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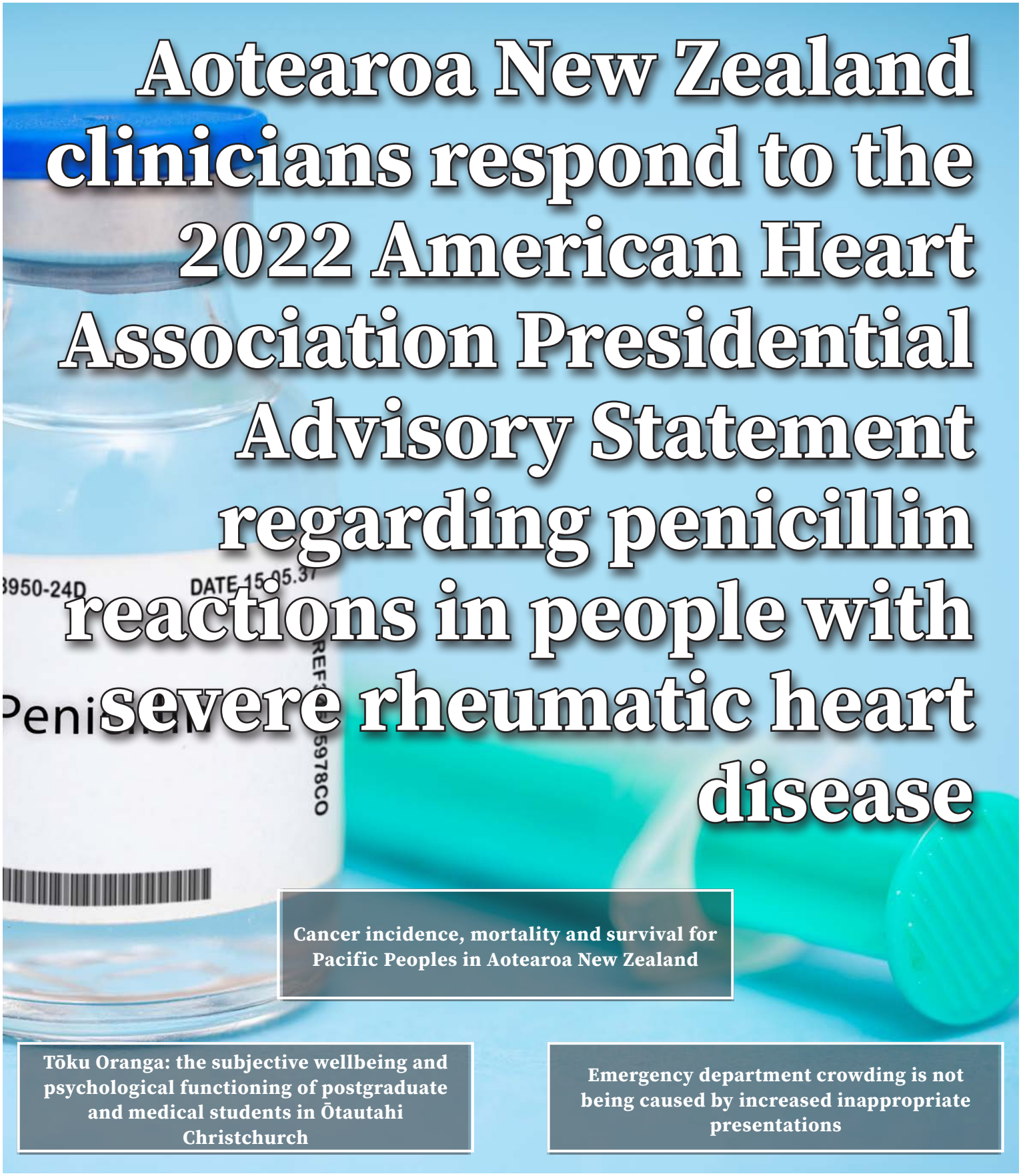

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PMA PASIFIKA MEDICAL ASSOCIATION Group

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In 2022, the American Heart Association (AHA) published an advisory statement cautioning about potential safety risks of intramuscular benzathine penicillin for people with very severe rheumatic heart disease (RHD). The AHA report was based on a very small number of sudden deaths that occurred in low-middle income countries among people with very severe RHD. Aotearoa New Zealand is very different to overseas countries where RHD is common; we use a different brand of pre-mixed benzathine penicillin. Specialist cardiac care and heart surgery are available for people with severe RHD through the public health system, well before they get to "end-stage" or "palliative" heart disease, which can occur in low-income countries. In Aotearoa New Zealand, we have careful medication safety monitoring systems and to date no sudden deaths or collapses have been reported amongst people with ARF/RHD on the benzathine penicillin programme. In Aotearoa New Zealand the penicillin programme (which is delivered by highly trained community nurses) is very successful at preventing rheumatic fever recurrences and protecting the hearts of people living with ARF/RHD. The authors of this editorial statement are specialist doctors and nurses who are very experienced in the care of children and adults with ARF/RHD. After carefully reviewing the AHA Presidential statement and local safety data, we think that the American Heart Association Statement does not apply to Aotearoa New Zealand at this time. We have full confidence in our current benzathine penicillin programme and medication safety monitoring systems. Patients with ARF/RHD or their families who have concerns or questions should be encouraged to ask their community nurse or doctor for advice.

Cancer incidence, mortality and survival for Pacific Peoples in Aotearoa New Zealand

Tara Cleverley, Ineke Meredith, Dianne Sika-Paotonu, Jason Gurney

In this study we have looked across all cancers and identified the most commonly diagnosed cancers, and the most common causes of cancer death, among Pacific peoples. We also looked at survival after a diagnosis of cancer and compared this survival between our Pacific and European peoples. We found that Pacific Peoples are much more likely to be diagnosed with (and die from) certain cancers, but not others, compared to Europeans, and have poorer survival for most cancers. Our findings are most likely to be caused by a failure in our system to provide equal access to the drivers of good health, which means that we need system-level actions to prevent cancers related to infectious diseases, smoking and obesity, as well as actions to make our cancer services work better for Pacific Peoples.

Analysis of skin condition emergency department outcomes via the free Healthline service from Whakarongorau Aotearoa

Miriama K Wilson, Fiona Pienaar, Ruth Large, Matt Wright, Graham Howie, Siale Foliaki, Martin Mikaere, Rebecca Davis, Verity Todd

This study investigated who called the free 24/7 Healthline service between the first of January 2019 and the end of December 2022 regarding skin conditions such as rashes. Of the 61,876 calls made during this period, 5.3% of these calls (3,294) were recommended to go to an emergency department (ED). Of these ED calls, 28.6% were Māori, and 5.9% were Pasifika; these are significantly higher and lower (respectively) than their New Zealand demographics of 17% and 8%. Wairarapa and West Coast

districts were found to have the highest ED data (per capita) for skin conditions. This district ED data had significant correlations with district deprivation data (published by The University of Auckland) and supports the theory that severe skin conditions correlate with inaccessibility and unaffordability of healthcare services.

Tōku Oranga: the subjective wellbeing and psychological functioning of postgraduate and medical students in Ōtautahi Christchurch

Katherine A Donovan, Ben Beaglehole, Christopher MA Frampton, Margaret Currie, Joseph M Boden, Jennifer Jordan

Postgraduate and medical students at the University of Otago's Christchurch campus completed an online survey during 2019–2020 about their experience of psychological distress and burnout while studying. They reported high levels of psychological distress and burnout—roughly a third reported clinical symptoms of depression, anxiety or stress, and over 3/4 of the students reported burnout. Both individual (e.g., certain personality factors and resilience) and contextual factors (e.g., how much support and how well they thought they were progressing in their studies) were associated with distress and burnout. Exposure to the major earthquakes in 2010/2011 and the 2019 terrorist attack was not found to be associated with increased levels of distress and burnout in this sample. Despite high levels of distress, over two thirds of our sample reported feeling satisfied with life.

Laxative-prescribing habits: a summative impact evaluation of a constipation programme implemented in two hospitals in New Zealand

Jennifer CH Cook, Abdullah AO Alhaidari, Blake W Jackson, Matthew P Ordish

Constipation is a common and harmful condition. Many patients with constipation are given useless and potentially dangerous medications. Education and guidelines can improve this situation and increase the use of safe and effective laxatives.

Te Ōranga Ō Te Roro: kaumātua perspectives on the development of a mobile app for mate wareware (dementia) awareness

Makarena Dudley, Sharon Olsen, Cherry Reihana, Marcus King, Hohepa Spooner, Sarah Cullum, Alexander Merkin, Edgar Ramirez-Rodriguez, Bobby Nepia, Adrian Martinez Ruiz, Kahu Pou, Susan Yates

Mate wareware, or dementia, is a growing problem for Māori, who experience more cases of early-onset symptoms, and a particular burden for their families, who often provide care in the home rather than residential facilities. Māori have expressed a desire for information about the causes of mate wareware and its management, and we wanted to design a mobile app to meet this need. Before designing the mobile app, we talked to Māori kaumātua (elders) to find out what information they wanted to know and how this should be delivered in the mobile app. The kaumātua provided valuable insights about the information they needed, such as the symptoms of memory loss and how these differ from normal ageing, lifestyle changes that can reduce the risk of memory changes, and how to manage a family member with challenging behaviour. The kaumātua recommended the app is kept simple, particularly for the older generation who might be less familiar with apps, but that it should also appeal to the younger generation and incorporate Māori-centred design features and elements that support connecting with others. The findings were incorporated into the Mate Wareware app, which can be downloaded at https://www.matewareware.co.nz/.

Trends in penicillin dispensing during an acute rheumatic fever prevention programme

Julie Bennett, Anneka Anderson, June Atkinson, Emma Best, John Malcolm, Gary McAuliffe, Rachel Webb, Jeffrey Cannon

Between 2011 and 2016, Aotearoa New Zealand implemented a rheumatic fever prevention programme to reduce our unacceptably high rates of rheumatic fever. The programme aimed to improve access to timely diagnosis and early treatment of strep throat, which has been shown to prevent the subsequent development of rheumatic fever. This study investigated if there were any changes in antibiotic dispensing rates as a result of the programme. During the prevention programme an increase in amoxicillin dispensing was seen in regions participating in the programme and regions outside of the programme, indicating the programmatic approach led to improved adherence to recommended first-line antibiotics. This is a good example of the positive impact of a programmatic approach leading to more prudent use of antibiotics in the community.

Emergency department crowding is not being caused by increased inappropriate presentations

Peter G Jones, Gary Jackson

Contrary to the prevailing wisdom, there may be little or no room to move with respect to reducing emergency department (ED) utilisation, as ED utilisation in Aotearoa New Zealand is low by world standards and is not driven by patients presenting inappropriately with minor conditions. We should continue the excellent work done in the primary care sector to maintain our low ED presentation rate and support primary and urgent care providers to provide alternatives to the ED for people with minor conditions. However, to reduce the system pressure and harms caused by ED crowding due to access block for admitted patients, we also need to adequately resource our hospital-based inpatient teams and EDs so that the (appropriate) acute care workload can be managed safely.

Lamotrigine-induced generalised pustular psoriasis

Hyun Kyoung Lee, Louise Reiche

Generalised pustular psoriasis is a rare skin condition that can be life threatening. In our case the patient had developing generalised pustular psoriasis, but New Zealand health system pressures led to a delay in outpatient review, which resulted in disease progression and a subsequent acute admission to hospital. Timely multi-specialist care in hospital was received, leading to a good outcome. Lamotrigine is a commonly used anti-epileptic and can often cause rashes, with some being severe and life-threatening. This case report demonstrates a case of generalised pustular psoriasis induced by lamotrigine that has never been previously reported.

Aotearoa New Zealand clinicians respond to the 2022 American Heart Association Presidential Advisory Statement regarding penicillin reactions in people with severe rheumatic heart disease

Rachel Webb, Miriam Wheeler, Briar Peat, Mayanna Lund, Christopher Luey, Simon Briggs, Mary-Anne Ross, Belinda Paku, Philippa Anderson, Nevin Zhong, Danny de Lore, Joshua Agnew, Teuila Percival, Nigel Wilson

In 2022, the American Heart Association (AHA) published a Presidential Advisory Statement highlighting sudden cardiac deaths in 10 individuals with severe symptomatic rheumatic heart disease (RHD), shortly after they received intramuscular benzathine penicillin G (BPG).[1,2] The Advisory Statement authors concluded that BPG should no longer be recommended for individuals with most subtypes of severe RHD, on the basis that such events may undermine public confidence in the safety of secondary penicillin prophylaxis programmes in high-prevalence RHD populations. They concluded that oral penicillin is the preferred form of secondary prophylaxis for this group of patients.

BPG secondary prophylaxis has been the cornerstone of RHD control globally for decades, and it is well established that BPG is superior to oral penicillin in preventing acute rheumatic fever (ARF) recurrences.[3,4]

We sought to consider the implications of the AHA recommendations for Aotearoa New Zealand. A group of ARF/RHD clinicians reviewed the AHA statement and local safety data. Additional consultation occurred with Medsafe (the national pharmacovigilance centre) and with colleagues working across the sector. Differences in clinical profiles and management between the AHA Advisory cases and the Aotearoa New Zealand context were evaluated.

In Aotearoa New Zealand, BPG has been administered via register-based programmes in community settings since the 1980s. Injections are given by nurses in homes, schools and primary care clinics. Pfizer brand pre-formulated Bicillin® L-A is used exclusively, in contrast to most other RHD-endemic populations where cheaper reconstituted lyophilized dry powder formulation is used.[5] In Aotearoa New Zealand, BPG injections are given at the ventrogluteal site, deemed to be safer than the dorsogluteal site due to its greater distance from neurovascular structures.[6] Community nurses undergo competency-based training in BPG administration. Analgesia and non-pharmacologic measures to reduce injection-related pain are routinely used,[7] and adrenaline and basic resuscitation equipment are carried by community nurses.

The high level of confidence in the safety of the BPG programme is backed up by reassuring pharmacovigilance data. A December 2022 review undertaken by Medsafe found only seven reports of adverse reactions in the last 10 years, most on the hypersensitivity spectrum, and no deaths (2023 May, email, Nevin Zhong, Medsafe NZ).

Aotearoa New Zealand is different to many other regions with high prevalence of RHD. Unlike other endemic settings, where problems with BPG quality and stock-outs are frequently encountered,[5] in Aotearoa New Zealand there is a secure supply of high-quality preformulated BPG. With well-established register-based delivery of preformulated BPG and extremely low ARF recurrence rates (around 6% overall, less in children),[8] the benefit of BPG secondary prophylaxis is clear. Recurrence prevention minimises damage to affected valves, prevents damage to healthy valves and may delay or avert the need

for cardiac surgery. This is particularly important in growing children and teenagers. Publicly funded healthcare, including cardiac surgery, is available to all Aotearoa New Zealand residents with severe RHD.

The 10 AHA Advisory cases had symptomatic decompensated advanced RHD. Very little clinical information was provided to accurately stratify risk among the very small group of individuals with severe RHD. While the vasovagal pathogenesis postulated by the AHA authors is a consideration, vasovagal syncope is generally associated with a benign prognosis. Despite hundreds of people with severe RHD in Aotearoa New Zealand receiving BPG, no cases of cardiovascular collapse associated with BPG have been recorded. As published on the AHA website, we have postulated that a more likely mechanism for the episodes reported is severe decompensated RHD with co-existing advanced pulmonary hypertension.[9] Any such patients in Aotearoa New Zealand would be under cardiology specialist monitoring and consideration for cardiac surgery.

No sudden cardiac events have been observed in Aotearoa New Zealand following administration of Bicillin® L-A, and therefore we do not favour adopting the AHA recommendations in Aotearoa New Zealand at this time. Currently, our position is that adopting the AHA Advisory recommendations in Aotearoa New Zealand could result in excess harm due to ARF recurrences and loss of trust in national secondary prophylaxis programmes.

Recommendations:

- All persons with ARF/RHD should be offered BPG prophylaxis as first line, according to New Zealand Heart Foundation Guidelines.[10]
- It is strongly recommended that BPG injections are administered by trained nurses working in regional register-based programmes.
- Adverse reactions should continue to be notified through the usual reporting systems to Medsafe. Any person with a suspected adverse reaction should be reviewed by a specialist paediatrician or physician to determine the most appropriate antibiotic choice for secondary prophylaxis.
- We agree with the AHA Advisory recommendation that it is prudent to ensure that fluids and food have been consumed in the hours before the injection to avoid hypovolaemia and syncope.
- Best practice guidelines to reduce injection-related pain (including the use of lignocaine and Buzzy® device) should be followed.
- For individuals with severe RHD who may be anxious about the safety of IM BPG, prophylaxis recommendations can be discussed on an individual basis with a paediatrician, physician or cardiologist experienced in RHD management.
- Ongoing safety monitoring should continue via existing mechanisms, including the Centre for Adverse Reactions Monitoring (CARM) and register programmes. The new National Care Coordination System should assist with this.

The above position has been considered in light of circumstances in Aotearoa New Zealand, where there is access to high-quality preformulated Bicillin® L-A, excellent adherence and safety monitoring, and where end-stage cardiac disease is uncommon. These views may not apply in other ARF/RHD endemic countries where circumstances may be very different.

COMPETING INTERESTS
Nil.

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Cancer incidence, mortality and survival for Pacific Peoples in Aotearoa New Zealand

Tara Cleverley, Ineke Meredith, Dianne Sika-Paotonu, Jason Gurney

ABSTRACT

AIMS: Pacific Peoples comprise over 16 culturally diverse ethnic groups and experience a disproportionate burden of preventable cancers, attributable to infectious diseases and obesity. This study aims to provide updated evidence on cancer incidence, mortality and survival rates among Pacific Peoples in Aotearoa New Zealand.

METHODS: The study extracted incident cases of cancer diagnosed between 2007–2019 from the New Zealand Cancer Registry (NZCR) and linked them to the national Mortality Collection to determine individuals who died of cancer over the study period. The study also compared cancer survival rates between Pacific and European peoples in Aotearoa New Zealand. The most commonly diagnosed cancers and the most common causes of cancer death among Pacific Peoples were identified, and key findings were summarised. The European population was utilised as the comparator group for the analyses. The study employed a total ethnicity approach, wherein anyone with a record of Pacific ethnicity was classified as Total Pacific, regardless of other ethnicities. The age- and sex-standardised incidence and mortality rates were calculated, and 1-, 3- and 5-year survival rates determined. We used Cox proportional-hazards models to compare survival outcomes between Pacific and European peoples.

CONCLUSIONS: The study results revealed that Pacific Peoples in Aotearoa New Zealand experience higher cancer incidence and a lower survival rate for several cancers, including lung, liver and stomach cancers, when compared to the European population. This study underscores the need for intervention to reduce the burden of cancer among Pacific Peoples and improve cancer outcomes. This study's findings can inform planning and delivery of interventions to achieve equitable outcomes across the cancer continuum for Pacific Peoples in Aotearoa New Zealand.

Pacific Peoples in Aotearoa New Zealand encompass over 16 culturally diverse and linguistically distinct ethnic groups,[1] and comprise 8% of the population in Aotearoa New Zealand.[2] There is some evidence that Pacific Peoples experience excess cancer incidence and mortality, as well as poorer survival for several cancers, when compared to other ethnic groups in Aotearoa New Zealand.[3,4,5] There is also evidence that Pacific Peoples experience a disproportionate burden of preventable cancers, attributable to infectious diseases and obesity.[6] Major contributors to these disparities have been attributed to underlying upstream determinants, including poverty, inadequate housing, inequities of access, and timeliness and quality of care along the cancer diagnosis and treatment pathways.[7] However, the fuller extent of these cancer disparities, and their drivers, remain under-explored and poorly understood.

A collaborative approach has been suggested as the best means of improving cancer outcomes for Pacific Peoples, both within Ola Manuia: Pacific Health and Wellbeing Action Plan 2020–2025[1] and the New Zealand Cancer Action Plan 2019–2029,[8] with the latter having the goal of reducing cancer disparities and achieving equitable outcomes across the cancer continuum. In order to help guide activities that aim to reduce the cancer burden for Pacific Peoples, we need to understand where the need for intervention is currently greatest. As such, there is need for updated research that draws together current evidence on cancer incidence, mortality and survival, in order to inform planning and delivery of interventions that reduce the burden of cancer for Pacific Peoples.

This study provides evidence of the most commonly diagnosed cancers among Pacific Peoples in Aotearoa New Zealand between 2007–2019, in addition to the most common causes of cancer death. We also compare cancer survival between European and Pacific Peoples in Aotearoa New Zealand. Finally, we summarise our key findings and consider their implications regarding cancer prevention, care access and outcomes for Pacific Peoples in Aotearoa New Zealand.

Methods

Data sources

We extracted all incident cases of cancer diagnosed between 2007–2019 from the New Zealand Cancer Registry (NZCR). The NZCR is a nationally mandated record of all cancers diagnosed in Aotearoa New Zealand, excluding basal and squamous cell skin cancers.[9] We then linked these data to the national Mortality Collection to determine the individuals who died of their cancer over the study period for the purposes of survival analysis. In addition, we extracted all deaths where cancer was listed as the underlying cause from the Mortality Collection to identify all cancer deaths. Because cause-of-death data was only available until the end of 2018, mortality and survival analyses are restricted to 2007–2018.

Variables

Ethnicity at the time of cancer registration was derived from the NZCR for cancer incidence and survival analysis and the Mortality Collection for mortality analysis. We also supplemented ethnicity data from the Mortality Collection with data from the NZCR to maximise ethnicity data completeness. We utilised a modified version of the total ethnicity approach to attribute ethnicity, wherein anyone with a record of Pacific ethnicity was classified as Total Pacific, while those who only have a record of European ethnicity (i.e., non-Pacific/Māori/Asian/Other ethnicities, or sole European) were classified as European. The European group was used as the comparator population, given their status as the majority population within Aotearoa New Zealand.[9] We have purposely chosen to exclude Māori and Asian peoples from the comparator group for two reasons: 1) the existence of stark differences in cancer rates for several key cancers between the majority European population and other ethnic groups (particularly Māori),[10] and 2) consistency with how cancer data for Pacific Peoples have been presented previously.[4,6] The total ethnicity approach was adopted in favour of a prioritised ethnicity approach because prioritised ethnicity prioritises Māori ethnicity over Pacific,[11] which means that those who identify as both Māori and Pacific would not be included in the Pacific group if we were to utilise a prioritised ethnicity approach. Using a total ethnicity approach ensures that all people recorded as Pacific are included in the Total Pacific group, regardless of whether they are also recorded as another ethnicity.

No restriction was placed on **New Zealand residency status**, which allowed for the inclusion of those Pacific (and non-Pacific) peoples diagnosed with their cancer within Aotearoa New Zealand while holding residency in another country. **Cancer type** (e.g., lung cancer) was determined utilising the International Classification of Diseases (ICD) codes on the NZCR. In the case of breast cancer, only female breast cancer cases were included in the analysis.

Statistical analysis

Numerators and denominators

For cancer incidence, our numerator data was the number of cases over the study period, as determined by the NZCR. For mortality, numerator data was the number of deaths where a given cancer was listed as the underlying cause of death within the Mortality Collection. In terms of denominators, age-stratified denominator data for Pacific and European peoples were derived from the usual resident population counts from the 2013 Census,[12] derived from Statistics New Zealand.[13] The 2013 Census population was chosen as the denominator because it is a midpoint within the study period (2007–2019).

Descriptive analysis

In terms of descriptive analysis, we used the NZCR to determine the total number of new cancer cases and incidence rates, with a focus on the top 10 cancers that were the most commonly diagnosed among Pacific Peoples over the study period on the NZCR (based on absolute counts). Similarly, we utilised the Mortality Collection to determine the number of cancer deaths and mortality rates among our cohort, focusing on the top 10 most common cancers listed as an underlying cause of death among Pacific Peoples within the Mortality Collection.

Age- and sex-standardisation

We employed the use of direct age standardisation to calculate age- and sex-standardised cancer incidence rates (SIR) and standardised mortality rates (SMR), along with their 95% confidence intervals (CIs),[14] utilising the World Health Organization (WHO) world standard population as the standard. We used this standard population for two reasons: 1) the WHO world standard population has a similarly young age structure to the Pacific population, which in turn has a younger age structure than the European population;[9] choosing the WHO standard population

normalises this more youthful age structure, and 2) the WHO world standard population was also utilised by Meredith et al. in their previous examination of cancer trends among Pacific Peoples,[6] maximising our ability to compare findings between studies. In those cases where incidence and mortality rates are presented by sex, the denominator and standard population used for these rates are sex specific.

Survival analysis

Kaplan–Meier analysis was utilised to determine 1-, 3- and 5-year cancer-specific survival for Pacific and European peoples separately by cancer type. Cox proportional-hazards modelling was then used to describe the extent to which Pacific Peoples are more or less likely to die of their cancer than Europeans, adjusted for age (continuous variable) and sex. These results were described using hazard ratios (HR), along with their 95% confidence intervals (CIs), with Europeans as the reference group.

All analyses were conducted in SAS v9.4 (SAS Enterprises Inc.) and Microsoft Excel (Microsoft Corporation). Ethical approval was sought and received from the University of Otago Human Ethics Committee, reference HD23/005. The study was led by a Pacific researcher (TC), supported by Pacific (IM and DS-P) and non-Pacific researchers (JG).

Results

What are the most commonly diagnosed cancers among Pacific Peoples in Aotearoa New Zealand?

Incidence rates and rate differences are shown for the total population (Figure 1) and separately for males and females (Appendices 1 and 2). Among Pacific Peoples, the most commonly diagnosed cancer in terms of absolute numbers of cases was breast cancer, with 166 cases per year, followed by prostate (105/year), lung (104/year) and uterine (79/year).

In terms of age- and sex- standardised incidence rates, the highest were breast (SIR: 127/100,000 Pacific women per year) and prostate cancer (109/100,000 Pacific men per year), followed by lung (50/100,000 total Pacific Peoples) and uterus (61/100,000 Pacific women). The other 10 most common types of cancer, such as colorectal, stomach, liver, non-Hodgkin's lymphoma, leukaemia, thyroid and endocrine ranged from 12–32/100,000 Pacific Peoples. The top three most commonly diagnosed cancers among Pacific females were breast cancer (127/100,000 Pacific females), followed by uterus (61/100,000) and lung (34/100,000). For Pacific males, the three most commonly diagnosed cancers were prostate (109/100,000 Pacific males), followed by lung (65/100,000) and colorectal (39/100,000; Figure 1). Compared to the European population, Pacific Peoples had a higher incidence of most of these cancers, particularly uterine (SRD 48) and lung (SRD 25). Pacific Peoples were less likely to be diagnosed with colorectal (SRD females -15, males -13) and prostate (SRD -2; Figure 1).

What are the most common causes of cancer death for Pacific Peoples in Aotearoa New Zealand?

We determined the mortality rates and rate differences for the total population (Figure 2), and separately for males and females (Appendices 3 and 4). In terms of absolute numbers, lung cancer was the most common cause of cancer death among Pacific Peoples, with 72 deaths per year (SMR 35/100,000), followed by breast (34 deaths/year, SMR: 27/100,000 Pacific women) and colorectal (29 deaths/year, SMR: 13/100,000). The remainder of the top 10 cancers (uterus, prostate, stomach, liver, pancreas, ill-defined, leukaemia) caused between 15–23 deaths per year (SMR: 7–20/100,000). The three most common causes of cancer death for Pacific females were breast cancer (27/100,00), lung (22/100,000) and uterus (13/100,000). The three most common causes of cancer death among Pacific males were lung (SMR: 47/100,000), prostate (20/100,000) and liver (16/100,000; Figure 2). Compared to Europeans, Pacific Peoples were more likely to die of all of these cancers, particularly lung (SRD: 26) and uterine (SRD: 11), but less likely to die of colorectal cancer (SRD females -5, SRD males -4; Figure 2).

There was strong overlap between the incidence and mortality data, with eight of the top 10 cancers occurring on both lists. A summary of annual cases, incidence rates and mortality rates is shown in Appendix 5.

Survival

Results from our analysis of cancer survival are shown in Table 1 and Figure 3. We found that Pacific Peoples had poorer cancer survival than Europeans for multiple cancers. The strongest disparity was found for leukaemia (age-sex-adjusted hazard ratio [HR]: 2.1, 95% CI 1.8–2.5), cervix (HR: 1.8, 95% CI 1.3–2.3), breast (HR: 1.7, 95% CI 1.5–1.9) and uterine cancers (HR: 1.7, 95% CI 1.5–2.0). We noted negligible differences in

Figure 1: Age- and sex-standardised incidence rate (SIR) and absolute numbers of annual cases for the top 10 most commonly diagnosed cancers for Pacific Peoples between 2007–2019 (top), along with the age- and sex-standardised rate difference (SRD) between Pacific Peoples and Europeans (bottom). Rates for breast, prostate and uterine cancers are sex specific.

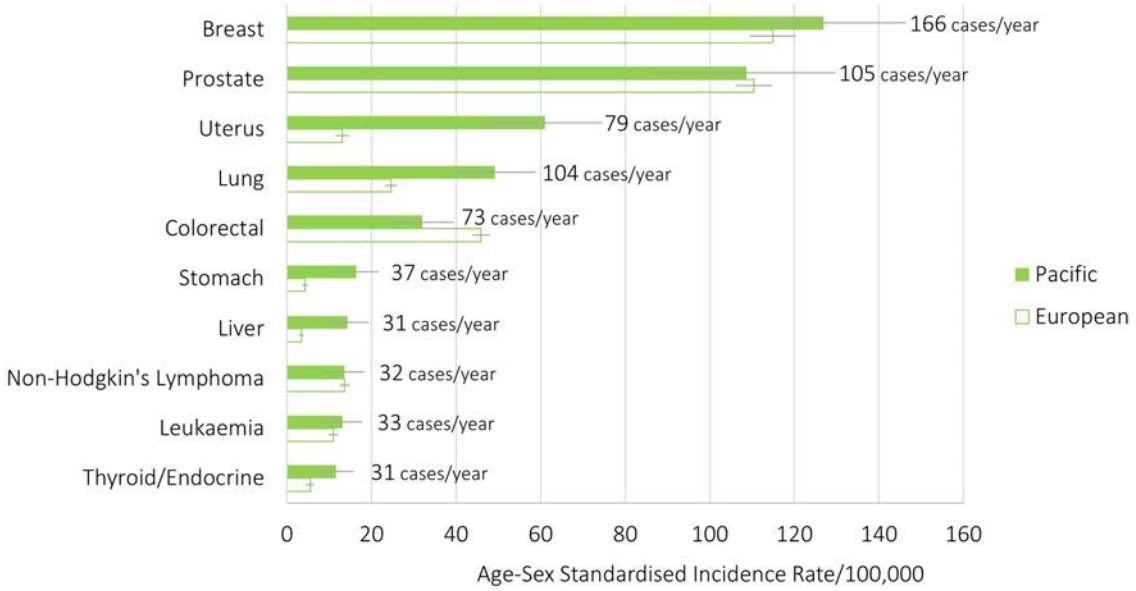


Figure 2: Age- and sex-standardised mortality rate (SMR) and absolute numbers of cases for the top 10 most common causes of cancer death for Pacific Peoples between 2007–2018 (top), along with the age- and sex-standardised rate difference (SRD) between Pacific and European peoples (bottom). Rates for breast, prostate and uterine cancers are sex specific. Ill-defined cancers are those cancers that are unspecified, lack precise definition, or are secondary (i.e., non-primary) cancers.

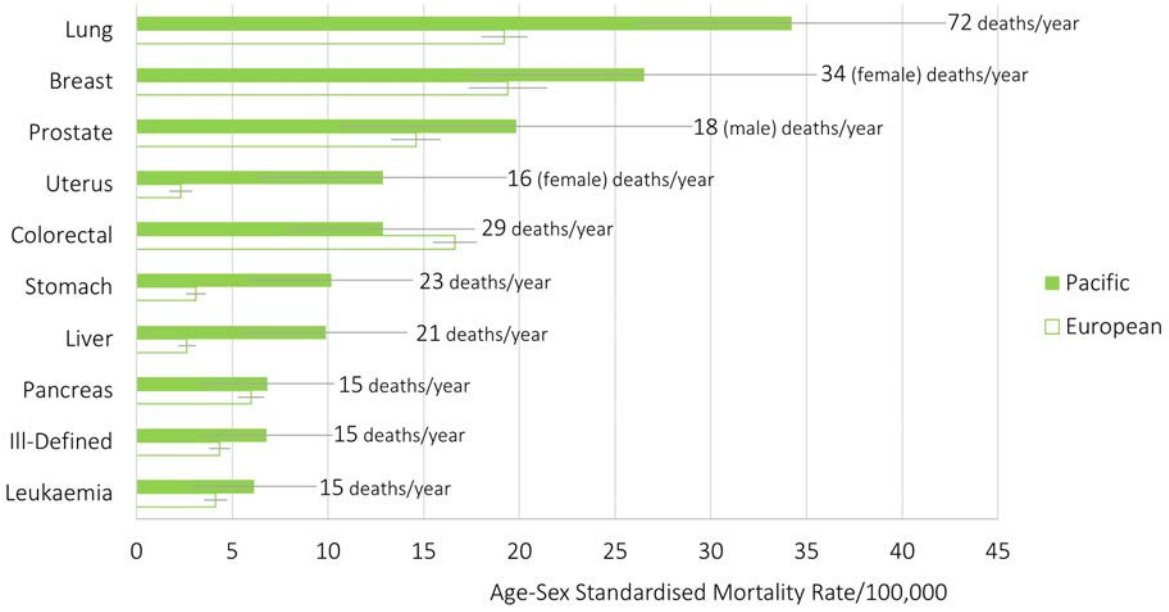
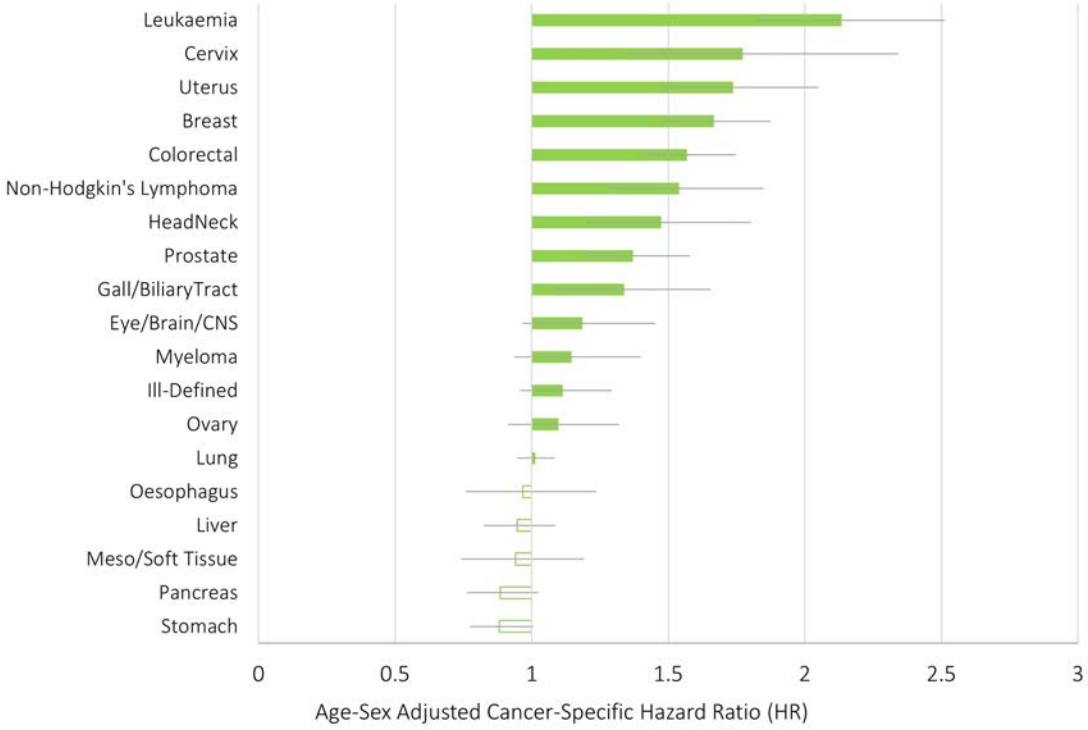
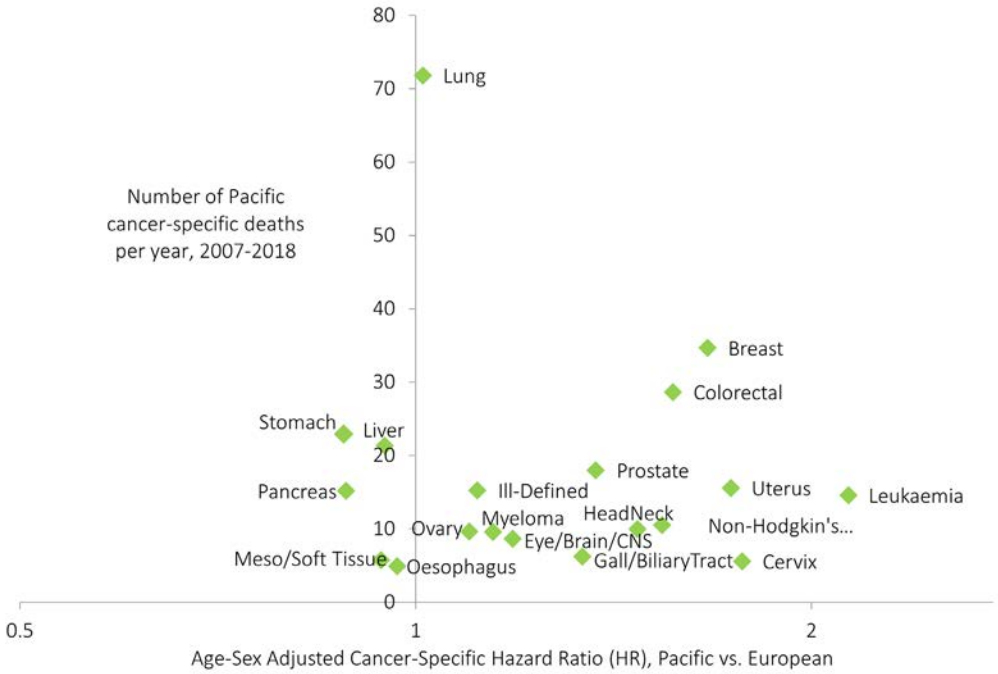


Table 1: Crude (i.e., unadjusted) 1-, 3- and 5-year survival and age–sex-adjusted hazard ratios (HRs) comparing the likelihood of cancer-specific mortality between Pacific and European peoples with cancer. Cancers for which fewer than five Pacific Peoples died per year during the study period were excluded. HRs are adjusted for age and sex for all cancers except breast, cervical, ovarian, prostate and uterine (age only).

	Survival rates (%)						Hazard ratios (HR)	
	1-Year (%)		3-Year (%)		5-Year (%)		Adj. HR (95% CI)	
Cancer name	Pacific	European	Pacific	European	Pacific	European	Pacific	European
Breast	96%	96%	88%	91%	82%	86%	1.7 (1.5–1.9)	Ref
Cervix	80%	88%	62%	76%	59%	72%	1.8 (1.3–2.3)	Ref
Colorectal	76%	79%	59%	64%	53%	58%	1.6 (1.4–1.7)	Ref
Eye, brain and CNS	66%	54%	48%	33%	45%	28%	1.2 (1–1.5)	Ref
Gallbladder and biliary tract	35%	39%	16%	20%	16%	14%	1.3 (1.1–1.7)	Ref
Head and neck	84%	84%	70%	72%	65%	66%	1.5 (1.2–1.8)	Ref
Ill-defined, secondary or unspecified	24%	19%	19%	12%	18%	10%	1.1 (1–1.3)	Ref
Leukaemia	68%	73%	60%	62%	56%	55%	2.1 (1.8–2.5)	Ref
Liver	44%	36%	28%	18%	23%	13%	0.9 (0.8–1.1)	Ref
Lung	39%	36%	19%	17%	16%	13%	1 (0.9–1.1)	Ref
Mesothelioma and soft tissue	74%	60%	53%	38%	49%	32%	0.9 (0.7–1.2)	Ref
Myeloma	82%	81%	63%	62%	49%	49%	1.1 (0.9–1.4)	Ref
Non-Hodgkin's lymphoma	75%	79%	68%	68%	66%	63%	1.5 (1.3–1.8)	Ref
Oesophagus	38%	38%	27%	16%	24%	13%	1 (0.8–1.2)	Ref
Ovary	74%	67%	54%	42%	48%	33%	1.1 (0.9–1.3)	Ref
Pancreas	29%	19%	19%	7%	18%	5%	0.9 (0.8–1)	Ref
Prostate	95%	95%	87%	90%	82%	85%	1.4 (1.2–1.6)	Ref
Stomach	54%	44%	34%	23%	30%	19%	0.9 (0.8–1)	Ref
Uterus	89%	90%	80%	79%	78%	75%	1.7 (1.5–2)	Ref

Figure 3: Forest plot showing cancer-specific mortality hazard ratios (HRs; top) and scatterplot showing the average annual cancer-specific deaths among Pacific Peoples versus the same HRs (reference = Europeans). Cancers for which fewer than five Pacific Peoples died per year during the study period were excluded.





survival for other common causes of cancer death, including lung (HR: 1.0, 95% CI 0.9–1.1), liver (0.9, 95% CI 0.8–1.1), pancreatic (HR: 0.9, 95% CI: 0.8–1) and stomach cancers (0.9, 95% CI 0.9–1; Figure 3).

Figure 3 illustrates the correlation between the disparities in cancer survival rates (x-axis) between Pacific and European populations, and the annual number of cancer-related deaths among Pacific Peoples (y-axis). This visual representation helps to contextualise the relative disparities in cancer survival rates against real-world mortality. This figure shows that over the study period, the most significant survival disparity is found for leukaemia, where Pacific Peoples have more than twice the probability of death compared to Europeans (HR:2.1, 95% CI 1.8–2.5), but of which there are only 15 Pacific people deaths per year. This figure also shows the highest cancer-mortality burden is caused by lung cancer (72 Pacific deaths per year), but the survival disparity is negligible (HR: 1, 95% CI 0.9–1.1; Figure 3).

Figure 3 also illustrates that breast and colorectal cancers pose a significant cancer mortality burden, as demonstrated by the increased number of deaths each year (although not the highest), and shows a notable survival disparity. Specifically, breast cancer caused 34 female deaths per year, and the hazard ratio for overall breast cancer survival was 1.7 (95% CI 1.5–1.9) in Pacific Peoples when compared to Europeans. Similarly, colorectal cancer resulted in 29 deaths per year, with a hazard ratio for overall colorectal cancer survival of 1.6 (95% CI 1.4–1.7) in Pacific Peoples compared to Europeans. It is also worth highlighting uterine and prostate cancers as contributors to cancer-related deaths (16 and 18 deaths per year, respectively), where Pacific Peoples also experienced a survival gap (uterus HR: 1.7, 95% CI 1.5–2 and prostate HR: 1.4, 95% CI 1.2–1.6; Figure 3).

Discussion

In this study, we found striking disparities in cancer incidence, mortality and survival for Pacific peoples when compared to European peoples. These differences are strongly patterned by cancer type, wherein Pacific Peoples are more likely to be diagnosed with (and die from) certain cancers, but not others.

Our findings highlight significant adverse impacts of the differential distribution of the social determinants of health on cancer incidence, mortality and survival for Pacific Peoples.[15] High deprivation, poor living standards, occupation type, housing and employment status in Aotearoa New Zealand play strong roles in driving poor access to care and health outcomes.[16] These factors are set against a backdrop of exposure to cancer-promoting aetiological factors,[17] which perpetuate the compounded ethnic differences at each stage of the cancer continuum (poor cancer screening, delayed diagnosis, treatment, comorbidity, service quality, barriers to timely treatment access and access to follow-up, etc.).[18,19,20]

The most common cancers (Figure 1) and causes of cancer death (Figure 2) among Pacific Peoples can largely be attributed to social determinants, which disproportionately affect Pacific Peoples compared to Europeans.[3,6] These exposures can be broadly grouped as tobacco exposure (lung cancer[21]), infectious diseases (liver[6] and stomach[22] cancers) and obesity (breast,[23] uterine[24] and colorectal cancers[25]). We will now consider each of these broad groups, and their role as drivers of our observed disparities for incidence and mortality.

Tobacco

Smoking is a well-established and significant risk factor for lung cancer and various other cancers.[21,26,27,28] Pacific Peoples are 1.9 times more likely than non-Pacific Peoples to be current smokers.[29] Further vigilance and vigour are required to address tobacco exposure, as modelling studies suggest Aotearoa New Zealand is unlikely to meet its Smokefree 2025 goal.[30] The introduction of the Smokefree Environments and Regulated Products (Smoked Tobacco) Amendment Act looks promising (effective from 1 January 2023), which limits the sale of smoked tobacco products to approved retail outlets and prohibits their sale to individuals born on or after 1 January 2009, with the aim of creating a smokefree generation and preventing the uptake of smoking.[31]

The present study showed a remarkable improvement in the standardised incidence rate (SIR) of lung cancer of 50/100,000, compared to 109/100,000 in the period between 1981 and 2004, reported by Meredith et al.[6] This is a promising finding, as it suggests that reductions over time in tobacco exposure have had a positive effect on lung cancer outcomes for Pacific Peoples. The observed improvement in lung cancer incidence rates is a strong impetus to continue with system-level efforts to reduce tobacco exposure.

Obesity

Obesity has been attributed as one of the main drivers of several types of cancer, especially

breast, colorectal and uterine cancers.[23,32,33,34] Notably, ethnic inequalities in the incidence of obesity-related cancers in Aotearoa New Zealand have widened,[3] with Pacific Peoples 2.5 times more likely to be obese than non-Pacific adults (adjusted for age and gender).[1] In this study, we showed that breast, colorectal and uterine cancers are among the top five most commonly diagnosed and most common causes of cancer death for Pacific Peoples, and that incidence and mortality from breast and uterine cancers are higher among Pacific than among European peoples.

Aotearoa New Zealand has implemented multiple prevention activities to address the structural and behavioural causes of obesity, including the Healthy Eating – Healthy Action programme,[35] the Green Prescription programme,[36] the Food and Beverage Classification System, the Childhood Obesity Plan[37] and the Healthy Families NZ initiative.[38] Despite these efforts, the prevalence of obesity remains high in Aotearoa New Zealand. The limited impact of these interventions may be due to the complexity of the issue and the multitude of factors contributing to obesity, which calls for more substantive interventions and a continued commitment to research and implementation of evidence-based approaches.

Infectious diseases

Helicobacter pylori (*H. pylori*) infection is a well-established and potent modifiable risk factor for stomach cancer,[39] with a higher prevalence among Pacific Peoples in Aotearoa New Zealand than for other ethnic groups.[40] According to previous studies, human papillomavirus (HPV) infection is highly attributable to cervical cancers.[41] Hepatitis B infection is considered to be the primary risk factor for liver cancer, as it increases the risk of developing liver cancer by 30–60 times compared to those without the infection.[42] Research has shown that the estimated prevalence of chronic hepatitis B infection is 7.3% among Pacific Peoples, which is notably higher than the 0.5% observed among Europeans.[43,44] In this study, we found that stomach and liver cancers were among the top 10 most frequently diagnosed and leading causes of cancer deaths within the Pacific population, and that incidence and mortality from these cancers was substantially higher among Pacific Peoples relative to Europeans.

In summary, the intrinsic role tobacco, obesity and infectious diseases play as key drivers of inequities in cancer outcomes for Pacific Peoples means that addressing these social determinants is both crucial and urgent. There is a fertile area for Pacific-led policies and actions to address these social determinants, with a view to reducing excess cancers among Pacific Peoples. An appropriate balance must be reached regarding population-wide and Pacific cancer-focused interventions, tailored to Pacific Peoples' specific needs, values and acceptability to bridge unmet, disproportionate needs and structural disadvantages.[1]

Early detection and screening activities

The disparity in cancer detection and access to screening between Pacific Peoples and Europeans in New Zealand is multifactorial, compounded by ethnic differences on the cancer continuum, as stated above.[16,18,19,20,45] Screening programmes and early detection through primary care are major interventions that can improve cancer outcomes and survival.[16] However, delays in cancer diagnosis among Pacific Peoples when compared to European patients[46] are caused by the former facing more barriers to accessing primary health-care than non-Pacific and non-Māori groups.[47] Furthermore, Pacific Peoples have poorer access to some national screening programmes compared to Europeans,[48,49] resulting in some cancers being diagnosed at a more advanced stage.[50,51] For example, cervical screening participation rates have been steadily decreasing among eligible Pacific women since 2017, and are now 56%, compared to 75% among European/Other women.[49] Some of the impact of this poorer access can be seen in the results of our survival analysis (Table 1/Figure 3), wherein Pacific Peoples had poorer survival for each of the cancers for which we have national screening programmes (breast, colorectal, cervical). We note that these (and other) substantial disparities in cancer survival among Pacific Peoples compared to Europeans became obvious once the confounding impact of age was accounted for within the adjusted hazard ratios; this is because the Pacific population has a much younger age structure to the European population (i.e., there are fewer older Pacific Peoples), and increasing age is a significant risk factor for cancer death.

We must continue to work to ensure that screening and early detection programmes (including the burgeoning lung cancer screening programme[52]) works well for Pacific Peoples, to maximise coverage and improve survival outcomes.

Access to best-practice and timely treatment

The unequal access to cancer services and treatment for Pacific Peoples has been shown to contribute to the observed survival disparities for Pacific population groups.[3,4,53] Specifically, a previous study has reported that Pacific patients had the longest median waiting times (32 days) between cancer diagnosis and treatment, as compared to other ethnic groups, and a higher proportion of Pacific patients (16%) died prior to receiving treatment, compared to non-Pacific patients (11%).[54] Additionally, a study by Schaaf has shown that Pacific men with symptomatic prostate cancer experience delays in treatment.[55] In terms of breast cancer, only 16% of Pacific women received private care for their primary treatment compared to 47% of non-Pacific and non-Māori women,[7] and there is evidence that differential access to private care accounted for 10% of survival disparities in Pacific women with breast cancer.[56] These findings highlight some of the challenges Pacific Peoples face in accessing timely cancer treatment in Aotearoa New Zealand, and underscore the crucial role and need for continual commitment of cancer services in improving survival and cancer outcomes for this population.

Te Aho o Te Kahu, New Zealand's Cancer Control Agency, acknowledges the differential access to cancer treatment for Pacific Peoples among other population groups and has recommended strategies to address these inequities.[4,57] Recommended strategies include a Pacific cancer action plan, increasing access to screening and culturally appropriate care, improving data collection, strengthening the Pacific health workforce, increasing public awareness, including Pacific Peoples in cancer research and fostering partnerships between Pacific communities and cancer service providers.[57]

Other considerations for cancer in Pacific Peoples

Although our focus has been on the most commonly diagnosed and common causes of cancer death among Pacific Peoples in Aotearoa New Zealand, we recognise the importance of addressing all cancer types that impact individuals and their families. For example, while leukaemia is not one of the most commonly diagnosed, it has the largest survival disparity for Pacific Peoples when compared to Europeans (HR:2.1, 95% CI 1.8–2.5), and 15 Pacific deaths per year (Figure 3). There is limited research on ethnicity and treatment outcomes for leukaemia, although it has been suggested that there is ethnic-based variation in the treatment response to ALL.[58] Continued efforts to collect and analyse data on cancer incidence, mortality and survival among Pacific Peoples, including the monitoring of trends for less common cancers, can help to inform the development and implementation of effective cancer control strategies that target the specific needs of Pacific Peoples.[57]

Strengths and limitations

The New Zealand Cancer Registry is mandated by law to compile data on all cancer cases diagnosed in Aotearoa New Zealand, with the exception of basal and squamous cell carcinomas.[59] This means that the study is less prone to underestimating the true number of cancer cases, which can be an issue in studies where certain groups are less likely to seek healthcare or receive appropriate diagnostic testing. Death registration is also mandatory and can be linked to cancer registrations using the NHI number, making the study less prone to biases and inaccuracies that may result from incomplete or inaccurate reporting of deaths. There could have been misclassifications for the cause of death, but it is likely not to significantly impact bias in ethnic comparisons.[60] While we have utilised a total ethnicity approach to maximise the capture of those who identify as Pacific, there may be some misclassification of ethnicity on the cancer registry, whereby Pacific Peoples may be undercounted.[61] The impact of such an undercount would be to make the results reported in this study conservative. The impact of using the total ethnicity approach in the current study is that we included 774 Pacific cancer cases (out of a total of 12,387, or 6% of the cohort) who identified as both Pacific and Māori; we have included a table in **Appendix 6** to show which cancers these cases were diagnosed with, over the study period. As noted in the Methods section, no restriction was placed on New Zealand residency status, which means it was possible for Pacific (and non-Pacific) peoples diagnosed with their cancer within Aotearoa New Zealand to be included in this study even if they held residency in another country. This approach was taken to maximise the inclusivity of the Pacific cohort. It is plausible that Pacific cases were more likely to be misclassified as alive at the end of follow-up because they died in their country of residence;

the impact of this misclassification would again be to make the mortality and survival results within this study conservative. Finally, we note that we have categorised Pacific Peoples as one group for the purposes of this study to maximise data precision. Further research describing differences in cancer incidence and outcomes between Pacific ethnicities within this broader group is needed.

Conclusions

This study presents the most up-to-date data on cancer incidence, mortality and survival among Pacific Peoples in Aotearoa New Zealand. By identifying the cancers with the greatest burden on Pacific communities and examining disparities in survival between Pacific and European peoples post-diagnosis, this study provides insight into where resources can be focused to reduce the overall cancer burden for this population. Introducing interventions to eradicate ethnic disparities at each stage of the cancer continuum (prevention, detection and screening, timely and appropriate access to care) will lead to a reduction in avoidable cancer deaths for Pacific Peoples. Tackling socio-economic inequalities will likely have flow-on effects that will reduce inequalities in risk factor profiles for Pacific Peoples overall. Improving health risk profiles requires a comprehensive strategy that targets both the aetiological causes of the cancers and specific cancers themselves, such as targeting obesity through addressing obesogenic environments, while simultaneously improving access to national screening programmes to maximise early detection for relevant cancers. Cross-government and intersectoral interventions to prevent cancers related to infectious diseases, smoking and obesity will also significantly reduce the cancer burden faced by Pacific Peoples.

COMPETING INTERESTS
Nil.

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Tara Cleverley conducted the literature review, drafted the manuscript and revised content based on feedback. Jason Gurney designed the study, conducted the data analysis and revised content based on feedback. Ineke Meredith and Dianne Sika-Paotonu assisted with interpretation of data and provided critical revision of drafts.

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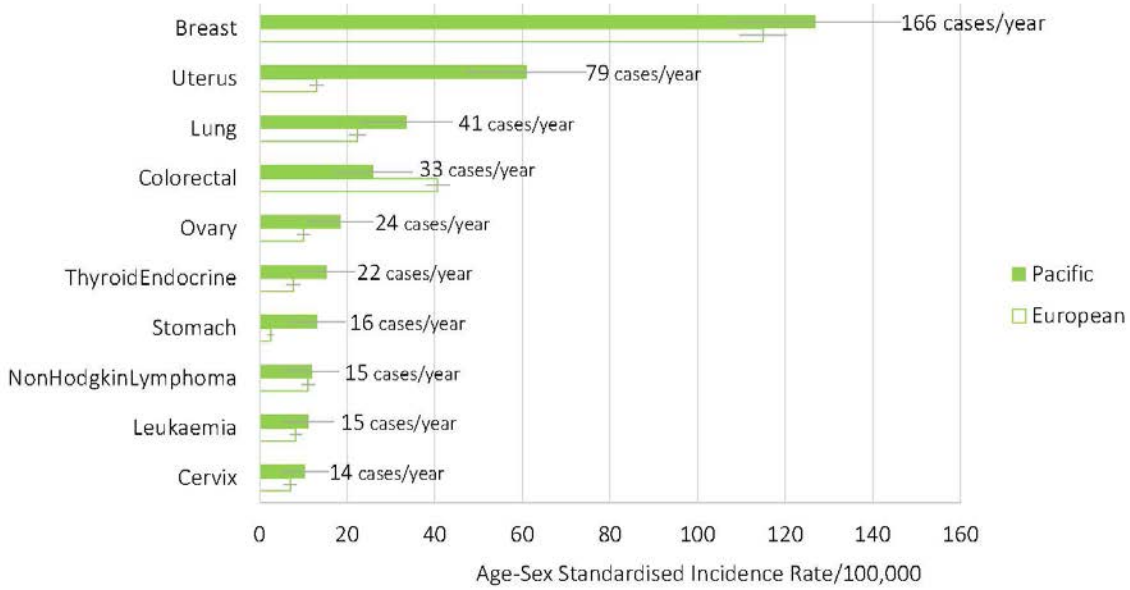
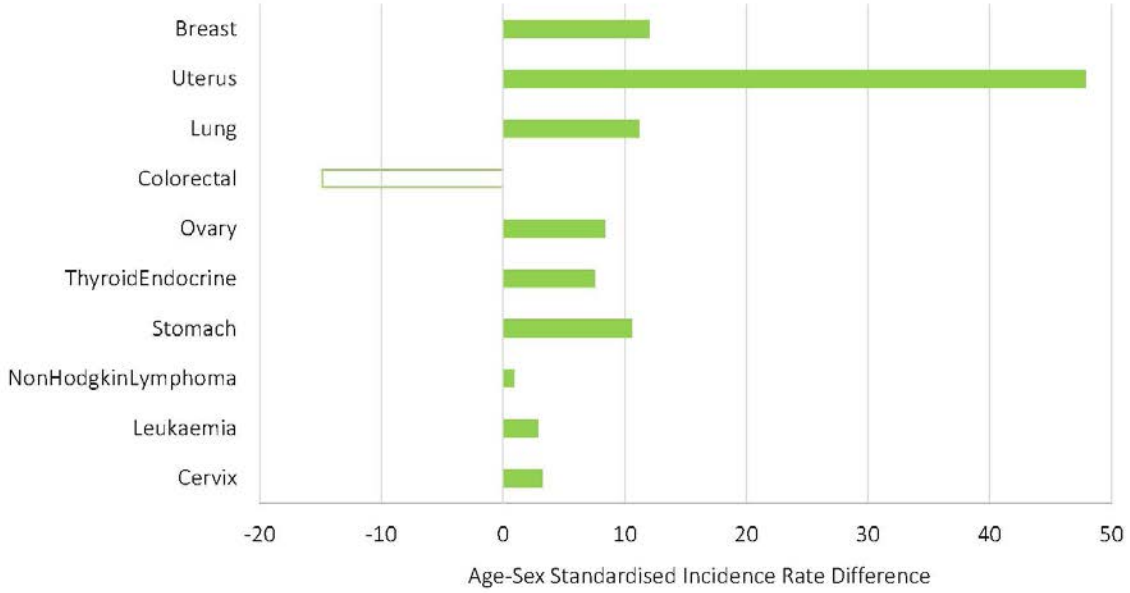
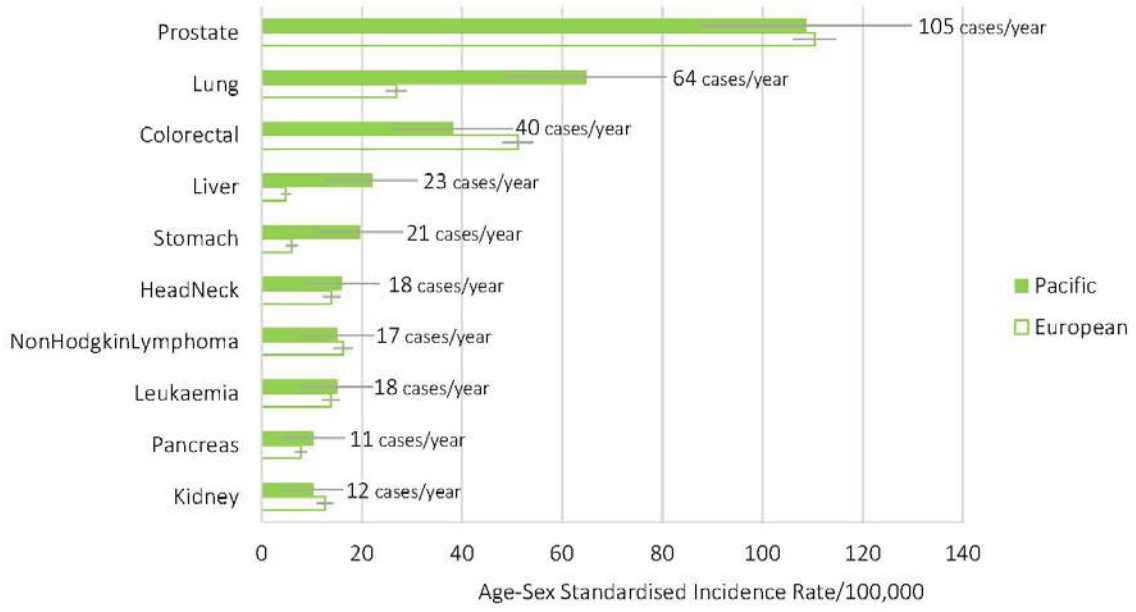
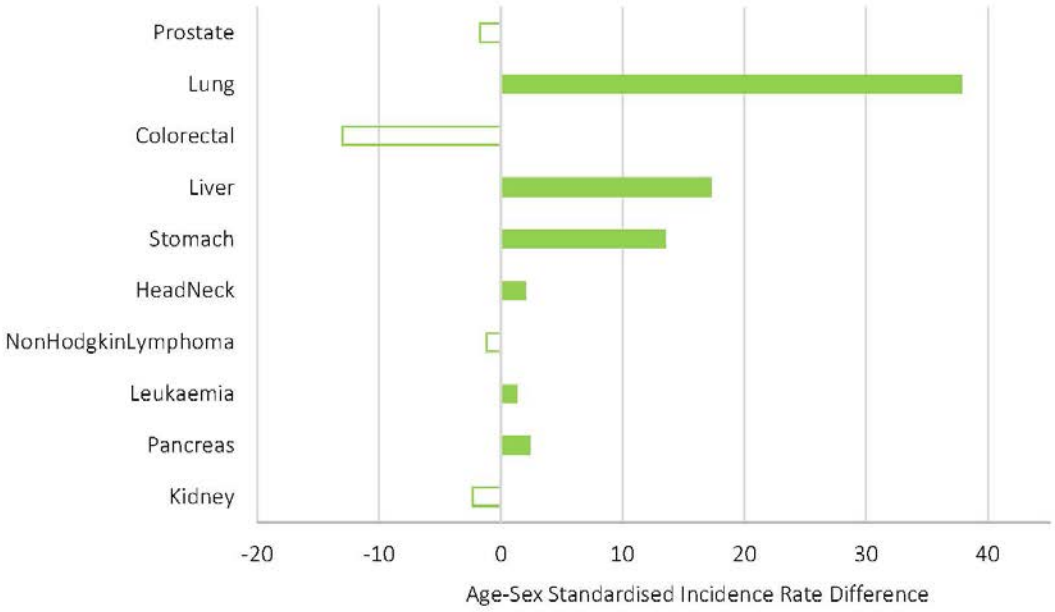
Appendix 1: Age- and sex-standardised incidence rate (SIR) and absolute numbers of annual cases for the top 10 most commonly diagnosed cancers for Pacific **females** between 2007–2019 (top), along with the age- and sex-standardised rate difference (SRD) between Pacific females and European females (bottom).



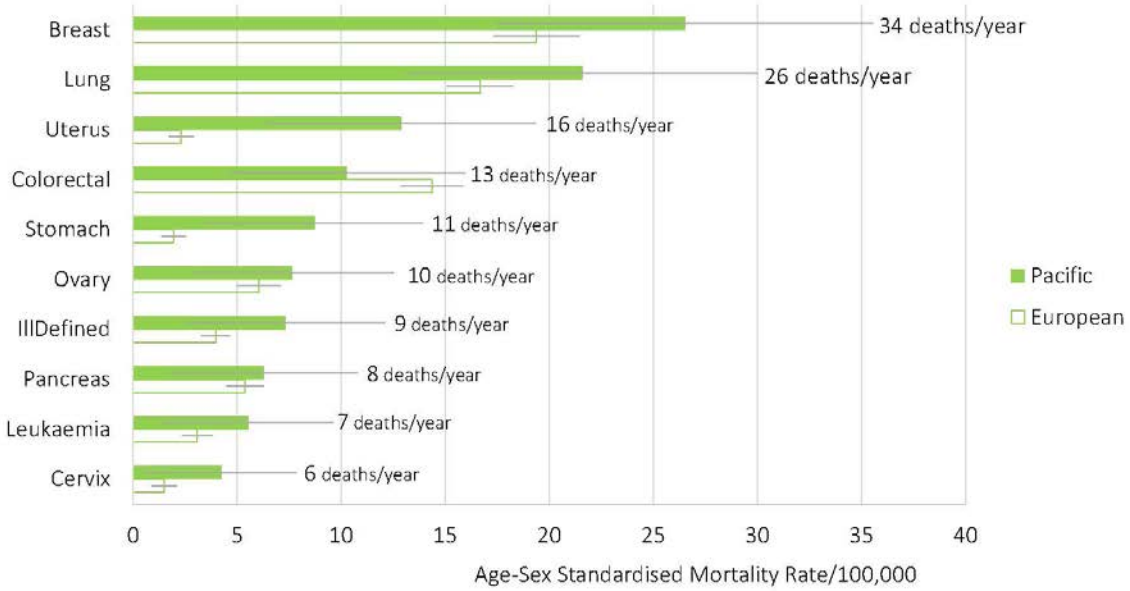


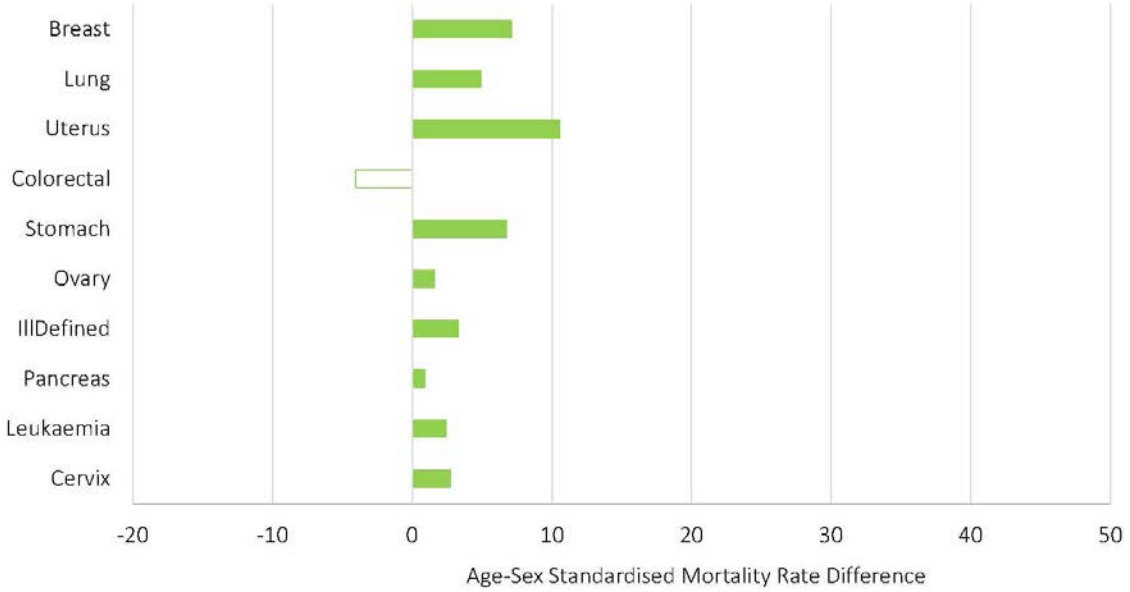
Appendix 2: Age- and sex-standardised incidence rate (SIR) and absolute numbers of annual cases for the top 10 most commonly diagnosed cancers for Pacific **males** between 2007–2019 (top), along with the age- and sex-standardised rate difference (SRD) between Pacific males and European males (bottom).



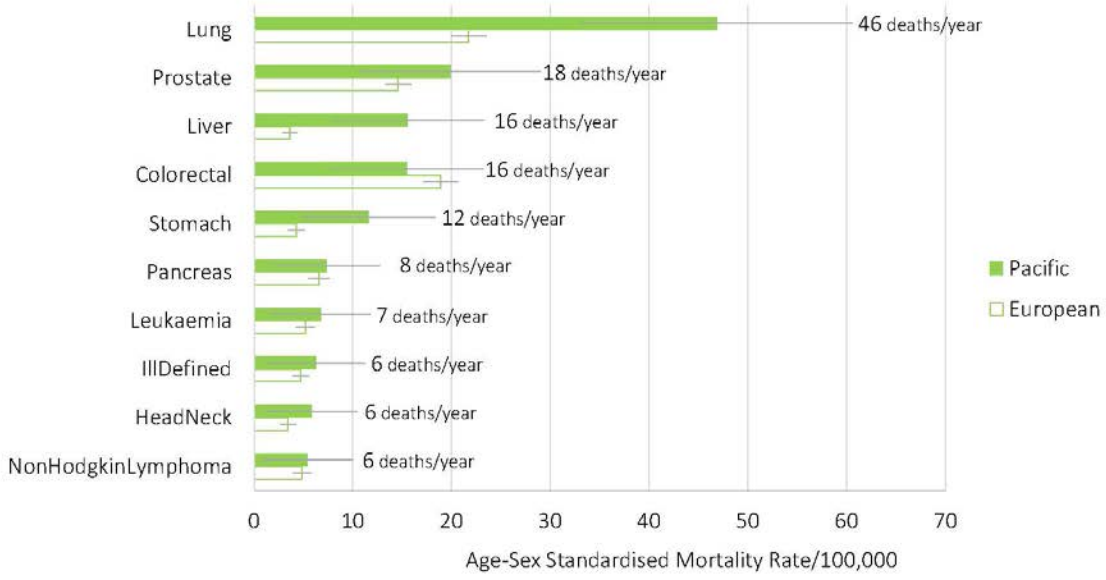


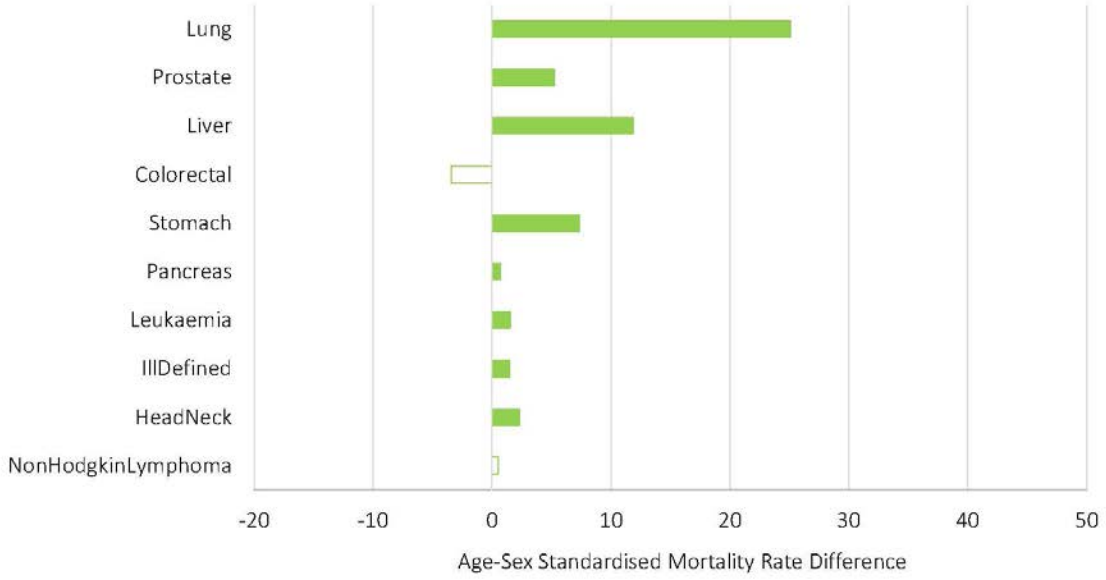
Appendix 3: Age- and sex-standardised mortality rate (SMR) and absolute numbers of cases for the top 10 most common causes of cancer death for Pacific **females** between 2007–2018 (top), along with the age- and sex-standardised rate difference (SRD) between Pacific females and European females (bottom).





Appendix 4: Age- and sex-standardised mortality rate (SMR) and absolute numbers of cases for the top 10 most common causes of cancer death for Pacific **males** between 2007–2018 (top), along with the age- and sex-standardised rate difference (SRD) between Pacific males and European males (bottom).





Appendix 5: Annual cancer cases, incidence rates and mortality rates for Pacific and European peoples. SIR: Standardised incidence rate; SMR: standardised mortality rate.

	Incidence				Mortality			
	Cases/year		SIR (95% CI)		Deaths/year		SMR (95% CI)	
Cancer name	Pacific	European	Pacific	European	Pacific	European	Pacific	European
Bladder	8	353	3.9 (1.2–6.6)	5.4 (4.7–6)	4	189	-	-
Bone and cartilage	5	25	1.5 (0.1–2.9)	0.9 (0.5–1.3)	2	13	-	-
Breast	166	2,370	126.9 (107.3–146.5)	114.9 (109.5–120.3)	34	507	26.5 (17.5–35.5)	19.4 (17.3–21.4)
Cervix	14	97	10.3 (4.8–15.7)	7 (5.4–8.5)	6	34	4.3 (0.7–7.8)	1.5 (0.9–2.1)
Colorectal	73	2,677	32 (24.5–39.5)	45.9 (43.9–48)	29	1,100	12.9 (8.1–17.7)	16.6 (15.5–17.8)
Eye, brain and CNS	18	311	6.4 (3.4–9.4)	7.9 (6.9–8.9)	9	235	3.3 (1–5.5)	5.4 (4.6–6.2)
Gallbladder and biliary tract	12	101	5.4 (2.2–8.5)	1.6 (1.2–2)	6	69	2.9 (0.6–5.2)	1 (0.7–1.3)
Head and neck	29	442	12.2 (7.6–16.7)	9.6 (8.6–10.6)	10	138	4.4 (1.6–7.1)	2.4 (1.9–2.8)
Hodgkin's lymphoma	7	78	2.3 (0.5–4.1)	2.9 (2.2–3.6)	1	16	-	-
Ill-defined, secondary or unspecified	20	356	9 (5–13)	5 (4.4–5.6)	15	328	6.8 (3.3–10.3)	4.3 (3.8–4.9)
Kidney	20	440	8.2 (4.5–11.9)	9.3 (8.3–10.3)	4	161	-	-
Leukaemia	33	534	13.1 (8.5–17.7)	11 (9.9–12.1)	15	261	6.2 (2.9–9.4)	4.1 (3.5–4.7)
Liver	31	190	14.3 (9.2–19.4)	3.4 (2.9–4)	21	157	9.9 (5.6–14.2)	2.6 (2.2–3.1)
Lung	104	1,520	49.1 (39.6–58.7)	24.6 (23.2–26)	72	1,229	34.2 (26.2–42.3)	19.2 (18–20.4)
Melanoma	8	2,493	3.3 (0.9–5.6)	56.2 (53.6–58.8)	2	328	-	-
Mesothelioma and soft tissue	14	207	5.8 (2.7–8.9)	4.3 (3.6–5)	6	142	2.5 (0.4–4.6)	2.5 (2–3)
Myeloma	22	279	10 (5.7–14.2)	4.9 (4.2–5.5)	10	147	4.5 (1.6–7.4)	2.1 (1.7–2.5)

Appendix 5 (continued): Annual cancer cases, incidence rates and mortality rates for Pacific and European peoples. SIR: Standardised incidence rate; SMR: standardised mortality rate.

	Incidence				Mortality			
	Cases/year		SIR (95% CI)		Deaths/year		SMR (95% CI)	
Cancer name	Pacific	European	Pacific	European	Pacific	European	Pacific	European
Non-Hodgkin's lymphoma	32	682	13.5 (8.8–18.3)	13.7 (12.5–14.9)	11	254	4.6 (1.7–7.4)	3.9 (3.4–4.5)
Oesophagus	8	250	3.7 (1.1–6.4)	4.1 (3.5–4.7)	5	210	2.4 (0.3–4.6)	3.3 (2.8–3.8)
Ovary	24	255	18.4 (11–25.8)	10 (8.6–11.5)	10	186	7.7 (2.8–12.5)	6 (5–7.1)
Pancreas	22	433	9.7 (5.6–13.8)	7 (6.3–7.8)	15	385	6.8 (3.3–10.3)	6 (5.3–6.7)
Prostate	105	2,899	108.7 (87.8–129.7)	110.4 (106.1–114.7)	18	555	19.8 (10.6–29)	14.6 (13.3–15.9)
Small intestine	6	79	2.7 (0.5–4.8)	1.5 (1.1–1.9)	2	35	-	-
Stomach	37	244	16.3 (11–21.7)	4.3 (3.7–4.9)	23	191	10.2 (5.9–14.4)	3.1 (2.6–3.6)
Testis	8	107	4.9 (1.4–8.4)	9.9 (8–11.8)	0	5	-	-
Thyroid and endocrine	31	175	11.6 (7.4–15.7)	5.5 (4.6–6.4)	3	24	-	-
Uterus	79	333	61 (47.3–74.6)	13.1 (11.5–14.7)	16	79	12.9 (6.4–19.3)	2.3 (1.7–2.9)

Analysis of skin condition emergency department outcomes via the free Healthline service from Whakarongorau Aotearoa

Miriama K Wilson, Fiona Pienaar, Ruth Large, Matt Wright, Graham Howie, Siale Foliaki, Martin Mikaere, Rebecca Davis, Verity Todd

ABSTRACT

The aim of this research is to gain a deeper understanding of the ethnic and socio-demographic differences in the utilisation of the national 24/7 Healthline service in relation to skin condition calls and their outcomes. Healthline is one of the 39 free telehealth services that Whakarongorau Aotearoa | New Zealand Telehealth Services provides to New Zealanders. This is a retrospective observational study analysing Healthline data over a 4-year period: January 2019 through to December 2022. A total of 61,876 skin condition calls were analysed including demographics of service users: age group, ethnicity, area of residence and call outcome. Higher acuity skin condition calls resulting in an outcome of a recommendation for emergency department (ED) care accounted for 5.3% (n=3,294) of calls. This research found that Māori were over-represented in this ED recommendation data over four years (942 ED outcomes; 28.6%), and Pasifika were under-represented (203 ED outcomes; 5.9%). Wairarapa and West Coast were found to have the highest number of ED outcomes per capita. Our results support the theory that severe skin conditions positively correlate with smaller district populations and increased deprivation in access to services. This study highlights the potential that telehealth services have to help reduce the inequity of access to care.

Skin conditions are known to disproportionately affect Māori and Pasifika,[1] children under 4, and New Zealanders living in more deprived areas of Aotearoa New Zealand.[2] The higher prevalence of skin diseases among Māori and Pasifika in Aotearoa New Zealand and other Indigenous groups around the world has been linked to many factors, including the impact of socio-economic factors, inadequate and overcrowded housing, lack of access to primary healthcare,[3,4] poverty, health literacy[3] and the historical effects of colonisation.[5,6]

The risks of untreated skin conditions include secondary infection by *Staphylococcus aureus* and *Streptococcus pyogenes* (group A streptococcus; GAS), which can lead to cellulitis, bacteraemia and osteomyelitis.[7] Researchers have reported robust evidence linking a GAS-positive throat or skin swab to the subsequent triggering of acute rheumatic fever (ARF), particularly in vulnerable Indigenous communities.[8] In an Auckland analysis of laboratory skin swabs, Māori and Pasifika under 20 years of age had considerably higher GAS detected than in European and other ethnicities.[9] Māori and Pasifika in Aotearoa New Zealand have some of the highest rates of rheumatic fever in the world.[10]

The aim of this research was to understand the utilisation of the Whakarongorau Aotearoa | New Zealand Telehealth Services' free 24/7 Healthline service for skin conditions, with a specific interest in whether Māori and Pasifika were utilising the service and their subsequent call outcomes. This study aimed to analyse the outcomes of skin condition calls made through Healthline and investigate which service users were advised to go to emergency departments (EDs; within the recommended 6 hours).

Methods

Whakarongorau Aotearoa is a government-funded, free-to-use, 24 hours a day, 7 days a week health advice and support service accessible via phone, text, email and web chat.[11] Whakarongorau Aotearoa and its services are supported by trained professionals, including medical doctors, nurses, paramedics, psychologists, counsellors and other health personnel.[12] In 2022, Whakarongorau Aotearoa had 725,661 contacts (464,631 unique contacts), i.e., approximately one in 11 people in

Aotearoa New Zealand.[13] Healthline call handlers have access to the Odyssey clinical decision support tool to support their decision making in advising a service user during a call. These clinicians can also ask for an image to be uploaded (by the service user) to support their decision.

Whakarongorau Aotearoa's Healthline service is not a diagnostic service; rather it is a triage line, meaning they are not responsible for diagnosing a service user's symptoms but in recommending a service user on where to go to receive the appropriate treatment. A service user's outcome depends on their symptoms, the time of day, where they are located and how far away they are to the nearest primary care service. It is also factored in whether a service user states they cannot afford a particular service, for example an after-hours clinic. If a service user calls in after-hours i.e., after 6 pm, their only options for care within 12 hours are an urgent care clinic or an ED.

Service user data are collected during the call with Whakarongorau for clinical audit and quality improvement. Service users are made aware that their calls are being recorded (before the call begins) and can choose to remain anonymous without impacting the call outcome. All data is stored securely on a Whakarongorau device (in compliance with the *Health Information Privacy Code 2020* and the *Privacy Act 2020*).[14,15] Data are provided for research purposes in an aggregated de-identifiable form. As the data are de-identifiable, there is minimal risk of breaking service user confidentiality. Data from service users were collected between 1 January 2019 to 31 December 2022 from the skin condition dataset, a subset of the broader Healthline database. This research project was approved by the Auckland University of Technology Ethics Committee (AUTEC) (23/28). STROBE Guidelines were followed (see Appendix A).[16]

Participants

Participants were service users who called the free Healthline service seeking advice about skin conditions in 2019 through to the end of 2022. The skin condition subset of Healthline data is comprised of specific skin symptoms, including: skin rash, skin allergy symptoms, measles rash, lump(s), skin/tissue problems, itching, hives, nappy rash, skin irritation, eczema, cold sores, impetigo, dry skin, spot on the skin, "slapped cheek" disease, flea bites, phlebitis, acne, dermatitis, cradle cap, scratching, nettle rash, Seborrhoeic dermatitis and tinea (ringworm).

Variables

De-identified data were provided for age group, ethnicity group and residential district. The Whakarongorau system allows for multiple ethnicities to be recorded for any individual who identifies with more than one ethnic group; however, only one "prioritised" ethnicity is used in this study.[17]

Call outcomes through Healthline are the advice given by a Healthline call handler to a service user regarding their symptoms. This includes the most acute outcome, "111 Emergency", where an ambulance is called for the service user, to the least acute outcome, "Self Care", where a service user can manage their symptoms at home and to call back if they have further concerns (this outcome includes general health information; see Appendix B for more information). ED outcomes in this research include the recommendation of a service user to go to ED (within 6 hours); this research does not show whether a service user turned up to an ED.

Data sources

Deprivation data were used in this research to investigate possible correlations with ED outcome data using regression analysis. These deprivation data were accessed from The University of Auckland's School of Population Health Research (2018) (see Appendix C).[18]

Study size

Between 2019 and the end of 2022, 61,876 skin condition calls were recorded through the Healthline service: 19,809 in 2019; 13,771 in 2020; 14,105 in 2021; and 14,191 in 2022.

Statistical methods

R and RStudio were used to conduct statistical data analysis using significance tests (including Chi-squared tests, ANOVA, regression analysis and t-Tests). Differences with p-value (p) <0.05 were deemed statistically significant.[19] Graphical representations of data were made using Microsoft Excel. "Unknown" or anonymous data were included in this research.

Results

Between the start of 2019 and the end of 2022, 1,414,664 calls were recorded through the free 24/7 Healthline service, with 4.4% of these regarding skin conditions (61,876 calls). A total of 188,231 calls (13.3%) through Healthline resulted

in an ED outcome recommendation, whereas for skin condition calls, 3,294 calls (5.3% of skin condition calls) resulted in an ED outcome. Outcomes resulting in a "111 Emergency" and requiring an ambulance were 0.7% for skin condition calls (406) and 3.7% for total Healthline calls (52,408) (see Appendix B). Skin condition calls peaked on Sundays every year and between 6 and 7 pm each day (see Appendix D).

ED outcome by ethnicity

Skin condition ED outcomes were further investigated by ethnicity group.

Over 4 years (2019–2022), there were 3,294 ED outcomes (5.3%) for skin condition calls through Healthline. Of the ED outcome skin condition calls, 29% identified as Māori (942; Figure 1), a significantly higher proportion than the stated proportion of Māori in the Aotearoa New Zealand population (17% Māori, $p<0.0001$).[20] This is also statistically higher than the proportion of Māori calling into Healthline regarding a skin condition (23.6% Māori or 14,572 calls, $p<0.0001$). Additionally, European (53.6% or 1,766 ED outcomes), Pasifika (6.2% or 203) and Asian (2.6% or 86) ethnicity groups were under-represented in the ED outcome for skin conditions than their respective Aotearoa New Zealand population demographics ($p<0.0001$).[20] However, the proportion of Pasifika calling regarding a skin condition is not statistically different from their ED outcomes (5.9% Pasifika or 3,648 calls, $p=0.552$).

ED outcome by age and ethnicity

The highest number of skin condition calls were regarding service users aged under 12 years of age. This age group had 33,710 calls documented (54% of calls). The proportion of each ethnicity by age group for skin condition ED outcomes are shown in Figure 2 (see also Appendix F). This table includes four age groups: 0–12 years, 13–34 years, 35–64 years and 65+ years.

The distribution of recommended ED outcomes by ethnicity and age group is shown in Figure 2. All ethnicity groups had their highest number of ED outcomes for service users aged 12 years and under. Māori have a high proportion of service users aged 12 years and under, with 37% of this group identifying as Māori (942 ED outcomes; Figure 2). The highest age group for Māori and Pasifika ED outcomes were service users aged between 3 and 5 years old, with 208 and 46 ED outcomes, respectively.

ED outcome by district

ED outcomes by Aotearoa New Zealand district (per 10,000 people) were investigated, shown in Figure 3 (see also Appendix G).

The highest proportion of ED outcomes per capita came from the Wairarapa district, with 5.49 ED outcomes per 10,000 people. The second highest was the West Coast district, with 4.28 ED outcomes per 10,000 people, the smallest district in Aotearoa New Zealand (~32,700).[21] The lowest ED outcomes per capita were from Waitematā district, the largest district in Aotearoa New Zealand (~633,500).[21] All the district population sizes are available in Appendix G, Table 5. Wairarapa, West Coast, Taranaki, and South Canterbury districts had significantly higher ED outcomes than the overall Aotearoa New Zealand average ($p<0.005$). All of these regions have smaller Aotearoa New Zealand populations (shown in Figure 3 in blue font).

The overall highest skin condition ED outcomes in 2022 were from Canterbury (103 ED outcomes) and Waikato (95). The highest number of skin condition calls (all outcomes) were from Canterbury, with 2,147. However, the highest number of calls per capita came from Wairarapa, with 49.8 calls per 10,000 people. This was significantly higher than the average of 33.4 calls per 10,000 people ($p<0.0001$).

ED outcome by district deprivation

Figure 4 shows the relationship between skin condition ED outcomes and overall district deprivation.

The 2018 New Zealand Index of Multiple Deprivation (IMD18) data were used to investigate a relationship between district deprivation and skin condition ED outcomes.[18] Education district deprivation proved the highest correlation with district ED outcomes, with an R^2 value of 0.897. Regression analysis further demonstrated a linear relationship between the two variables ($p<0.0005$). "Access to services" (including health services) and "Overall" district deprivation (Figure 4) also correlated with district ED outcomes ($p<0.005$, and $p<0.05$, respectively), but to a lesser significance (see Appendix H). Interestingly, no significant correlation was found between health deprivation and the results of this research. A positive correlation was proven between ED outcomes (per capita) and smaller district population sizes, with an R^2 value of 0.895. Regression analysis further proved a linear

Figure 1: Pie chart representing the proportion of each ethnicity group with skin condition calls resulting in an ED outcome from 2019–2022 (see Appendix E). The acronym "MELAA" stands for Middle Eastern, Latin American and African.

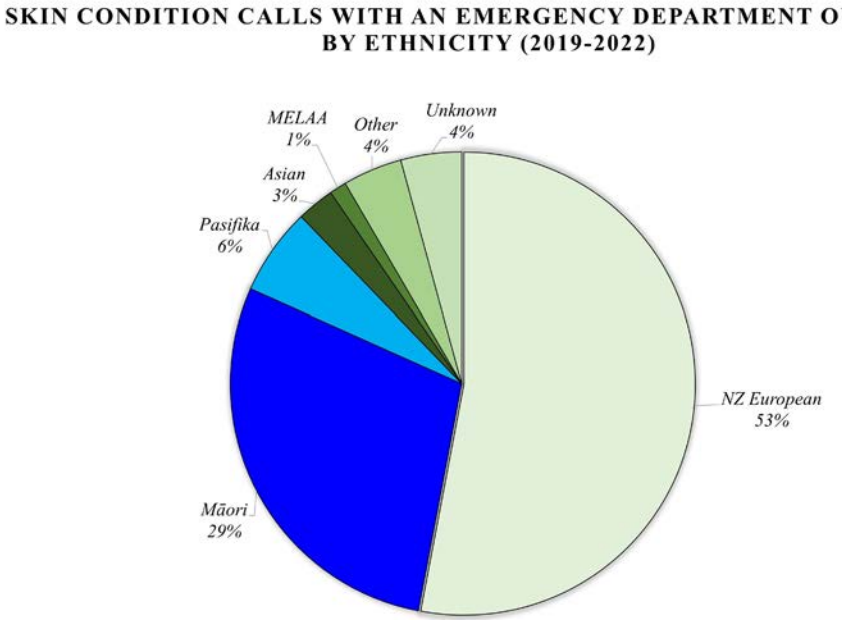
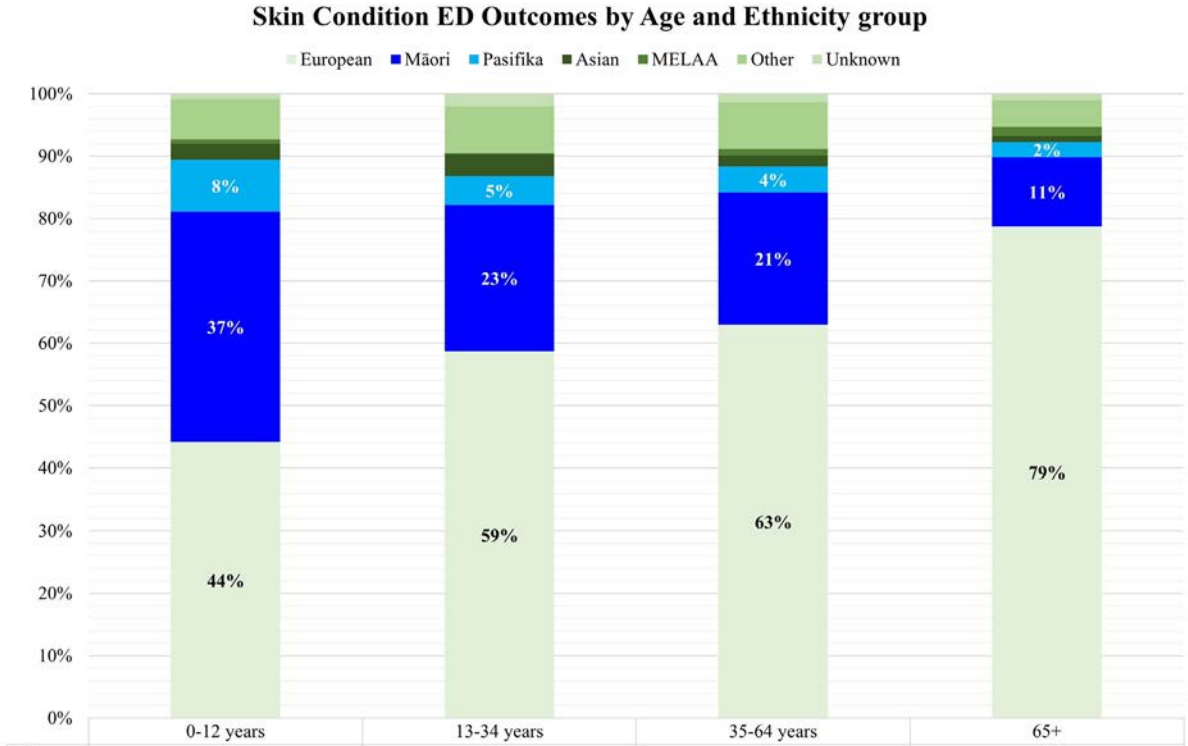


Figure 2: The ethnicity group proportion for each age range (0–12 years, 13–34 years, 35–64 years and 65+) for skin condition calls with a recommended ED outcome between 2019 and 2022. The "MELAA" acronym stands for Middle Eastern, Latin American and African.



	0-12 years	13-34 years	35-64 years	65+
Unknown	1%	2%	1%	1%
Other	6%	7%	8%	4%
MELAA	1%	0%	1%	1%
Asian	3%	3%	2%	1%
Pasifika	8%	5%	4%	2%
Māori	37%	23%	21%	11%
European	44%	59%	63%	79%

Figure 3: The number of ED outcomes for skin condition calls per 10,000 people in each Aotearoa New Zealand district (2022). The Aotearoa New Zealand average is shown (blue) for comparison. Statistically higher district values from the average are shown (blue font). Districts are ordered from largest to smallest population size (provided by Stats NZ).[21] See Appendix G, Table 5 for more information.

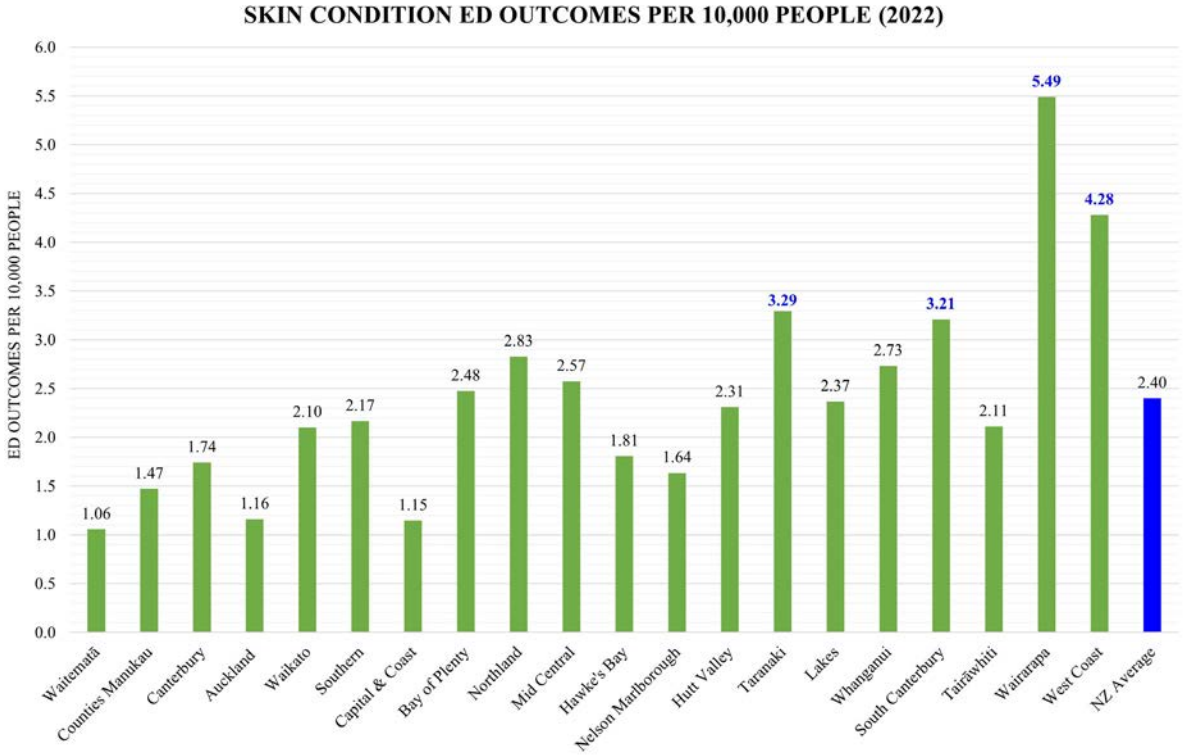
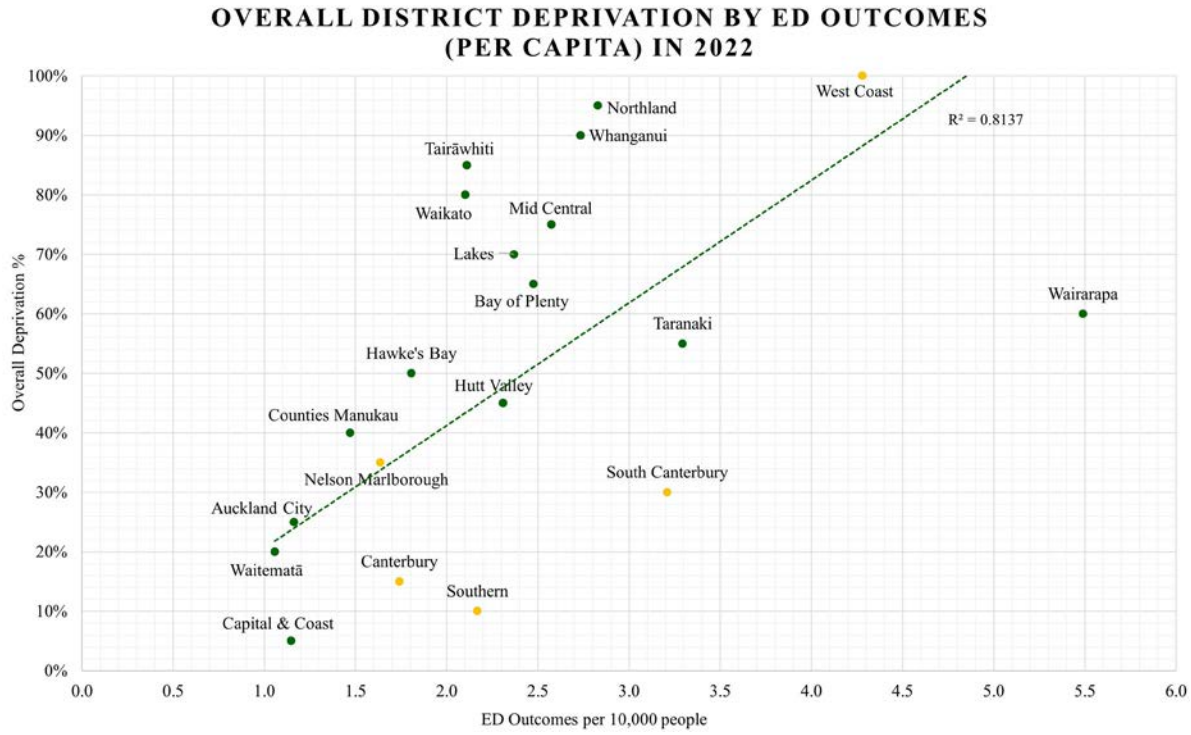


Figure 4: The relationship between skin condition ED outcomes per 10,000 people and overall deprivation (%). A high percentage is representative of the most deprived districts. Green data points are shown for North Island districts and yellow for South Island. District deprivation provided by The University of Auckland (2018).[18]



relationship between the two variables (p<0.0005).

In 2022, service users living in rural areas made up 20.3% of skin condition ED outcomes, and urban users were 79.7%. The proportion of rural ED outcomes is statistically higher when compared to their Aotearoa New Zealand demographic (16.3%) (p<0.001).[22] This further strengthens our finding that more deprived service users correlate with higher skin condition ED outcomes (see Appendix I).

Discussion

Māori are over-represented for skin condition calls with the recommended outcome of attendance at ED within 6 hours. This is not unexpected as Māori are known to be over-represented in ED data. However, this over-representation is not seen in Pasifika Healthline data, when Pasifika are known to have high presentations of severe infectious skin conditions at EDs across Aotearoa New Zealand. This suggests that Pasifika are not using the Healthline service before presenting at ED with severe skin conditions, whereas Māori are. From the results we can hypothesise that Pasifika have competing social demands and may not be aware of how serious a skin condition can become if it turns septic. Alternatively, Pasifika may prefer to use in-person primary care or ED services rather than a virtual telehealth service. Our finding is important as it suggests there should be more targeted support and advertisement to Pasifika communities to ensure they are aware of the free 24/7 service.

Younger Māori (≤12 years old) are especially affected in this ED outcome data, which correlates with the larger younger population observed in Māori. Māori are associated with a shorter life expectancy (male = 73.4 years and female = 77.1 years) than NZ Europeans (81 and 84.5 years) and the overall Aotearoa New Zealand average (80 and 83.5 years).[23] Skin conditions are very common for the under 2-year-old age group, with infection occurring much quicker than other age groups. Māori and Pasifika both have larger young populations, meaning they are more likely to have skin conditions, leading to higher rates of infections. Another explanation for this age group having the highest ED outcomes is increased precautions taken due to awareness that neonates and young children have under-developed and immature immune systems, meaning a minor infection can be life threatening.[24]

A high proportion of Māori (18% of the Māori population),[22] unlike Pasifika, live in rural areas around Aotearoa New Zealand, which corresponds with decreased access to health services. This study shows that Wairarapa and West Coast had the highest ED outcomes per capita; these are two rural districts with small populations. Both districts ranked poorly for access to services (including education).[19] Urgent care is not an option in rural areas, making ED a service user's only option after hours. ED is also the only option (during the day) when general practitioner (GP) appointments are not available in the near future. It should be noted that although Māori and rural districts are over-represented in this data, it is a good result that they are aware of and using the free Healthline service to seek advice and help.

Previous literature has detailed factors contributing to more severe skin conditions, including the overcrowding of unsuitable housing (mouldy and damp housing), lower socio-economic status and the inability to afford a GP appointment or other preventative care before the hospital.[4] In Aotearoa New Zealand, health-care is free for under 14-year-olds; however, one study identified that while patients might try to make an appointment to see a doctor, the most frequently named reason they don't is that they often cannot get an appointment.[25] Yeoh et al.[7] proposed the idea of skin conditions (specifically scabies and impetigo) becoming normalised in communities where the prevalence was high and it was assumed the condition would resolve itself.[7] Jeffreys et al.[26] found that cost, time and lack of transport were essential factors regarding the severity of skin conditions.[26] This is further complicated in rural areas, where patients must travel further to reach healthcare.[27]

From the results of our research, it appears that access to services (especially education) is an important factor in preventing skin conditions from getting to the stage of needing hospitalisation. In Aotearoa New Zealand, access to nurses is available, free of charge, to students throughout the school day regarding any health concerns or requests for information. As a result, students do not have to travel elsewhere for healthcare or miss school for an appointment. This eliminates the cost, time and lack of transport, a factor communicated by Jeffreys et al.,[26] and the lack of access to services in rural areas by Norris et al.[27] Education also provides an essential service by teachers, as if they see a student with a skin condition (or another health issue), they can inform the nurse and

parents about getting it looked at by a healthcare professional.

Limitations

This research's limitations include the prioritised ethnicity data of Whakarongorau service users, which could result in certain ethnic groups being under-represented in the data. There is also the issue surrounding anonymous service users and the lack of information surrounding these users, resulting in once again certain ethnic groups being under-represented. It is, however, a right of Whakarongorau service users to remain anonymous without impacting the outcome of their call.

Future research

With the introduction of the new Māori pathway in Healthline (launched Dec 2022), 2023 data will be of particular interest to determine whether skin condition outcomes for Māori differ from previous years. This research suggests the benefit of having a Māori pathway and potentially a Pasifika pathway in Healthline to increase access to health services for Māori and Pasifika and improve their health outcomes.

Conclusion

This study has shown that Māori and those living in more rural areas are over-represented in skin condition ED outcome calls through the Healthline service. The reasonings proposed in this paper for these findings are due to the inaccessibility and unaffordability of health services. It should be acknowledged that other underlying contributing factors impact Māori health (not discussed in this paper), such as marginalisation. It is, however, a positive result that these groups are using the Healthline service. More concerningly, Pasifika Healthline ED outcome data do not match the high numbers of Pasifika presenting at ED with severe skin conditions. Skin conditions are linked to life-threatening diseases, including invasive GAS and rheumatic fever. Early access to the Healthline service could increase health literacy and perhaps prevent skin conditions from deteriorating into more serious diseases. This paper will help inform Whakarongorau to implement a strategy for supporting Pasifika with skin conditions, as well as further support the Healthline Māori pathway.

COMPETING INTERESTS
This article uses Whakarongorau Aotearoa data. Several authors of this article are employees of Whakarongorau Aotearoa (as stated in the author's information).

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Appendices

Appendix A

STROBE Guidelines Checklist for Observational Studies[16]

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.	Relevant text from manuscript (line no.)
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	*1*	*1-2*
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	*1*	*6-16*
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	*1-2*	*19-31*
Objectives	3	State specific objectives, including any prespecified hypotheses	*2*	*32-36*
Methods				
Study design	4	Present key elements of study design early in the paper	-	-
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	*2*	*39-55*
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	*2-3*	*57-62*
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	-	-
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	*3*	*64-72*
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*3*	*74-76*
Bias	9	Describe any efforts to address potential sources of bias	-	-
Study size	10	Explain how the study size was arrived at	*3*	*78-79*
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	-	-
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	*3*	*81-84*
		(*b*) Describe any methods used to examine subgroups and interactions		-
		€ Explain how missing data were addressed	*3*	*84*
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	-	-
		€ Describe any sensitivity analyses	-	-
Results				
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	*3-4*	*87-91*
		(b) Give reasons for non-participation at each stage	-	-
		© Consider use of a flow diagram	-	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	*4-6*	*94-122*
		(b) Indicate number of participants with missing data for each variable of interest		
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	-	-
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	*6-7*	*125-142*
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	-	-
		Cross-sectional study—Report numbers of outcome events or summary measures	-	-
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	*7-8*	*145-161*
		(*b*) Report category boundaries when continuous variables were categorized	-	-
		© If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	*8*	*162-165*
Discussion				
Key results	18	Summarise key results with reference to study objectives	*8*	*168-176*
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	*10*	*214-218*
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	*8-9*	*177-212*
Generalisability	21	Discuss the generalisability (external validity) of the study results	*10*	*227-237*
Other information				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	-	-

Appendix B

Healthline call outcomes

ED outcomes in this research include "111 Emergency", "Emergency Department" and "111 for Transport Only" outcomes. All three outcomes advise a service user to go to the ED, the only difference being transport by an ambulance. Other outcomes discussed in this research involve advice to go to an urgent care clinic ("Urgent Care"), stay on call to speak with a Whakarongorau doctor/GP or other health professionals ("On Call Dr"), book an appointment with their GP ("GP") and go to a pharmacy to speak with a pharmacist ("Pharmacist"). The "Other" outcome includes "General Information", where a service user has sought information rather than needing health advice, and service users who have hung up mid-call or called the wrong number.

Table 1: Healthline and skin condition calls by outcome from 2019–2022.

Call outcomes	Healthline calls	Skin condition calls
111 Emergency	52,408 (3.7%)	406 (0.7%)
Emergency department	119,721 (8.5%)	2,735 (4.4%)
Ambulance for transport	16,102 (1.1%)	153 (0.3%)
Urgent care	242,321 (17.1)	11,785 (19.1%)
Queued for doctor (on call)	687 (0.0%)	46 (0.1%)
On-call practitioner	14,235 (1.0%)	887 (1.4%)
Other professional	18,286 (1.3%)	279 (0.5%)
GP	374,568 (26.5%)	26,680 (43.2%)
Pharmacist	11,304 (0.8%)	1,110 (1.8%)
Self care	248,930 (17.6%)	15,439 (25.0%)
General health info	121,764 (8.6%)	730 (1.2%)
Other	194,338 (13.7%)	1,534 (2.5%)
Total	1,414,664	61,876
%	100%	4.37%

Appendix C

Index of Multiple Deprivation 2018 (IMD18) data[18]

Deprivation of education is calculated using five indicators, which include school leavers who left before the age of 17 (1), those who did not gain Level 2 NCEA (2) and those who did not enrol in tertiary studies (3). The last two indicators involve the proportion of youth (aged 15–24 years) not in education, work or training (4), and finally, the proportion of the population without a formal qualification (5).[18] The "access to services deprivation" involves the cost and distance of accessing services, including "*supermarkets, primary health care providers, service stations, early childhood centres and schools*".[18] Overall deprivation is calculated using seven indicators, including access to services, education, employment, income, crime, housing and health.[18]

Table 2: The district deprivation ranking by each social category; data provided from The University of Auckland.[18] Each ranking is out of 20, making 20 the highest deprivation and 1 the lowest.

District	Income	Health	Access to services	Employ-ment	Crime	Housing	Education	Overall
Auckland City	3	8	1	4	18	20	2	5
Bay of Plenty	11	11	18	9	8	10	10	13
Canterbury	4	4	5	3	11	5	4	3
Capital & Coast	1	3	4	6	4	6	1	1
Counties Manukau	9	13	2	7	9	18	8	8
Hawke's Bay	13	10	3	10	17	11	7	10
Hutt Valley	8	16	6	15	7	7	6	9
Lakes	12	12	7	14	20	15	15	14
MidCentral	19	14	8	17	13	8	12	15
Nelson Marlborough	7	1	15	8	3	1	9	7
Northland	20	7	19	20	16	16	20	19
South Canterbury	5	2	10	2	5	3	13	6
Southern	2	5	11	1	1	2	5	2
Tairāwhiti	17	20	9	18	19	19	14	17
Taranaki	15	18	14	11	6	9	16	11
Waikato	14	15	13	12	14	17	11	16
Wairarapa	10	9	16	16	10	4	17	12
Waitematā	6	6	12	5	2	14	3	4
West Coast	16	17	20	13	15	12	18	20
Whanganui	18	19	17	19	12	13	19	18

Appendix D

Figure 5: Line chart representing all skin condition calls (2019–2022) with the time of day the calls were received. Skin condition calls peaked each day between 6–7 pm.

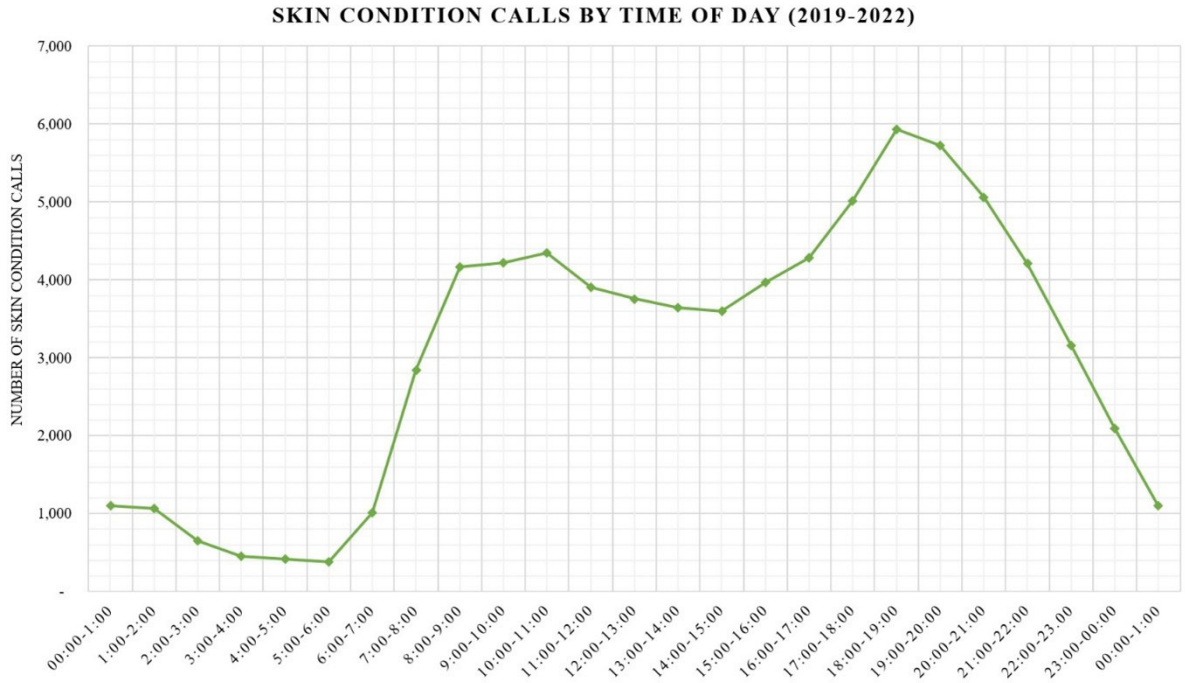
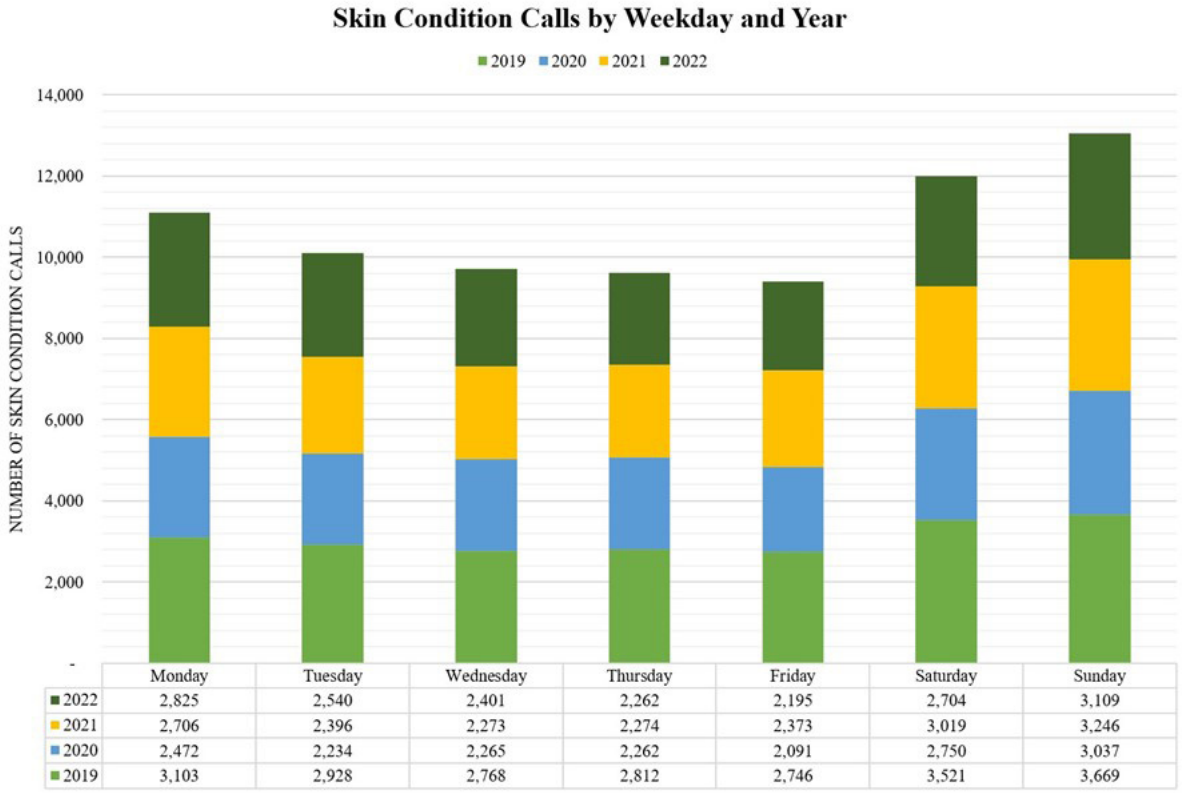


Figure 6: Stacked bar chart representing the number of skin condition calls by weekday and year (2019–2022). Skin condition calls peaked on Sundays each year.



	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
2022	2,825	2,540	2,401	2,262	2,195	2,704	3,109
2021	2,706	2,396	2,273	2,274	2,373	3,019	3,246
2020	2,472	2,234	2,265	2,262	2,091	2,750	3,037
2019	3,103	2,928	2,768	2,812	2,746	3,521	3,669

Appendix E

Table 3: Skin condition ED outcomes by ethnicity by year for the calendar years 2019–2022.

Year	European	Māori	Pasifika	Asian	MELAA	Other	Unknown	Total
2019	473	285	77	24	3	91	10	963
2020	395	193	43	17	3	55	14	720
2021	406	236	44	20	5	46	10	767
2022	492	228	39	25	10	41	9	844
Total	1,766	942	203	86	21	233	43	3,294
%	53.6%	28.6%	6.2%	2.6%	0.6%	7.1%	1.3%	
Total skin condition calls %	56.8%	23.6%	5.9%	4.0%	0.6%	8.3%	0.9%	
New Zealand demographic [20]	70%	17%	8%	15%	2%	1%	-	

*MELAA stands for “Middle Eastern, Latin American and African” ethnicities

Appendix F

Table 4: Skin condition ED outcomes by age range and ethnicity between 2019 and 2022 (with total Healthline calls).

Age group	NZ European	Māori	Pasifika	Asian	MELAA	Other	Unknown	Total	Healthline calls total
Under 1	109	125	32	10	4	23	5	308	4,775 (7.7%)
1–2	152	140	40	15	2	18	3	370	7,355 (11.9%)
3–5	275	208	46	10	1	35	5	580	13,861 (22.4%)
6–12	163	110	14	7	3	26	0	323	7,719 (12.5%)
13–19	130	50	7	7	0	13	3	210	3,422 (5.5%)
20–24	149	60	13	6	1	13	6	248	4,450 (7.2%)
25–29	121	48	15	4	1	27	5	221	4,063 (6.6%)
30–34	121	50	6	14	0	13	4	208	3,578 (5.8%)
35–39	84	33	6	3	2	16	3	147	2,520 (4.1%)
40–44	68	19	6	0	1	5	1	100	1,911 (3.1%)
45–49	59	24	3	3	2	3	1	95	1,584 (2.6%)
50–54	71	22	6	2	0	13	3	117	1,370 (2.2%)
55–59	45	16	3	2	1	4	0	71	1,192 (1.9%)
60–64	51	13	1	1	0	4	0	70	1,088 (1.8%)
65–74	90	13	3	0	1	0	2	109	1,503 (2.4%)
75–84	51	7	1	2	2	7	0	70	867 (1.4%)
85+	22	3	1	0	0	2	0	28	265 (0.4%)
Unknown	5	1	0	0	0	11	2	19	353 (0.6%)
Total	**1,766**	**942**	**203**	**86**	**21**	**222**	**43**	**3,294**	**61,876**

Appendix G

Table 5: The number of skin condition calls and ED outcomes by district in 2022, per capita.

District	Skin condition calls	Calls per capita	ED outcomes	ED outcomes per capita	District size (2022)[21]	Size rank
Auckland City	1,178	24.5	56	1.16	481,600	4
Bay of Plenty	782	28.5	68	2.48	274,700	8
Canterbury	2,147	36.3	103	1.74	591,500	3
Capital & Coast	1,262	39.2	37	1.15	322,300	7
Counties Manukau	1,491	24.6	89	1.47	605,100	2
Hawke's Bay	404	22.1	33	1.81	182,600	11
Hutt Valley	725	45.3	37	2.31	160,200	13
Lakes	356	30.1	28	2.37	118,200	15
MidCentral	742	39.0	49	2.57	190,300	10
Nelson Marlborough	434	26.3	27	1.64	165,000	12
Northland	735	36.5	57	2.83	201,500	9
South Canterbury	179	28.7	20	3.21	62,300	17
Southern	1,168	33.3	76	2.17	350,500	6
Tairāwhiti	178	34.2	11	2.11	52,100	18
Taranaki	471	36.9	42	3.29	127,500	14
Waikato	1,525	33.7	95	2.10	451,900	5
Wairarapa	254	49.8	28	5.49	51,000	19
Waitematā	1,643	25.9	67	1.06	633,500	1
West Coast	118	36.1	14	4.28	32,700	20
Whanganui	258	37.1	19	2.73	69,500	16
Total	16,050	-	956	-	5,124,000	-

Appendix H

Figure 7: The relationship between skin condition ED outcomes per 10,000 people and district population size. A low ranking (e.g., 1) indicates a higher district population, and a high ranking (e.g., 20) indicates a lower population size. Green data points are shown for North Island districts and yellow for South Island.

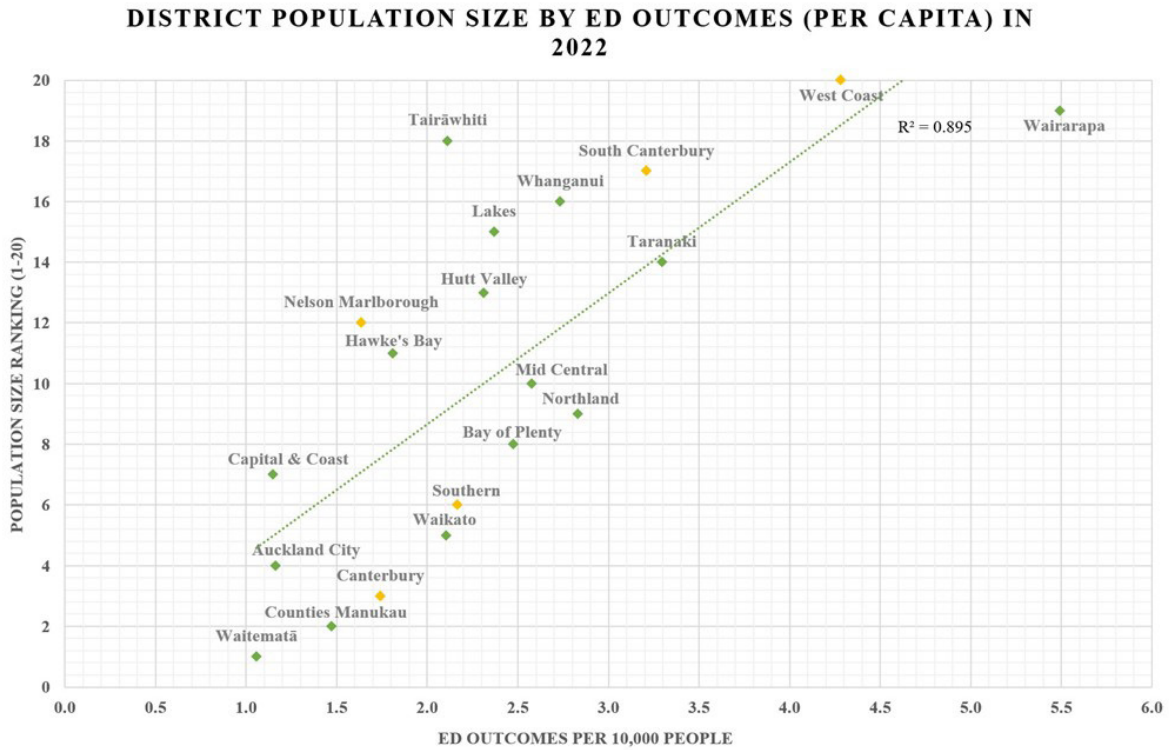


Figure 8: Scatter chart representing skin condition ED outcomes per 10,000 people with education deprivation (%). A high percentage is representative of the most deprived districts of education. Green data points are shown for North Island districts and yellow for South Island. District deprivation provided by The University of Auckland (2018).[18]

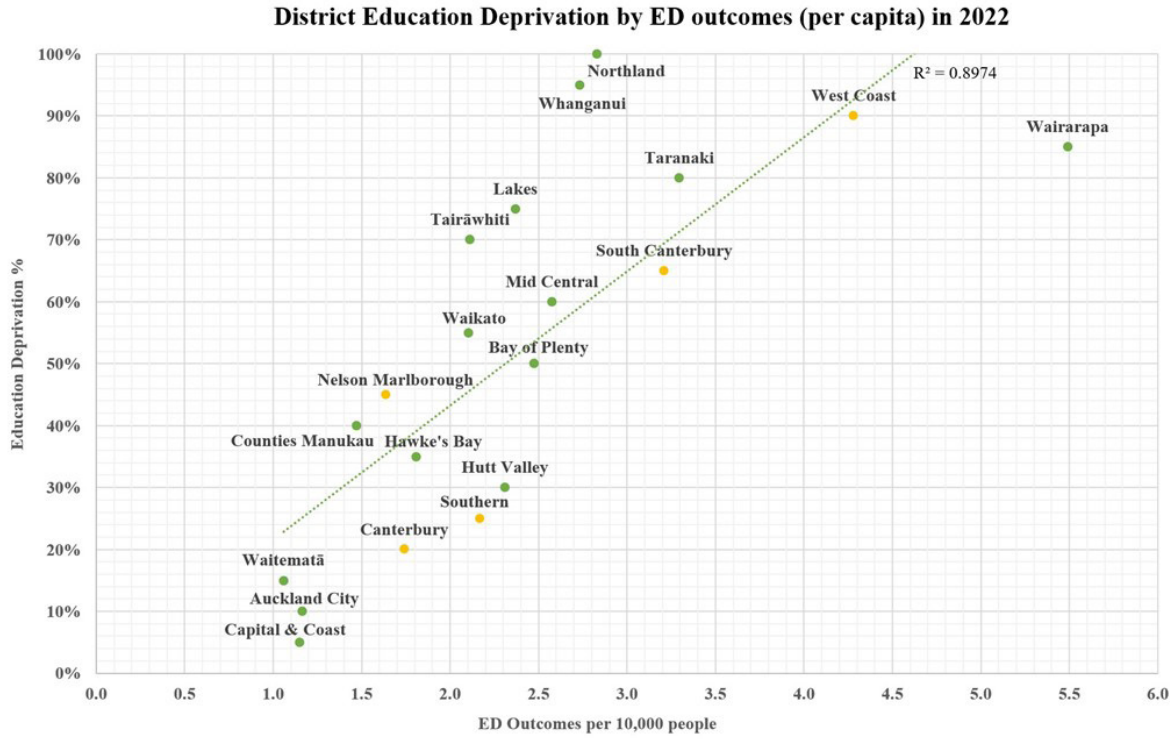
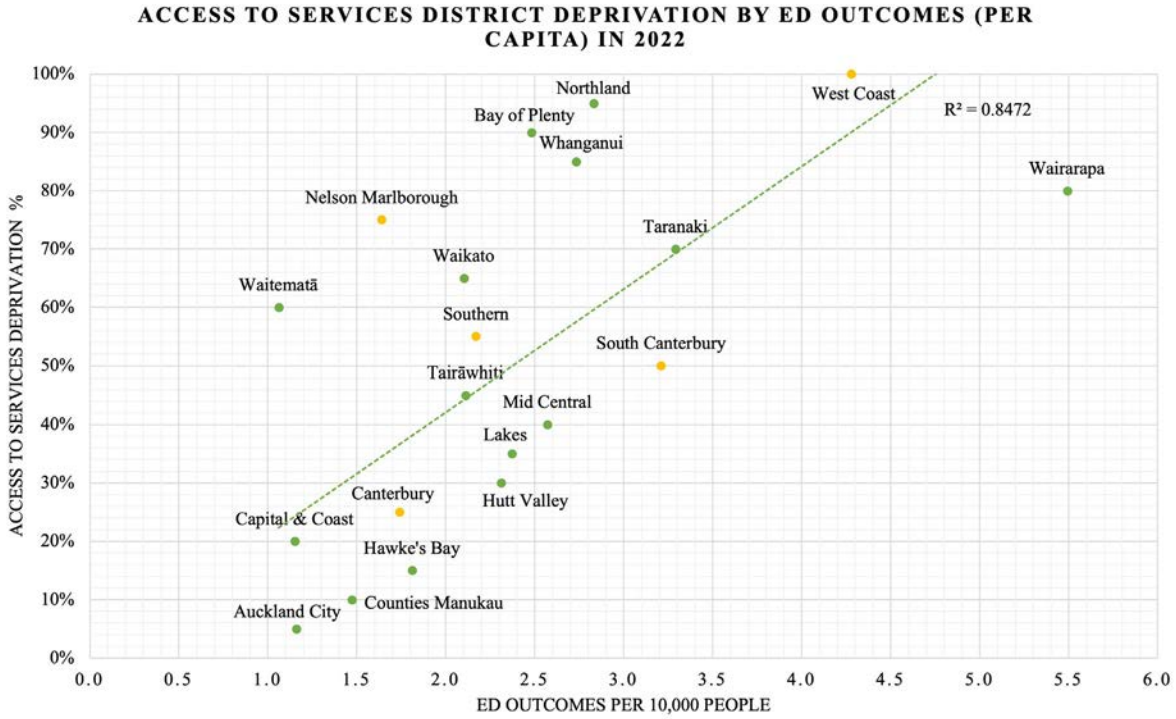


Figure 9: Scatter chart representing skin condition ED outcomes per 10,000 people with access to services deprivation (%). A high percentage is representative of the most deprived districts of access to services. Green data points are shown for North Island districts and yellow for South Island. District deprivation provided by The University of Auckland (2018).[18]



Appendix I

Table 6: Skin condition ED outcomes by Aotearoa New Zealand suburb (urban vs rural) compared to the Aotearoa New Zealand demographic.[22]

Area type	Number of New Zealand suburbs/ areas	ED outcomes	ED outcome %	New Zealand demographic %
Urban	404	786	20.3%	16.3%
Rural	140	200	79.7%	83.7%
Total	544	986	100%	100%

Tōku Oranga: the subjective wellbeing and psychological functioning of postgraduate and medical students in Ōtautahi Christchurch

Katherine A Donovan, Ben Beaglehole, Christopher MA Frampton, Margaret Currie, Joseph M Boden, Jennifer Jordan

ABSTRACT

AIMS: Postgraduate and medical students are at risk of psychological distress and burnout, which can cause significant functional and occupational impairment. We aimed to report subjective wellbeing, psychological distress and burnout in postgraduate and medical students in Ōtautahi Christchurch, Aotearoa (New Zealand), and identify any associations between participant and course information and outcome measures including exposure to major earthquakes in 2010/2011 and the 2019 terrorist attack.

METHODS: A self-report online survey was completed by 140 students between November 2019 and March 2020. Life satisfaction, psychological distress and burnout were primary outcomes. Data were analysed using univariate and multivariable analysis.

RESULTS: High levels of psychological distress were present in both student groups. Burnout was reported by 78% of respondents. There were no significant associations found between exposure to the Christchurch earthquakes or terrorist attack with primary outcomes. Personality factors, resilience and perceived support and success were weakly associated with wellbeing, distress and burnout.

CONCLUSIONS: Postgraduates and medical students reported high levels of psychological distress and burnout. The earthquakes and terrorist attack do not appear to be associated with negative effects in these cohorts. Personality and resilience characteristics may assist in predicting students at risk of morbidity and evaluating potentially relevant interventions.

University students have a higher prevalence of mental disorders than the general population.[1] Within this population, postgraduate and medical students have a high prevalence of mental disorders and psychological distress with widespread personal, academic and professional repercussions.[1–4] Meta-analyses estimate the prevalence of depression in medical students to be above 25% and suggest an increase in symptoms during medical school.[3,5] A third of medical students globally are estimated to have anxiety disorders.[4] Medical students also present with a relatively high frequency of suicidal ideation (5.8%), but low rates of seeking help (12.9%) for their distress.[3] Studies reporting on purely postgraduate students are scarce, and student and course differences make generalising findings from undergraduates to the postgraduate student population difficult.

Burnout was originally studied in professional populations, with a focus on "emotional exhaustion", "depersonalisation" and "reduced personal accomplishment" as per the Maslach Burnout Inventory.[6] It is now recognised in student populations and the construct has evolved, with multiple measures developed. The Oldenburg Burnout Inventory (OLBI)[7] employs a two-factor model incorporating "exhaustion" and "disengagement and cynicism towards studies" to measure burnout with both negatively and positively framed items. These dimensions are considered core to the concept of burnout, while "reduced personal accomplishment" is thought to develop separately.[7] Both individual factors (e.g., personality, supports) and systemic factors (e.g., course structure and culture) contribute to burnout but are still poorly understood.[8,9]

Burnout has both personal and wider social impacts. It is recognised as a cause for loss of productivity, reduced quality of life and physical and mental health problems—particularly in healthcare professionals, but also increasingly recognised in students. Academic burnout in students is associated with higher rates of burnout later in their professional careers.[10,11] The prevalence of student burnout is difficult to establish given the number of different instruments used and contextual factors associated with tertiary study (e.g., country-specific funding models). Estimates of medical student burnout range between

45–75%.[8] Findings from a longitudinal study of medical students suggest that burnout predicts psychological distress, and recovery from burnout reduces suicide risk.[9]

In Aotearoa New Zealand, concerns over medical student and postgraduate student wellbeing have been raised. The Kei Te Pai student survey of mental illness identified moderate levels of psychological distress in tertiary students in New Zealand.[12] A survey undertaken by the New Zealand Medical Students Association[13] also identified concerns about the mental health of medical students. Te Whare Whānaga o Otāgo ki Ōtautahi (University of Otago, Christchurch; UOC) hosts students across postgraduate health sciences courses as well as clinical medical students (final 3 years of study). Ōtautahi Christchurch has experienced significant stressors—notably a series of earthquakes in 2010–2011 and a terrorist attack on two mosques in the city in March 2019. Both events had significant impacts on the psychosocial wellbeing of the local community. The psychological functioning of medical students in Ōtautahi Christchurch was substantially affected 7 months following the earthquakes, but this has not been re-measured.[14] The extent of symptoms of mental illness in local postgraduate students has not been specifically measured.

This study aims to report subjective wellbeing and symptoms of burnout and mental illness in medical students and postgraduate students in Ōtautahi Christchurch using standardised measures. A secondary aim was to identify any associations between demographic information, perceived supports and academic course factors with psychological distress and burnout. Given the additional stressors of the earthquakes and mosque shootings, associations between exposure to these events and outcome measures were also explored to identify ongoing impacts and contributing factors to distress and burnout.

Methods

The administration of this online cross-sectional survey was approved by the University of Otago Human Ethics Committee (HE19/009) and received support from the Dean of UOC and an advisory group, including associate deans and student representatives for postgraduate and medical student groups. Study information, and consent and data collection, were managed with the online survey tool REDCAP. The survey was anonymous. Questions on post-traumatic stress with the potential to trigger psychological distress could be skipped. Participants were provided with links to further sources of support.

Participants were postgraduate health sciences students completing Master's or PhD theses or 4th–6th year medical students, studying at UOC. Data were collected between November 2019 and March 2020. The survey closed prematurely due to the COVID-19 pandemic and its ensuing lockdown. Invitations to participate were emailed to all postgraduate thesis students in November 2019, with reminder emails at 3–4 weekly intervals. Email invitations and reminders were also sent to medical students in February 2020. Medical students were informed about the study and encouraged to participate by one of the study authors (KD) at teaching sessions in early March 2020.

Participant demographic and related information included age, gender identity, ethnicity, relationship status, English as a second language, whether born in New Zealand and perceived personal supports. Course factors included type of study, progress through course, enrolment status, perceived academic support and perceived success. Key outcomes were wellbeing, psychological distress (depression, anxiety and stress subscales) and burnout.

The survey included a comprehensive range of measures but for the purposes of this study, we report on the following measures:

- **Satisfaction with Life Scale (SWLS)**[15] is a five-question measure of wellbeing and quality of life, with a seven-item Likert scale ranging from "strongly disagree" to "strongly agree". Total scores are categorised into "extremely satisfied", "satisfied", "slightly satisfied", "neutral", "slightly dissatisfied" and "dissatisfied" and "extremely dissatisfied".
- **Depression Anxiety and Stress Scale (DASS-21)**[16] is a 21-item measure of emotional symptoms of distress yielding a total score for overall severity of symptoms plus subscale totals for depression, anxiety and stress. Subscale scores are categorised as "normal", "mild", "moderate", "severe" or "extremely severe".
- **Oldenburg Burnout Inventory—student version (OLBI-S)**[17] adapts the original OLBI to the academic context. It asks 16 questions with a four-item Likert scale ranging from "totally disagree" to "totally agree". Responses are scored for two domains of

"exhaustion" and "disengagement" with clinical cut-offs of 2.25 for "exhaustion" and 2.1 for "disengagement".[7] Positive scores in both domains indicate burnout.

- **The Big Five Inventory-10 (BFI-10)** is a 10-item questionnaire that measures personality dimensions of extroversion, agreeableness, conscientiousness, neuroticism and openness to experience.[18] Responses range from "disagree strongly" to "agree strongly".
- **The Conner-Davidson Resilience Scale (CD-RISC-10)**[19] assesses resilience (past month) with 10 questions and five-item Likert scales of "not true at all" to "true nearly all the time".
- **The Primary Care PTSD screen (PC-PTSD-5)** is a five-item questionnaire designed for primary care providers as a screening tool for PTSD according to DSM-5 criteria. A cut-off score of three or more is considered highly sensitive for PTSD.[20]
- **Specific trauma exposure** is a bespoke set of questions that assessed exposure to specific stressors to Ōtautahi Christchurch (including the Canterbury earthquakes and 2019 terrorist attack) and levels of distress following these events.

Data were analysed using SPSS (version 27). Comparisons between student groups were made using t-Tests and Chi-squared tests. Continuous variables were re-coded into categorical variables according to established cut-offs for clinically significant levels of symptoms. For analysis of associations between predictor variables and outcome variables (wellbeing, emotional distress and burnout), the samples were combined as no significant differences between sample outcome measures were found between student groups. Correlation analysis and comparisons of means using ANOVA tests were undertaken for continuous and categorical predictor variables respectively. Predictor variables showing statistically significant associations were then analysed using multivariable analysis to control for other variables and to look for independent associations. The significance level was $p<.05$ (two tailed).

Results

Responses were received from 52 of 140 enrolled (38%) postgraduate students and 88 of 316 enrolled (28%) medical students (total response rate 31%). The majority of respondents were female. The mean age for the total study population was 28.3 years (standard deviation [SD] 9.0). Postgraduate students were significantly older than medical students: the postgraduate students mean was 36.1 years (SD 10.0); the medical students mean was 23.6 years (SD 3.5 years, $p<0.01$). Table 1 reports additional demographics, course factors and support data grouped by student type.

Of postgraduates, 73% were enrolled in PhD programmes, and the remaining in Master's programmes. Sixty-seven percent of postgraduate respondents identified as being closer to the end of their course than the start. Of medical students, 14% were 4th year students, 53% were 5th year students and 33% were 6th year students.

Resilience scores (CD-RISC-10) were similar across both groups: the postgraduate mean was 26.2 (SD 6.1); the medical student was mean 25.0 (SD 5.8). There were no statistically significant differences in scores for resilience or personality factors (BFI-10) between postgraduates and medical students.

Only 4% of students skipped the trauma exposure questions. Exposure to the Christchurch earthquakes was higher in postgraduates than medical students (52% vs 28%, $p=0.02$), and exposure to the 2019 mosque shootings was similar between groups (50% vs 52%, $p=0.73$). There were no significant differences in levels of reported event-related distress between student groups. Responses from the screen for PTSD suggested 17% of postgraduates and 17% of medical students met criteria for current PTSD. Data were not collected on which event the PSTD symptoms related to.

Table 2 shows rates of reported wellbeing, psychological distress and burnout symptoms by all respondents. The mean responses from the DASS-21 corresponded to "mild" levels of depression and anxiety in both postgraduate and medical student samples, "mild" stress symptoms in the postgraduate sample and "normal" levels of stress in the medical student sample. Seventy-six percent of postgraduates and 80% of medical students met criteria for burnout (total sample 78%). There were no statistically significant differences in scores for psychological distress or burnout between student groups.

Associations among predictor variables (demographic, study and supports information, and trauma exposure) in relation to the primary outcomes (life satisfaction, DASS subscales and burnout) were examined using multivariate

Table 1: Demographic and other sample characteristics.

	Postgraduates (n=52)		Medical students (n=88)	
	N	**%**	**N**	**%**
Demographic information				
Female	41	79%	67	76%
In a relationship*	38	73%	40	45%
English as second language	12	24%	10	11%
Born in New Zealand*	30	58%	66	75%
Ethnicity				
NZ European	26	50%	52	59%
Māori or Pasifika	4	8%	13	15%
Other	22	42%	23	26%
Course factors				
Full-time enrolment status*	33	63%	86	98%
Concerned over academic progress	8	15%	8	9%
Adverse event exposure				
Earthquakes*	27	64%	25	36%
Terrorist attack	26	62%	46	68%
Presence of supports				
Whānau/family*	40	77%	85	97%
Cultural	5	10%	4	5%
Academic/administrative*	23	44%	18	20%
Supervisor/teaching*	35	67%	18	20%
Social*	22	42%	71	81%
Pastoral	1	2%	9	10%
Mentor	6	12%	6	7%
Counselling/chaplain	4	8%	8	9%

Note: *$p<0.05$

Table 2: Mean scores and frequencies of psychological distress and burnout.

Measure		Total sample	Postgraduate	Medical student
Satisfaction with Life Scale (SWLS)				
Wellbeing	Mean score, M (SD)	23.6 (7.4)	23.4 (7.3)	23.7 (7.4)
	"Slightly satisfied", "satisfied" or "extremely satisfied" with life, *N* (%)	86 (70)	34 (74)	52 (68)
Depression Anxiety and Stress Scale (DASS-21)[a]				
Depression	Mean score, M (SD)	5.7 (5.7)	5.8 (5.9)	5.6 (5.6)
	"Moderate–extremely severe", *N* (%)	39 (31)	12 (26)	26 (32)
Anxiety	Mean score M (SD)	4.6 (4.6)	4.1 (4.6)	4.9 (4.6)
	"Moderate–extremely severe", *N* (%)	39 (31)	12 (26)	27 (34)
Stress	Mean score M (SD)	7.5 (5.4)	8.2 (5.8)	7.2 (5.2)
	"Moderate–extremely severe", *N* (%)	34 (27)	14 (30)	20 (25)
Oldenburg Burnout Inventory—student version				
Exhaustion	Mean score M (SD)	2.5 (0.2)	2.5 (0.3)	2.5 (0.2)
	Clinical level, *N* (%)	113 (90)	40 (87)	73 (92)
Disengagement	Mean score M (SD)	2.5 (0.3)	2.5 (0.4)	2.5 (0.3)
	Clinical level, *N* (%)	110 (88)	41 (89)	69 (87)

Notes: [a] "Moderate–extremely severe" chosen from DASS-21 as indicator for likely clinically significant levels of symptoms. No statistical difference between group means or frequencies between student types. *p≤.05, **p≤.01.

analyses (see Table 3). Age showed no significant correlation with any of the outcomes. There were no significant differences in outcome variables dependent on exposure to the earthquakes or mosque shootings. Neuroticism was positively correlated with depression, anxiety, stress and exhaustion, and negatively correlated with wellbeing and disengagement. Resilience showed the opposite pattern—positively correlated with wellbeing and disengagement but negatively correlated with depression, anxiety, stress and exhaustion.

Students who were concerned about their academic success reported higher depression and stress scores, and lower wellbeing and disengagement scores. Having support was associated with positive outcomes. Those with whānau (family) support reported lower depression and stress scores, while those students with supervisor/teaching support reported lower anxiety scores. Social support was associated with higher life satisfaction and lower depression and stress scores. Male respondents reported higher exhaustion scores. Being in a relationship was associated with higher stress scores.

The strongest predictor variables were identified for each outcome, as shown in Table 4.

Table 3: Univariate associations between demographic, study, support and trauma exposure and primary outcomes in total sample.

Variable		Wellbeing [a]	Depression [b]	Anxiety [b]	Stress [b]	Exhaustion [c]	Disengagement [c]
Correlations							
Age		0.04	-0.08	-0.08	0.06	-0.18	0.18
Personality factors [d]	Agreeableness	.30*	-.22*	-0.12	-.26**	-0.17	0.14
	Conscientiousness	0.09	-0.04	0.13	.19*	-.21*	.23*
	Neuroticism	-.27**	.33**	.41**	.44**	0.16	-.35**
	Resilience [e]	.45**	-.43**	-.28**	-.30**	-.27**	.34**
ANOVA/F statistic							
Demographic information	Gender	0.82	2.28	0.51	0.41	9.78**(M)	1.22
	Ethnicity NZ European/ other	1.10	0.23	0.99	1.11	0.65	0.07
	In a relationship	0.47	0.51	0.15	6.41*(+)	0.14	1.21
	English is second language	0.25	0.74	1.07	0.05	0.90	0
	Born in New Zealand	0.83	0.56	1.33	0.44	1.61	0.94
Course factors	Closer to end of course	2.32	9.88**(+)	0.99	4.93*(+)	4.59*(+)	5.59*(-)
	Enrolment	0.07	1.66	1.55	0.04	0.46	0.66
	Concerned over academic success	20.35**(-)	15.95**(+)	3.07	5.06*(+)	3.35	12.00**(-)

Table 3 (continued): Univariate associations between demographic, study, support and trauma exposure and primary outcomes in total sample.

Variable		Wellbeing [a]	Depression [b]	Anxiety [b]	Stress [b]	Exhaustion [c]	Disengagement [c]
Presence of supports	Whānau support	2.06	8.08**(-)	3.27	6.43*(-)	1.79	0.01
	Academic/administrative support	2.38	3.34	1.83	0.97	1.12	3.06
	Supervisor/teaching support	1.33	3.67	4.57*(-)	0.70	1.75	1.63
	Social support	4.44*(+)	5.69*(-)	0.49	6.60*(-)	0.06	0.00
Exposure to earthquakes		0.37	3.68	1.28	0.73	1.06	0.05
Exposure to mosque shootings		0.02	1.77	2.72	1.88	0.57	0.08

Notes:
[a] Wellbeing measured by Satisfaction with Life Scale (SWLS).
[b] Depression, anxiety and stress measured by Depression Anxiety and Stress Scale (DASS-21).
[c] Exhaustion, disengagement and burnout measured by Oldenburg Burnout Inventory—student version (OLBI-S).
[d] Neuroticism, agreeableness and conscientiousness measured by BFI-10.
[e] Resilience measured by CD-RISC-10.
*p≤.05, **p≤.01. +/- indicates direction of association.

Table 4: Multivariable analysis of associations.

Outcome	Variables included in model	Adjusted R squared
Wellbeing [a]	Agreeableness (+) *, concerned over academic success (-) **, resilience (+) **	0.302
Depression [b]	Agreeableness (-) *, concerned over academic success (+) *, closer to end of course (+) *, resilience (-) **, presence of whānau support (-) (p=0.09)	0.287
Anxiety [b]	Neuroticism**, supervisor support (p=0.09)	0.172
Stress [b]	Agreeableness (-) *, conscientiousness**, presence of whānau support (-) **, neuroticism**, in a relationship (+) (p=0.06), resilience (-) (p=0.06)	0.326
Exhaustion [c]	Conscientiousness (-) *, gender (M)**, resilience (-) **	0.204
Disengagement [c]	Conscientiousness (+) *, neuroticism (-) **, concerned over academic success (-) **	0.217

Notes:
[a] Wellbeing measured by Satisfaction with Life Scale (SWLS).
[b] Depression, anxiety and stress measured by Depression Anxiety and Stress Scale (DASS-21).
[c] Exhaustion and disengagement measured by Oldenburg Burnout Inventory—student version (OLBI-S). +/- indicates direction of association. Neuroticism, Agreeableness and Conscientiousness measured by BFI-10. *p≤.05, **p≤.01.

Concern over academic performance was associated with lower wellbeing scores, higher depression and lower disengagement scores. Resilience was associated with higher wellbeing, lower depression and lower exhaustion scores. Neuroticism was associated with higher anxiety and stress but lower disengagement. Conscientiousness was associated with higher stress and disengagement but lower exhaustion. Agreeableness was associated with increased wellbeing, and lower depression and stress.

Discussion

Medical students and postgraduate health sciences students completing this survey reported high levels of burnout and psychological distress, including symptoms of depression, anxiety and stress. Despite this, over two thirds of our sample reported feeling satisfied with life, with no significant difference across postgraduates and medical students. A study comparing life satisfaction of medical students with other undergraduate students in Auckland reported that medical students were more satisfied than other students.[21] Increased job certainty for medical students could be a factor, and possibly for some postgraduate students in our sample (37% were enrolled part time, possibly indicating ongoing employment).

Considering mean scores of psychological distress using the DASS-21 scale, our sample means (indicative of "normal" or "mild" symptoms of depression, anxiety or stress) were comparable with previous studies at single university campuses in Australia and New Zealand.[14,22] The prevalence of clinical levels of depression and anxiety in this

medical student sample were also similar to global estimates of depression (32% from our sample vs 27–28% from two meta-analyses[3,5]) and anxiety (our sample 34% vs 34%[4]) in medical students.

For postgraduate students, Evans et al.[2] reported the prevalence of "moderate to severe" depression and anxiety in a large international study to be approximately 39% and 40%, respectively. We found similar levels of "moderate to extremely severe" depression (41%) but lower levels of anxiety (26%) in our sample, possibly due to methodological factors (e.g., different measures of anxiety). The DASS-21 discriminates between anxiety and stress—"tension", "irritability" and "difficulty relaxing" are reported in the stress subscale while the anxiety subscale measures symptoms such as "fear" and "panic".[16] This may explain the lower rates of anxiety reported in the current study compared to studies using more general anxiety measures that may incorporate symptoms of stress.

Exposure to the earthquakes or terrorist attack in our sample was not associated with psychological distress; however, the low sample size may underestimate this relationship. Other larger community studies have suggested that the cumulative effect of multiple traumatic events may still be a factor in small but functionally significant increases in distress symptoms.[23]

Both of our samples reported high levels of burnout. Systematic reviews of burnout in medical students report variable prevalence of burnout in medical students of 7–75% depending on country-specific factors, cut off criteria and instrument used to measure burnout.[24, 25] Frajerman et al. (2019) reported additional geographical variation with higher rates of burnout in Australia and New Zealand than in Europe and Latin America.[25] Our findings of 78% of the total sample meeting criteria for burnout may be explained by selection bias given our lower response rates and smaller sample sizes, as well as use of a different measure, but could also be an accurate estimate of burnout in this region. Farrell et al. (2019) found similar rates of burnout in medical students at a different New Zealand university using the OLBI-S.[26] However, the majority of studies use MBI-HSS to measure student burnout, which limits full comparison of our findings.

Our analysis of the combined sample of postgraduate students and medical students identified several factors associated with the primary outcomes of life satisfaction, psychological distress and burnout including individual factors (e.g., demographics, personality and resilience) and systemic factors (e.g., supervisor support and progress through course). Male respondents reported higher exhaustion scores, which was also reported in a systematic review of burnout in Chinese medical students.[27] Whether this was related to selection bias of the males who responded to the survey or actual trends is unclear. In a study of whether gender and age impacted experience of workplace burnout, younger males were identified as having a higher risk of burnout while females had a bimodal risk profile.[28] Further investigation into gender differences in experience of burnout is needed.

Being in a relationship was also associated with higher stress scores, although respondents who reported having "social support" and "whānau support" tended to report higher levels of wellbeing and lower depression scores, which is more consistent with previous findings in the literature.[1,27] Work, mental health difficulties and study burnout are known to impact on relationships; therefore, this finding may reflect a bidirectional effect. More postgraduate students reported English as a second language and not being born in New Zealand, as well as less whānau support. Larger sample sizes and subgroup analysis are needed to explore whether these demographic differences could impact on postgraduate students' experience of burnout and psychological distress.

Neuroticism was associated with increased anxiety and stress, but less disengagement. Conscientiousness was associated with less exhaustion, but surprisingly increased stress and disengagement. Our study may have been underpowered to detect true associations between neuroticism and exhaustion and does not allow for causal conclusions given its cross-sectional design. A recent review on personality traits and job burnout concluded that neuroticism is associated with higher levels of burnout while conscientiousness is thought to be protective (though noted variation in findings); however, the impact of personality traits and student burnout is yet to be explored fully.[29]

Resilience was associated with increased wellbeing, and less depression and exhaustion. The responses on the CD-RISC-10 in our study were similar to other estimates of resilience in undergraduate samples although lower than general community sample means.[19,30] Resilience training has been adopted by many medical schools and training schemes. Some students may perceive this

approach as "individual blaming" when systemic factors of the learning environment are well recognised to impact on the development of burnout.[8,11] Addressing both systemic and individual factors related to improving wellbeing may be more acceptable to students with already high personal and external expectations.

Apart from resilience, separate factors were identified as being most strongly associated with the domains of burnout compared to depression, supporting the understanding of the two concepts being related but independent.

This study has limitations. First, this was a self-selected sample, which may have disproportionately attracted individuals with experience of current or past distress or burnout. Conversely the survey sample may have missed participants with severe distress or burnout—potential response and sampling bias from the low response rate make it difficult to interpret the findings from this sample. The low response rate was worsened by an early termination of recruitment due to COVID-19. The resulting small sample size did not permit subgroup analyses. The cross-sectional study design also limits the interpretation of associations and causality. However, comparison with other studies shows reasonable consistency and suggests validity in our findings.

To conclude, this first study to include both medical and postgraduate students in Aotearoa New Zealand found high levels of psychological distress and burnout in both medical students and postgraduate students. These findings are consistent with international literature. Exposure to two major adverse events was not related to current levels of psychological distress or mental health symptoms. Individual and contextual factors associated with wellbeing, psychological distress and burnout were identified; however, the contributing factors remain poorly understood. Longitudinal and qualitative studies are needed to explore causative factors relating to both the individual and institutions in order to better support tertiary students and mitigate the impacts of psychological distress and burnout during study. The additional impact of COVID-19 on student wellbeing and burnout is another area for study.

COMPETING INTERESTS
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Laxative-prescribing habits: a summative impact evaluation of a constipation programme implemented in two hospitals in New Zealand

Jennifer CH Cook, Abdullah AO Alhaidari, Blake W Jackson, Matthew P Ordish

ABSTRACT

AIMS: To evaluate the impact of a multifaceted intervention aimed at improving adherence to a list of preferred laxatives in two hospitals in New Zealand.

METHODS: A constipation programme was developed at Capital & Coast District Health Board to improve adherence to safe and effective (preferred) laxatives over potentially dangerous and less effective (non-preferred) agents. The intervention included a new constipation guideline, a poster of preferred laxatives, a patient information leaflet, hospital formulary adjustments and staff education. The evaluation compared the number of dispensations of each laxative during two periods: a 12-month period prior to programme implementation and a 12-month period following programme implementation. Data were retrospectively gathered from multiple sources on all laxatives dispensed on 14 adult wards across two New Zealand hospitals.

RESULTS: Prior to the programme, there were 111,771 laxatives dispensed, the majority of which (62%) were non-preferred agents. Following the programme, there were 91,005 laxatives dispensed, the majority of which (82%) were from the preferred list, indicating a large shift in prescribing habits.

CONCLUSIONS: Inpatient laxative prescribing habits require attention and are amenable to quality improvement initiatives. This may reduce waste, prevent harm and improve patient outcomes.

Constipation among hospitalised adults is a common, burdensome and costly condition that is poorly studied. A universally accepted definition for constipation does not exist. It is a vague term that health professionals and patients may use to indicate altered stool frequency or consistency, abdominal discomfort, defecation difficulties, or the requirement for laxatives or manual manoeuvres to defecate. It is a prevalent condition, affecting as many as 39–43% of patients upon admission into medical wards and hospices, respectively.[1,2] It is also a common hospital-acquired complication, affecting up to 43–83% of inpatients in medical wards and intensive care units, respectively.[1,3] Constipation has deleterious effects on patients' physical and mental wellbeing and overall quality of life.[4] Constipation also has enormous financial implications; in England alone, £168 million was spent on constipation-related emergency care in one year.[5] In 2020, the global laxative market was valued at $5,239 million USD.[6]

Laxatives have an important role in managing constipation. Unfortunately, the little evidence available indicates widespread use of ineffective and potentially harmful laxatives in the management of constipation among inpatients. A particular example is docusate, which remains one of the most commonly prescribed laxatives despite increasing evidence of ineffectiveness.[7] Indeed, docusate was not better than placebo when added to sennoside in a randomised, double-blinded, placebo-controlled trial.[8] Yet, docusate accounts for up to 64% of all laxatives given to medical and surgical inpatients.[9] In one study, 53% of internal medicine inpatients were taking docusate before admission and 67% of the remaining group were started on docusate during their admission.[10] The common use of ineffective laxatives may delay or prevent the use of safer and more effective laxatives.

Another issue is using colonoscopy preparation agents, such as phosphate and sodium citrate-based enemas, for constipation. These agents are potentially harmful and were not evaluated in the

treatment of constipation.[11] The U.S. Food and Drug Administration attached a black box warning, and the American Gastroenterological Association advised against using phosphate-based bowel preparation products for constipation due to serious safety risks, including severe electrolyte derangement, renal impairment and death.[12,13] Unfortunately, health professionals are not always aware of the numerous conditions contradicting the use of phosphate enemas. These conditions are prevalent among hospitalised adults, including old age, dehydration, renal or cardiac disease, slow transit constipation, use of diuretics and other common anti-hypertensives.[14] It is therefore important to address laxative-prescribing practices to reduce waste, prevent harm and improve patient outcomes.

This study aimed to evaluate the impact of a system-wide constipation programme on promoting safe and effective (preferred) laxatives in place of potentially harmful and less effective (non-preferred) agents in 14 adult wards in two hospitals in New Zealand. This was achieved by comparing the percentage of non-preferred-to-total laxatives dispensed before and after programme implementation. The study provides lessons on addressing the exceedingly common problem of constipation. It is among the very few and most inclusive assessments of laxative prescribing habits among hospitalised adults.

Methods

Context

In 2018, the Choosing Wisely Steering Board at Capital & Coast District Health Board (CCDHB) questioned whether to use a natural laxative extracted from kiwifruit to treat constipation at Wellington Regional Hospital and Kenepuru Community Hospital. Both hospitals were described in a previous publication.[15] The board recruited a project team from both hospitals to answer this question. The project team consisted of the nurse manager of the gastrointestinal department, a consultant geriatrician (AA), a pharmacist (BJ), a dietician and the director of midwifery. The team started by evaluating the literature supporting the use of the proposed and all other laxatives available at CCDHB. The team quickly identified common shortcomings that occurred when diagnosing and managing constipation at CCDHB. These included the type, dose and combination of laxatives prescribed and an expired constipation guideline. For instance, several inpatients at risk of constipation were not offered laxatives. Furthermore, hospital-acquired constipation was sometimes treated with supratherapeutic doses of multiple laxatives that resulted in diarrhoea, incontinence and then isolation due to concerns for possible *Clostridioides difficile* colitis. The team expanded the project scope to include developing a system-wide constipation programme that would improve staff and patients' knowledge about constipation and how to prescribe safe and effective laxatives instead of ineffective and potentially harmful ones.

Developing the programme

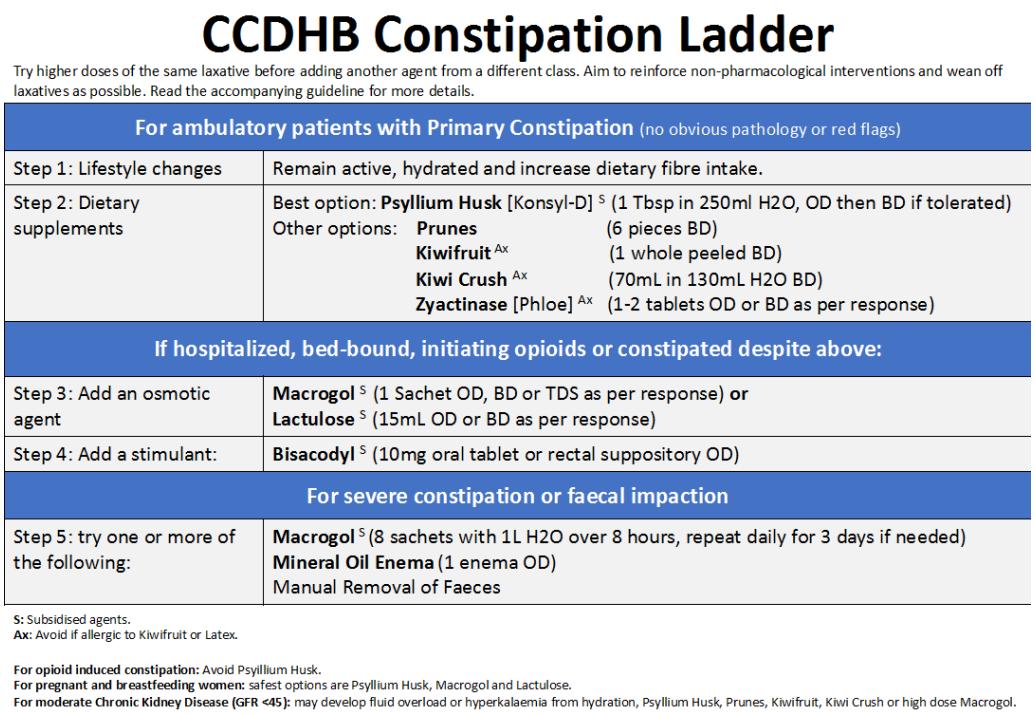
The team held fortnightly meetings to define the programme's scope, systematically review the literature for all available laxatives and develop new guidelines and educational material. Representatives of different departments were invited to these meetings to endorse and contribute to the programme's development.

The programme scope included all nursing, medical and midwifery staff caring for adults in the community and hospital settings. The scope excluded specific departments (paediatrics, psychiatry and intensive care units), specific types of constipation (slow-transit constipation, defecation disorders, constipation secondary to clozapine, spinal injury, or bariatric surgery), bowel preparation protocols, and laxatives not available in New Zealand such as intestinal secretagogues and serotonergic laxatives.

The main components of the constipation programme included a guideline, a poster highlighting preferred laxatives and a patient information leaflet. The guideline outlined the programme's objectives and scope, and listed evidence supporting the use of specific laxatives over others. A geriatrician (AA) wrote the guideline with the support of the project team and volunteer resident medical officers. The guideline included a literature review pertinent to all available laxatives in New Zealand. The review included PubMed, Google Scholar and UpToDate. Pharmaceutical companies were contacted where there was a lack of, or contradicting, evidence about a specific laxative.

The second component was the Constipation Ladder, a poster depicting the guideline's main recommendations in a concise and memorable manner. The Constipation Ladder (see Figure 1) divided patients into three groups, each with a list of preferred interventions and laxatives. The first group were ambulatory patients with primary

Figure 1: The Constipation Ladder (version 1).



CCDHB Constipation Ladder

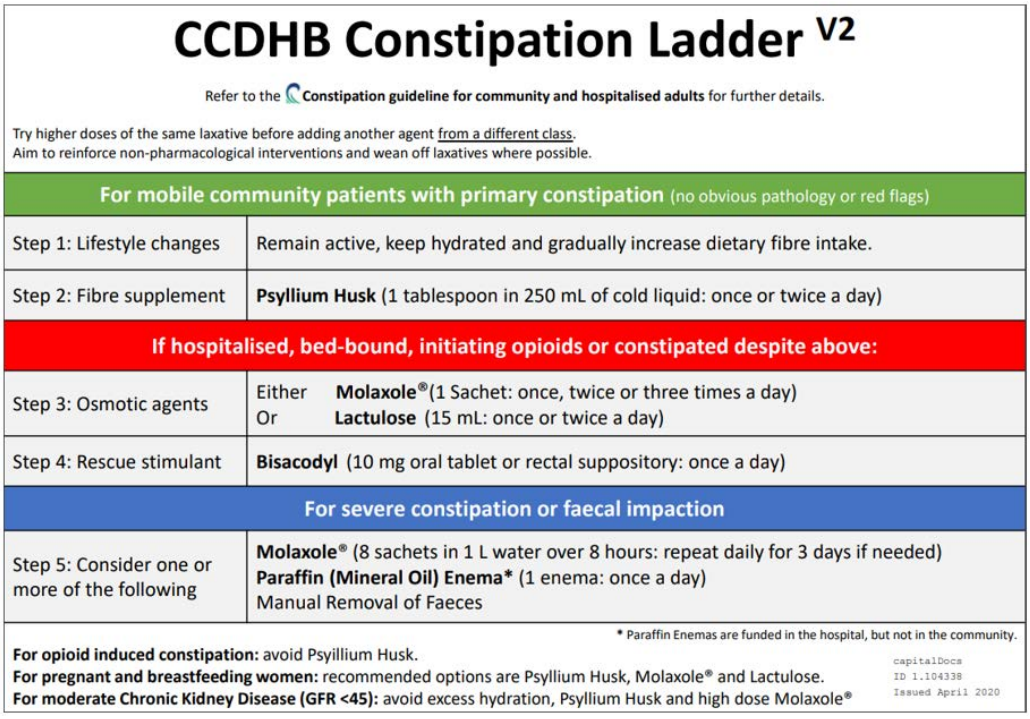
Try higher doses of the same laxative before adding another agent from a different class. Aim to reinforce non-pharmacological interventions and wean off laxatives as possible. Read the accompanying guideline for more details.

For ambulatory patients with Primary Constipation (no obvious pathology or red flags)	
Step 1: Lifestyle changes	Remain active, hydrated and increase dietary fibre intake.
Step 2: Dietary supplements	Best option: **Psyllium Husk** [Konsyl-D] [S] (1 Tbsp in 250ml H2O, OD then BD if tolerated) Other options: **Prunes** (6 pieces BD) **Kiwifruit** [Ax] (1 whole peeled BD) **Kiwi Crush** [Ax] (70mL in 130mL H2O BD) **Zyactinase** [Phloe] [Ax] (1-2 tablets OD or BD as per response)
If hospitalized, bed-bound, initiating opioids or constipated despite above:	
Step 3: Add an osmotic agent	**Macrogol** [S] (1 Sachet OD, BD or TDS as per response) **or** **Lactulose** [S] (15mL OD or BD as per response)
Step 4: Add a stimulant:	**Bisacodyl** [S] (10mg oral tablet or rectal suppository OD)
For severe constipation or faecal impaction	
Step 5: try one or more of the following:	**Macrogol** [S] (8 sachets with 1L H2O over 8 hours, repeat daily for 3 days if needed) **Mineral Oil Enema** (1 enema OD) Manual Removal of Faeces

S: Subsidised agents.
Ax: Avoid if allergic to Kiwifruit or Latex.

For opioid induced constipation: Avoid Psyillium Husk.
For pregnant and breastfeeding women: safest options are Psyllium Husk, Macrogol and Lactulose.
For moderate Chronic Kidney Disease (GFR <45): may develop fluid overload or hyperkalaemia from hydration, Psyllium Husk, Prunes, Kiwifruit, Kiwi Crush or high dose Macrogol.

Figure 2: The Constipation Ladder (version 2).



CCDHB Constipation Ladder V2

Refer to the **Constipation guideline for community and hospitalised adults** for further details.

Try higher doses of the same laxative before adding another agent from a different class.
Aim to reinforce non-pharmacological interventions and wean off laxatives where possible.

For mobile community patients with primary constipation (no obvious pathology or red flags)	
Step 1: Lifestyle changes	Remain active, keep hydrated and gradually increase dietary fibre intake.
Step 2: Fibre supplement	**Psyllium Husk** (1 tablespoon in 250 mL of cold liquid: once or twice a day)
If hospitalised, bed-bound, initiating opioids or constipated despite above:	
Step 3: Osmotic agents	Either **Molaxole®** (1 Sachet: once, twice or three times a day) Or **Lactulose** (15 mL: once or twice a day)
Step 4: Rescue stimulant	**Bisacodyl** (10 mg oral tablet or rectal suppository: once a day)
For severe constipation or faecal impaction	
Step 5: Consider one or more of the following	**Molaxole®** (8 sachets in 1 L water over 8 hours: repeat daily for 3 days if needed) **Paraffin (Mineral Oil) Enema*** (1 enema: once a day) Manual Removal of Faeces

* Paraffin Enemas are funded in the hospital, but not in the community.

For opioid induced constipation: avoid Psyillium Husk.
For pregnant and breastfeeding women: recommended options are Psyllium Husk, Molaxole® and Lactulose.
For moderate Chronic Kidney Disease (GFR <45): avoid excess hydration, Psyllium Husk and high dose Molaxole®

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Table 1: The Defined Daily Dose (DDD) utilised for each laxative.

Laxative	Defined Daily Dose (DDD)
Docusate tablet	150mg
Laxsol®	2 tablets
Sodium-phosphate enema	1 enema
Glycerol 3.6g suppository	1 suppository
Sodium-citrate enema	1 enema
Psyllium husk	1 dispensation event
Macrogol (Molaxole®)	2 sachets
Lactulose	10mL
Bisacodyl tablet	10mg
Bisacodyl suppository	10mg
Paraffin mineral oil enema	1 enema
Methylnaltrexone ampoule	6mg

Table 2: Comparison of laxatives dispensed before and after the intervention.

Laxative dispensed	Pre-implementation period Defined Daily Doses dispensed		Post-implementation period Defined Daily Doses dispensed	
	n	(%)*	n	(%)*
Docusate tablet	1,170	(1.0%)	396	(0.4%)
Laxsol®	63,693	(57.0%)	14,554	(16.0%)
Sodium-phosphate enema	1,222	(1.1%)	343	(0.4%)
Glycerol suppository	1,596	(1.4%)	1,025	(1.1%)
Sodium-citrate enema	1,340	(1.2%)	140	(0.2%)
Non-Preferred Laxatives	**69,021**	**(61.8%)**	**16,458**	**(18.1%)**
Psyllium husk	2,186	(2.0%)	2,791	(3.1%)
Macrogol (Molaxole®)	11,471	(10.3%)	24,874	(27.3%)
Lactulose	28,641	(25.6%)	26,897	(29.6%)
Bisacodyl tablet	208	(0.2%)	17,773	(19.5%)
Bisacodyl suppository	236	(0.2%)	678	(0.7%)
Paraffin mineral oil enema	6	(0.0%)	1,344	(1.5%)
Methylnaltrexone	2	(0.0%)	190	(0.2%)
Preferred Laxatives	**42,750**	**(38.2%)**	**74,547**	**(81.9%)**
Total Laxative	**111,771**	**(100.0%)**	**91,005**	**(100.0%)**

Table 3: Comparison of lactulose doses dispensed before and after the intervention.

Lactulose dosage dispensed	Pre-implementation period*	Post-implementation period*
<10mL	1.4 %	0.7 %
10mL	12.3 %	10.6 %
15mL	11.9 %	28.2 %
20mL	71.5 %	49.7 %
25mL	0.5 %	0.5 %
30mL	1.7 %	7.0 %
>30mL	0.6 %	3.4 %

*Due to rounding, totals of percentages may not correspond with the sum of the separate values.

constipation. This group was recommended lifestyle interventions with consideration to adding a fibre supplement like psyllium husk or another natural laxative. The second group consisted of patients who were either hospitalised, bed-bound, taking opioids, or not responding to the previously mentioned interventions. This group was recommended macrogol (polyethylene glycol) or lactulose, with consideration to adding bisacodyl as a rescue agent. The third group consisted of patients with severe constipation or faecal impaction who were recommended high dose macrogol, mineral oil enema, or manual disimpaction. The recommended doses for each laxative were provided to reduce the commonly witnessed variance in prescribing. The ladder was not based on the number of days spent without a bowel motion, given how widely variable bowel habits are among people.

The third component was an updated patient information leaflet that included a more inclusive definition of constipation and information about the newly recommended laxatives: macrogol, lactulose and bisacodyl, instead of docusate and Laxsol® (docusate 50 mg + sennoside B 8 mg).

Disseminating the programme

The consultation process started in September 2019. The guideline and ladder were presented to the local Choosing Wisely Steering Board, the Medicines Review Committee, the Departmental Heads of Surgery, Obstetrics & Gynaecology and Gastroenterology, and various healthcare professionals representing hospital and community-based services. Their input was considered before sending an all-staff email seeking feedback on the guideline and ladder.

The implementation process started in January 2020. The guideline and ladder were made available on the hospitals' intranet. More supplies of macrogol, oral and rectal bisacodyl, and mineral oil enemas were secured. Despite being classified as non-preferred laxatives, docusate and Laxsol® were kept in stock to avoid sudden changes to patients' regular medications upon admission. Phosphate and sodium citrate-based enemas were removed from all adult wards not performing lower gastrointestinal endoscopic and surgical procedures.

News about the guideline and ladder was spread through the hospitals' intranet, all-staff emails and posters around the hospitals. Links to the guideline and ladder were added to the Preferred Medicines List, an electronic resource commonly accessed by hospital staff. The team provided face-to-face and online presentations to hospital and community staff, including nurses, nurse practitioners, pharmacists, medical students, junior doctors and the gynaecology, geriatric and general medical teams. Presentations began with a clinical vignette demonstrating patient harm caused by delayed and inappropriate over-prescribing of laxatives. These presentations aimed to clarify how to identify patients at risk of, and those suffering from, constipation, its impact, the evidence supporting specific laxatives, how to prescribe these and evidence against using other agents for constipation.

By February 2020, the programme was

implemented across 14 adult wards in both hospitals. These wards represented general medicine, geriatric medicine, cardiology, nephrology, respiratory, gastroenterology, neurology, haematology, medical oncology, radiation oncology, ophthalmology, orthopaedics, general surgery, neurosurgery, cardiothoracic surgery, otorhinolaryngology, vascular surgery, urology, gynaecology and rehabilitation.

Programme adjustments

During the first two months post-implementation, the clinical members of the project team identified a few implementation problems. They sensed that inpatients were increasingly prescribed laxatives intended for community patients, such as Kiwi Crush™. There were also reported difficulties retrieving macrogol-based laxatives from the BD Pyxis™ MedStation™ ES automated medication dispensing machines. Finally, some departments questioned why they no longer had access to particular agents.

To address these issues, the team developed version 2 of the Constipation Ladder (Figure 2) in April 2020. The title "ambulatory patients" was simplified to "mobile community patients" to distinguish this group from hospitalised ones. Step 2 of the ladder was shortened only to include fibre supplements because they are the safest, cheapest and most extensively studied of the natural supplements. Step 3 was coloured red to grab doctors' attention that inpatients are to be given different laxatives than the ones for community-dwelling adults. We used the tradename "Molaxole®" instead of the ingredient name "macrogol" for easier identification on the Pyxis™ machine and to avoid confusion with non-laxative products containing macrogol. The ladder was provided to charge nurses to display in all nursing stations. Finally, sodium citrate-based enemas were returned to the radiation oncology department, as evidence supported its use prior to prostate radiation. Contrary to initial intentions, the programme was not disseminated to the community as the preparations for the COVID-19 pandemic took priority.

Study of the intervention

A retrospective audit was designed to evaluate the impact of the constipation programme on promoting safe and effective laxatives in the 14 adult wards where the programme was implemented. The impact was assessed by comparing the ratio of preferred laxatives to all laxatives dispensed (adherence) pre- and post-programme implementation. Preferred laxatives were psyllium, macrogol, lactulose, bisacodyl, mineral oil enemas, and methylnaltrexone. Non-preferred laxatives were defined as docusate, Laxsol®, glycerol suppositories, sodium citrate enemas, and sodium phosphate enemas. The rationale for choosing these medications can be found in the guideline.[16] Adherence was measured during a pre-implementation period from 1 September 2018 to 31 August 2019 and a post-implementation period from 1 September 2020 to 31 August 2021. A one-year gap was left between both periods to account for programme design, implementation, and maturation.

The hospitals' informatics pharmacist extracted dispensing data relevant to drugs of interest from Pyxis MedStation™ ES, the ward-based automated medication dispensing system, and from ePharmacy® and WinDose®, the dispensary-based inventory management software systems. For each dispensation, data included the dispensation date, dispenser's name, patient's National Health Index number (NHI), dispensing station and ward names, and the drug's name, strength (e.g., 5 mg), form (e.g., tablet), and amount dispensed (e.g., two tablets).

Analysis

We used Microsoft Excel to analyse the data. We removed dispensers' and patients' identifying details and counted the amount dispensed for each drug formulation during both periods. To display laxative dispensation figures in meaningful and comparable units, we converted the total amount dispensed into the total number of Defined Daily Doses (DDD) as specified by the World Health Organization Collaborating Centre for Drug Statistics Methodology (WHO CCDSM).[17] DDD is the average maintenance dosing per day for a medication that allows for a stable drug utilisation metric, enabling comparison between different medication preparations, countries, regions and other healthcare settings.

Psyllium husk, docusate and Laxsol® were analysed differently. At CCDHB, psyllium husk requires nursing staff to enter the dose in grams into the Pyxis MedStation™. During analysis, we found that the values entered did not correlate to meaningful doses. Psyllium was therefore measured by the count of dispensation events regardless of amount, i.e., each dispensation was counted as one DDD, as psyllium is most often dosed once daily. For docusate, the WHO CCDSM DDD is 150mg, but it was available in 50mg and

120mg strength tablets in New Zealand. We therefore calculated the DDD for docusate by dividing the total number of milligrams dispensed by 150. Finally, the combination product Laxsol® is not included in the WHO CCDSM database, so we used The New Zealand Formulary's recommended daily dose of two tablets.[18] The DDDs we utilised are displayed in Table 1.

A statistician assisted with data analysis; tests of significance were not required because dispensation data were complete.

Ethical considerations

CCDHB's local Research Office approved this study. The authors did not receive any funding and report no financial conflicts of interest.

Results

Data were obtained for 14 adult wards across both hospitals. During the pre-implementation period, 111,771 DDDs were dispensed, 42,750 (38%) of which were preferred laxatives (Table 2). The most commonly dispensed laxatives were docusate-based products: docusate and Laxsol®, which accounted for 58% of all laxatives.

During the post-implementation period, 91,005 DDDs were dispensed, 74,547 (82%) of which were preferred laxatives. The most commonly dispensed laxative was lactulose, which accounted for 30% of all laxatives.

Comparison of laxatives dispensed before and after the intervention

Following the intervention, the ratio of non-preferred-to-total laxatives dispensed decreased from 61.8% to 18.1%. There was a reduction in the DDD of all non-preferred laxatives: docusate-based products from 64,863 to 14,950, sodium-phosphate enemas from 1,222 to 343, glycerol suppositories from 1,596 to 1,025 and sodium-citrate enemas from 1,340 to 140. Comparably, the ratio of preferred-to-total laxatives dispensed increased from 38.2% to 81.9%. There was an increase in the DDD of all preferred laxatives except lactulose: macrogol from 11,471 to 24,874, lactulose from 28,641 to 26,897, bisacodyl-based products from 444 to 18,451, paraffin mineral oil enemas from 6 to 1,344, and methylnaltrexone from 2 to 190. See Table 2 for details of the type and number of laxatives dispensed during both periods, noting that DDDs were rounded to the nearest whole number.

Comparison of lactulose doses dispensed before and after the intervention

Following the intervention, dispensations of the preferred dose of lactulose of 15mL increased from 12% to 28%. There was a reduction in supratherapeutic doses ≥20mL/dispensation. See Table 3 for details of lactulose doses dispensed.

Discussion

This study evaluated laxative prescribing habits and the impact of a system-wide intervention in reducing the use of ineffective and potentially harmful agents for constipation in two hospitals in New Zealand. The evaluation identified that most dispensations (61.8%) were accounted for by non-preferred laxatives, which was a problem. However, this percentage dropped to 18.1% following the intervention, which is promising. We now discuss the challenges and facilitators of changing laxative prescribing habits.

There were multiple barriers to the development and implementation of the constipation programme. There was limited research on inpatient laxative use and the treatment of acute constipation. In addition, many guidelines contained inaccurate information. For example, some guidelines defined acute inpatient constipation according to the ROME criteria for chronic constipation, which requires 3 to 6 months of symptoms.[19] Other guidelines defined constipation according to the number of days without a bowel movement, despite the well-known variability among individuals. As a result, an extensive literature review was required, with continuing consultation with various stakeholders and experts, followed by the development of new guidelines and educational material.

Another challenge was to change health professionals' misconceptions about certain laxatives. Our experience is in keeping with the findings of other studies where prescribers commonly regarded docusate as a safe and effective laxative.[20,21] Indeed, docusate-based products were the most frequently dispensed laxatives in this study and in other hospitals.[9,10,21] This is not surprising, given the number of guidelines endorsing docusate-based products despite increasing evidence of ineffectiveness. To counteract this, a group of practitioners removed docusate from their hospital formulary, resulting in a 74% decrease in the number of patients discharged on it.[20] We did not restrict the use of docusate, to avoid sudden changes to patients' regular medications. Instead,

we advocated for effective alternatives, leading to a nearly 77% drop (from 64,863 to 14,950) in dispensing of docusate-based products. Similarly, a large health organisation used a communication tool with live webinars to reduce docusate use by 54.9% while saving approximately 940 hours of nursing time over 18 months.[22] Education and communication thus appear effective at changing laxative prescribing habits.

Another misconception we encountered was that phosphate-based products were the ultimate solution to severe constipation and faecal impaction. Again, we addressed this through education on their potential adverse effects, the numerous contraindications to their use and the lack of evidence supporting their use for constipation.[12–14] We also removed these agents from non-surgical wards, given the potential for serious harm, resulting in a 72% reduction in their use. A similar approach was taken in another hospital that utilised education and removed phosphate-based products from the emergency department following several significant adverse effects, thus reducing their use by 96%.[23]

Another challenge worth mentioning is the difficulties securing supplies and storing mineral oil enemas. Supplies had to be brought in from overseas, their relatively large size prevented storage within dispensing machines and they were relatively expensive. Given these difficulties, we recommend looking for an alternative lubricant for faecal impaction, because the evidence supporting their use is merely based on expert opinion.

Facilitators of implementation included leadership support and involvement of stakeholders from various disciplines and levels in the development and implementation of the programme. Another facilitator was the written guideline with referenced articles supporting arguments for change. These arguments for change were communicated during our educational sessions as follows: osmotic laxatives were favoured for inpatients given their low cost, excellent safety profile and proven effectiveness among various patient groups for extended periods.[13] Macrogol-based products were favoured over lactulose, given superior effectiveness and tolerability in head-to-head trials.[24,25] Prescribers were advised that lactulose is effective and well-tolerated when prescribed at lower doses than commonly seen in our hospitals.[26] Bisacodyl was favoured over sennoside as it can be administered either orally or rectally, has superior evidence in acute and chronic constipation, and because sennoside is only subsidised in combination with docusate in New Zealand.[27,28] Methylnaltrexone was introduced as a new agent that has been approved for palliative patients with opioid-induced constipation resistant to traditional laxatives.

This study has strengths. Data on dispensed drugs were gathered from all available sources in collaboration with two pharmacists. The study adds to limited research on laxative prescribing habits within hospital settings. It also demonstrates that low-cost interventions can successfully shift prescribing habits.

This study has limitations. It is an observational study that does not establish causation between the intervention and the change achieved. It did not assess the aetiology of inpatient constipation. It assessed the dispensation of laxatives rather than consumption. In addition, data on prunes, kiwifruit and Kiwi Crush™ were unavailable as these were dispensed from the hospital kitchen.

Conclusion

This study provided information on laxative-prescribing habits within the hospital setting and how to improve these habits. By introducing a constipation programme and education, we successfully increased the use of recommended laxatives and reduced the use of ineffective and potentially harmful agents. To raise awareness, celebrate achievements and sustain the intervention, a series of all-staff emails were sent out. Each email relayed brief messages on a specific laxative and how this intervention affected its use.

Of note is the widespread use of ineffective and potentially harmful agents for constipation in our hospital and other studies. While we have taken steps to improve the situation, recent data shows that Laxsol® made the top 20 list of community medicines in New Zealand, with 570,000 funded prescriptions dispensed in 2022 alone.[29] This inspires the need to disseminate the intervention beyond the hospital setting and help unify prescribing across primary and tertiary care. Ultimately, we recommend incorporating teaching about constipation and laxatives at medical and nursing schools and studying the effects of similar programmes on patient-related outcomes.

COMPETING INTERESTS
Nil.

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Te Ōranga Ō Te Roro: kaumātua perspectives on the development of a mobile app for mate wareware (dementia) awareness

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ABSTRACT

AIM: Mate wareware (dementia) presents a significant social and economic burden for Māori in Aotearoa New Zealand. Previous literature has highlighted the need to improve health literacy for Māori regarding the causes and management of mate wareware, yet there is a lack of Māori-centred educational resources. It was determined that a mobile phone application (app) could meet this need and that early consultation with Māori was required to ensure the digital solution would be culturally safe and relevant.

METHOD: This study explored the perspectives of kaumātua (Māori elders) regarding how to cater the mate wareware mobile app to Māori. Through a qualitative approach based on Kaupapa Māori principles, two focus groups were held with 15 kaumātua. Focus group data were thematically analysed.

RESULTS: The analysis identified four themes related to the content of the proposed app and its design features. "Information about mate wareware" and "Caregiver support" were prominent themes that kaumātua prioritised for inclusion in the proposed app. To ensure uptake, kaumātua emphasised that the "Access" and "Appeal" of the proposed app should be considered.

CONCLUSION: The findings have informed the design of the Mate Wareware app and should be considered when developing other digital health interventions for Māori.

Mate wareware, or dementia, is typically defined by cognitive decline that interferes with social or occupational functioning.[1] In Aotearoa New Zealand, there are an estimated 70,000 people living with mate wareware, and this is predicted to increase to 170,000 by 2050.[2] The prevalence of mate wareware is estimated to be much higher among Māori compared with other ethnicities[3] and Māori represent a greater proportion of those with early-onset dementia (19% Māori versus 8% NZ Europeans).[2,4] The total economic costs of dementia are greater for Māori compared to Europeans as a result of lost productivity and income due to earlier mate wareware onset in Māori,[2] and the costs of caring for kaumātua (elders) at home rather than having them placed in residential care facilities.[5] Thus, mate wareware presents a significant burden for Māori in terms of lost quality of life, increased caregiving responsibility and financial impacts.[2]

Research indicates Māori perspectives of the causes of mate wareware differ from Western views. There is less focus on the physical pathology, and greater focus on spiritual, historical or social causes, and for some, a perception that mate wareware is a normal part of ageing.[5] In relation to protective factors for mate wareware, Māori have reported using a range of strategies to support cognitive, psychological and spiritual health, such as speaking and listening to te reo Māori (the Māori language), singing waiata (song), reciting whakapapa (genealogy), conducting whaikōrero (formal speaking on marae) and participating in raranga (weaving) and whakairo (carving).[5] However, longstanding health inequities[6] have led to Māori disproportionately experiencing obesity, hypertension and diabetes, which have increased their risk for mate wareware.[7,8] It has been established that Māori would benefit from greater health literacy about the causes and management of mate wareware;[5] however, at the inception of this project there was a lack of Māori-centred educational resources concerning mate wareware.

Mobile phone technology is one platform for building health literacy and support around

mate wareware. Māori have rapidly adopted smartphones and other internet-based technologies because of the opportunities for learning, creating a Māori voice, knowledge sharing and socialising virtually, all of which empower Māori values.[9,10] Mobile interventions have been successfully delivered to Māori to manage conditions such as diabetes,[11] alcohol misuse[12] and smoking cessation.[13] Personalisation of mobile interventions with Māori content has had positive effects,[13] suggesting Māori will use a tool if it is targeted for Māori specifically. Importantly, digital technology can remove barriers that prevent Māori accessing information and support.[14]

This paper presents the first study in a research programme and was the starting point for designing a mobile application (app) with Māori whānau (families and communities). The aim of the study was to explore the perspectives of kaumātua (Māori elders) regarding how to best design and develop the mate wareware mobile app for maximum uptake by Māori.

Method

Study design

This study adopted a Māori-centred research design[15] in that all the kaumātua were Māori and the lead researcher (MD) was Māori; however, the research team was comprised of both Māori and non-Māori researchers.[16] Analyses of the data were undertaken using Western-based thematic analysis and a mahi rōpū approach.[17] Kaupapa Māori principles underpinned the research.[18,19] All kaumātua provided informed written consent and ethical approval was obtained from the Health and Disability Ethics Committees (16/STH/154).

Kaumātua

The participants were kaumātua who identified as Māori and were members of a local kaumātua rōpū (community group of Māori elders) in Tāmaki Makaurau (Auckland).

Procedure

Kaumātua were invited to a local marae in Tāmaki Makaurau to participate in focus group interviews. Māori tikanga (protocol) was observed throughout the wānanga (meeting to discuss, deliberate and consider), beginning with a mihi whakatau (a traditional Māori welcome) followed by whakawhanaunga (people making connections). This was followed by a morning tea break, which is part of Māori tikanga that allowed the wānanga to move from a state of tapu (sacredness) into a state of noa (without restriction). During morning tea, kaumātua had the opportunity to ask questions about the study and provide informed consent. Following this, kaumātua divided into two equal groups for the focus group discussions. The two focus groups occurred simultaneously and took approximately 90 minutes. Discussions were conducted in te reo Pākehā (English) at the request of the kaumātua. Kaumātua then re-joined as a larger group to share kai (lunch). To ensure reciprocity,[19] the research team then led a general discussion and question/answer session about mate wareware, and all kaumātua received a $50 koha (gift) as acknowledgement of their participation.

Data analysis

Focus group audio data were transcribed, coded and categorised under emerging themes (by CR) using Braun and Clarke's thematic analysis approach.[20] Themes were required to have been discussed more than twice by two or more different kaumātua. Themes were discussed and redefined by CR and MD, both Māori researchers. Transcriptions, codes and themes were shared with the wider research team and redefined as needed to ensure consensus.

Results

Kaumātua

The focus groups were attended by 15 kaumātua (>60 years of age) and three whānau/family members (<60 years of age). The two focus groups included a majority of female participants, with only one or two male participants in each group. The kaumātua affiliated to a wide range of iwi in the North Island of New Zealand. All kaumātua had some understanding of mate wareware, but only one person was experiencing memory loss themselves.

Analysis

Four themes were identified as priorities for app development: two related to app content, and two related to the design and delivery of the content and were underpinned by five subthemes. An illustration of the themes and subthemes is presented in Figure 1, and example quotes for each theme and subtheme are presented in Table 1.

Figure 1: Themes from qualitative analysis illustrating requirements of the proposed mobile app.

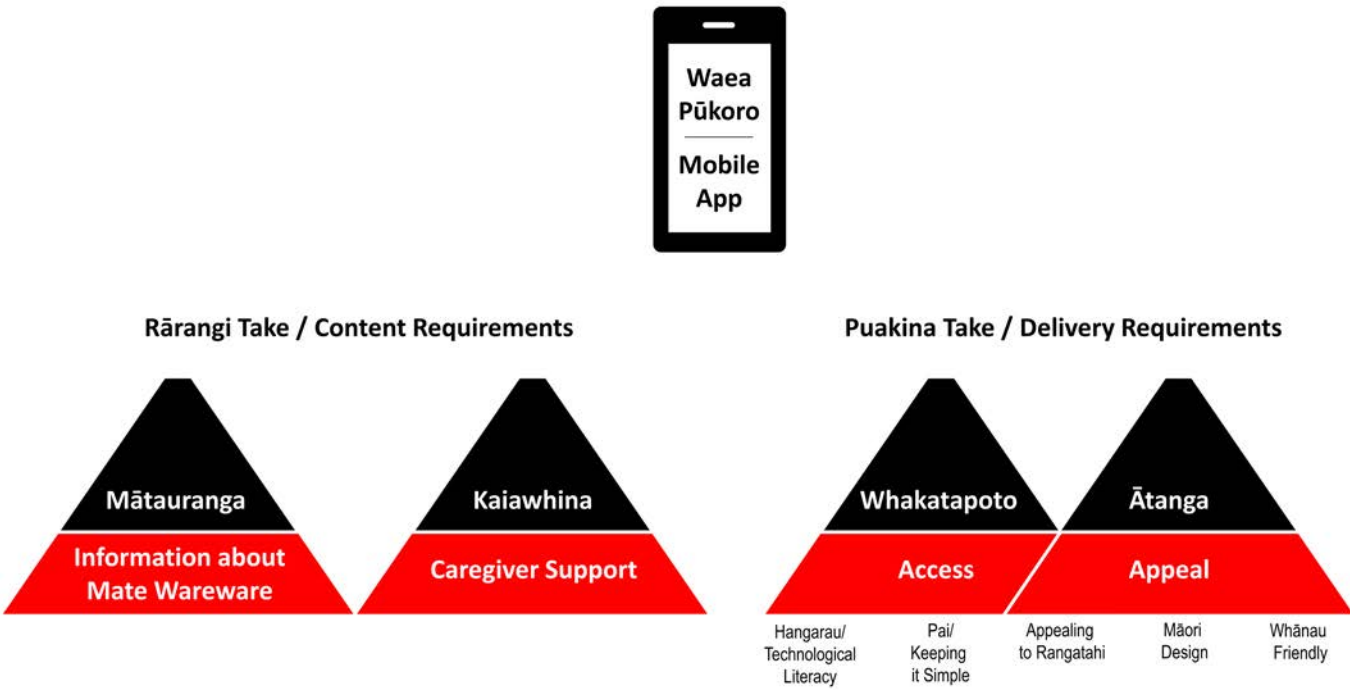

Table 1: Themes and example quotes.

Rārangi take/Content requirements	
Themes	Quotes
1. Mātauranga Information about mate wareware	• "*What is mate wareware in simple terms, because the carers and the supporter, whānau and friends, and all they hear are Alzheimer's or dementia, but they don't fully understand what it is that that actually means*." – P2/G1 • "*I can't explain to them what it is … it upsets me when I myself can't explain it*." – P7/G1 • "*Because rather than look at the symptoms first, I want to be in that preventative stage of my life if I haven't missed the bus already!*" – P3/G1 • "*These apps, you know, to make our grandchildren realise the risk factors that can come or how things can help to keep our brains alive*." – P8/G2
2. Kaiāwhina Caregiver support	• "*Who to go to. How to get help…*" – P2/G1 • "*But I think one of the main things is information about where we can go for help if we've got any questions*." – P8/G2 • "*Where you can go and where your whānau can go—not in a horrible way—for that burden*." – P12/G2 • "*The thing is who looks after the carer when they are looking after someone with dementia you know nobody looks after the carer*." – P9/G2

Table 1 (continued): Themes and example quotes.

Puakina take/Delivery requirements		
Themes	Subthemes	Quotes
3. Whakatapoto Access	Technological literacy	• "*A lot of us don't even know how to access an app … I just learnt how to send an email … a lot of us weren't brought up in this IT business … we cannot go to a normal computer class because we don't absorb, our brains are not like sponges anymore*." – P8/G2 • "*It would be nice if us kaumātua could learn how to use it … because some kaumātua don't have children to rely on like us*." – P15/G2 • "*I don't want to sit around and sit at home there just twiddling my fingers*." – P14/G2
	Keeping it simple	• "*So, perhaps a slight description of what it is in not big words but in a simple user-friendly way, first and foremost*." – P2/G1 • "*I think simple is key … if it's going to be a whole lot of information going past the screen, I think anyone is going to want to fade off*." – P12/G2 • "*While it sounds great to have it in Māori, let's face it, a lot of our people can't read Māori*." – P3/G1 • "*I don't know, yeah, but I think if we had a simple tool that you could just bring up information on it*." – P8/G2
4. Ātanga Appeal	Appealing to rangatahi (Māori adolescents)	• "*We have our grandchildren or our children having to access these apps, you know … must be designed with our moko and our children in mind so that they think the app is interesting enough to pass it on to us. You know, or because we are never going to—we are never going to see these apps and the fact that they are going to help us*." – P8/G2 • "*…My mokopuna … they're the ones that are going to be looking after me and they are going to have to be able to access it*." – P3/G1 • "*Wouldn't it help for the younger generation to know about it (mate wareware) too, because most of the young generation would like to know and like to find out why is nana like this? Because they don't understand*." – P7/G1
	Māori design	• "*A lot of our whakataukī have been written by our elders and it is about tapping into the past then bringing me into the present. That absolutely allows me to build for the future because I'm including my elders ... a whakataukī would take care of a lot of things for me*." – P3/G1 • "*I would like some sort of waiata and tikanga and things on this application (to make this) spiritually correct for me*." – P1, G1 • "*Just colouring definitely is the one, because in Te Ao Māori colours/ colouring are different with meaning to each other and where it comes from*." – P4/G1 • "*We should put in, like, Māori music because we always sing no matter what*." – P12/G2

Table 1 (continued): Themes and example quotes.

	Whānau (family) friendly	• "*We have noticed that when we do a collage of whānau photos that triggers them and opens them up to kōrero (conversation), it really is a stimulator … perhaps if there was one way to individualising? … Once it's personalised there's more interest*." – P2/G1 • "*…Where your whānau could be in there as well, so maybe at first it could be individualised and then maybe whānau can talk 'what does she need?', 'who is going to go now?'*." – P5/G1 • "*Another aspect of keeping it whānau based is that if it is like a Facebook page, if you have other people in (placename) that are prepared to face-to-face talk to you, support you, swap stories with what is happening with your loved one, perhaps*." – P1/G1

P = participant, G = focus group

Theme 1: Mātauranga (information about mate wareware)

> *"I can't explain to them what it is … it upsets me when I myself can't explain it." – Participant 7*

Information was a prominent theme, and many kaumātua emphasised their desire to be educated on mate wareware, including the symptoms, causes and protective factors. All kaumātua had experiences with mate wareware and some reported experiencing memory loss themselves, but they struggled to understand the underlying process. The kaumātua were unaware of the modifiable risk factors for mate wareware. Some reported anecdotal ideas about the cause of mate wareware, such as the overuse of technology. Kaumātua showed a strong interest in the education of their whānau around risk factors and recognised that this would benefit future generations. Kaumātua wanted information about activities and foods that can keep the brain healthy, as well as information about normal cognitive ageing compared with the signs of mate wareware. Kaumātua also desired information on comorbid lifestyle diseases such as diabetes, heart disease and obesity.

Theme 2: Kaiāwhina (caregiver support)

> *"The thing is who looks after the carer when they are looking after someone with dementia, you know, nobody looks after the carer." – Participant 9*

Kaiāwhina (caregiver) support was deemed important and included caring for oneself and caring for a loved one with mate wareware. Kaumātua expressed a need for information about where to access support for older whānau members, as well as sources of support for the caregiver. It was recommended that information be displayed clearly with external links that directly transfer to supporting organisations. Kaumātua also asked for information on managing challenging behaviours with whānau with mate wareware.

Theme 3: Whakatapoto (access)

This theme considers how people will access the mobile app and is underpinned by three subthemes: "Technological literacy", "Keeping it simple" and "Appealing to rangatahi" (this final subtheme also aligns with theme 4, "Appeal").

Technological literacy

> *"A lot of us don't even know how to access an app." – Participant 8*

Access to technology was limited among kaumātua, and all but one reported having never used an app. Most kaumātua had access to a mobile phone but only engaged in simple tasks such as speed dialling and text messaging. One participant reported that kaumātua have a limited ability to learn about new technology due to difficulty retaining new information. Some kaumātua were not open to learning how to use a mobile app and preferred to be contacted through the landline phone or through the distribution of pamphlets. Others were interested in learning to use technology.

Keeping it simple

> *"I think simple is key." – Participant 12*

A key requirement of the app was simplicity. Kaumātua recommended keeping the app simple and including additional prompts within the app to further assist the user. This would enable all whānau members to use the app, including tamariki (children) and kaumātua with and without thinking difficulties. Kaumātua recommended video content from medical experts and those experiencing mate wareware. Written information was recommended to be precise and presented in bullet points. Kaumātua wanted simple terminology such as "brain disease" to keep the users' interest, rather than scientific terminology. Additional recommendations were for larger text, auditory options, colour coding and step-by-step instructions. Kaumātua stated that the app would need to be predominantly in English and complimented with te reo Māori.

Appealing to rangatahi (Māori adolescents)

> *"Must be designed with our moko and our children in mind so that they think the app is interesting enough to pass it on to us." – Participant 8*

Given the aforementioned issues with technological literacy, the kaumātua reported that all of their interactions with technology were facilitated by their tamariki (children) and mokopuna (grandchildren). The kaumātua emphasised that the app must be interesting enough to engage the younger generation in order for them to utilise the app and pass on the information to their elders. In addition, kaumātua believed it was important to target some education towards the younger generation and that video demonstrations would increase younger users' understanding of mate wareware. Games would also encourage the attention of younger generations. Kaumātua acknowledged that this reliance on younger whānau would disadvantage some kaumātua who do not have support to engage with the app.

Theme 4: Ātanga (appeal)

This theme considers how to design the app to appeal to Māori and is underpinned by three sub-themes: "Appealing to rangatahi" (described under theme 3), "Māori design" and "Whānau friendly".

Māori design

> *"…A whakataukī would take care of a lot of things for me." – Participant 3*

Kaumātua favoured a Māori-centred app. The inclusion of karakia (prayer) and waiata (songs) were discussed; however, participants agreed that a whakataukī (Māori proverb) would suffice. The group decided the most appropriate whakataukī was "He aha te mea nui o te ao? He tāngata, he tāngata, he tāngata"; this translates to "What is the most important thing on this earth? The people, the people, the people". Kaumātua also suggested that the choice of colours would be important, as each colour has a different meaning in Te Ao Māori (the Māori worldview).

Whānau friendly

> *"Once it's personalised there's more interest." – Participant 2*

Whanaungatanga (connectedness) with whānau and iwi was repeatedly referenced by all kaumātua. Thus, there was interest in being able to personalise the app and incorporate features that facilitate the connection between whānau and the person with mate wareware. It was suggested that the inclusion of personal features such as whānau photos might trigger the memory and stimulate conversation. An app with similar features to Facebook, such as status updates and diary entries, would enable whānau members to remain connected and combine efforts to support their loved one with mate wareware.

Discussion

This is the first study to explore kaumātua perspectives of a proposed mobile app for mate wareware awareness, and the first culturally specific digital intervention to address mate wareware in Aotearoa New Zealand. Early consultation with Māori in the design of the app was essential to ensure a meaningful and relevant intervention for Māori. This approach aligns with Te Tiriti o Waitangi principles of tino rangatiratanga and partnership, which guarantee Māori a voice in the design and delivery of healthcare interventions.[21] The design of a mobile app specifically targeting Māori also aligns with Te Tiriti o Waitangi principles of equity, active protection and options, which pledge a commitment to equitable outcomes for

Māori and the provision of culturally appropriate hauora (health) services.[21]

App content requirements

The lives of kaumātua and their whānau are significantly affected by mate wareware, yet this research suggests kaumātua have a limited understanding of the disease process, its clinical presentation, lifestyle factors that increase risk and sources of support. The theme "Information about mate wareware" primarily focused on understanding mate wareware and modifying risk factors. However, kaumātua also wanted information on other comorbidities so that all information was in one place. This would be an advantage given the common risk factors across chronic health conditions such as cardiovascular disease, diabetes, stroke and mate wareware.[8] Information on risk reduction was considered a priority and is consistent with previous research where kaumātua reported limited knowledge about risk factors for mate wareware.[5] Lifestyle risk factors such as obesity, hearing loss, hypertension, traumatic brain injury, alcohol, social isolation, physical inactivity, smoking, depression, diabetes and air pollution account for 51% of the risk for mate wareware in Māori.[7] Due to longstanding health inequities and socio-economic determinants that have led to poor biological health,[22] Māori are disproportionately affected by lifestyle-related diseases such as diabetes, hypertension, obesity,[23] mild traumatic brain injury[24] and alcohol disorders.[25] Therefore, it is vital that Māori are provided with information about these lifestyle risks and ways to manage them to ensure the health of current and future generations.

"Caregiver support" was an important theme. Caring for a whānau member with mate wareware is associated with poor health and quality of life for both the caregiver and the individual with dementia.[26] Caregiver self-efficacy and coping strategies are an important mechanism for reducing caregiver burden,[26] and the proposed app has potential to provide support through self-help information and links to external support. Importantly, for Māori, whānau members tend to be cared for within the home rather than in residential care facilities,[5] and therefore support for this role was prioritised for inclusion in the proposed app.

App design and delivery requirements

The findings emphasised that the design of the app should consider how Māori will "Access" the app and whether it will "Appeal" to them. The subtheme "Technological literacy" emphasised the challenges faced by kaumātua when accessing technology, yet there was still a strong desire for kaumātua to be actively involved in designing the app. Kaumātua acknowledged their children and grandchildren would initially help them access the app, and thus it was essential the app was "Appealing to rangatahi". Kaumātua also expressed a desire for simplicity and prompts to help navigate the app, reinforcing the importance of "Keeping it simple". There was a concern that some kaumātua would not have support to help them navigate the app. This is concerning, as social isolation is a risk factor for developing mate wareware.[7,8] Further research is required to identify how to reach individuals who live in isolation. Indeed, a mobile app solution may not be appropriate for this group; as suggested by two kaumātua, communication through landline phone calls or pamphlets may be more appropriate. In relation to the proposed app, the ability to print out a brochure from written text within the app would offer a partial solution to this problem.

Within the subthemes of "Keeping it simple" and "Appealing to rangatahi", videos of clinicians and those with lived experience of mate wareware were considered important. This aligns with Te Ao Māori, where storytelling is a preferred medium for knowledge sharing and traditionally takes place through waiata (song), mōteatea (poetry) and kauwhau (moralistic tale).[27] Lived experience videos have been used in other digital health literacy resources in Aotearoa New Zealand.[28,29] In the wider literature, digital health education interventions often include video content; however, personal storytelling videos appear less common.[30] This reinforces the unique requirements of a Māori-centred mobile app.

There was a strong interest in "Māori design". This aligns with user feedback obtained during the development of the OL@-OR@ app, a mobile app co-designed with Māori communities to support healthy lifestyle behaviours.[31,32] During that co-design process, feedback supported the inclusion of Māori imagery such as a kete (basket) and waka (canoe), and symbolism such as the koru, manaia and tiki patterns.[31] The inclusion of Māori tikanga, language and knowledge was also deemed important; however, it was cautioned that some knowledge is iwi (tribe) specific.[32] In other Indigenous research, culturally relevant graphics and animations have enhanced

the acceptability of digital mental health apps in Aboriginal and Torres Strait Islander communities.[33]

While the inclusion of te reo Māori was considered important, kaumātua noted that most Māori elders cannot speak (or read) fluent Māori as a result of the lack of Māori language learning they experienced in schools,[34] and recommended the app should be in English with the inclusion of common Māori words throughout. In contrast, the inclusion of te reo Māori may also support the person with mate wareware, as many Māori with mate wareware return to speaking te reo Māori, which was their first language prior to its suppression in their early years.[5] Providing opportunities for the individual with mate wareware to choose to speak te reo Māori affirms their cultural and ethnic identity[22] and is considered a source of healing and comfort by Māori.[5] More younger Māori speak fluent te reo Māori as a result of increased learning opportunities;[34,35] therefore, a full Māori version of the app should be considered in the future.

The final subtheme of "Whānau friendly" speaks to the importance of whānau relationships in Te Ao Māori.[19] This could be supported by offering a section of the app that could be personalised with images, updates and a messaging feature to connect whānau members. This theme has also been highlighted in the previously described OL@-OR@ app, in which participants wanted the app to foster relationships and whānau participation.[32] In relation to mate wareware, social support is an essential aspect of reducing caregiver burden,[26] and thus a social feature in the proposed app could offer the ability to unite caregivers. This approach might alleviate the social isolation, limited social outings and whānau conflict experienced by whānau members of a person with mate wareware.[26]

Conclusion

Te Ōranga Ō Te Roro is an important step in providing culturally tailored information about mate wareware for Māori. This study reinforced how important this topic is for kaumātua and identified ways to ensure the proposed mobile intervention is culturally safe and relevant. The findings have informed the design of the Mate Wareware app and should be considered when developing other digital health interventions for Māori.

COMPETING INTERESTS
Nil.

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Trends in penicillin dispensing during an acute rheumatic fever prevention programme

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ABSTRACT

AIM: Acute rheumatic fever (ARF), a serious inflammatory condition, often leads to rheumatic heart disease (RHD). Between 2011 and 2016, Aotearoa New Zealand implemented a rheumatic fever prevention programme (RFPP) to reduce high rates of ARF through improved community access to timely diagnosis and early treatment of group A streptococcal (GAS) pharyngitis, which has been shown to prevent subsequent ARF. This study aimed to quantify the change in penicillin antibiotic dispensing rates among children aged 18 years or younger during the RFPP.

METHOD: This retrospective analysis utilised administrative data from the National Pharmaceutical Collection. Using a controlled, interrupted time series analysis, the effect of the RFPP on antibiotic dispensing rates was explored. Poisson regression models were used to assess the change in dispensing rates during the RFPP among control regions (those not in the RFPP) and regions participating in the RFPP. The primary measure was rate ratio (RR) for the difference between the observed versus counterfactual rates of penicillin dispensing.

RESULT: A total of 12,154,872 dispensing records between 2005 and 2018 were included. Amoxicillin was the most frequently dispensed penicillin (57.7%), followed by amoxicillin-clavulanate (23.4%). Amoxicillin dispensing increased by 4.3% in regions operating the RFPP compared to the increase in control regions ($p<0.001$). The overall rate of penicillin dispensing decreased, driven by a rapid decline in amoxicillin-clavulanate dispensing.

CONCLUSION: During the RFPP an increase in amoxicillin dispensing was seen in regions participating in the programme and regions outside of the programme, indicating the programmatic approach led to improved adherence to recommended first-line antibiotics.

Acute rheumatic fever (ARF) is an inflammatory disease that can develop 2–4 weeks after group A streptococcal (GAS) infection and often progresses to permanent cardiac valve damage or rheumatic heart disease (RHD).[1–3] Globally, ARF and RHD continue to cause considerable morbidity and mortality in low- and middle-income countries and among some disadvantaged populations living in high-income countries.[4] RHD is responsible for around 300,000 deaths annually, predominantly in children and young adults.[4]

In Aotearoa New Zealand, the rates of ARF steadily increased during the 1990s.[5] Between 2000 and 2018, the rate of initial ARF hospitalisations for Indigenous Māori children (5–14 years of age) was 36 per 100,000, and Pacific children had a rate of 80 per 100,000; this represents some of the highest ARF rates in the world.[2] By comparison, the rates for NZ European/Other ethnicities over the same time frame and age group was <2 per 100,000.[2]

ARF may be prevented by prompt treatment of GAS pharyngitis with antibiotics.[6] In Aotearoa New Zealand, the current guidelines for the treatment of GAS pharyngitis recommend that people at high risk of ARF (i.e., Māori and Pacific peoples aged 3–35 years, with emphasis on children and adolescents aged 4–19 years of age) who present to primary care or an emergency department with a sore throat are treated with a 10-day oral course of phenoxymethylpenicillin (penicillin V) two or three times daily, with amoxicillin once daily or with a single dose of intramuscular (IM) benzathine benzylpenicillin (BPG).[7] Guidelines also outline treatment recommendations for children presenting to school-based sore throat clinics, including the recommendation to wait for confirmation of a GAS-positive throat culture before a 10-day course of antibiotics is dispensed. In addition, national guidelines recommended that children at high risk of ARF presenting to primary care with recurrent GAS pharyngitis be treated with either IM BPG or directly observed oral amoxicillin, with options including amoxicillin-clavulanate, clindamycin or adjunctive

rifampicin, reserved for high-risk recurrent cases.[7]

In response to Aotearoa New Zealand's high and inequitable rates of ARF, from 2011 the government implemented the rheumatic fever prevention programme (RFPP) in 11 out of 20 regions or district health boards (DHBs) that experienced the highest rates of ARF.[5] This multi-faceted intervention aimed to reduce ARF incidence by improving access to timely diagnosis and antibiotics for GAS pharyngitis.[8] The RFPP included school-based sore throat services,[9,10] community "rapid response" clinics for sore throats (from 2014), and mass media health promotion campaigns (2014 and 2015). By 2014, 244 schools were participating, involving an estimated 53,376 children aged 5–12 years.[11] The success of the programme on reducing ARF was variable and those areas that had high-risk populations geographically concentrated were found to be more effective.[11] A 2014 evaluation of antimicrobial use in one region's school-based clinics reported that 91% of prescriptions were for GAS pharyngitis and 9% for skin infections. School-based programmes treated skin infections opportunistically, rather than as an intervention to prevent ARF. For skin infections, topical management is recommended for simple impetigo, with oral flucloxacillin tablets or cephalexin suspension for multi-lesional impetigo and other infective skin conditions. As part of the RFPP almost all children (98%) with GAS pharyngitis were treated with first-line antibiotics and the majority of skin infections (35%) were prescribed topical fusidic acid or cephalexin (37%).[10]

The impact of the RFPP on antibiotic consumption in Aotearoa New Zealand has not previously been assessed, particularly whether this altered treatment of GAS pharyngitis outside the at-risk population, or whether the programmatic approach led to improved adherence to recommended first-line antibiotics. Accordingly, the aims of this study are to explore trends in penicillin dispensing between 2005 and 2018 in the context of the RFPP.

Method

Data

In Aotearoa New Zealand, antibiotics for systemic use are only available with a prescription and/or under standing orders. From 2014, there has been no prescription charge for children under the age of 14 years. Each medicine dispensed is recorded in the National Pharmaceutical Collection (using the Anatomical Therapeutic Chemical system) along with the age of the person receiving the prescription and the funding DHB. Pharmaceutical data from 2005 to 2018 were obtained from the Ministry of Health, who manage the Pharmaceutical Collection. Included in the analysis were selected beta-lactam antibiotics from the penicillin class, commonly recommended in Aotearoa New Zealand, for the treatment of GAS pharyngitis (amoxicillin, BPG, penicillin V, flucloxacillin, and amoxicillin-clavulanate). While our dataset accounted for 97% of antibiotics dispensed (2012–2016), it did not include supply orders (practitioner and bulk). Statistics NZ estimate resident population (ERP) and projections (children 0–18 years) based off census data were used as denominator data for the period 2005–2018.

Study design and analysis

This study utilised a controlled, interrupted time series (CITS) analysis, as described elsewhere,[12] and Poisson regression models. The models comprised a dependant variable for the rate of penicillin dispensing and independent variables for calendar year, and an indicator for RFPP implementation (see Appendix for model formulae). Because the RFPP was implemented at varying coverage levels among participating regions (DHBs) during approximately 2012 to 2016, the RFPP indicator was time invariant and represented the average effect of the RFPP on dispensing rates throughout the RFPP period.

The models were used to predict the counterfactual penicillin dispensing rates had the RFPP not been implemented. The counterfactual rates were predicted based on the rates of dispensing outside of the RFPP period (i.e., 2005–2011 and 2017–2018). The primary measure was the rate ratio (RR) for the change in observed versus counterfactual rates of dispensing among residents of regions participating in the RFPP compared to the change in rates among residents of regions not participating in the RFPP (controls). The change in dispensing rates among regions not participating in the RFPP were used to control for temporal trends and spill-over effects (from mass media campaigns) on dispensing rates, which was quantified through an interaction term in the models. Data were analysed using R, version 4.1.0.

Ethical approval

Ethical approval for the study was obtained from the University of Otago, New Zealand (Minimal Risk Health Research reference HD19/033).

Results

All penicillins

Included in the analysis were all amoxicillin, BPG, penicillin V, flucloxacillin and amoxicillin-clavulanate records dispensed to individuals aged 18 years or under (n=12,154,872) between 2005 and 2018 (Table 1). The most frequently dispensed agent during this period was amoxicillin, which made up 57.7% of dispensed penicillin. Amoxicillin-clavulanate made up 23.4% and flucloxacillin made up 13.2%.

Overall, there was a reduction in penicillin dispensing during the years that the RFPP was in operation (2012–2016) (Figure 1). The baseline dispensing rates were higher in regions participating in the RFPP compared to controls (regions not in the RFPP; RR 1.46, p<0.001). The RFPP had no effect on dispensing rates among controls (p=0.204), but it did increase dispensing rates in regions with the RFPP (RR 1.031, p<0.001). See Appendix Figure 1 for observed incidence rates for penicillin dispensing stratified by DHB.

Penicillins by group

The rates of dispensing of BPG, penicillin V and flucloxacillin over time are shown in Figures 2c and 2d. A downward trend in dispensing rates of amoxicillin-clavulanate was observed over time, particularly among regions that were implementing the RFPP (Figure 2b). In contrast, dispensing rates of amoxicillin increased predominately among regions operating RFPP (Figure 2a).

Amoxicillin

Figure 3 shows a model for 2005–2016 amoxicillin dispensing rates. There was a significant increase in amoxicillin dispensing during the period the RFPP was operated in, which occurred in regions both participating and not participating in the RFPP. Among regions not participating in the RFPP, the dispensing rate increased by 4.3% during the RFPP (2012–2016) relative to the counterfactual rate (RR 1.043, p<0.001). In comparison, among those regions participating in the RFPP the rate increased an additional 4.3% (RR 1.043, p<0.001), such that the difference in rates during the RFPP were 8.9% higher relative to the counterfactual rate among controls.

Amoxicillin-clavulanate

Rates of amoxicillin-clavulanate dispensing have declined since 2005 (Figure 4). However, there was an increase in amoxicillin-clavulanate dispensing rates during the RFPP. During that period, rates of amoxicillin-clavulanate dispensing increased by 1.9% in regions not in the RFPP (RR 1.019, p<0.001) and an additional 3.9% in regions operating the RFPP relative to the increase in non-RFPP regions (RR 1.039, p<0.001).

Discussion

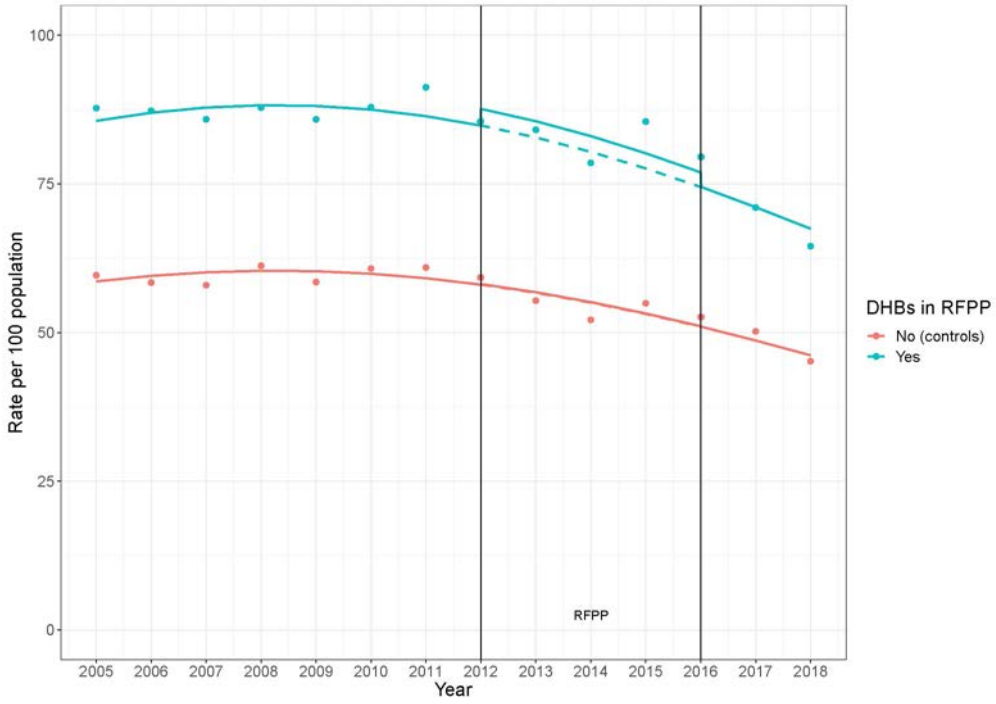
Our findings show there was a non-sustained increase in amoxicillin dispensing during the RFPP that was greatest in RFPP regions, but also occurred in non-RFPP regions. This occurred on the back of declining overall rates of penicillin

Table 1: Summary of national penicillin dispensing frequency between 2005 and 2018.

Aotearoa New Zealand		
Name	**Total dispensing N=34,152,401 (%)**	**Dispensing among children (≤18 years) N=12,154,872 (%)**
Amoxicillin	15,108,527 (44.2)	7,016,771 (57.7)
Benzathine benzylpenicillin (BPG)*	38,157 (0.1)	695,417 (5.7)
Phenoxymethylpenicillin (penicillin V)*	1,583,782 (4.6)	
Flucloxacillin	6,246,620 (18.3)	1,602,276 (13.2)
Amoxicillin-clavulanate	11,136,556 (32.6)	2,840,408 (23.4)

* Due to small numbers, data for BPG and penicillin V were only available as combined data for children ≤18 years.

Figure 1: Timeline of all penicillin dispensing for children (≤18 years-old) before (2005–2011), during (2012–2016) and after the rheumatic fever prevention programme (2017–2018), by district health boards participating in the programme and district health boards that were not participating.



*Dotted line indicates the expected (counterfactual) rate.

Figure 2: Summary of penicillin dispensing rates among children ≤18 years by penicillin class period (before [2005–2011], during [2012–2016] and after [2017–2018] the rheumatic fever prevention programme) and DHBs participating in the programme and those that were not participating (controls).

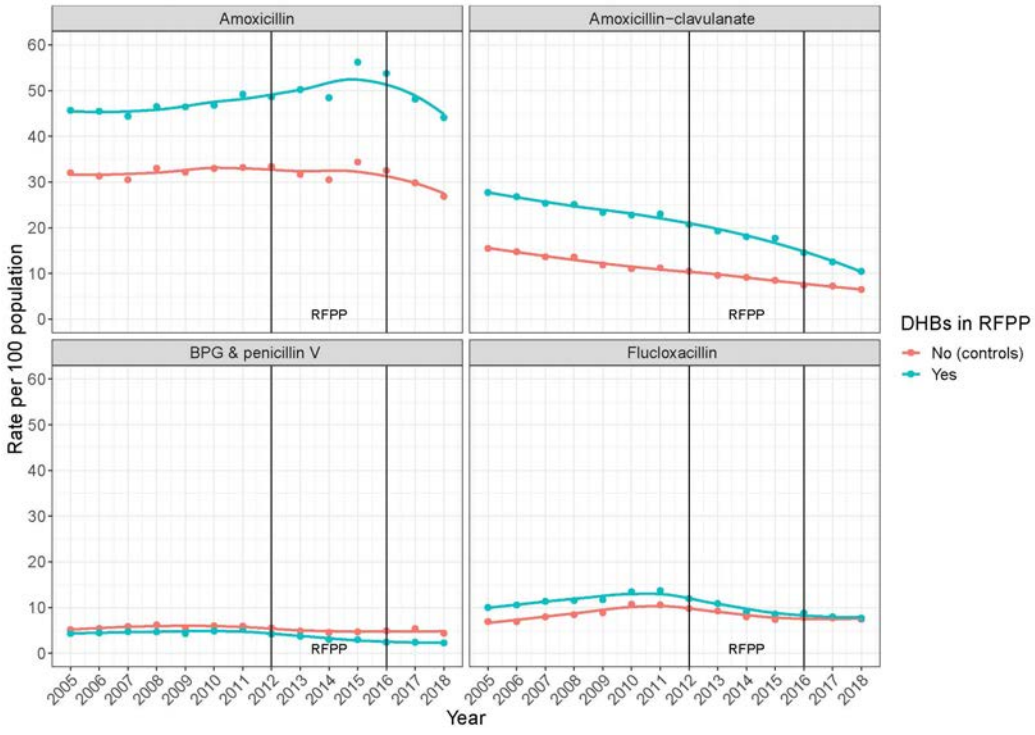
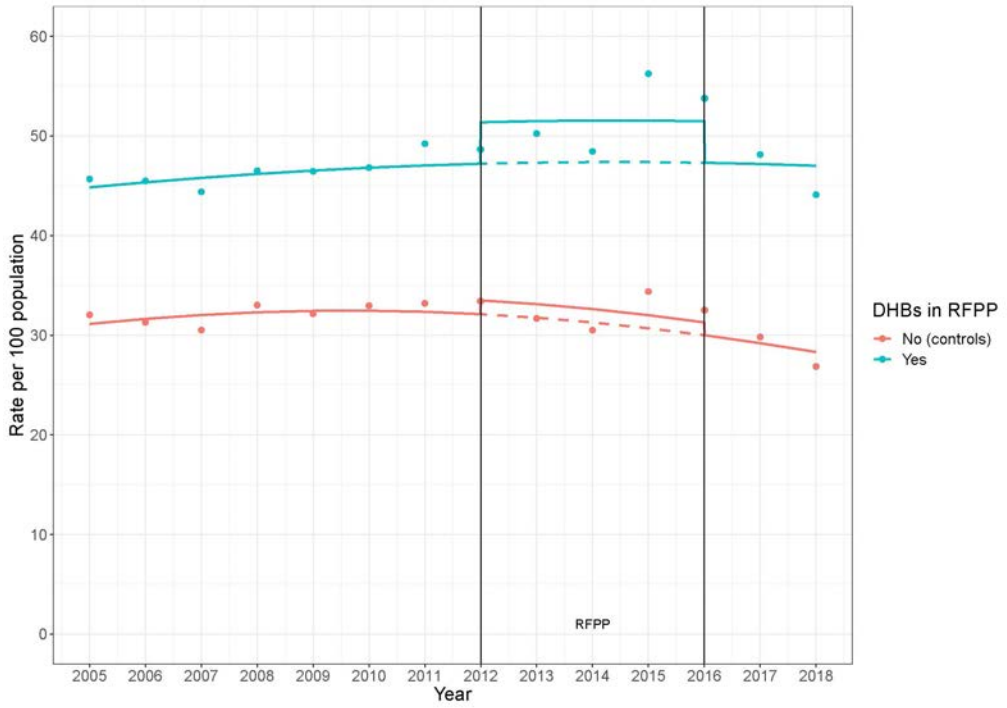
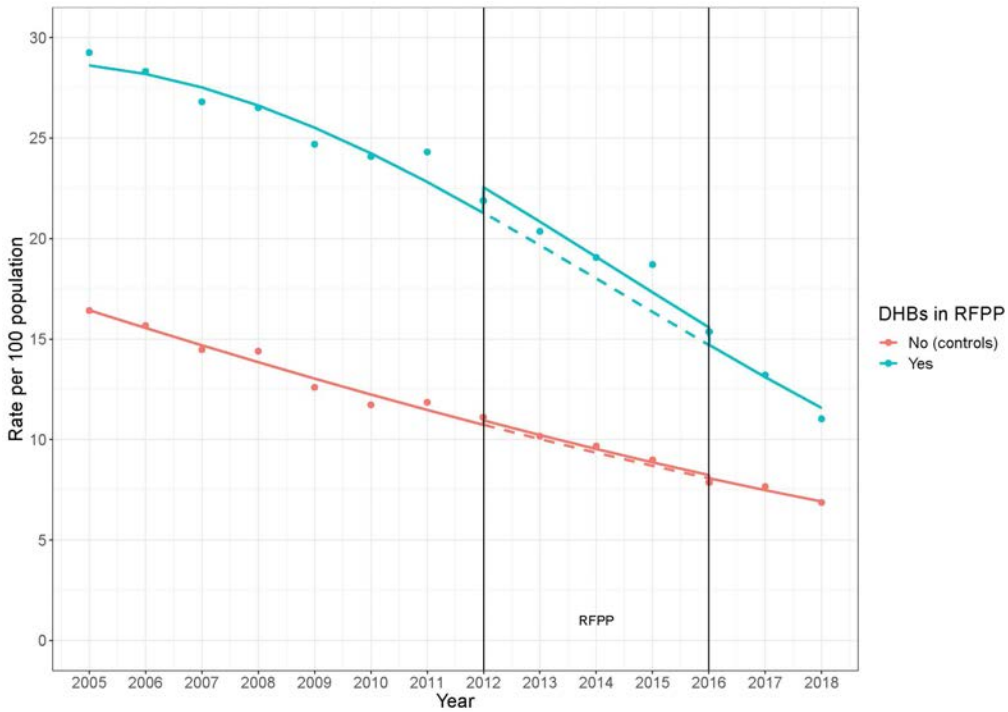


Figure 3: Timeline of amoxicillin dispensing rates among children ≤18 years before (2005–2011), during (2012–2016) and after (2017–2018) the rheumatic fever prevention programme by DHBs participating in the programme and those that were not participating.



*Dotted line indicates the expected (counterfactual) rate.

Figure 4: Timeline of amoxicillin-clavulanate dispensing among children ≤18 years before (2005–2011), during (2012–2016) and after (2017–2018) the rheumatic fever prevention programme by DHBs participating in the programme and those that were not participating.



*Dotted line indicates the expected (counterfactual) rate.

dispensing, driven predominately by reduced use of amoxicillin-clavulanate. In Aotearoa New Zealand, total community antibiotic dispensing declined between 2015–2018.[13] The increase in amoxicillin use is expected, given it was the recommended first-line antibiotic for the RFPP, which intensified detecting and treating GAS pharyngitis.

Tracking the impact of population-wide interventions on antibiotic use and antibiotic resistance is important[14,15] as increased use of antibiotics has the potential to facilitate resistance not only in the bacteria they are targeting but also in bystander pathogens.[16] Increasing amoxicillin minimum inhibitory concentrations (MICs) have been noted in several studies.[17,18] A recent clinical report detected a novel GAS mutation in the penicillin binding protein (pbp2x) of isolates collected from two patients with extensive and repeat histories of prior penicillin use, with resultant elevated MICs to ampicillin, amoxicillin and cefotaxime.[19] An additional study was undertaken to determine if the findings of the clinical report were isolated cases or reflective of a broader prevalence of mutations.[20] This study found that across a global database of GAS isolates, pbp mutations occurred infrequently with only four of the 9,667 strains containing mutations near transpeptidase active sites of pbp2x or pbp1a.[20] While there is no evidence of pbp mutations becoming fixed in the GAS population, further surveillance of local GAS isolates is warranted.

This study provides valuable information on patterns of antibiotic prescribing over an extended timeline, including the period when the RFPP was in operation. However, there are some limitations. While our dataset accounted for 97% of antibiotics dispensed (2012–2016), it did not include supply orders (practitioner and bulk). The 3% of unaccounted antibiotics may have underestimated the rates of amoxicillin dispensing, particularly as the sore throat component of the RFPP uses supply orders to access antibiotics. However, if the marginal amoxicillin rates are not an underestimate, it may indicate that children most at risk of developing ARF were not treated with recommended antibiotics,[21] with ethnic disparities previously reported.[13,22] This in part may explain why, despite best efforts, ARF incidence reductions were less than expected (28% from 4.0 per 100,000 to 2.9 per 100,000).[11] In addition, we used dispensing rates post- and pre-RFPP intervention to estimate the counterfactual rate of dispensing, which may have led to conservative counterfactual trends—potentially reducing the effect of the RFPP. We would expect that any increase in dispensing during the RFPP would likely linger post-RFPP. Finally, as the RFPP focussed primarily on treating GAS pharyngitis, the study did not include the assessment of trends in dispensing of cephalexin, which is a preferable treatment for skin infections. Given the mounting evidence that GAS skin infections also precede ARF,[23–25] this may account for disparities in the success of the RFPP, as only some areas treated skin infections.

Conclusions

In summary, during the RFPP an increase in amoxicillin dispensing was seen in regions participating in the programme and to a lesser extent, regions outside of the programme, indicating the programmatic approach overall led to improved adherence to recommended first-line antibiotics. Treating children at risk of ARF presenting with GAS pharyngitis is critical, but potential overuse of amoxicillin should be assessed.

COMPETING INTERESTS
The authors have no conflict of interest to declare.
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Appendix

Model formulae

For total penicillin dispensing rates:

$$Log(\frac{Y_t}{P_t}) = \beta_0 + \beta_1 T + \beta_2 T^2 + \beta_3 D + \beta_4 I_t + \beta_5 DI_t$$

For amoxicillin and amoxicillin-clavulanate dispensing rates, such that the trend in dispensing rates differs depending on RFPP group:

$$Log\left(\frac{Y_t}{P_t}\right) = \beta_0 + \beta_1 T + \beta_2 T^2 + \beta_3 D + \beta_4 I_t + \beta_5 DI_t + \beta_6 DT + \beta_7 DT^2$$

Where:

T = time (calendar year)

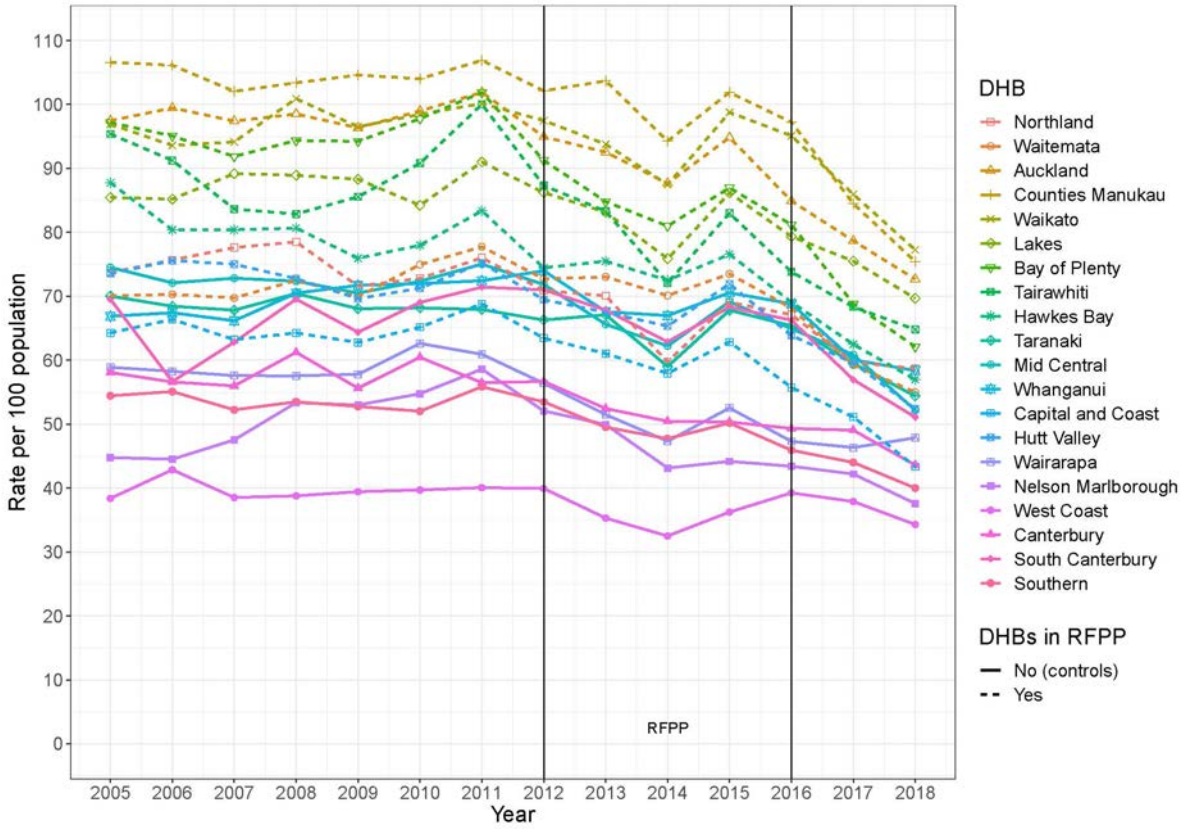
D = a dummy variable indicating the DHBs participating in the RFPP (coded 1) or not participating (coded 0)

I_t = a dummy variable indicating the RFPP intervention period coded 1, else 0

P_t = population size at time t

Y_t = penicillin dispensing at time t

Appendix Figure 1: Observed incidence rates for penicillin dispensing (all classes) between 2005–2018, stratified by DHB.



Emergency department crowding is not being caused by increased inappropriate presentations

Peter G Jones, Gary Jackson

ABSTRACT

Contrary to the prevailing wisdom, there may be little or no room to move with respect to reducing emergency department (ED) utilisation, as ED utilisation in Aotearoa New Zealand is low by world standards and is not driven by patients presenting inappropriately with minor conditions. We should continue the excellent work done in the primary care sector to maintain our low ED presentation rate and support primary and urgent care providers to provide alternatives to the ED for people with minor conditions. However, to reduce the system pressure and harms caused by ED crowding due to access block for admitted patients, we also need to adequately resource our hospital-based inpatient teams and EDs so that the (appropriate) acute care workload can be managed safely.

The pervasive narrative about health system pressures in Aotearoa New Zealand has been that acute demand for hospital services is too high and increasing—especially for minor conditions—driven by lack of knowledge or access to alternative care in the community, and by costs of care, reflected in presentations to the emergency department (ED). This narrative was the rationale for a recently published article in the *New Zealand Medical Journal*.[1] Yang et al. explored why patients with minor presentations came to the ED at Middlemore Hospital. They found that the most common reason for presenting was that they had been referred there by a primary care provider (41%), while unavailability of alternatives and cost of care in the community were reasons for 28% and less than 2% of presentations respectively.[1] Furthermore, more than 95% of these patients had a primary care provider, nearly half had been to their primary care provider before presenting to the ED and virtually all were aware of alternatives to the ED.[1] These findings are consistent with a prior systematic review of 13 studies exploring the issue of why patients present to the ED.[2] Yang et al. argue that attempts to reduce non-urgent ED presentations should focus on the real reasons why people are coming, rather than unfounded assumptions that are not evidence based, which is to be applauded. However, Yang and colleagues themselves perpetuate a popular myth about ED presentations in New Zealand. This is that presentations are increasing markedly and that this is driven by people with minor conditions.[1]

The reality is that ED presentations in New Zealand are among the lowest in the world based on population and are not increasing beyond expected levels. A recent paper comparing New York, Ontario and New Zealand found that there were approximately 250 ED visits per 1,000 population in 2016–2017 in New Zealand, compared to over 400 ED visits per 1,000 population in New York State and the province of Ontario.[3] In major cities in New Zealand, after-hours accident and medical clinics see an estimated 2.5 million patients annually.[4] In addition, it is estimated that primary care also sees approximately 2.5 million acute patients (out of 20 million visits annually).[5] In contrast, there are 1 million ED visits annually, of which between 5% and 20% are "minor" cases suitable for primary care. Hence, in New Zealand more than 95% of people with minor acute health problems see providers outside of hospital-based EDs.

ED crowding and acute hospital system pressures causing risks to patient safety are primarily caused by insufficient resources within hospitals to cope with the appropriate demand for emergency care, especially timely access to hospital wards for admitted patients (access block), rather than too many minor presentations to ED.[6,7]

Methods

For the following analyses, we used data from the National Non-Admitted Patient Collection (NNPAC) dataset extracted in July 2023. There

is a time lag of approximately 3 months for this data to be updated and go through data quality assurance, so the 2023 data shown in Figure 1 has been estimated from data up to March 2023. Rates are per 100,000 population, age standardised by 5-year age groups to the New Zealand estimated resident population for 2018. The data for the triage category is not age standardised. As we present data from the whole population rather than a sample of the population, we have not performed inferential tests. Trends were calculated using the Least Squares method in Microsoft Excel.

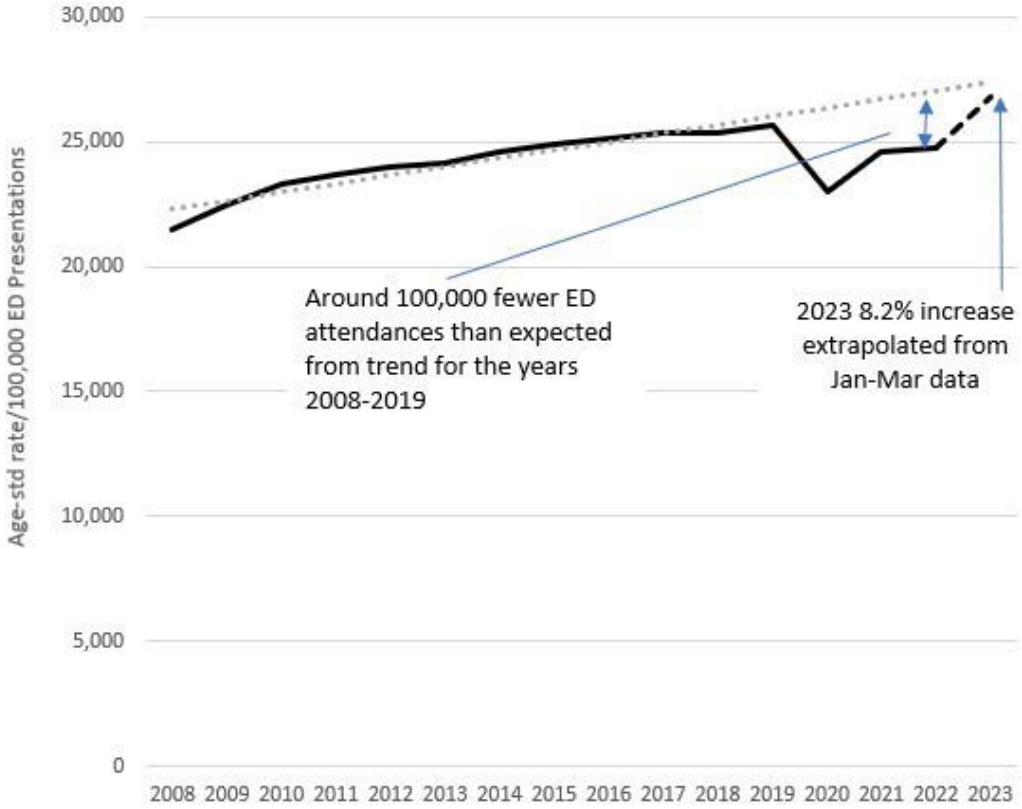
Results

Figure 1 shows that age-adjusted ED presentations per 100,000 population have risen approximately 0.7 % per year from 2008–2022, remaining low by international standards. Figure 1 also shows the impact of the COVID-19 pandemic and the public health measures taken in response to this, with an estimated 100,000 fewer presentations in 2022 than would have been expected if the pre-pandemic trend had continued. ED presentations in 2023 appear to be returning to near pre-pandemic levels.

It is important to note that Figure 1 shows the national trend, which is not seen in all districts. Tairāwhiti and Canterbury had increases in presentations beyond that expected (Table 1). The increase in Canterbury coincided with opening of the new hospital in Christchurch in November 2020, which is consistent with but smaller than the increase in ED age-standardised presentations that was seen in Waitematā when Waitakere hospital was opened in 2005.[8] The increase in Tairāwhiti may partly be due to effects of climate events and the provision of primary care in the region.

When broken down by urgency of condition, presentations with non-urgent conditions are reducing over time while the number of more urgent presentations is increasing (Figure 2).

Figure 1: Age-standardised ED presentations 2008–2023.



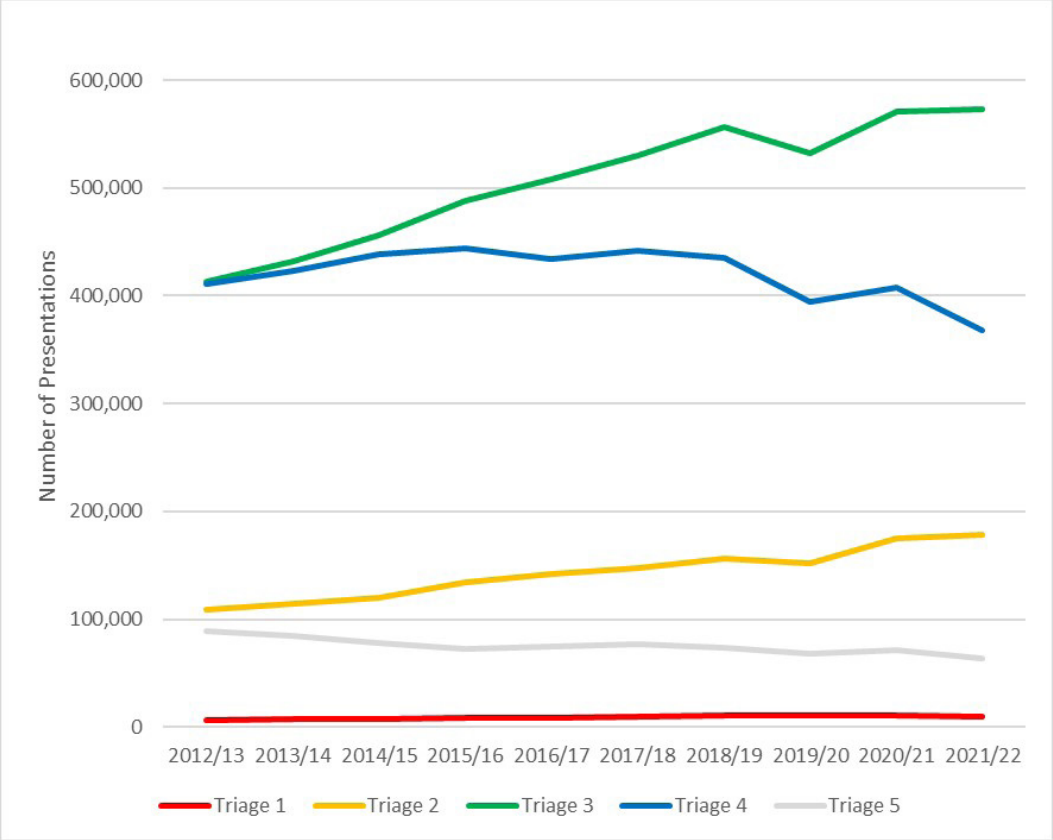
Key: ED = emergency department. ED attendance data sourced from the National Non-Admitted Patient Collection dataset. Population data sourced from Statistics New Zealand.

Table 1: Changes in age-standardised ED presentation rates from 2012 to 2022, by districts.

Districts	% change from 2012 to 2017	% change from 2017 to 2022	% change from 2012 to 2022	Annualised change from 2012 to 2019	Annualised change from 2019 to 2022
Northland	5%	8%	13%	1.3%	1.1%
Waitematā	4%	-8%	-5%	0.0%	-1.6%
Auckland	14%	0%	14%	2.0%	-0.2%
Counties Manukau	7%	-10%	-4%	1.5%	-4.8%
Waikato	8%	-6%	1%	1.7%	-3.5%
Lakes	8%	0%	8%	1.4%	-0.6%
Bay of Plenty	13%	-12%	0%	1.5%	-3.6%
Tairāwhiti	5%	21%	27%	2.1%	3.1%
Taranaki	-5%	-5%	-10%	-0.9%	-1.4%
Hawke's Bay	14%	-9%	4%	2.1%	-3.7%
MidCentral	-7%	-12%	-18%	0.7%	-8.0%
Whanganui	2%	-11%	-9%	-0.7%	-1.6%
Capital & Coast	13%	-9%	3%	1.5%	-2.4%
Hutt Valley	0%	-7%	-7%	-0.1%	-2.3%
Wairarapa	-10%	-19%	-27%	-2.3%	-5.0%
Nelson Marlborough	-10%	-1%	-11%	-1.6%	-0.2%
West Coast	3%	-38%	-36%	0.6%	-15.2%
Canterbury	8%	6%	15%	0.8%	3.0%
South Canterbury	13%	2%	15%	2.5%	-1.0%
Southern	6%	-2%	4%	1.8%	-2.9%
New Zealand overall	**6%**	**-4%**	**1%**	**1.0%**	**-1.9%**

Note: West Coast stopped reporting to NNPAC from Buller and Reefton in 2022 as these are community-based, not hospital-based, providers, which accounts for the apparent large drop in this district. The number from these providers is <0.2% of the overall population.

Figure 2: ED presentations by triage category 2012–2022.



Key: ED = emergency department. Triage 1–3 = more urgent, triage 4–5 = less urgent, based on the Australasian Triage Scale. Data sourced from the National Non-Admitted Patient Collection dataset.

This suggests that the increased pressure observed in EDs is due to a higher proportion of more urgent cases presenting over time rather than less urgent cases. Triage 3 cases are more likely to be older and more complex. They will require more investigations and will be more likely to be admitted to hospital and be exposed to hospital access block than triage 4 cases. They spend longer in ED (approximately an hour more on average) and thus lead to higher ED occupancy and crowding, as ED occupancy is intimately related to time patients spend in ED.[7] It is also possible that there has been a change in the way patients are triaged over time; although the Australasian Triage Scale has been largely unchanged since 2011, only minor changes recommended to how patients were triaged were made in 2016.[9] The proportion of triage 3 patients requiring admission to hospital is more than double that of triage 4 and this ratio has remained constant over the last 10 years (data not shown).

Conclusion

Contrary to the prevailing wisdom, there may be little or no room to move with respect to reducing ED utilisation, as ED utilisation in New Zealand is already low by world standards and is not driven by patients presenting inappropriately to ED with minor conditions. We should continue the excellent work done to date by the primary care sector in maintaining our low ED presentation rate and supporting primary and urgent care providers to provide alternatives to the ED for people with minor conditions. However, to reduce the system pressure and harms caused by ED crowding due to access block for admitted patients, we also need to adequately resource our hospital-based inpatient teams and EDs so that the (appropriate) acute care workload can be managed safely.

COMPETING INTERESTS
PJ is an emergency physician and GJ is a public health physician. Both authors are employed by Te Whatu Ora – Health New Zealand. The views expressed in this article are the personal views of the authors and not of Te Whatu Ora – Health New Zealand.

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Lamotrigine-induced generalised pustular psoriasis

Hyun Kyoung Lee, Louise Reiche

Generalised pustular psoriasis (GPP) is a rare form of psoriasis featuring sterile pustules and systemic inflammation.[1] We present a case of GPP secondary to lamotrigine that has not previously been reported.

Case report

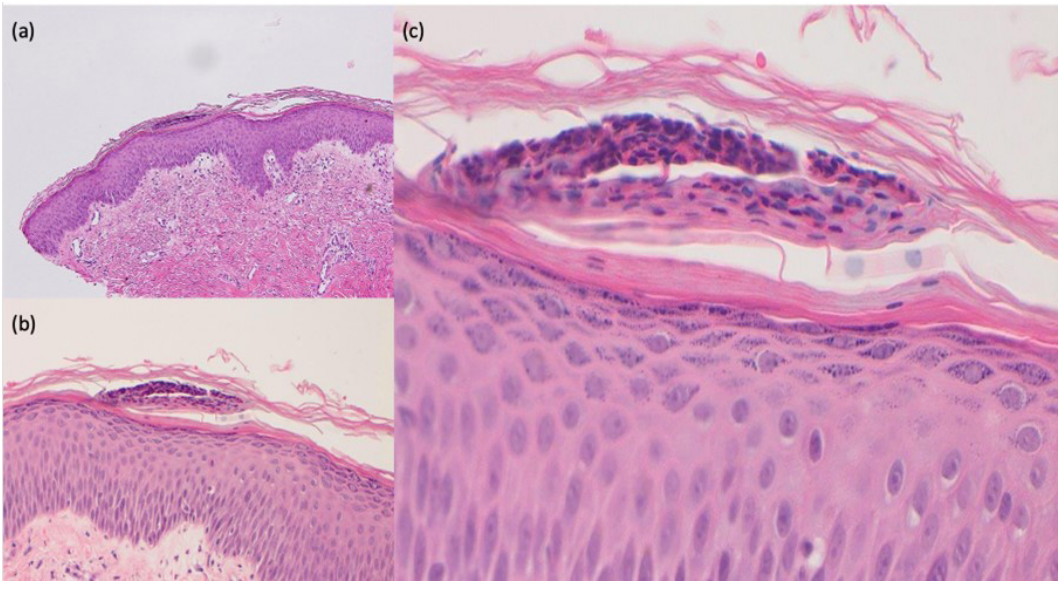
A 23-year-old female presented with a 6-week history of an erythematous rash beginning within a week of starting lamotrigine on top of her regular levetiracetam 1g BD, for recalcitrant epilepsy. It began on her feet, then spread cephalically accelerant in extent and degree as the lamotrigine dose was slowly incremented to 100mg BD. She had no personal or family history of dermatological conditions. General practitioner prescriptions including oral antibiotics, topical and systemic steroids, oral antifungals and oral antihistamines failed to help. Public hospital dermatology appointment delays necessitated urgent private dermatology referral. On skin examination, she had an erythematous pseudo-pustular eruption covering 60% of the skin surface, most confluent over the torso where there was confluence, and more classic psoriasis plaques up to 9cm over her anterior shins, sparing her face, palms and soles. The rash can be seen in Figure 2 and 3. The temporal history and cutaneous findings suggested lamotrigine-induced pustular psoriasis as the initial clinical diagnosis.

Lamotrigine was stopped and weekly methotrexate 10mg and folic acid 5mg was prescribed. Levetiracetam was increased to 1.5g BD after consulting an on-call neurologist, to minimise status epilepticus and acute admission arranged to the public hospital for supportive treatment. Oral cyclosporine 100mg BD was added by the inpatient hospital dermatologist.

The skin histology of the pustules can be seen in Figure 1.

One month later significant improvement in the extensive dermatosis was seen and by 4 months, when reviewed in outpatients, it had fully resolved apart from residual anterior shin psoriatic plaques.

Figure 1: Histopathology findings on hematoxylin-eosin staining of the pustules show small plaques of parakeratosis in the keratin layer, as well as neutrophil scale crust. The underlying epidermis was mildly acanthotic and showed a mild degree of basal spongiosis. Neutrophils and lymphocytes are present within the papillary dermis, which shows a mild degree of oedema. a) 100x magnification, b) 200x magnification, and c) 400x magnification.



Discussion

GPP is rare and can be life threatening, as is status epilepticus.[1,2]

This patient had not been able to seek timely public hospital dermatology clinic review, due to New Zealand health service pressures, resulting in disease progression and subsequent need for admission. Fortunately, she had a favourable (non-fatal) outcome, attributable to timely and collaborative multi specialist care: private dermatology diagnostic expertise identifying and stopping lamotrigine causation, providing appropriate systemic treatment and obtaining immediate neurology expertise, enabling appropriate levetiracetam dose increment to minimise status epilepticus risk.

Naranjo and the WHO-UMC system's standardised causality scales assessment produced a probable or likely causal relationship between lamotrigine and GPP.[3] The main differential diagnosis for GPP is acute generalised exanthematous pustulosis (AGEP), which shares similar histopathological findings and clinical features.[4] However, AGEP is self-limiting and usually settles within a few to 15 days of stopping the causative agent,[4] in contrast to our case.

Lamotrigine is a widely used medication in treating epilepsy, bipolar disorder and neuropathic pain.[5] A cutaneous rash from lamotrigine, appearing within the first 2 to 8 weeks of therapy, has an incidence of approximately 10% and is the most common reason for discontinuation.[6] More serious rashes including Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) have an incidence of 0.1%.[5]

In a recent review on drug-induced psoriasis by Balak et al.,[5] Google and PubMed literature searches, there have been no previous cases of lamotrigine-induced GPP recorded. On June 2023 there were no reported cases of GPP to the Centre for Adverse Reactions Monitoring (CARM) New Zealand. To the best of our knowledge, lamotrigine-induced GPP has not been previously reported.

This case report serves to raise awareness of life-threatening GPP and severe cutaneous rashes that can be associated with lamotrigine. Access to appropriate specialist care throughout New Zealand to foster prompt diagnosis and management of rare and severe conditions is life-saving.

Figure 2: The posterior trunk with a patchy and confluent erythematous rash studded with fine pseudo-pustulosis and annular peeling.

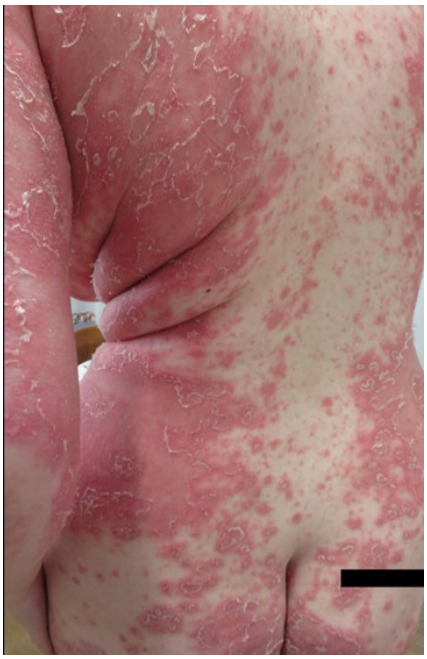
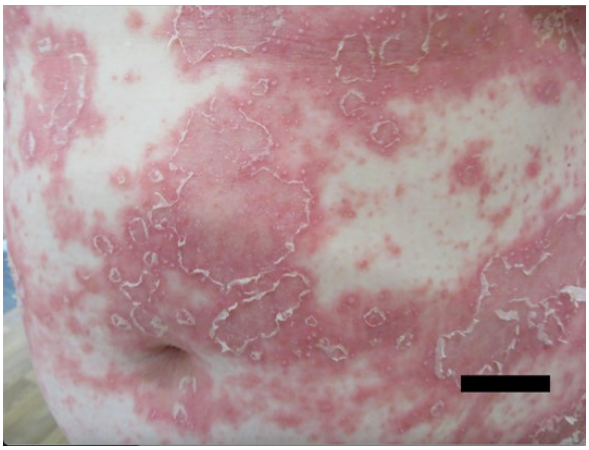


Figure 3: The anterior side of the abdomen shows a patchy and confluent erythematous rash studded with fine pseudo-pustulosis and peripheral circular peeling.



COMPETING INTERESTS
No conflicts of interest to disclose.

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Two approaches to enhancing patient care and job satisfaction in primary care

Marcus Hawkins

For too many years, perimenopausal women have suffered in the absence of treatment, most likely due to embarrassment or fear of discredited treatments. In addition, medicine is seeing increasing numbers of patients with co-morbidities related to insulin resistance (IR), which incidentally also includes perimenopause.

I would like to describe two approaches addressing these conditions. The first is to advocate for menopausal hormone therapy (MHT). The second is a low carbohydrate diet (LCD) as a means of improving disorders related to IR. Both approaches are evidence-based and have reported improved medical outcomes and patient and doctor satisfaction.[1]

Over 20 years ago, we were encouraged to advocate for hormone replacement therapy (HRT) at perimenopause. Then HRT was discredited, and it faded from our consciousness. So, I was recently surprised when asked if I would prescribe MHT for a patient. It became evident that if the necessary questions and safeguards were followed, then MHT could be safe and effective.[2] The Australian Menopause Society provide an excellent online resource.[3] I designed a questionnaire (available on request) which lists common symptoms of perimenopause and asks relevant safety questions.

I got back to my patient, she completed the questionnaire, and we agreed to try MHT with planned follow-up after a few weeks. Subsequently, she reported a marked benefit from MHT. I next emailed all women of perimenopausal age in my practice, asking them to complete the questionnaire and consider consultation. There were a considerable number of consultations that followed. I received many positive responses from women reporting resolution of hot flushes, improved sleep and no further "brain fog", to mention but a few symptoms. I have received comments like "I feel like I have got my life back," and "I feel so much better". The questionnaire has proved very useful in assessment and has assisted in joint decision-making.

Perimenopausal women can also develop central obesity and find it very difficult to lose weight. Perimenopause is associated with IR, and it is suggested that MHT may facilitate weight loss and therefore reduce IR.[4,5] MHT is unlikely to increase body weight. With improved symptoms, including mood, women might find the energy and motivation for lifestyle choices that might aid weight modification.

For several years I have personally adopted a LCD. I was introduced to this by a friend. It has been shown to be effective and safe, and improves many health parameters, including haemoglobin A1C, liver function and lipid profile, and is particularly good in combatting IR.[1,6,7,8] I have been actively recommending this to patients who are overweight or have prediabetes, type 2 diabetes (T2DM), non-alcoholic fatty liver disease (NAFLD), hypertension and polycystic ovarian syndrome (PCOS), with some very positive and rewarding results.[9] There is a growing body of evidence in support of low carbohydrate eating for management of T2DM for up to 5 years.[8] Noakes described the scientific basis and practicalities behind a LCD.[7] Suffice to say that there has been a good deal of patient and professional satisfaction as a result. Imagine seeing weight loss actually happen, reducing/stopping blood pressure medication and T2DM medication, witnessing T2DM reversal/remission, observing resolution of NAFLD and menstrual periods returning in PCOS, with pregnancy becoming a very real option. Patients are happy. The doctor is happy. I am more often treating patients with diet as an adjunct to or as a primary method for managing some disorders, and not just depending on drugs to improve "numbers". I am now considering widening the approach to include a health coach in order to optimise the process and the results. It is often argued that low carbohydrate eating plans are not sustainable, but it is also obvious that this approach works for a significant number of people who can adopt it. With respect to other weight loss approaches, on a population level they do not appear to be any more sustainable, as evidenced by their apparent failure; obesity is

increasing, not decreasing.[10]

Being open to change is arguably quite difficult for some health professionals, and change can be daunting. I would have been as resistant as the next person about making these changes had the suggestion not come from "patient pressure" and a friend's suggestion. Health professionals are often faced with time constraints and significant workloads that can make finding the time to research other treatments difficult. The easier path is most likely to be chosen; therefore, that of no change. I would strongly urge all relevant health professionals to consider one or both of the therapeutic modalities described above. When I consider my retirement, I feel that I might continue working a few more years, now that these two approaches have reduced the "burden" of everyday practice by rewarding me and some of my patients with the positive feedback necessary to enhance patient care and increase job satisfaction.

COMPETING INTERESTS
Nil.

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A Note on Fur Dermatitis

By David Whyte, F.R.C.S.

The range of trade dermatitis is yearly extending as new chemical processes are brought into industrial practice. Capitalist and worker are by no means the only classes in the community whose interests may be affected. The relationship between irritant and lesion is not necessarily obvious, and requires a detailed investigation of each and every case. The present vogue of fur has been responsible for a recent outbreak of dermatitis in London of such an extent as to call for the consideration of the London Fur Trade Association and of the Home Office.* The furs responsible are reported to have been of the dyed rabbit variety. The use of dyed rabbit is not confined to London, and a case that has lately come under my notice in New Zealand may therefore be of interest.. One Sunday in Wellington I was asked to see a lady who presented a widespread erysipelas-like condition of neck, chest and back. The skin was reddened and swollen, but not brawny, with indefinite margin, and there was an absence of constitutional disturbance. This condition extended from the scalp down to the inferior angles of the scapulæ, encircled the neck, and in front reached well below the clavicles. The fur neck-band, presumably dyed rabbit, of an imported frock, purchased eleven weeks ago, and worn intermittently since, was, I consider, the undoubted cause. When its use was discontinued, the skin condition cleared up in a few days, leaving a branny desquamation. The question of sensitisation in these cases has been put forward. In the present instance there was a premonitory irritation a fortnight previously, and for a few days thereafter the frock was not worn. The patient has now decided to burn the fur.

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