripts, independently coded the data and then came together to engage in detailed data coding. Coded segments were clustered together by the researchers based on underlying similarities. From these clusters larger overarching themes were generated. The thematic findings centre on Deaf women's experiences of cervical and breast screening, in particular the exchange of information with service providers and use of NZSL interpreters.

Results

Table 1 denotes some key socio-demographic and screening details of participants. There were mainly younger aged women (35–40 years), with the majority Pākehā/European. All 18 Deaf women had engaged with cervical screening. Seventeen women had been screened every three years, with the exception of one woman. This was because she was uncertain about the criterion of **ever** having been sexually active. Four women had engaged with mammography services and had been screened within the last two years. The key issue from the focus groups was the communication between the women and the cervical screening practitioners and mammographers

The significance of Deaf aware staff

Four of the Deaf participants attended the same general practice, as it was located where many members of the Deaf community reside, and, importantly, because its fees were relatively low. Given this, the reception and nursing staff have become adept at communicating with Deaf patients (Deaf aware). R spoke of her first experience of a cervical smear with Deaf aware general practice staff:

> *R: I mean for me they (the nurse) had quite a positive attitude and I explained that I was Deaf and they were like "ok" and so then they showed me, they told me that, I could leave my top on but needed to take my pants off. So they explained to me what I needed to do and I just followed along with it and it was fine.*

For S, who attended another practice where the staff were not aware of how to communicate with Deaf clients, her first experience of cervical screening and understanding what was involved was not so positive:

> *S: The first time there weren't enough interpreters around. I went by myself. It wasn't a comfortable experience for me at all.*
>
> *I: And so you mean it was difficult, the communication was difficult? Or difficult to follow? Or what was happening?*
>
> *S: Well, you just go in there and you have just got to open the pants and just end up having. So it's kind of an interesting experience without an interpreter.*

Comparing these two excerpts, when clinic staff were aware of R's communication needs as a Deaf woman and were able to use gestures effectively, R was able to understand what she was required do. The procedure was not perceived as so uncomfortable. In comparison, S, who would have preferred to have had an interpreter present at her first cervical smear, was not at ease and did not understand fully what was involved. Her experience indicates the importance of both Deaf aware staff and the role a NZSL interpreter has in these examinations.

Use of interpreters

Using NZSL interpreters is seen as best practice in effective communication for Deaf people. Currently, NZSL interpreters in the healthcare setting are funded via iSign. iSign is contracted by Manatū Hauora – Ministry of Health to provide this service.[28] Our participants identified when going through the public hospital/health system they expected that the hospital would arrange for the NZSL interpreters. However, going to see their GP the women would organise this for themselves:

> *A: If it's the private system then I would organise my own interpreter. If it was in the public then, when they texted me the appointment or sent me the letter I would reply and say "please arrange*

Table 1: Demographic information of participants.

	Age of participants			Ethnicity of participants			Type of screening experienced by participants	
	35–40yrs	45–50yrs	60–65yrs	Māori	Asian	Pākehā/ European	Cervical cancer screening/ PAP smear	Breast cancer screening/ mammography
Number of participants	9	5	4	1	2	15	18	4

an interpreter." And then they would book an interpreter. And when I would arrive there would be one there.

The issue of privacy

Engaging a NZSL interpreter for either mammography or cervical cancer screening was not routinely practiced by all the women. One factor influencing whether the women wanted an interpreter present was the issue of privacy. For NZSL interpreting to be effective, both the woman and the interpreter need to clearly see one another's faces and hand movements.

Both cervical screening and breast cancer screening involve exposure of highly intimate parts of the woman's body. In using a NZSL interpreter for a mammography or cervical PAP smear, the woman needs to be comfortable in having an interpreter present who might see her exposed body. "SZ" spoke about an interpreter service that provided her with a male NZSL interpreter:

SZ: I have had problems with bookings. They have booked the wrong interpreter. For example, they have brought a male interpreter.

The sex of the interpreter can also be perceived as potential threat to maintaining one's privacy. For all the women, ensuring that they had a female interpreter at their mammography or cervical screening was important, as indicated by P:

P: Yes, well for me sometimes I do prefer a woman interpreter rather than a male interpreter. Especially if it's a private woman's issue. So I will ask for a female interpreter.

For some women, the need to maintain their privacy took precedence over their communication needs. These women relied on the health practitioner's ability to communicate what they needed the women to do and to read the woman's body language. Sometimes this was a satisfactory experience for women and for others not. R related her experience of having a mammography:

R: I feel like I don't need an interpreter to come in and see everything. I mean it's my privacy that I want to keep as well. I just work with a radiographer and we use gestures and I watch her body language. Once I tried to tell the radiographer that I had pulled a muscle in my shoulder and to just be gentle, but she didn't understand. And so I was actually in a lot of pain the last time. I have actually had it [my shoulder] pulled twice, and I was saying to the radiographer "Can you please stop because it's really painful in my shoulder" but she just didn't listen to me.

Mammography screening often requires women to adopt uncomfortable positions: draping their arms over or around the machine and having their breasts compressed. R's reliance on gestures to communicate with her radiographer about her injured shoulder failed. Her experience demonstrates the limited nature of gestures as a main

means of communication. It also highlights the need for practitioners to be observant of their clients' expressions and movements.

The effective use of interpreters: extra time and complexity of issue

For the effective use of NZSL interpreters, increased time and energy was needed for good three-way communication by participant, interpreter and provider. One participant stated:

> *S: …communicating through the interpreter you know it takes longer. And because I am Deaf I feel that I have to communicate to the interpreter and it takes longer for the three-way communication and for things to be clarified and signed back to me. And I think the clarification time takes more of the time. So it is better if I have got longer than 15 minutes [for an appointment].*

GP visits are usually scheduled for about 15 minutes. For mammograms it is approximately 20 minutes. In the above account, S suggests that standard medical appointment times may be a barrier to Deaf women in seeking health information as the presence of an interpreter slows the direct communication between the practitioner and the woman as they relay the information from the woman to practitioner and then the practitioner back to the woman.

Besides additional time, other participants identified the complexity of the reason for seeing their doctor as to whether or not they require an interpreter present:

> *P: It depends on the issue as well. If it is just a small thing you are seeing the doctor for then 15 minutes is just enough. And it depends on the interpreter you are working with as well. I always pick an experienced interpreter, not a new graduate, you know, never for the doctor because there are just too many communication breakdowns.*

If the health issue is perceived as relatively minor, then a woman might decide to communicate directly to her doctor using other modes of communication. Both mammography and cervical cancer screenings, because of their respective three- and two-yearly occurrences, and each following a standard procedure, have the potential to become known to the women and may not require the repeated presence of an interpreter.

However, if her health issue is a major or complex health issue, such as the presence of cancer, not only is more time required but also the need for an experienced NZSL interpreter, and very often the need for the same interpreter, to provide continuity of communication.

Several participants discussed this:

> *N: If you are going to the doctor perhaps and then if you are talking about cancer or something really serious, you want the same interpreter for continuity.*
>
> *P: Yeah definitely.*
>
> *T: So maybe it doesn't really matter at the start but when you find out that you have got a serious condition you want the same interpreter every time.*

More complicated and nuanced consultations were seen by the women to warrant an interpreter. Having the same interpreter appeared to provide some surety for the women in that they would not have to explain their circumstances/medical history to a new interpreter. More importantly, having the same interpreter for complex medical issues, treatment or procedures allows the interpreter and Deaf woman to have a shared understanding of terms they will use to promote communication. Major, McKee, McGregor and Pivac[29] note that NZSL does not have an exact vocabulary for many medical terms, therefore this shared understanding is crucial.

Discussion

Our findings highlight the importance of effective communication during these sensitive health encounters, which is enabled through staff aware of how to communicate effectively with Deaf women (for suggestions, see Appendix 2) and the use of NZSL interpreters.

While NZSL is often seen as the "gold standard" with respect to communication with Deaf clients, the context of the clinical setting and the wishes of the Deaf woman herself are essential with respect as to when to employ NZSL. Ideally, Deaf women need to be consulted on their communication preferences prior to their cancer screening encounters. This could be ascertained directly with the woman when booking appointments so that at the

appointment staff are prepared, and the preferred mode of communication is used. Such preparations could be facilitated by having a note on the woman's file that she identifies as Deaf. As indicated in our findings, should the women request a NZSL interpreter be organised, they may have a specific NZSL interpreter whom they use. In the case of GP visits, the woman may prefer to book these herself through iSign. However, with hospital appointments the hospital is responsible for booking the NZSL. Should the woman choose not to have an interpreter, then health practitioners need to be aware of the possible limitations that gestures and lip reading have as the main means of communication. Researchers have shown experienced lip-readers only understand about 30–45% of what is being said.[30] This percentage is likely to be less when the Deaf person is ill.[19] Reliance on written material may also be problematic as people who have been Deaf from birth or early childhood may have low literacy levels.[31]

When interpreters are requested and used by Deaf clients, practitioners still play an important role in ensuring communication throughout the encounter. For example, visual aids were identified as a significant means of communication by Deaf participants in an Australian study.[32] For example, NZSL could be augmented with appropriate models and diagrams to ensure full understanding of the procedures.

Regardless of whether an interpreter is present or not, our findings suggest that additional time should be allocated for Deaf women in the setting up of appointments. This would facilitate the exchange of full information and for the service to be given equitably. In addition, practitioners could make Deaf women aware of available accessible resources related to cancer screening, such as those on the Health Education webpage for NZSL resources.[33] Information about how and when the screening results are made available to the woman and her practitioner could also be given. Any additional national resources to support Deaf women's understanding of cancer screening procedures, timing of results, etc. should be developed in consultation with Deaf women.

Currently in Aotearoa New Zealand no information is gathered regarding the participation levels of Deaf (and disabled) women in these screening programmes. However, the Office for Disability Issue's Disability Data and Evidence Working Group's research may make this possible. There is a need for disaggregated data on Deaf women's engagement with screening and other health services. Such information would help direct, at a public health level, cancer screening knowledge/education and screening procedures that must be accessible to Deaf women and their community. This should be done in partnership with Deaf organisations.

Conclusion

Our findings were based on Deaf women's experiences with breast and cancer screening. We suggest they are applicable to other health national screening programmes' services. Ensuring Deaf clients have full information while balancing privacy and effective communication should be seen as best practices for all health practitioners and their staff. In this way we may hope to achieve health equity for this population.

COMPETING INTERESTS
Nil.

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Appendix 1: Semi structured Focus Group Interview Guide

Following welcome, introduction and establishment of ground rules:

Cervical Screening

- Who of you has not had a cervical smear test?
- Can you tell us why you have not had one, please?
- Who of you has had cervical smear test?
- How were you notified?
- Did you have an NZSL interpreter?
- Tell us about your experiences of having a cervical smear.
- Did you encounter any barriers?
- If so, explore further as to what kind, how they overcame them.

Breast Cancer Screening

- Who of you has not had a mammography?
- Can you tell us why you have not had one, please?
- Who of you has had a mammography?
- How were you notified?
- Did you have an NZSL interpreter?
- Tell us about your experiences of having a mammography.
- Did you encounter any barriers?
- If so, explore further as to what kind, how they overcame them.

Appendix 2: Some suggested resources

- Making health care more accessible for Deaf patients, Medical Assurance Society. https://www.mas.co.nz/hub/making-health-care-more-accessible-for-deaf-patients/.
- Say that again, Deaf Aotearoa. https://www.deaf.org.nz/translation/say-that-again/.
- Guidelines for working with people who are Deaf or hard of hearing, Queensland Government. https://www.health.qld.gov.au/__data/assets/pdf_file/0032/1098842/dmhs-guidelines.pdf.
- HealthEd has NZSL versions of both Breastscreen Aotearoa and cervical screening pamphlets available at https://healthed.govt.nz/collections/all/language-nz-sign-language.

The impact of COVID-19 restrictions on acute hospital presentations due to alcohol-related harm in Waitematā Auckland, New Zealand

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ABSTRACT

AIMS: New Zealand's public health response to the COVID-19 pandemic has largely been considered successful, although there have been concerns surrounding the potential harms of the lockdown restrictions enforced, including alteration of alcohol consumption. New Zealand utilised a four-tiered alert level system of lockdowns and restrictions, with Level 4 denoting strict lockdown. This study aimed to compare alcohol-related hospital presentations during these periods with corresponding calendar-matched dates from the preceding year.

METHODS: We conducted a retrospective case-controlled analysis of all alcohol-related hospital presentations between 1 January 2019 to 2 December 2021 and compared COVID-19 restriction periods to corresponding calendar-matched pre-pandemic periods.

RESULTS: A total of 3,722 and 3,479 alcohol-related acute hospital presentations occurred during the four COVID-19 restriction levels and corresponding control periods respectively. Alcohol-related presentations accounted for a greater proportion of all admissions during COVID-19 Alert Levels 3 and 1 than the respective control periods (both $p<0.05$), but not during Levels 4 and 2 (both $p>0.30$). Acute mental and behavioural disorders accounted for a greater proportion of alcohol-related presentations during Alert Levels 4 and 3 (both $p\leq0.02$), although alcohol dependence was present in a lower proportion of presentations during Alert Levels 4, 3, and 2 (all $p<0.01$). There was no difference in acute medical conditions including hepatitis and pancreatitis during all alert levels (all $p>0.05$).

CONCLUSION: Alcohol-related presentations were unchanged compared to matched control periods during the strictest level of lockdown, although acute mental and behavioural disorders accounted for a greater proportion of alcohol-related admissions during this period. New Zealand appears to have avoided the general trend of increased alcohol-related harms seen internationally during the COVID-19 pandemic and its lockdown restrictions.

New Zealand's public health response to the SARS-CoV-2 virus (COVID-19) pandemic has largely been considered successful, with lower-than-expected mortality.[1–3] The initial strategy to switch from infection mitigation to elimination was implemented by a nationwide "lockdown" on 26 March 2020 following evidence of community spread. This strictest level of enforcement, designated as "Level 4" of a four-tiered alert system, was a stay-at-home order and shut down all non-essential businesses. After 5 weeks, the country moved to "Level 3" for a further 2 weeks, which allowed limited contact with close family/whānau, and restricted regional movement.[4] This initial lockdown was successful in eliminating COVID-19 for 4 months, with subsequent staged reductions to less stringent restrictions of "Level 2 and 1". However, cases re-emerged and a further Level 4 lockdown in August 2021 was ordered after the first case of the Delta variant—this lasted 5 weeks in Auckland, the largest city in New Zealand, containing one third of the country's population. New Zealand then cycled in and out of restrictions thereafter, until 2 December 2021 when a different protection framework was introduced.

By April 2020, nearly half of the world's population was also under some form of lockdown across 90 countries or territories.[5] While there has been an apparent overall mortality benefit in countries with stringent lockdowns such as New Zealand and Australia, the United Kingdom (UK) imposed three lockdowns that did not show a clear benefit in terms of excess mortality.[3] There has been debate and criticism of the firm lockdown restrictions enforced, in particular that benefits of these interventions may be outweighed by potential harms on the economy, social structure, education and mental health.[6] These are amplified in vulnerable populations.[7,8]

Clarifying and quantifying excess morbidity

related to lockdowns is challenging. The World Health Organization (WHO) estimates that this pandemic has led to a 25% increase in the prevalence of anxiety and depression globally.[9] With considerable additional mental health burden, it has been widely reported that alcohol sales and use have increased during this time.[10–12] Consumption of alcohol has been shown to be significantly altered after implementation of lockdowns, with a trend towards increased consumption, although there is widespread variability between countries.[13] WHO encouraged governments to enforce measures that limited alcohol consumption.[14] Social isolation, fear, loss of work in conjunction with disruption to community alcohol and drug services, diversion of hospital resources and medical service avoidance are postulated as contributory.[15–17]

Specific research into acute hospital presentations due to alcohol-related harm during the lockdowns and pandemic restrictions in general are limited, both in New Zealand and internationally. They may only report on a narrow spectrum of conditions. While there are suggestions of harm, data may also often be at a population level as opposed to an individual level, and therefore miss important information and nuance.[18] Research from New Zealand offers a unique insight as an island nation of 5 million people, where lockdowns were strictly adhered to and initial limited infection numbers reduced the confounding effects of COVID-19 pathology.

We aimed to calculate the proportion of the total number of acute hospital presentations due to alcohol-related harm during each specific alert level period compared to control dates in 2019. In addition, we aimed to clarify the demographics of these patients, specialty involved with their care, final diagnoses and length and cost of their hospital presentation.

Methods

We conducted a retrospective case-controlled analysis of all patients with acute hospital contact due to alcohol-related harm as the primary cause of presentation within the Waitematā District, an area with a catchment of 650,000 people. This lies within Auckland, the largest city in New Zealand, which has a total population of 1.57 million and contains two other tertiary hospitals. We assessed presentations to the North Shore and Waitakere hospitals, which support over 660 and 283 beds respectively. In addition, we reviewed data from the Community Alcohol and Drug Service (CADS), a 10-bed inpatient unit for medically supervised detoxification. People domiciled in the catchment area of each hospital are admitted directly to that hospital.

Patients' presentations were extracted from clinical coding using ICD10-AM, 11th Edition from 1 January 2019 to 2 December 2021. Codes for disorders due to alcohol including intoxication, harmful use, poisoning, withdrawal, dependence, mental and behavioural disturbance or a medical condition due to alcohol were collected. Each case presentation was then individually reviewed by three doctors. Cases were only included if acute alcohol intake was deemed to be the primary cause of admission. If a case was ambiguous, it was independently reviewed by a fourth doctor.

To adjust for seasonality, admission data from matched calendar dates from the year immediately preceding the commencement of the COVID-19 alert level system were collected to serve as the control groups for each COVID-19 alert level period. Total patient hospital discharge numbers were obtained for 2019 to 2021 for proportional comparison. Local ethical approval was granted (ID: RM15128).

Diagnosis at discharge were categorised into 11 groups, as summarised in Appendix 2, and included acute medical conditions, acute mental and behavioural disorders, alcohol dependence, chronic medical conditions, chronic mental and behavioural disorders, gastrointestinal complaints, hepatitis, non-orthopaedic trauma, orthopaedic trauma, pancreatitis and seizures.

Alert Level Restriction categories can be summarised as:[4]

- Level 4 (lockdown): no travel or gatherings, all businesses must close except for necessities.
- Level 3: restricted local travel only, gatherings of up to 10 people allowed for weddings or funerals, contactless businesses may open, reconnection allowed with close family/whānau.
- Level 2: Domestic travel allowed, gatherings of up to 100 people allowed, businesses can open with additional health measures in place, reconnection with friends and socialisation in groups allowed.
- Level 1: No restrictions on personal movement or gatherings, all businesses can open, mask wearing and social distancing continue.

The primary outcome was calculation of the proportion of total number of acute hospital pre-

sentations due to alcohol-related harm during each alert level period compared to control dates in 2019. An additional review of differences in discharge diagnosis during these dates was also completed. Additional data collected for assessment of secondary outcomes included demographic variables, length of inpatient stay, discharge specialty and estimated cost of admission.

Statistical analysis was performed using IBM SPSS Statistics version 26.0 (New York, USA) and GraphPad Prism version 8.2.0 (California, USA). Inter-group comparisons of continuous variables between groups were performed using one-way analysis of variance (ANOVA), where normal distributions had been confirmed by Kolmogorov–Smirnov testing ($p>0.05$), with *post hoc* analysis for pairwise comparisons then being conducted using the multiplicity-adjusted Tukey test. Non-normally distributed continuous data were analysed using the Kruskall–Wallis test and *post hoc* pairwise comparisons performed using the multiplicity-adjusted Dunn test. Categorical data were compared using the Chi-squared and Fisher's exact tests. All tests were two-tailed and $p<0.05$ was considered significant. Data are presented as mean ± SD, median (IQR) or number of presentations (% of presentations), unless otherwise stated.

Results

A total of 3,722 alcohol-related acute hospital presentations occurred during the four COVID-19 alert levels, and 3,479 alcohol-related hospital presentations occurred during the corresponding seasonality-matched control periods from the preceding year (Table 2).

164 patients were excluded from final analysis as their presentations were not assessed to be due to acute alcohol use (120), had incomplete documentation (28) or were an electively arranged review (16).

Overall, alcohol-related presentations accounted for between 1.5–1.8% of all presentations within the district during the four COVID-19 alert levels. Alcohol-related presentations accounted for a greater proportion of all presentations during COVID-19 Alert Levels 3 and 1 when compared to the corresponding seasonality-matched control periods (both $p<0.05$), but not during Alert Levels 4 and 2 (both $p \geq 0.30$). The frequency of alcohol-related presentations by discharge diagnosis per month and alert level is illustrated in Figure 1.

Alcohol-related presentation characteristics by COVID-19 alert level are summarised in Table 3. Further detail is available in the Appendix 1. Age, gender, ethnicity, admission length and cost of admission did not differ significantly between the four alert levels and the corresponding control periods.

Acute mental and behavioural disorders accounted for a greater proportion of alcohol-related presentations during Alert Levels 4 and 3 (both $p\leq0.02$), chronic medical conditions were present in a higher portion of presentations during Alert Levels 3 and 1 (both $p<0.05$), while an increased proportion of orthopaedic conditions were observed during Alert Level 2. Alcohol dependence was present in a lower proportion of presentations during Alert Levels 4, 3, and 2 (all $p<0.01$), while chronic mental and behavioural disorders accounted for a decreased proportion of presentations during Alert Level 3 ($p<0.001$). Acute medical conditions did not differ from the control periods during all alert levels (all $p>0.05$).

A higher proportion of cases were discharged from the General Medicine service during all four alert levels than control periods (all $p\leq0.01$), and an increased proportion of patients were also discharged from the General Surgery service during Alert Level 2 ($p=0.048$). Discharges from the Emergency Medicine service accounted for a lower proportion of alcohol-related admissions during Alert Levels 3 and 1 (both $p\leq0.01$), while a decreased proportion of discharges from the Community Alcohol and Drug Service were observed during Alert Levels 4 and 2 (both $p\leq0.01$).

Discussion

To the best of our knowledge, this is the first study to compare all-cause acute presentations due to alcohol-related harm before, during and after restrictions during the COVID-19 pandemic. During the 67 days Auckland spent in the strictest COVID-19 lockdown (Level 4), there was no change in proportion of alcohol-related presentations as compared to the previous control year ($p=0.42$). Published data from an online survey of 925 New Zealanders for Te Hiringa Hauora | Health Promotion Agency, *Impact of COVID-19*, reported a 19% increase in alcohol consumption during the first lockdown, noting stress, boredom and anxiety as key factors for this. However, 47% did not change consumption, and 34% decreased consumption.[19] These figures may help to explain this finding, and the reduced proportions of patients

diagnosed with alcohol dependence at Levels 4, 3 and 2 respectively: 13 vs 25% (p=0.002), 20 vs 27% (p=0.006), 19 vs 27% p<0.001. Over this time there was little change in the volume of alcohol available for consumption, despite the major disruption to the hospitality industry.[20] This must then reflect the availability and prominence of packaged alcohol consumption in New Zealand, which has been shown as problematic.[21]

Published national data of drinking practices during the pandemic vary considerably. In Colombia, Mexico [22] and South Australia, [23] alcohol use reportedly decreased, while in Greece consumption was largely unchanged.[24] Surveys from Germany,[25] Canada[26] and Poland[27] suggest substantially increased consumption. In the UK, high risk drinking increased by over 5%, with the prevalence of drinking ≥4 times a week dou-

Table 1: Dates for restrictions within Auckland.[4]

Level 4	25 March 2020	27 April 2020
Level 3	28 April 2020	13 May 2020
Level 2	14 May 2020	8 June 2020
Level 1	9 June 2020	11 August 2020
Level 3	12 August 2020	30 August 2020
Level 2	31 August 2020	7 October 2020
Level 1	8 October 2020	13 February 2021
Level 3	14 February 2021	17 February 2021
Level 2	18 February 2021	22 February 2021
Level 1	23 February 2021	28 February 2021
Level 3	28 February 2021	7 March 2021
Level 2	7 March 2021	12 March 2021
Level 1	12 March 2021	17 August 2021
Level 4	18 August 2021	21 September 2021
Level 3*	22 September 2021	2 December 2021

*The easing of restrictions within the Level 3 framework ("steps") was ordered from 7 October 2021.[4]

Table 2: Proportion of alcohol-related acute hospital presentations by COVID-19 alert levels and control periods.

Characteristic	Alert level	Alert level period	Control period	P-value
Proportion of alcohol-related presentations (number, %)	4	294/19429 (1.5%)	392/24286 (1.6%)	0.42
	3	649/39715 (1.6%)	618/42618 (1.5%)	0.03*
	2	482/24850 (1.8%)	424/26340 (1.7%)	0.30
	1	2297/127532 (1.8%)	2045/126736 (1.6%)	<0.001*

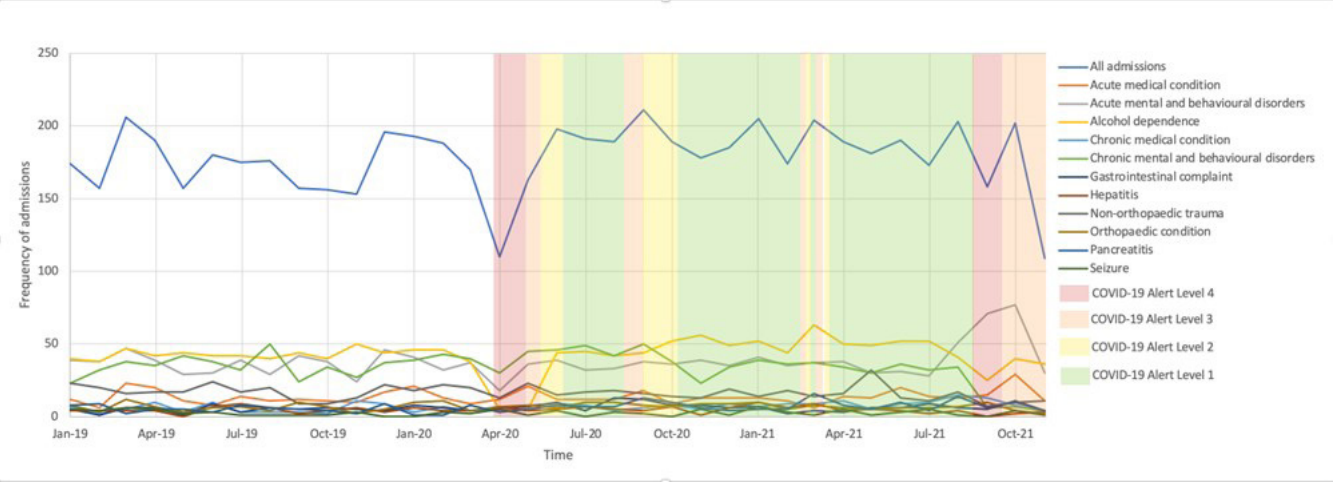
Table 3: Alcohol-related acute hospital presentation characteristics by COVID-19 alert level and control periods. Data are presented as mean ± SD, median (IQR) or number of presentations (% of presentations).

	COVID-19 Alert Level											
	Level 4			Level 3			Level 2			Level 1		
Characteristic	Alert level period	Control period	P-value	Alert level period	Control period	P-value	Alert level period	Control period	P-value	Alert level period	Control period	P-value
Sample size	294	392		649	618		482	424		2297	2045	
Length of admission (days)	2 (1–9)	2 (1–7)	0.02	2 (1–10)	1 (0–7)	0.01	1 (0–6)	2 (0–7)	0.29	2 (0–7)	2 (0–7)	0.46
Cost of admission (NZD, in $)	2,914 (1,150–7,729)	3,905 (1,206–8,140)	0.42	2,822 (1,353–7,393)	3,027 (1,065–8,028)	0.43	2,905 (1,378–7,362)	3015 (1,224–8,028)	0.68	3,449 (1,505–7,505)	3,280 (1,231–8,057)	0.16
Diagnosis			0.01			<0.001			0.02			0.04
Acute medical condition	32 (10.9%)	31 (7.9%)		65 (10.0%)	42 (6.8%)		46 (9.5%)	26 (6.1%)		142 (6.2%)	151 (7.4%)	
Acute mental and behavioural disorders	82 (27.9%)	79 (20.2%)		188 (29.0%)	120 (19.4%)		101 (21.0%)	104 (24.5%)		430 (18.7%)	430 (21.0%)	
Alcohol dependence	38 (12.9%)	96 (24.5%)		132 (20.3%)	166 (26.9%)		93 (19.3%)	113 (26.7%)		612 (26.6%)	499 (24.4%)	
Chronic medical condition	12 (4.1%)	10 (2.6%)		28 (4.3%)	14 (2.3%)		18 (3.7%)	10 (2.4%)		109 (4.7%)	71 (3.5%)	

Table 3 (continued): Alcohol-related acute hospital presentation characteristics by COVID-19 alert level and control periods. Data are presented as mean ± SD, median (IQR) or number of presentations (% of presentations).

	Level 4			Level 3			Level 2			Level 1		
Characteristic	**Alert level period**	**Control period**	**P-value**	**Alert level period**	**Control period**	**P-value**	**Alert level period**	**Control period**	**P-value**	**Alert level period**	**Control period**	**P-value**
Chronic mental and behavioural disorders	52 (17.7%)	80 (20.4%)		74 (11.4%)	135 (21.8%)		102 (21.2%)	84 (19.8%)		442 (19.2%)	400 (19.6%)	
Gastrointesti-nal complaint	10 (3.4%)	13 (3.3%)		31 (4.8%)	21 (3.4%)		22 (4.6%)	12 (2.8%)		80 (3.5%)	56 (2.7%)	
Hepatitis	8 (2.7%)	9 (2.3%)		13 (2.0%)	13 (2.1%)		10 (2.1%)	7 (1.7%)		64 (2.8%)	61 (3.0%)	
Non-orthopae-dic trauma	16 (5.4%)	20 (5.1%)		28 (4.3%)	27 (4.4%)		17 (3.5%)	17 (4.0%)		89 (3.9%)	64 (3.1%)	
Orthopaedic condition	16 (5.4%)	12 (3.1%)		29 (4.5%)	20 (3.2%)		27 (5.6%)	10 (2.4%)		85 (3.7%)	70 (3.4%)	
Pancreatitis	3 (1.0%)	6 (1.5%)		14 (2.2%)	11 (1.8%)		3 (0.6%)	2 (0.5%)		35 (1.5%)	31 (1.5%)	
Seizure	25 (8.5%)	36 (9.2%)		47 (7.2%)	49 (7.9%)		43 (8.9%)	39 (9.2%)		209 (9.1%)	212 (10.4%)	

Figure 1: Total number of alcohol-related acute hospital presentations by discharge diagnosis and dates (COVID-19 alert levels and control period).



bling from 12.5% to 26% from before to during the pandemic (p<0.001).[28] There is similar data from the United States (US), with a 14% increase of frequency of consumption compared to 2019.[29]

However, within New Zealand, there may have been rebound consumption following the complete relaxation of restrictions seen in Level 1, where there were no longer limitations placed on individual movements, gatherings or businesses operations. 1.8% of total presentations were attributable to alcohol, an increase from 1.5% in Level 4, and 0.2% higher than corresponding dates from 2019 (p<0.001) (see Table 2). These findings are supported by the Te Hiringa Hauora | Health Promotion Agency's *Impact of COVID-19* survey, indicating 64% returned to their pre-lockdown drinking practices. This suggests that people who may have been drinking less during lockdown may have subsequently increasing their consumption again.[19] Along with Level 3, this was also the period where alcohol induced exacerbations of chronic medical conditions were higher than matched controls, 2.3 vs 4.3%; p=0.04 and 4.7 vs 3.5%; p=0.04 in Level 3 and 1 respectively. This rebound effect was also noted with alcohol consumption in Belgium,[30] in trauma admissions in South Africa[31] and in emergency department presentations in the Netherlands[32] and Italy, where the relative frequency of severe alcohol intoxication in adolescents and young adults increased from 0.88% during the last part of the lockdown to 11.3% after lockdown release.[33]

There was much concern around resources and preparedness of hospital services for the care of patients.[34] General medicine experienced significant increase in numbers of patients with alcohol-related harm at each alert level compared to the 2019 control year. This was most pronounced in Level 4 lockdown (30% vs 19%; p=0.001). This first lockdown was also when the Community Alcohol and Drug Service (CADS) shut, and along with reduced services in the second Level 4 lockdown accounts for the decrease in discharges during this period (22 vs 9% p<0.001). A proportion of these admissions may have been passed onto the general medical service to manage. Certainly in the US, alcohol withdrawal rates in hospitalised patients increased by 34% in 2020 during the pandemic compared to 2019.[35]

Concerningly, there was a significant increase in acute mental and behavioural disorders during the strictest lockdown periods, Level 4 and 3. This increased from 20% to 28% (p=0.02) and 20% to 29% (p<0.001) respectively. This is in keeping with data stating that the majority of those who were drinking more said it was to help them "relax or switch off, or because they have been feeling stressed and anxious".[19] In Alberta, Canada, presentations to the ED due to mental and behavioural disorders stemming from alcohol increased significantly from 2.7% in 2019 to 3.5% in 2020.[36] In the UK, there was significant association found between increased alcohol consumption and poor overall mental health (odds ratio (OR) 1.64), depres-

sive symptoms and lower mental wellbeing.[37] Deaths from mental and behavioural disorders due to alcohol increased by 10.8%, compared to a 1.1% increase between 2018 and 2019.[38] In Australia, respondents who reported an increase in alcohol intake were more likely to have higher levels of depression (OR 1.07), anxiety (OR 1.08) and stress (OR 1.10).[39]

The influence on presentations due to alcohol-related harm on rates of acute medical conditions, gastrointestinal complaints, hepatitis and pancreatitis was surprisingly limited in our study, with no significant differences seen. In comparison, in the US following the onset of the pandemic, alcoholic liver disease became the most common indication for being listed on the transplant waitlist, and the fastest increasing cause for liver transplant.[40] A tertiary liver unit in London reported more than a doubling of referrals for alcohol-related liver disease.[41] Japan reported an increase of over 20% of hospital presentations with alcohol-related liver disease or pancreatitis.[18]

Presentations with orthopaedic injury or non-orthopaedic related trauma was also stable, aside from an increase in orthopaedic diagnoses at Level 2 (6 vs 2%, p=0.01). A study from Christchurch Hospital in New Zealand noted a 42% reduction in the volume of major trauma admissions during lockdown, yet an increase from 25% to 33% of those associated with alcohol intake pre-lockdown and during lockdown respectively. Post-lockdown, this decreased to 19%, although numbers were small.[42]

Patient demographics in our study were also remarkably alike, with no differences seen in presentation patterns based on age, gender or ethnicity during alert levels and control periods.

These data represent a detailed and complete overview of the impact of COVID-19 on a whole healthcare system. We believe that overall, it demonstrates that this population has largely managed to limit some of the harmful effects of alcohol harms seen in other countries. The New Zealand Government has been praised in its response and public health measures, with daily televised briefings re-enforcing key themes of 1) open, honest and straightforward communication, 2) distinctive and motivational language, and 3) expressions of care.[43] Frequent references to the New Zealand public as a "team of 5 million", with a slogan of "be kind", along with implementation of widespread social support structures including wage subsidy and leave support schemes may have helped to partially mitigate some of the negative effects of lockdown seen elsewhere.

Strengths of this study include the complete, real-world picture of the burden of alcohol harm on hospitalisation within Waitematā, Auckland. Studies reporting on only a specific or narrow spectrum of conditions may miss counter reactionary outcomes in other areas or specialties not measured. Individual case review of each presentation allowed for accurate inclusion and exclusion of cases. It is likely that accurate full population data within our catchment area was obtained, as at the onset of the pandemic people were advised to return to their home address. Patients domiciled in the area of each hospital are only admitted directly to that hospital, with few inter-hospital transfers and no acute private healthcare facilities functioning to see patients to provide acute care for alcohol-related harm. The initial low rates of infection and community transmission, and minimal hospital occupancy with COVID-19 cases, limited confounding of illnesses. A long follow-up period allowed for measurement of any rebound phenomenon; however, further data collection should be continued. Legacy effects of previous mass crises, such as the severe acute respiratory syndrome (SARS) epidemic of 2003, which led to increases in alcohol use including in hospital workers at a rate nearly 1.5 times higher even 3 years after this outbreak.[44,45]

This study is limited by its retrospective design. Quantification of excess alcohol that caused presentations was not recorded. Severity of illnesses of the patients was not measured, although we note there were no large differences in length of hospital stay or cost of hospitalisation, which may suggest otherwise. There was a considerable decrease of over 4,800 total acute hospital presentations during 67 days spent during the strict lockdown (Level 4). These data do not capture many patients who may have not presented to hospital that ordinarily would have. Research from New Zealand confirms that concerns regarding the risk of COVID-19 was prevalent and affected the decision to present to hospital.[46] Comparisons of alcohol-related presentations as a proportion of all hospital presentations between the COVID-19 alert levels and seasonality-matched control periods might have partially mitigated this bias. In addition, this study does not take into account

primary care presentations or ambulance callouts to homes, which have been reported to be considerably higher in some areas.[47] Although this data may be generalisable to larger New Zealand cities, it is difficult to extrapolate to other countries given the substantial differences in pre-pandemic alcohol misuse, variations in restrictions enforced, other social responses and national geography including rurality.[48]

In conclusion, alcohol-related presentations were unchanged compared to matched control periods during the strictest level of lockdown. There was a significant increase in presentations with acute mental and behavioural disorders due to alcohol misuse in this period, although presentations with alcohol dependence were consistently lower even as restrictions eased. The general medical service saw a significantly increased burden of patients with alcohol-related harm. Although difficult to compare internationally, New Zealand appears to have largely avoided the general trend of increased alcohol-related harms during the COVID-19 pandemic and its lockdown restrictions.

COMPETING INTERESTS
Nil.

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Appendices

Appendix 1

Appendix 1 Table 1: Alcohol-related acute hospital presentation characteristics by COVID-19 alert level and control periods. Data are presented as mean ± SD, median (IQR) or number of presentations (% of presentations).

Characteristic	Alert level period	Control period	P-value
COVID-19 Alert Level 4	**N=294**	**N=392**	
Age (years)	46.5±17.3	46.6±16.8	0.82
Male gender	170 (57.8%)	241 (61.5%)	0.35
Ethnicity			**0.15**
New Zealand European	200 (68.0%)	273 (69.6%)	
Māori	33 (11.2%)	62 (15.8%)	
Pasifika	16 (5.4%)	17 (4.3%)	
Asian	37 (12.6%)	34 (8.7%)	
Other	8 (2.7%)	6 (1.5%)	
Length of admission (days)	2 (1–9)	2 (1–7)	0.02*
Cost of admission (NZD, in $)	2,914 (1,150-7,729)	3,905 (1,206-8,140)	0.42
Discharge specialty			**<0.001***
Community alcohol and drug service	26 (8.8%)	85 (21.7%)	
Emergency medicine	67 (22.8%)	106 (27.0%)	
General medicine	89 (30.3%)	76 (19.4%)	
General surgery	19 (6.5%)	17 (4.3%)	
Intensive care	0 (0.0%)	2 (0.5%)	
Medicine sub-specialties	75 (25.5%)	79 (20.2%)	
Mental health	12 (4.1%)	14 (3.6%)	
Orthopaedic surgery	6 (2.0%)	13 (3.3%)	
Diagnosis			**0.01***
Acute medical condition	32 (10.9%)	31 (7.9%)	
Acute mental and behavioural disorders	82 (27.9%)	79 (20.2%)	
Alcohol dependence	38 (12.9%)	96 (24.5%)	
Chronic medical condition	12 (4.1%)	10 (2.6%)	
Chronic mental and behavioural disorders	52 (17.7%)	80 (20.4%)	
Gastrointestinal complaint	10 (3.4%)	13 (3.3%)	

Appendix 1 Table 1 (continued): Alcohol-related acute hospital presentation characteristics by COVID-19 alert level and control periods. Data are presented as mean ± SD, median (IQR) or number of presentations (% of presentations).

Hepatitis	8 (2.7%)	9 (2.3%)	
Non-orthopaedic trauma	16 (5.4%)	20 (5.1%)	
Orthopaedic condition	16 (5.4%)	12 (3.1%)	
Pancreatitis	3 (1.0%)	6 (1.5%)	
Seizure	25 (8.5%)	36 (9.2%)	
COVID-19 Alert Level 3	**N=649**	**N=618**	
Age (years)	45.2±16.0	44.7±17.1	0.78
Male gender	377 (57.7%)	357 (61.0%)	0.91
Ethnicity			**0.66**
New Zealand European	475 (73.2%)	451 (73.0%)	
Māori	79 (12.2%)	75 (12.1%)	
Pasifika	32 (4.9%)	22 (3.6%)	
Asian	52 (8.0%)	60 (9.7%)	
Other	11 (1.7%)	10 (1.6%)	
Length of admission (days)	2 (1–10)	1 (0–7)	0.01*
Cost of admission (NZD, in $)	2,822 (1,353–7,393)	3,027 (1,065–8,028)	0.43
Discharge specialty			**0.047***
Community alcohol and drug service	118 (18.2%)	137 (22.2%)	
Emergency medicine	149 (23.0%)	174 (28.2%)	
General medicine	175 (27.0%)	124 (20.1%)	
General surgery	35 (5.4%)	30 (4.9%)	
Intensive care	1 (0.2%)	0 (0.0%)	
Medicine sub-specialties	127 (19.6%)	118 (29.1%)	
Mental health	28 (4.3%)	24 (3.9%)	
Orthopaedic surgery	16 (2.5%)	11 (1.8%)	
Diagnosis			**<0.001***
Acute medical condition	65 (10.0%)	42 (6.8%)	
Acute mental and behavioural disorders	188 (29.0%)	120 (19.4%)	
Alcohol dependence	132 (20.3%)	166 (26.9%)	
Chronic medical condition	28 (4.3%)	14 (2.3%)	

Appendix 1 Table 1 (continued): Alcohol-related acute hospital presentation characteristics by COVID-19 alert level and control periods. Data are presented as mean ± SD, median (IQR) or number of presentations (% of presentations).

Chronic mental and behavioural disorders	74 (11.4%)	135 (21.8%)	
Gastrointestinal complaint	31 (4.8%)	21 (3.4%)	
Hepatitis	13 (2.0%)	13 (2.1%)	
Non-orthopaedic trauma	28 (4.3%)	27 (4.4%)	
Orthopaedic condition	29 (4.5%)	20 (3.2%)	
Pancreatitis	14 (2.2%)	11 (1.8%)	
Seizure	47 (7.2%)	49 (7.9%)	
COVID-19 Alert Level 2	**N=482**	**N=424**	
Age (years)	44.5±16.8	44.6±16.8	0.93
Male gender	289 (60.0%)	258 (60.8%)	0.78
Ethnicity			**0.24**
New Zealand European	346 (71.8%)	318 (75.0%)	
Māori	70 (14.5%)	41 (9.7%)	
Pasifika	19 (3.9%)	16 (3.8%)	
Asian	38 (7.9%)	41 (9.7%)	
Other	9 (1.9%)	8 (1.9%)	
Length of admission (days)	1 (0–6)	2 (0–7)	0.29
Cost of admission (NZD, in $)	2,905 (1378–7362)	3,015 (1,224–8,028)	0.68
Discharge specialty			**0.006***
Community alcohol and drug service	77 (16.0%)	95 (22.4%)	
Emergency medicine	131 (27.2%)	136 (32.1%)	
General medicine	123 (25.5%)	79 (18.6%)	
General surgery	28 (5.8%)	13 (3.1%)	
Intensive care	4 (0.8%)	0 (0.0%)	
Medicine sub-specialties	101 (21.0%)	84 (19.8%)	
Mental health	6 (1.2%)	8 (1.9%)	
Orthopaedic surgery	12 (2.5%)	9 (2.1%)	
Diagnosis			**0.02***
Acute medical condition	46 (9.5%)	26 (6.1%)	
Acute mental and behavioural disorders	101 (21.0%)	104 (24.5%)	

Appendix 1 Table 1 (continued): Alcohol-related acute hospital presentation characteristics by COVID-19 alert level and control periods. Data are presented as mean ± SD, median (IQR) or number of presentations (% of presentations).

Alcohol dependence	93 (19.3%)	113 (26.7%)	
Chronic medical condition	18 (3.7%)	10 (2.4%)	
Chronic mental and behavioural disorders	102 (21.2%)	84 (19.8%)	
Gastrointestinal complaint	22 (4.6%)	12 (2.8%)	
Hepatitis	10 (2.1%)	7 (1.7%)	
Non-orthopaedic trauma	17 (3.5%)	17 (4.0%)	
Orthopaedic condition	27 (5.6%)	10 (2.4%)	
Pancreatitis	3 (0.6%)	2 (0.5%)	
Seizure	43 (8.9%)	39 (9.2%)	
COVID-19 Alert Level 1	**N=2,297**	**N=2,045**	
Age (years)	46.0±17.2	45.4±16.9	0.25
Male gender	1455 (63.3%)	1247 (61.0%)	0.11
Ethnicity			**0.41**
New Zealand European	1,636 (71.2%)	1,502 (73.4%)	
Māori	322 (14.0%)	253 (12.4%)	
Pasifika	97 (4.2%)	83 (4.1%)	
Asian	206 (9.0%)	170 (8.3%)	
Other	36 (1.6%)	37 (1.8%)	
Length of admission (days)	2 (0–7)	2 (0–7)	0.46
Cost of admission (NZD, in $)	3,449 (1,505–7,505)	3,280 (1,231–8,057)	0.16
Discharge specialty			**0.005***
Community alcohol and drug service	485 (21.1%)	424 (20.7%)	
Emergency medicine	555 (24.2%)	606 (29.6%)	
General medicine	591 (25.7%)	437 (21.4%)	
General surgery	108 (4.7%)	77 (3.8%)	
Intensive care	7 (0.3%)	7 (0.3%)	
Medicine sub-specialties	434 (18.9%)	397 (19.4%)	
Mental health	61 (2.7%)	61 (3.0%)	
Orthopaedic surgery	56 (2.4%)	36 (1.8%)	

Appendix 1 Table 1 (continued): Alcohol-related acute hospital presentation characteristics by COVID-19 alert level and control periods. Data are presented as mean ± SD, median (IQR) or number of presentations (% of presentations).

Diagnosis			**0.04***
Acute medical condition	142 (6.2%)	151 (7.4%)	
Acute mental and behavioural disorders	430 (18.7%)	430 (21.0%)	
Alcohol dependence	612 (26.6%)	499 (24.4%)	
Chronic medical condition	109 (4.7%)	71 (3.5%)	
Chronic mental and behavioural disorders	442 (19.2%)	400 (19.6%)	
Gastrointestinal complaint	80 (3.5%)	56 (2.7%)	
Hepatitis	64 (2.8%)	61 (3.0%)	
Non-orthopaedic trauma	89 (3.9%)	64 (3.1%)	
Orthopaedic condition	85 (3.7%)	70 (3.4%)	
Pancreatitis	35 (1.5%)	31 (1.5%)	
Seizure	209 (9.1%)	212 (10.4%)	

Appendix 2

Appendix 2 Table 1: Diagnosis at discharge categorisation.

Diagnosis	Details
Acute medical condition	Alcohol use resulting in acute medical condition, e.g., syncope or collapse, volume depletion, nausea and/or vomiting, new atrial fibrillation or arrhythmia, diarrhoea, aspiration, headache, ataxia.
Acute mental and behavioural disorders	Acute mental health changes including anxiety or agitation, suicidal intent, delirium, overdose (including polysubstance).
Alcohol dependence	Community alcohol and drug services (CADS) admission or acute review, inpatient hospital requirement for medically supervised withdrawal.
Chronic medical condition	Exacerbation of underlying chronic condition due to alcohol use, e.g., poorly controlled type I or II diabetes mellitus (diabetic ketoacidosis, hyperosmolar hyperglycaemic state), Addisonian crisis, fluid overload, arrythmia, fluid overload, renal disease, alcoholic myopathy, delirium superimposed on dementia.
Chronic mental and behavioural disorders	Previously diagnosed chronic mental health issue (e.g., anxiety, depression, schizophrenia, bipolar effective disorder) exacerbated by alcohol use.
Gastrointestinal complaint	Gastritis or gastrointestinal bleeding (e.g., varices, alcohol-induced Mallory-Weiss tear, oesophagitis).
Hepatitis	Acute hepatitis or decompensated cirrhosis due to acute alcohol use.
Non-orthopaedic trauma	Contusions, ribs fractures, facial fractures, lacerations, brain haemorrhage, concussion.
Orthopaedic trauma	Admission due to orthopaedic trauma e.g., joint dislocation, tendon rupture and broken bones, not including facial or rib fractures.
Pancreatitis	Confirmed acute or chronic pancreatitis.
Seizure	Acute seizure episode (either first event or known epilepsy disorder)

The incidence of juvenile onset recurrent respiratory papillomatosis at Starship Children's Hospital before and after a national HPV vaccination programme: a retrospective review

Dora Blair, Evelyn Lamble, Graeme van der Meer, Edward Toll, Craig McCaffer, Colin Barber, Nikki Mills, Michel Neeff

ABSTRACT

AIM: To review and compare the incidence of juvenile onset recurrent respiratory papillomatosis (JRRP) at Starship Children's Hospital (SSH) before and after the introduction of a national HPV vaccination programme.

METHODS: Patients treated for JRRP at SSH were identified retrospectively using ICD-10 code D14.1 over a 14-year period. The incidence of JRRP in the 10-year period prior to the introduction of HPV vaccination (1 September 1998 to 31 August 2008) was compared with the incidence after its introduction. A second comparison was made between the pre-vaccination incidence with the incidence over the most recent 6 years when the vaccination became more widely available. All New Zealand hospital ORL departments that referred children with JRRP to SSH exclusively were included.

RESULTS: SSH manages about half of the New Zealand paediatric population with JRRP. The incidence of JRRP before the introduction of the HPV vaccination programme was 0.21 per 100,000 per year in children 14 years of age and younger. This remained stable between 2008 and 2022 (0.23 vs 0.21 per 100,000 per year). The mean incidence in the later post-vaccination period was 0.15 per 100,000 per year based on small numbers.

CONCLUSION: The mean incidence of JRRP before and after the introduction of HPV has remained unchanged in children treated at SSH. More recently, a reduction in incidence has been noted, although this is based on small numbers. The low HPV vaccination rate (≤70%) may explain why a significant reduction in the incidence of JRRP seen overseas has not been observed in New Zealand. Ongoing surveillance and a national study would provide more insight into the true incidence and evolving trends.

Juvenile onset recurrent respiratory papillomatosis (JRRP) is a rare and often chronic disease.[1–4] It is characterised by benign but potentially aggressive recurring laryngeal epithelial lesions[5] caused by the human papilloma virus (HPV), most likely by vertical transmission.[6] Being the first-born child with a maternal age younger than 20 years increases the risk.[6] Children can present with dysphonia, chronic coughing or with signs of compromised airways including stridor.[5] Multiple procedures to debulk the recurrent lesions to maintain voice and airway patency are often required. More severely affected patients may require a tracheostomy. Mortality has been reported.[5]

A quadrivalent vaccine which protects against HPV subtypes 6, 11, 16 and 18 was added to the national immunisation schedule for females aged 12 years in 2008.[7] Females up to the age of 20 were later eligible as part of a catch-up programme between 2009 to 2016.[7] A nonavalent vaccine replaced this in 2017, which also protects against subtypes 31, 33, 45, 52 and 58. At the same time the immunisation schedule was extended to include males and females aged 9 to 26 years.[8] This vaccination protects against high-risk HPV types responsible for cervical cancer, but also offers protection against HPV types 6 and 11, which cause the majority of JRRP.[9]

As the number of individuals protected against HPV increases, the incidence and prevalence of JRRP could be expected to decrease. There are few studies reviewing the incidence of JRRP following the introduction of an HPV vaccination programme.[10] In Australia, an estimated incidence of 0.16 per 100,000 per year declining to 0.02 per 100,000 per year after the introduction of the vaccine has been reported.[10] Preliminary data from the US and

Canada show similar trends.[11] Trends in New Zealand are unknown.

Aim

To review and compare the incidence of JRRP at Starship Children's Hospital (SSH) before and after the introduction of a national HPV vaccination programme.

Study design

This is a single-centre retrospective review of children managed for JRRP at SSH. Children aged up to and including 14 years were included. This age cut-off was chosen to align with census data. As the HPV vaccination was introduced on 1 September 2007, a study year is counted from 1 September to 31 August. It took 1 year for the first cohort of children to complete their vaccination. As a result, children treated between 1 September 1998 and 31 August 2008 (before vaccination) were compared with those diagnosed between 1 September 2008 and 31 August 2022 (after vaccination).

Children without histopathological confirmation of laryngeal papillomatosis were excluded.

All New Zealand hospitals with otolaryngology (ORL) departments were contacted regarding their referral patterns. ORL departments that referred children with JRRP to SSH exclusively were included. Children were excluded when SSH was not the exclusive referral hospital.

This study (AH22479) was approved by Auckland Health Research Ethics Committee (AHREC) on 14 May 2021.

Method

A retrospective review of the electronic clinical records was performed at Starship Children's Hospital. Children were identified by searching for ICD-10 code D14.1 (benign lesions of the larynx).

A survey was emailed to all ORL departments' clinical directors and/or paediatric otolaryngology leads in New Zealand. Follow-up emails and phone calls were made where additional information was required. All New Zealand hospital ORL departments that referred patients with JRRP to SSH exclusively were included.

Population data by age and district were extracted from Statistics New Zealand.[12] These data were interpolated to calculate the population at risk of JRRP between 1998 and 2022. All data were analysed using a generalised linear model, modelling the observed counts data as having a Poisson distribution. A p-value of <0.05 was considered statistically significant.

The mean of the incidence over the 10 years prior to the introduction of the HPV vaccination was compared with the mean of the incidence after its introduction. Further analysis was performed from 2016 when the vaccination programme was made more widely available. Statistical analyses were carried out using SAS 9.4 and R statistical program version 4.1.2.[13,14]

Results

The SSH paediatric ORL department received referrals from hospitals throughout the North Island and from one hospital in the South Island. All ORL departments contacted completed the survey.

A total of 31 children with JRRP treated at SSH were identified between 1 September 2008 and 31 August 2022. This included patients from our catchment in central Auckland, as well as hospitals that referred to SSH exclusively. These included Northland, Waitamatā, Counties Manukau, MidCentral, Whanganui and Bay of Plenty (Figure 1). Eight children were excluded as their primary hospitals did not refer JRRP patients to SSH exclusively. These include Lakes, Taranaki, Hawkes Bay, Tairāwhiti, Capital Coast, Hutt Valley, Wairarapa and Nelson.

The paediatric populations of the qualifying districts were included in the analysis (Figure 1). This included 44 to 49% of the total New Zealand population of children. The incidence over the study period is displayed in Figure 2.

The mean incidence of JRRP prior to the introduction of the HPV vaccination was 0.21 per 100,000 children per year. There was no change after the introduction of the vaccination with a rate of 0.23 per 100,000 children per year observed (Table 1).

The mean incidence over the last 6 years (2017 to 2022) was 0.15 per 100,000 children per year. Compared to the baseline, there was a non-significant reduction by 0.06 per 100,000 children per year (p=0.56) (Table 2).

Discussion

The introduction of the HPV vaccine has not resulted in a significant reduction in the incidence of JRRP in New Zealand to date. Between 1998 and 2008, before the introduction of the HPV vaccine, the incidence of children with JRRP in the SSH

Figure 1: Map of referring districts of the North Island, New Zealand.

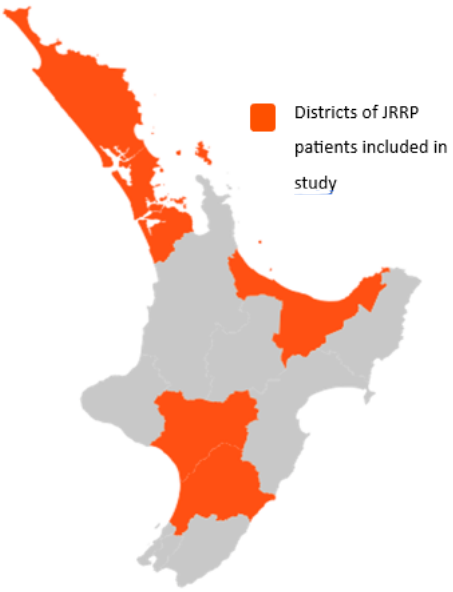

Figure 2: Yearly incidence of juvenile onset recurrent respiratory papillomatosis per 100,000 children treated at Starship Hospital.

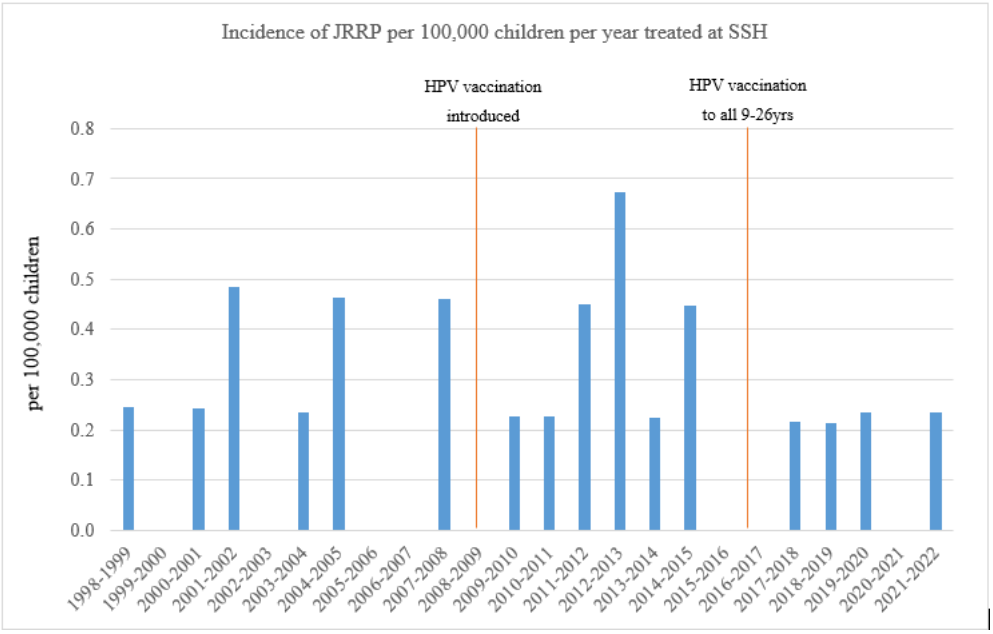

Table 1: Incidence of juvenile onset recurrent respiratory papillomatosis before and after HPV vaccination, 14-year-old children.

Period	Cases	Population	Incidence (95% CI)	*P*-value
1998–2008	9	4219400	0.21 (0.07–0.35)	0.90
2008–2022	14	6215000	0.23 (0.11–0.34)	

Table 2: Incidence before HPV vaccination and after extended eligibility criteria.

Period	Cases	Population	Incidence (95% CI)	*P*-value
1998–2008	9	4219400	0.21 (0.07–0.35)	0.56
2017–2022	4	2664500	0.15 (0.003–0.30)	

catchment area was 0.21 per 100,000 children per year. This is comparable to the baseline incidence of 0.24 in Canada.[15] The reported incidence range varies from 4.3 per 100,000 persons under 14 years per year in the US[16] to a much lower incidence of 0.17 per 100,000 persons under 18 years per year in Norway.[4] An Australian study could not determine the incidence but estimated the pre-vaccination prevalence of JRRP to have been between 0.6–1.1 per 100,000 persons under 20 years.[3]

There has been a reduction in the incidence of JRRP to 0.15 per 100,000 children per year in the most past 6 years. This decline compared to the pre-vaccination incidence remained non-significant (Table 2). Females who received their HPV vaccination in 2008 are now 26 years old and those eligible as part of the "catch-up" cohort are now 31 and 32 years old. The median age of first-time mothers has been between 29.9 and 30.5 years in New Zealand over the past decade,[17] therefore, many of the vaccinated women may not have borne children. As a greater number of vaccinated women become mothers, a further reduction in the incidence may be observed.[15] Additionally, the earlier cohorts included a heterogenous age group of 12- to 20-year-olds. As the effectiveness of the vaccine relies upon being vaccinated prior to sexual debut, a greater proportion of the earlier cohort may not be protected.

Australia reported a declining incidence from 0.16 per 100,000 children per year in 2012 to 0.02 in 2016.[10] The incidence rate in our cohort between 2016 and 2022 is comparable to the incidence rate in Australia a decade ago,[10] with more recent Australian results far lower than the SSH figures (Figure 2). Australia introduced a national HPV programme at a similar time to New Zealand.[18] At least half of Australia's female population aged 12–26 years were fully vaccinated in the year of the vaccination programme being introduced in 2007.[19] The Australian vaccination rates at age 15 have been above 78% since 2015.[18,19] It had increased to over 80% in females and 78% in males in 2020.[19] The roll out and uptake of the vaccine has been slower in New Zealand[8] with between 60 to 67% of eligible females vaccinated in the birth cohorts up until 2003.[20] According to the Immunisation Advisory Centre, the rate for females increased to 69–70% in the 2007 and 2008 cohorts.[21] Data beyond the 2008 birth cohort are not available. The vaccine uptake rate for males in New Zealand has been modelled to be 53%.[22] A rate of 75% is considered necessary for "herd immunity".[7] Our non-significant results may be due to this lower HPV vaccine coverage in our population.

Attitudes toward childhood vaccinations are becoming increasingly polarised in New Zealand.[23] There is a stigma around HPV being a sexually transmitted infection (STI).[24] The HPV vaccination programme brings together two demanding and confronting areas in promoting vaccination and sexual health.[24] Attempts to desexualise HPV vaccination failed overseas and high-profile public debate ensued with political, cultural and religious divide on the matter, which continues today.[24] Similar issues may have contributed to the low uptake of the HPV vaccination in New Zealand. Efforts are concentrated on improving coverage.[7]

Strengths of our study include the use of the International Classification of Disease code D14.1 (benign neoplasm of the larynx). This has been shown to be a very sensitive and specific ICD-10

code for identifying JRRP (PPV 98.1%).[2] We were able to obtain 100% feedback from referral centres and ORL departments around the country, which enabled more accurate estimates of the catchment population. Although a single-centre study, the referral population represents nearly half of the New Zealand population, which should provide a good proxy for the true incidence of JRRP in New Zealand. Limitations of the study include this being a single-centre study, the high number of patients that were excluded and the relatively low absolute numbers due to this being a rare disease.

A future study will be a national study with the aim to address these shortcomings. The establishment of a national database will allow continual monitoring of JRRP and provide more certainty about its incidence and disease patterns, which may in turn reduce the need of referrals to tertiary centres.

Conclusion

The mean incidence of JRRP before and after the introduction of HPV has remained unchanged in children treated at SSH. More recently, there has been a reduction in incidence—although this is based on small numbers. The low HPV vaccination rate (≤70%) may explain why a significant reduction in the incidence of JRRP seen overseas has not been observed in New Zealand. Ongoing surveillance and a national study would provide more insight into the true incidence and evolving trends.

COMPETING INTERESTS
Nil.

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The ownership elephant is becoming a mammoth: a policy focus on ownership is needed to transform Aotearoa New Zealand's health system

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ABSTRACT

Explicit government policy about ownership of health services is an important yet missing element in Aotearoa New Zealand's health system. Policy has not systematically addressed ownership as a health system policy tool since the late 1930s. It is timely to revisit ownership amid health system reform and increasing reliance on private provision (for-profit companies), notably for primary and community care, and also as an integral part of digitalisation. Simultaneously, policy should recognise the importance and potential of both the third sector (NGOs, Pasifika, community-owned services), Māori ownership and direct government provision of services to address health equity. Iwi-led developments over recent decades, along with the establishment of the Te Aka Whai Ora (Māori Health Authority), and Iwi Māori Partnership Boards provide opportunities for emerging Indigenous models of health service ownership, more consistent with Te Tiriti o Waitangi and mātauranga Māori. Four ownership types relevant to health service provision and equity are briefly explored: private for-profit, NGOs and community, government and Māori. These ownership domains operate differently in practice and over time, influencing service design, utilisation and health outcomes. Overall, the New Zealand state should take a deliberate strategic view of ownership as a policy instrument, in particular because of its relevance to health equity.

Ownership is an important policy tool within health systems.[1] It significantly influences structural arrangements and the political economy of the health sector,[2] its culture and health outcomes. Ownership interests can drive the behaviour of system actors: healthcare workers, government, business and the community.[3] Until recently, ownership has been something of an "elephant in the room"—that is, highly significant as an issue but not much discussed—in New Zealand health policy.[4,5] However, global institutions such as the OECD,[6] World Health Organization[7] and academics[6–9] have been critically examining the importance of ownership in health systems, especially in light of how ownership impacted the COVID-19 response.

Ownership exists at a nexus between how society values a healthy population, private enterprise and core public services. Prevailing economic theory holds that market disciplines place private sector organisations in a better position than governments to provide products and services.[10] However, market effectiveness is influenced by, among other things, the balance between supply and demand plus the degree of information symmetry between buyer and seller. The very nature of health and health services means there is frequently limited supply, and also information asymmetry between health professionals and patients. Consequently, many elements of the health system can only effectively operate in a market that is highly regulated.[10] Furthermore, sometimes the market fails to provide any service where market conditions are not favourable, or to effectively address negative or positive consequences of market activities (externalities) as is the case with potentially harmful products, for instance alcohol, or beneficial interventions such as community-wide immunisation.

Health inequities result, in part, from market conditions, and profoundly damage both health and the economy,[11] hence the importance of social and economic policies to reduce inequity in outcomes between and within population groups. A key policy option for government concerns the deliberate decision to use markets and private for-profit provision only when this is considered the most effective way to deliver health services, and to use other non-market approaches when markets and private provision are not geared

to meeting the overarching societal objective of reducing inequity. Governments can intervene strongly in healthcare markets in order to ensure that ownership arrangements are consistent with wider health system and social goals.

Ownership arrangements intersect with society's attitudes towards health service access: is access to comprehensive essential health services a right of citizenship? Should access to health services be determined by ability to pay? Is access to health services an individual concern or a community concern?[12] At the individual level, ownership shapes how service users are conceptualised:[13] as consumers of services provided by the market, as patients in a professional encounter or as citizens exercising their right to healthcare. Ownership influences the scope of the health system encounter, whether it focusses on the individual, or an individual in a whānau and/or an individual in a population context with either an episodic or a continuity focus.[14] Flexibility for professional discretion, time per consultation and service responsiveness are informed significantly by profit imperatives and commercial responsibilities to shareholders.[15] While ownership arrangements do not wholly determine the model of care, they influence how services are run and how professional and business conflicts are managed, as evidenced in recent vigorous discussions over the provision of radiology services.[e.g.,16] Notwithstanding the strong influence that ownership arrangements exert on health system performance,[17,18] for example through service accessibility,[4,19,20] current New Zealand health policies pay insufficient attention to this important health system design parameter. This is an important policy omission, since New Zealand's health services are currently provided by a range of service providers with a mixture of state, private for-profit, and NGO owners. Most services are owned and provided by various private sector actors, especially community-based services, each service attracting varying degrees of government funding.

The current mix of public and private provision of health services in New Zealand dates back to the health system's founding in the 1930s, where the government's aim was to ensure the provision of universally accessible healthcare services. While the Social Security Act 1938[21] envisaged free-at-the-point-of-care health services, the government of the day was unable to reach agreement with the medical profession on eliminating patient fees. The policy compromise that resulted was a free government-provided hospital system alongside privately provided primary healthcare (PHC), funded by government subsidies and patient co-payments, and insurance to a lesser extent.[22] This compromise cast a long shadow, which is still evident now, in terms of (in)equity of access to PHC services and service integration.

In the decades following the 1940s, New Zealand's health service ownership arrangements remained reasonably stable. The health system has historically been made up of a range of different service provider types, characterised by three main ownership types: private for-profit, third sector/not-for-profit (also referred to as NGOs, community trusts), and state-owned. A fourth ownership form has emerged over the past three decades: Māori ownership. These four ownership forms are described briefly below.

State ownership of health services

In New Zealand, the state has responsibility for health system stewardship, legislation and regulation, and as the main funder of health services.[23] It also owns most of the hospitals. This dual funder/provider role has led to system distortions when the purchasing was decentralised to a hospital-dominated district organisation during the time of district health boards (DHBs). For instance, DHBs' ownership of hospitals meant that, for example, investment for the PHC sector was diverted towards hospital care,[24] and there was a lack of pay parity for nurses across the secondary and PHC sectors.[25]

To ensure policy goals are met the state has intervened to address the failure of markets to meet the needs of vulnerable populations, frequently through fees subsidies (including CSC subsidies and free care for under four-year-olds[26]) and in direct provision centred on, but not limited to, hospital services. Direct state ownership of PHC services occurred from the late 1930s when the state introduced "special medical areas" providing essential PHC services in certain high-needs, high socio-economically deprived rural settings, because of failure of the market to provide adequate PHC services.[27] More recently DHBs (now Te Whatu Ora) have undertaken direct provision of PHC services, such as in Taranaki,[e.g.,28] operating government-owned, fee-charging rural PHC services in areas of under-provision.[29]

Private for-profit ownership of health services

Private for-profit ownership of health services

has consistently featured in New Zealand's health system since its inception, particularly for primary and community care. For instance, general practice and community pharmacy services have traditionally operated with a sole owner-operator style, "guild-like" professional ownership. Now a transition is underway where doctor/pharmacist/professional ownership of this part of the health sector is shifting to private corporate ownership where business models ultimately drive professional behaviour. Additionally, the steady aggregation of health services into fewer corporate hands,[30,31] with some owners being off-shore investors, has positive and negative consequences for the health system. Corporatisation may bring advantages, for example economies of scale, standardisation of services and quality management, and the ability to pool resources and redirect them towards other parts of a business. However, there are downsides to corporatisation, especially related to market failure, unresolved tensions between professional ethics and profit imperatives and the corporate models' impact on continuity of care for vulnerable people who live with complex health needs.[e.g.,32] Further, clinicians report curtailed clinical freedom to practice in corporate environments, and unless there is government regulatory policy intervention, the focus can be on high-volume episodic throughput rather than health outcomes,[8,9,15] at the expense of high-needs populations.[33] Recent discussions about outsourcing radiology procedures highlight the clash of doctors' ethical and professional duties to patients with commercial responsibilities to shareholders.[16]

In the context of market failure, the shift from smaller professionally controlled organisations to larger corporately owned organisations means the health system will need to rely on assertive government regulation if equity objectives are to be achieved. There are likely to be tensions between companies' aims and those of government, and it may well prove harder for citizens and governments to influence larger, offshore-owned companies; once liberalised, it is virtually impossible to de-liberalise health service provision, even if it transpires that the shift to liberalisation is not effectively contributing to health system goals.[34,35] Close monitoring by government of the behaviour of private for-profit health organisations is important.[8,9,36] Commercial incentives risk both over- and under-servicing.[36] Additionally, the practice of cost-shifting from private to public services, for example when surgical complications arise in private facilities, requires active management by government.[19]

Not-for-profit ownership of health services (community, NGOs, the third sector)

New Zealand has a long history (137 years)[37] of non-government non-profit provision of health services, largely in response to unmet need, encompassing a range of populations and issues from ambulance and stroke care to primary care. From the 1980s, community-initiated and led "third sector" providers of comprehensive PHC emerged as a response to the failure of markets to provide services in areas of high socio-economic deprivation, for those who were in low-paid employment, Māori, Pasifika or youth. Both theory and practice[38] suggest that third sector providers are likely to fill service gaps for high-needs populations in circumstances that are difficult or impossible for for-profit services and where government services may be inadequate or not exist.[39,40] During the COVID-19 pandemic, third sector organisations and community-based services were best placed to respond to high-needs populations such as Pasifika communities, because their existing relationships enhanced community mobilisation and outreach.[41–43]

Māori ownership of health services – an emergent Indigenous fourth sector

The three ownership forms described above reflect colonial institutional arrangements. Until now Iwi and other Māori health organisations have largely conformed to the third sector/NGO or private for-profit ownership types in order to receive funding and provide services.[39] The current health reforms present an opportunity to shape the health system's ownership arrangements for Māori beyond the constraints of existing ownership paradigms.[44] Alternative models of sector leadership, such as by Te Aka Whai Ora and Iwi Māori Partnership Boards, offer opportunities for different future paths for ownership arrangements within the framework of Te Tiriti o Waitangi. It is possible that new kaupapa Māori ownership models will emerge that challenge both the narrow scope of health services in relation to health, and existing ownership paradigms.

Hybrids

New Zealand has experimented with a range of hybrid ownership arrangements mixing features of private for-profit, third sector and government provision, and private-public partnerships, the latter being outside the scope of this paper. For example, the 1990s saw a largely failed attempt to introduce private sector corporate culture into public health sector provision.[45,46] Then the 2000s saw an attempt to establish primary health organisations as third sector organisations to support the meso-structure for PHC. These have now evolved to be significant owners of frontline services, including pivotal national health infrastructure such as Whakarongorau/Healthline, which operates as a separate company and returns dividends to its third sector owners.[47]

Breaking the policy silence: let's discuss the mammoth

The mix of ownership types in the system requires deliberate policy attention if equity goals are to be met. However, ownership remains the elephant in the room (particularly the growth of corporate ownership), possibly because of anxiety about whether discussing ownership would precipitate a crisis akin to the professional threats to withdraw service at the advent of the health system in the 1930s.

Successive governments have neglected strategic policy to address practical implications of different ownership arrangements for health services, systems and population health. Instead, state responses to ownership conundrums have been *ad hoc*, pragmatic responses to immediate concerns, largely lacking a longer-term strategic view. Meanwhile, ownership arrangements have become more complex. The private sector has become larger, with a trend towards corporate ownership aggregated into fewer hands. Private provision is an integral part of the provider landscape, and is growing to mammoth proportions. The Health and Disability System Review Interim Report highlighted how the business and professional interests of a few had a disproportionate impact on models of care, and access for everyone, particularly Māori.[48] The issue has become too large to ignore.

Since the Pae Ora reforms are underway, it makes sense for the state to develop a deliberate policy approach so ownership arrangements better support policy and health system goals and outcomes. Thus, instead of defaulting to any one model of provision (private for-profit, third sector/not-for-profit, state-owned, iwi, hybrid), government should dispassionately assess the mix and nature of service providers against their ability to serve populations to meet health system goals in a manner that leads to health improvement across a range of populations. This is particularly important in areas of high need. Ownership policy should be overseen by clear values and supported by a strategic framework and intervention logic that outlines how ownership can be optimised to improve health equity, support health system goals and benefit everyone. This approach would allow governments to be deliberate in addressing market failure in the provision of health services, providing a framework to actively manage ownership as a tool of health service provision. Additionally, specific policy mechanisms (for example subsidies, incentive payments, regulation, capacity building, workforce initiatives, growing different models of care that achieve similar impact across populations) could be deployed to expand on successes (particularly in areas of high socio-economic deprivation) and to explore different ways of improving health delivery in service of health system goals.

Ownership is not the only determinant of organisational behaviour, with some public providers and NGOs adopting corporate-like behaviours, and some corporates giving greater emphasis to social impact, over and above their profit margins. Policy makers should seek to understand an organisation's core drivers and values, irrespective of the particular organisational form; otherwise, some health service providers will exhibit isomorphic mimicry, that is operating for their own commercial benefit while mimicking an ownership profile that is theoretically more responsive to the health needs of communities. Government ownership policy could help identify and manage conflicts between business interests, commercial responsibilities, professional mores, ethical duties and health system goals. By framing ownership as a tool to support health system goals, the strengths and weaknesses of different ownership arrangements to achieve goals would be apparent. In addition, ownership policy could enhance the ability of the health charter to ensure that commissioning facilitates the link between provider and system values, policy aspirations and health system outcomes (outlined sections 56–58 in the Pae Ora (Healthy Futures) Act 2022) and remedy the worst effects of contractualism with narrow

service specifications that reflect government priorities at the expense of responding to local needs.[49]

Since ownership and provision of health services are inextricably linked to sovereignty, mana motuhake and mātaraunga Māori, deliberate ownership policy could help advance the Crown's Tiriti o Waitangi obligations, helping to address overlaps and conflicts between Western and Māori ownership paradigms.[50,51]

In commissioning and localities, all four ownership types should be considered based on their potential contribution to the policy goal, avoiding the assumption that private provision is the default setting. Rather, it would allow assessment of whether market-led supply works, whether there is the need for a community-led third sector, and where the fourth sector—Māori and iwi providers—should predominate.

It would also guide the use of government provision especially in PHC, where the failure of markets to provide adequate services is most extreme and health inequities most apparent. For instance, instead of a last resort crisis response, government-provided properly resourced and sustainable PHC should be normal in underserved areas that will never be serviced equitably within a market paradigm.

Conclusion

Since the beginning of our national health system, the ownership elephant in the room has quietly become a mammoth, literally, as corporate ownership slowly aggregates control into increasingly fewer hands. Eighty-five years of rich health system experience and research evidence has shown the circumstances in which markets are most effective, those where the state should step in and those where the third sector and Māori owners are best suited to meet needs. Global organisations are calling for this policy focus.[52] Yet here in Aotearoa, we have an ownership policy void.

Without filling this policy void we risk missing the promise of the Pae Ora reforms. Without deliberate ownership policy we risk establishing entrenched ownership arrangements that fail to protect and enhance people's health. There is not one "correct" ownership model, especially for PHC, but there is overseas and local evidence that certain arrangements are better suited in some contexts, especially for vulnerable populations[e.g.,1,53] Policy should intentionally address ownership arrangements so the upsides of market-led approaches are harnessed, but not at the expense of comprehensive and pro-equity service delivery, professionalism or Indigenous sovereignty.

In exercising its stewardship function, the state should not be timid in policy intervention or service provision to ensure all citizens have access to core services as a right. This action is especially vital for Māori and the evolution of the fourth sector—Māori and Iwi ownership. The first step is to talk about the ownership elephant, or mammoth, in the room.

COMPETING INTERESTS
Nil.

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Bottle gourd toxicity: the bitter truth of being green-thumbed

Aterea-James Knewstub-Brown, James S Shawcross

Bottle gourd, also known as Calabash, is used as a culinary vegetable in South East Asia. Toxicity mediated by the accumulation of cucurbitacins is most commonly associated with the ingestion of the juice as a tonic in India, where it is thought to provide health benefits in diabetes, hypertension, liver disease and depression.[1–4] More recently, there is significant interest in the use of cucurbitacins in the treatment of cancer.[5] We report a case of a patient admitted with bottle gourd toxicity following ingestion of the vegetable as a home-grown, home-cooked meal.

Case report

A 66-year-old Vietnam-born New Zealander was admitted to General Medicine via the Emergency Department with a diarrhoeal illness following the ingestion of bottle gourd, which he had grown in his garden and cooked by stir-fry. This was consumed for his evening meal, and symptoms of severe abdominal pain and diarrhoea without blood or mucus began six hours later, attending hospital 18 hours following ingestion. He had shared his garden produce with his son, who declined the meal because it tasted very bitter. On the onset of symptoms, the son ascertained the likely diagnosis of bottle gourd toxicity by means of an internet search.

Vomiting was absent. Pain was limited to the upper-abdomen and noted to be stabbing. The pain was cyclical and would occur for two hours then resolve spontaneously for an hour or two. His past medical history comprised type 2 diabetes mellitus (on Metformin), diverticulosis and hypertension.

Examination revealed a man of normal build in some discomfort. Abdomen was soft with epigastric tenderness. Bowel sounds were normal. Observations at presentation were BP 154/100, pulse 115, afebrile.

Laboratory investigations revealed acute kidney injury (AKI) stage 1, mild elevation of hepatic enzymes (ALT 50U/L), compensated metabolic acidosis with a serum lactate of 2.9mmol/L and base excess of -6. Haemoglobin was raised at 184g/L. C-reactive protein (CRP) was not significantly elevated. Electrocardiograph (ECG) demonstrated a sinus tachycardia but was otherwise normal. Stool culture was not possible as diarrhoea was not witnessed in hospital, with a return to normal stool the morning following presentation.

The patient was admitted for observation, rehydrated with intravenous fluids, and commenced on Omeprazole. Metformin was withheld. The following day his biochemical abnormalities had resolved. He was discharged with a prescription for Omeprazole 20mg once daily for two weeks and instructions to withhold his Metformin until well again. He has subsequently made a full recovery.

Discussion

Bottle gourd (*Lagenaria siceraria*), or Calabash, is known by number of other names internationally. Harvested early it can be eaten, and as a more mature fruit can be used to make containers and utensils.[2]

When the gourd is over ripe or stored improperly, they accumulate cucurbitacins, which are toxic at high concentrations.[1]

There is a preponderance of case reports from India,[1,3,4,6] though a Canadian case has been reported relating to juice toxicity.[7] Severe toxicity causes upper gastro-intestinal bleeding.[6]

It is important to enquire about bottle gourd ingestion in patients presenting with gastro-enteritic illness, and to educate patients on the dangers of eating fruit that is over ripe or has been stored improperly. We would also recommend that patients presenting with this toxidrome following bottle gourd ingestion should commence proton-pump inhibitor therapy to reduce the risk of acute upper gastrointestinal bleeding.

This is an important case to highlight because it is the first report of poisoning mediated by ingestion of the fruit as opposed to the juice. Additionally, the impact of global climate change, the move to home-grown vegetables, and the evolving ethnicity of New Zealand make it possible that this toxicity may be encountered more frequently in the future.

COMPETING INTERESTS
Nil.

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An initial exploration into the benefits of a proactive post-COVID-19 health check

Fiona Pienaar, Ruth Large

Whakarongorau Aotearoa | New Zealand Telehealth Services delivers national, free 24-hours a day, 7 days a week digital healthcare services, offering a comprehensive, multi-disciplinary range of services provided by professionals, including psychologists, counsellors, nurses, doctors and paramedics.[1]

During the October 2021 New Zealand outbreak of the COVID-19 Delta variant, Whakarongorau Aotearoa was the primary provider of care in the community for those impacted by COVID, and their whānau. This was provided through the COVID Healthline, the COVID Vaccination Healthline and the COVID Welfare and Healthline services. When Omicron became the prevalent strain, care was devolved to primary care, ensuring a shared approach across the country. Guidelines for GPs about post-COVID checks were also distributed, with the care offered by Whakarongorau-run services consistent with guidance.

While the sequelae of COVID infection has been given various names, in December 2022 the World Health Organization (WHO) defined the post-COVID-19 condition (commonly known as long COVID) as "t*he continuation or development of new symptoms 3 months after the initial SARS-CoV-2 infection, with these symptoms lasting for at least 2 months with no other explanation."*[2] With over 200 recognised symptoms associated with post-COVID[2,3] our knowledge and understanding about the impact and how we can safely treat the disease continues to evolve.

As a result of the COVID-19 services offered by Whakarongorau and the organisation's extensive data set, we conducted a 6-week check (within the Te Whatu Ora post-COVID timeframe of ongoing symptomatic COVID-19: from 4 weeks up to 12 weeks) with 244 participants from a contact list of service users in the Northern Region who identified as Māori and Pasifika, who had tested positive for COVID-19, spent time in CIQ care (community supported isolation and quarantine) and who had been referred to Whakarongorau's COVID Healthline in August 2022.

In New Zealand, in their description for health professionals (updated 28 February 2023), Te Whatu Ora – Health New Zealand[4] has described the progression of the disorder as:

- Acute COVID-19: Signs and symptoms of COVID-19 for up to 4 weeks.
- Ongoing symptomatic COVID-19: signs and symptoms of COVID-19 post the acute period of illness from 4 weeks up to 12 weeks.
- Post-COVID-19 syndrome: signs and symptoms that develop during or after an infection, consistent with COVID-19, continue for more than 12 weeks, and are not explained by an alternative diagnosis.

It has been noted that the evolution of our definitions reflects our limited understanding of the "nature and underlying mechanisms" of post-COVID,[5] meaning that guidelines about our understanding and how to manage the disease are continually updating. Underpinning the emerging insight must surely be the need for compassion, acknowledgement of the challenges people are experiencing and identification of those individuals requiring more detailed investigation to understand whether they are likely to need more intensive and specialist support. Indeed, the New Zealand Manatū Hauora – Ministry of Health's *Clinical Rehabilitation Guideline for People with Long COVID (Coronavirus Disease) in Aotearoa New Zealand* highlights some of the emotional and practical challenges that those struggling with this disease may experience, such as: barriers to accessing health services, including culturally sensitive services; lack of community awareness and understanding; social support and the ability to change appointments.[6] Similar to Indigenous ethnicities around the world,[7] Māori and Pasifika communities in New Zealand have been identified as (among those) most impacted by the COVID-19 pandemic.[8]

Given that, in the updated WHO Clinical Management of COVID-19 Living Guideline[9], new recommendations include "*a focus on continuity and co-ordination of person-centered care, and shared decision-making, standardised symptoms assessment and outcomes measurement, and follow-up and referral systems*", it seemed timely to reach out to better understand the level of potential post-COVID symptoms among a cohort of our previous tāngata whai ora.

The method involved a clinician calling the tāngata whai ora and completing an agreed courtesy health check (an adapted Newcastle post-COVID syndrome Follow Up Screening Questionnaire). There were two possible outcomes from the call. Either the tāngata whai ora did not meet any of the thresholds for a post-COVID clinical health check and the clinician thanked them for their time, or they remained symptomatic and therefore did meet one of the thresholds required for a post-COVID syndrome clinical health check. Participants were provided with information for self-care, for example, advice about community health pathways.

There was a general willingness from tāngata whai ora to engage in conversation, talk about their experiences and participate in the health check. This included being open to accepting a call outside of business hours if they were not available during standard working hours.

Of the 244 contacts, 62 (25.4%) tāngata whai ora experienced ongoing symptoms with fatigue being the most common symptom followed closely by cough, breathlessness, trouble concentrating and recalling information and low mood. Only nine of these tāngata whai ora had been prescribed a course of antiviral treatment medication.

In early 2022, public health experts identified possible key components for the establishment of a long COVID service in New Zealand, including the availability of an initial remote assessment process, potentially telehealth, offered by allied health or nursing professionals in order that any concerns identified could be referred to ongoing support and alternative services. They noted the importance of the public being able to easily access information and support when they needed it and while they waited for referral for treatment. Based on the acknowledged disproportionately negative impact of COVID-19 on Māori and Pasifika, they highlighted the need for "proactive engagement with these communities" in the development of long COVID services.[10]

Recent correspondence from *The Lancet*[11] highlighted the failure of the global "Access To COVID-19 Tools Accelerator" (ACT-A) to "*ensure equitable availability for anti-SARS-CoV-2 technologies – vaccines, treatments, and diagnostics*". In response, further correspondence[12] warned against the narrative that "the worst is over" and that the focus should now be on planning for future pandemics. The author acknowledges the need for this but highlights the importance of institutions, including governments, not forgetting those who have suffered a loss or who continue to be clinically vulnerable to COVID-19, warning that "moving on" may deplete already existing inadequate "care, response and advocacy", and potentially risk "further failing the people they intend to serve".

With Whakarongorau's depth of data and knowledge, experience supporting the public through the COVID-19 pandemic, clinical expertise, the range of services offered by the organisation and connections with other statutory services, this small exploratory health check supports the consideration for, and the benefits of, a wider post-COVID syndrome service to create tangible benefits for New Zealand citizens.

COMPETING INTERESTS
Nil.

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Emergency department point-of-care ultrasound in forearm fracture management

Andrew Russell Munro

Shaye Seefried et al., in their paper *Paediatric forearm fractures manipulated in the emergency department: incidence and risk factors for re-manipulation under general anaesthesia*,[1] show a high rate of reduction failure in forearm fractures in children in the Starship Hospital Emergency Department (ED). They suggest that the use of fluoroscopy in the ED would obviate the associated financial and opportunity costs of reduction failure.

A cheaper and more available real-time imaging modality is point-of-care ultrasound (POCUS). Many studies over the last 5 years show the accuracy of POCUS-assisted fracture reduction in the ED.[2–5] Every ED has an ultrasound machine: many emergency physicians have been using POCUS to assist in fracture assessment and management for more than a decade. By adopting POCUS as the modality of choice in fracture reduction, the additional costs of specialised radiation equipment, its storage, safety and maintenance can be circumvented in what are already cluttered EDs.

POCUS-assisted fracture reduction has also been shown to reduce ED length of stay.[6]

In addition to reducing the need for re-manipulation, the use of POCUS presents an opportunity for orthopaedic trainees to add this skill to their therapeutic repertoire.

COMPETING INTERESTS
Nil.

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Does an elevated HbA_{1c} of 41–49 mmol/mol during pregnancy associate with gestational diabetes mellitus?

Lynne Chepulis, Ha Nguyen, An Yu, Tomas Ashford, Nicole McGrath

Gestational diabetes mellitus (GDM) is an increasingly common condition during pregnancy, affecting 6–10% of all pregnancies in New Zealand and a disproportionate number of Māori and Pacific women.[1,2] Broadly identified as hyperglycaemia during pregnancy, GDM associates with a number of maternal and foetal complications including macrosomia, pre-eclampsia, caesarean delivery and neonatal hyperglycaemia.[3] It is extremely important to minimise GDM risk, including ensuring that all pregnant women are educated around the need for a nutritious, non-processed diet,[4] with optimal gestational weight gain.[5] Since 2015, national Diabetes in Pregnancy guidelines promote the need for universal screening for GDM at 24–28 weeks' gestation following screening for undiagnosed type 2 diabetes using a glycated haemoglobin (HbA_{1c}) test as a part of antenatal booking bloods.[6]

In New Zealand, the HbA_{1c} test should be performed before 20 weeks gestation, and a result of ≤40 mmol/mol is considered normal.[6] In contrast, women with an elevated HbA1c of 41–49 mmol/mol are deemed to be at higher risk for GDM and are recommended to be given lifestyle advice, and have the 2-hour 75g glucose tolerance test (GTT) at 24–28 weeks rather than the usual 50g glucose challenge test (but not to commence GDM management until a positive GTT test result is obtained).[6] While recent New Zealand data indicate that more than 90% of pregnant women undertake an HbA_{1c} test, up to 20% of all women (30% of Māori women and 18% of Pacific women) do not go on to have any testing for GDM.[1] Reasons for this vary,[7] though it does suggest HbA_{1c} alone may be important to support glycaemic management in some women; indeed, it is already current practice in several New Zealand regions for women with booking HbA_{1c} 41–49 to commence GDM intervention. It is currently unclear whether this results in improved maternal and foetal outcomes.[8,9]

Despite international literature suggesting that an elevated HbA_{1c} test result associates with an increased risk of GDM,[10] data evaluating this association in a New Zealand context are limited.[11] Thus, this study aims to explore the relationship between elevated HbA_{1c} and GDM risk in a cohort of New Zealand women to determine if those women with an elevated HbA_{1c} should be considered for early clinical management.

Clinical data (maternal age and ethnicity) were obtained and combined for a cohort of women who birthed in the Waikato region (including hospitals and birthing centres) during January–December 2018 (n=4,140) and from a second cohort who birthed in the Northland region (Whangārei, Bay of Islands, Rawene and Kaitaia hospitals) during January 2020–September 2021 (n=3,671). NHI-matched HbA_{1c} data were obtained from local laboratories and were deemed to be related to pregnancy if the date of the test was between 4 and 40 weeks gestation (or the date of delivery, whichever came first). Gestational age at the time of each HbA_{1c} test was recorded. Where multiple HbA_{1c} values were provided for any one patient, the first test result was used for analysis unless an elevated HbA_{1c} of 41–49 mmol/mol was recorded later in pregnancy, in which case the first elevated test result was used. Women were classified as having a normoglycaemic or elevated HbA_{1c} during pregnancy (≤40 vs 41–49 mmol/mol, respectively). Women without a pregnancy-related HbA_{1c} measurement, and those with an HbA_{1c} of ≥50 mmol/mol (indicative of type 2 diabetes) were excluded from the study.

Clinical information was also obtained from Te Whatu Ora (formerly Waikato and Northland District Health Boards) Diabetes in Pregnancy

units for women diagnosed with GDM. Women in this dataset were matched by NHI to the study population above, and women were also classified as with or without GDM.

For analysis, women were grouped by maternal age (≤20, 21–30, 31–40 and ≥41 years), gestational age at HbA_{1c} test (0–10, 11–20, 21–30 and 31–40 weeks), ethnicity (New Zealand European, Māori, Pacific, Asian, Other) and whether the gestational age at the time of the HbA_{1c} test was ≤20 weeks (yes/no). A logistic regression was undertaken to determine which factors impacted the likelihood of a GDM diagnosis for all women, and separately for those with an HbA_{1c} "before" compared to "after" 20 weeks' gestation. In the logistic regression, the outcome variable was the absence/presence of GDM. The independent predictors included HbA_{1c} test, ethnicity, gestational age and maternal age. Data were analysed in Stata with $p<0.05$ accepted as significant.

In total, 5,084 women were included in the study and the majority of women had their first HbA_{1c} test prior to 20 weeks (88.9%). This was lower for Māori (82.8%) and Pacific (79.2%) women compared to NZ Europeans (93.2%; $p<0.05$) or Asian women (91.3%; $p<0.05$).

Overall, 88 women (1.7%) had an elevated HbA_{1c} of 41–49 mmol/mol and 324 women had a diagnosis of GDM (6.4%). Fifty-five of the 88 women with an elevated HbA_{1c} (62.5%) went on to be diagnosed with GDM (including 57.1% of Māori (24/42), 66.7% of Pacific (4/6), 65.2% (15/23) of Asian and 55.6% (5/9) of NZ European women. Of the remaining 33 women with an elevated HbA_{1c}, 17 (51.5%) completed a GTT and did not have GDM, five (15.2%) returned a negative glucose challenge test result and had no GTT and 11 women (eight Māori, two NZ European, one Pacific and one Asian) had no evaluation for GDM. Based on those with GTT data only, the likelihood of an elevated HbA_{1c} resulting in a diagnosis of GDM was 76.3% overall and 71.4%, 64.7% 80.0% and 68.2%, respectively, for NZ European, Māori, Pacific and Asian women. Logistic regressions showed that after adjustment, women with an HbA_{1c} result of 41–49 mmol/mol were more likely to have GDM with an odds ratio (OR) of 23.60 at HbA_{1c} ≤20 weeks ($p< 0.001$) and an overall (anytime) OR of 16.67 ($p< 0.001$) (Table 1). Pacific and Asian women were more likely to have a higher risk of GDM compared to NZ European women (OR: 2.556, CI: 1.42–4.618, $p<0.01$ and OR: 4.67, CI: 3.45–6.32, $p<0.001$ respectively) as did Māori women when the HbA_{1c} was completed before 20 weeks (OR: 1.53, CI: 1.05–2.23, $p<0.05$). Similarly, women of older maternal age (>30 years) were more likely to have an increased risk of GDM compared to those aged 21–30 (Table 1; all $p<0.05$).

With logistic regressions undertaken separately for each ethnic group, NZ European women (n=2,500) with an elevated HbA_{1c} were more likely to have a higher probability of GDM diagnosis than those with an HbA_{1c} of <40 mmol/mol (OR: 19.90, CI: 4.70–84.40, $p<0.001$). Māori wāhine (n=1,533) with an elevated HbA^{1c} also had an increased risk of GDM (OR: 18.99, CI: 9.28–38.86, $p<0.001$). The odds ratios of Pacific (n=154) and Asian women (n=666) are 12.94 ($p<0.05$) and 11.62 ($p<0.001$) respectively.

We acknowledge that this was a small study and that the results may have been skewed by the omission of women for whom we had no HbA_{1c} or GTT results. Low sensitivity of an early HbA_{1c} to predict GDM at 24–28 weeks has been previously described,[11,12] but our results show that the majority of women with an elevated HbA_{1c} during pregnancy who are subsequently screened do develop GDM. Although this is a relatively small group of women (1.7% in our cohort), our study suggests that all women with an elevated booking HbA_{1c} should be encouraged to complete a GTT and should be considered for early targeted management. These results are timely given that the national Diabetes in Pregnancy Guideline is currently being reviewed and a well-designed randomised, controlled trial is needed to inform whether those with an elevated HbA_{1c} in pregnancy should be treated.

Table 1: The adjusted odds ratio (OR) of having GDM (vs non-GDM) in Waikato and Northland women who were screened for diabetes in pregnancy using HbA_{1c}.

	All observations				HbA_{1c} gestational age ≤20w				HbA_{1c} gestational age >20w			
	N	Adjusted OR of GDM	P-value	95% confidence interval	N	Adjusted OR of GDM	P-value	95% confidence interval	N	Adjusted OR of GDM	P-value	95% confidence interval
HbA_{1c} test												
≤40	4,996	1			4,471	1			515	1		
41–49	88	16.669***	0.000	10.155–27.361	50	23.601***	0.000	12.651–44.031	33	8.154***	0.000	3.317–20.044
Ethnicity												
NZ European	2,500	1			2,332	1			168	1		
Māori	1,533	1.305	0.116	0.936–1.821	1,270	1.529*	0.027	1.050–2.225	263	0.807	0.569	0.385–1.689
Pacific	154	2.556**	0.002	1.415–4.618	122	2.671**	0.007	1.307–5.459	32	2.173	0.170	0.718–6.578
Asian	666	4.669***	0.000	3.448–6.323	608	4.683***	0.000	3.360–6.526	58	5.031***	0.000	2.293–11.038
Other	215	1.908*	0.020	1.107–3.289	188	2.048*	0.022	1.110–3.781	27	1.144	0.844	0.301–4.351
Gestational age		1.027***	0.000	1.014–1.041		0.983	0.389	0.947–1.022		1.030	0.337	0.970–1.094
Maternal age												
≤20	408	0.683	0.244	0.360–1.297	337	0.992	0.980	0.513–1.917	67	0.183	0.112	0.022–1.488
21–30	2,657	1			2,367	1			285	1		
31–40	1,918	1.865***	0.000	1.442–2.413	1,728	1.763***	0.000	1.323–2.349	184	2.487**	0.003	1.361–4.547
≥41	100	3.838***	0.000	2.090–7.046	88	3.692***	0.000	1.858–7.336	12	6.146*	0.012	1.503–25.137
Constant		0.020***	0.000	0.015–0.027		0.026***	0.000	0.018–0.038		0.025***	0.000	0.004–0.172

Note: *** p<0.001, ** p<0.01, * p<0.05.

COMPETING INTERESTS
We have no conflict of interest.

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Further Consideration of Endemic Goitre

NZMJ, 1923

By Drs. C. E. Hercus and E. S. Baker.

PREVENTIVE WORK IN CANTERBURY

This work was made possible by a grant from the Department of Health, who have given every assistance in the carrying out of the work. In Christchurch two fairly large and typical schools were chosen—West Christchurch and Waltham. West Christchurch has attached to it a branch High School of nearly two hundred pupils, which enabled us to watch results over a longer period. Subsequently a large Timaru school, the Waimataitai school, was selected for further work with the employment of slightly different methods.

The administrative difficulties in carrying out an enterprise of this character are considerable. Authority had to be obtained from the Education board. The consent and co-operation of headmasters and teachers, upon whom considerable extra work falls, had to be obtained. Circulars had to be issued to parents explaining the objects of the work and asking for their permission to administer the treatment. (Specimen circular is attached.) Equipment—such as blue Winchesters, jugs, medicine glasses, etc.,—had to be purchased. Arrangements had to be made for the proper dispensing of a salt which is very deliquescent and is speedily rendered inert by exposure to light. The children whose parents refused treatment constituted our controls. All the children in the schools were completely examined as to height, weight, general nutrition, state of heart, lungs, teeth, throat, etc. The state of the thyroid, as determined by palpation, was noted, and neck measurements were taken. The latter procedure is difficult and cannot replace palpation as a method of detecting changes in the size of goitres, particularly early goitres. The growth factor, which is considerable in the younger children, has also to be considered in measurements were taken. The latter procedure is difficult and cannot replace palpation as a method of detecting changes in the size of goitres, particularly early goitres. The growth factor, which is considerable in the younger children, has also to be considered in measurements. All these records were recorded on a special goitre card on which provision was made for six-monthly progress reports.

In 1921 rather less than half the parents were willing that their children should receive the treatment. In 1922 two-thirds of the parents consented, and a number of children had joined the schools for the purpose of obtaining the treatment.

It seems to be immaterial in what form the iodine is presented, or whether it is given by the mouth, by external application, or by inhalation. The thyroid will take up the iodine from the most stable iodine compound. We adopted sodium iodide largely because this was the method used by *Marine* and *Kimball*. The headmasters were supplied with small bottles containing sufficient of the salt for one week's supply, the dosage being graded according to standards. Immediately before use the salt was dissolved in graduated bottles and administered in medicine glasses in tablespoonful dosage.

ARBITRARY STANDARD OF DOSAGE ADOPTED.—Standards 4, 5, 6, and High School (eleven years and upwards), 120 grains per annum; standards 1, 2, 3 (eight to eleven years), 60 grains per annum; infant school (five to eight years), 40 grains per annum. The method of dosage adopted was to give a weekly dose for ten weeks in each term, of 4 grains, 2 grains and 1 1-3 grains respectively, in half an ounce in water.

Owing to the administrative difficulties experienced in administering the salt in solution we adopted potassium iodide in pill form for the Timaru school. The satisfactory dispensing of iodine salts in pill form required a considerable amount of experiment, but greatly simplified the administration.

POSSIBLE ILL-EFFECTS.—The promiscuous giving of iodine to large numbers of children involved close attention to possible ill-effects, and

the teachers were instructed to report at once if there were any complaints of ill-effects from the children. No cases suggesting symptoms of iodine to persons with simple goitre converts it into an exophthalmic one. Nothing of the sort has yet occurred.

RESULTS.—The "casualty list" as might be expected from the peripatetic habits of the average New Zealander, was large. The school population of the two Christchurch schools in which the work commenced in April, 1921, was 1436, on re-examination in December, 1921, 1197 of these children remained, while in April, 1922, only 980 were still at school—a casualty list of one-third. On re-examination, every effort was made to overcome any tendency to bias. In assessment we did not know and took pains not to know, which children had been taking treatment and which had not. In May, 1922, a further examination was carried out, and the results are given in the following tables:—

SUMMARY OF RESULTS AND FIGURES.

CHRISTCHURCH CITY SCHOOLS

	Treated		**Untreated**	
Normal (258)	**Number**	**%**	**Number**	**%**
Unchanged	58	60.4	73	45
Increased	38	39.6	89	55
Total	96		162	
Goitrous (789)	**Number**	**%**	**Number**	**%**
Unchanged	173	43.1	159	41
Increased	86	21.4	169	43.5
Decreased	142	35.4	60	15.4
Total	401		388	
Grand Total (1047)	497		550	

CHRISTCHURCH CITY SCHOOLS

SHOWING RESULTS OF TREATMENT.

(Boys and Girls Separate.)

	Normal				**Goitrous**					
	Unaltered		**Increased**		**Unaltered**		**Increased**		**Decreased**	
	B	G	B	G	B	G	B	G	B	G
Treated										
Number	36	22	22	16	72	101	35	51	67	75
%	62.1	58	37.9	42	41.4	44.5	20.1	22.4	38.5	33
Not Treated										
Number	44	29	60	29	98	61	89	80	33	27
%	42.3	50	57.7	50	44.5	36.3	40.0	47.6	15	16.1

SHOWING LENGTH OF TIME UNDER TREATMENT OR OBSERVATION RESPECTIVELY.

	Normal				**Goitrous**					
	Unaltered		**Increased**		**Unaltered**		**Increased**		**Decreased**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Taking Treatment for:										
9 Weeks	8	61.6	5	38.5	17	30.3	16	28.6	23	41.1
38 Weeks	25	61	16	39	101	45.1	40	17.8	83	37
52 Weeks	25	59.5	17	40.5	55	45.5	30	24.8	36	29.7
Total	58	60.4	38	39.6	173	43.1	76	22.4	142	33
Not treated Observed for:										
38 Weeks	29	48.3	31	51.6	71	399	74	41.6	33	18.5
52 Weeks	44	43.1	58	56.8	88	42	95	45.2	27	12.8
Total	73	45	89	55	159	41	169	43.5	60	15.4

The results of treatment in a small group of children for nine weeks are included. They are of interest as showing how rapidly iodine acts. These figures were obtained by a lucky accident.

In June 1922, prophylactic treatment was commenced at the Waimataitai school, in Timaru, using tabloids composed of potassium iodide, gr. 1; starch, gr. 1-8; sugar of milk, gr. 7-8. The system decided on was to give 2 grammes per annum to all children irrespective of standard. Out of 800 children, 256 agreed to undergo treatment.

The same procedure was carried out as has been already outlined, and after six months' treatment, during which time 20 grains of potassium iodide were administered, the following results were obtained:—

The total number of children's records analysed for these tables was 1514 (1047 in Christchurch and 467 in Timaru.)

By other analyses of our figures we endeavoured to discover if non-adenomatous goitres at any particular age, or of any particular age, or of any particular size, responded especially to treatment, but our figured did not throw any great light on that question.

Marked changes occurred in 65 cases in the Christchurch schools as follows:—Treated—Marked increase 7 cases (1 boy and 6 girls); marked decrease in 16 cases (5 boys and 11 girls). Untreated—Marked increase 36 cases (19 boys and 17 girls); marked decrease in 6 cases (3 boys and 3 girls). In the Timaru school, 5 cases showed marked changes:—Treated—Marked decrease in 2 boys. Untreated—Marked increase in 3 girls.

TIMARU SCHOOL, FEBRUARY, 1923.

Grand Total Under Observation 467.				
	Treated		**Untreated**	
	Number	**%**	**Number**	**%**
Normal (134)				
Unchanged	49	94.2	78	95.1
Increased	3	5.7	4	4.8
Total	52		82	
Goitrous (333)				
Unchanged	48	33.3	115	60.8
Increased	9	6.2	12	6.3
Decreased	87	60.4	62	32.8
Total	144		189	

(Circular Issued to Parents in 1921.)

PREVENTION OF GOITRE

School ..... Date .....

To the parents or guardians of .....

An investigation into the prevention of goitre is being undertaken by the School Medical Officer. The treatment will follow very closely the lines of a similar experiment in America which has been, apparently, very successful. The treatment consists of minute doses of a salt containing a compound of iodine. It will not upset the digestion because the dose is so small, a mere trace of iodine.

During the treatment the children will be carefully watched by the School Medical Officer, and the treatment stopped if it disagrees in any way. No child will be treated without the consent in writing of the parent or guardian.

Please read the following carefully, and cross out whichever line is contrary to your wishes, and return it duly signed.

I desire/do not desire, that my child ..... should receive treatment for prevention of goitre as above.

Signature of Parent or Guardian

It will be of much assistance in the investigation if parents will fill in the answers to these questions, whether accepting treatment or not.

Name of child ..... Date of Birth .....

Address .....

Length of Residence in Canterbury? .....

Where living before Canterbury? .....

Has the child been strong and health? .....

Have you noticed any signs of goitre in this child? .....

If so, at what age? .....

Has this child ever had treatment for goitre? .....

If so, what treatment, and with what results? .....

Has this child's mother a goitre, or did she ever have a goitre? .....

If so, when did she first notice it? .....

How many brothers?..... How many sisters? .....

Have any of them got goitres? , and if so what are their ages? .....