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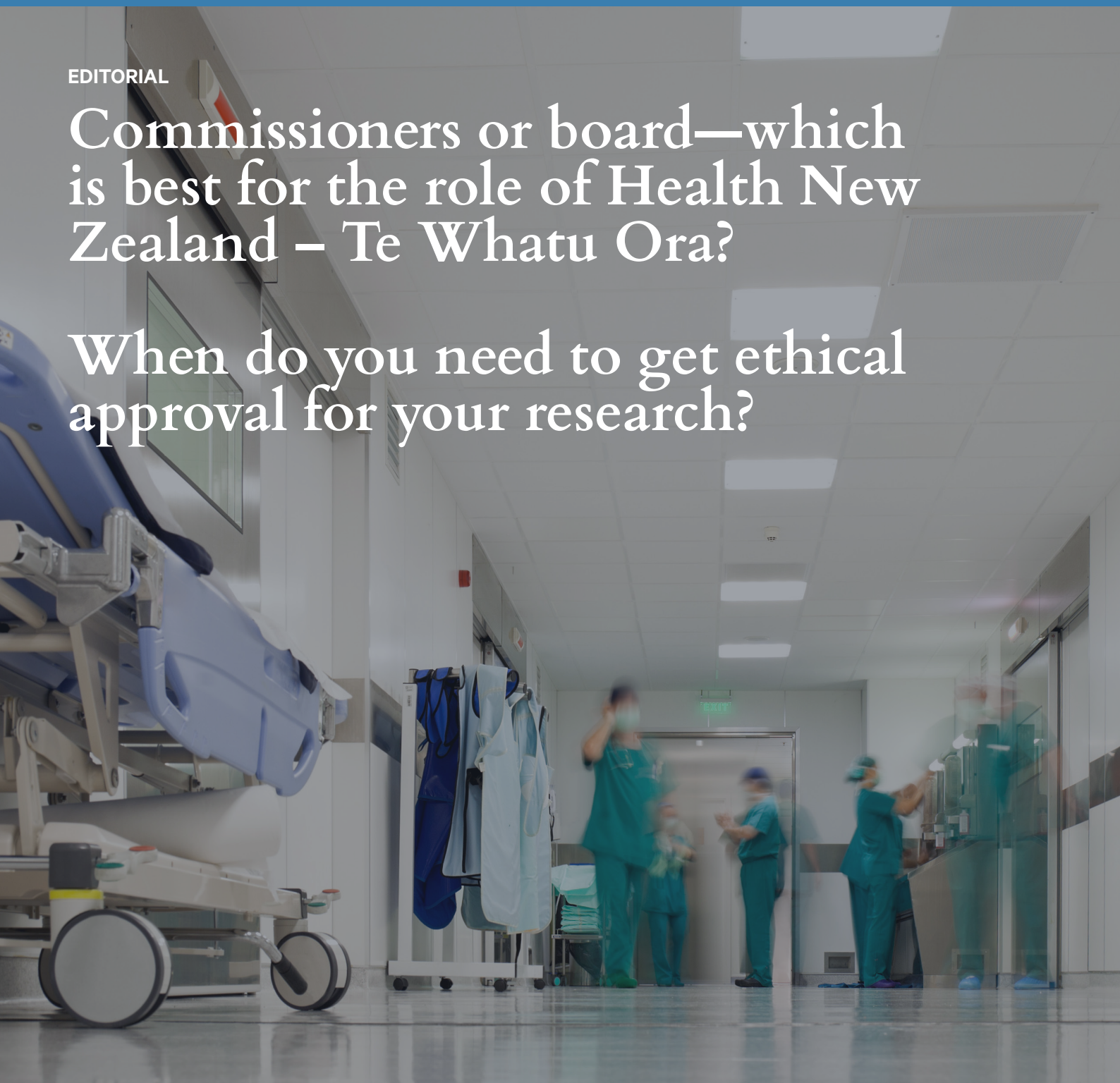

EDITORIAL

Commissioners or board—which is best for the role of Health New Zealand – Te Whatu Ora?

When do you need to get ethical approval for your research?

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Commissioners or board—which is best for the role of Health New Zealand – Te Whatu Ora?

Frank Frizelle

Over the last 40 years the most noticeable feature of the structure of the Aotearoa New Zealand health system has been repeatedly restructured looking for effectivities. We have had Area Health Boards (1983–1989), the Regional Health Authorities and Crown Health Enterprises (1993–1997) and the Health Funding Authority (HFA) and Hospital and Health Services (1998–2001). Subsequent to this, we had the District Health Boards (DHBs; 2001–30 June 2022). Now we have Health New Zealand – Te Whatu Ora, which replaced the countries' 20 DHBs as the primary publicly funded healthcare system of New Zealand. A commissioner and three assistant commissioners have now been appointed to oversee the financial turnaround of Health New Zealand – Te Whatu Ora and ensure robust financial management and accountability across the organisation.

When do you need to get ethical approval for your research?

Frank Frizelle

I am surprised to have to write on this topic; however there appears to still be some confusion among a few authors who wish to submit their manuscript to the New Zealand Medical Journal (NZMJ) about whether ethics approval was required for their study. The answer, if you wish to publish in the NZMJ, is that it usually is required, and this should be arranged before the study has been undertaken.

A quality improvement project: Rapid Access Hysteroscopy Clinics with nurse pre-procedural telephone support in the outpatient setting

Lucy Wong, Catherine Askew, Katherine Sowden, Kieran Dempster-Rivett, Valerio Malez

Rapid Access Clinics (RAC) for hysteroscopy (a medical procedure where a doctor investigates a woman's uterus using a light tube called a hysteroscope) were explored to expedite diagnosis and treatment of women highly suspected of having endometrial cancer. By combining the specialist appointment and procedure, RACs make the process quicker, reducing clinic visits and saving time and travel costs. Pre-procedural nurse phone consultations ensured patients were better prepared for the clinic and helped doctors to perform hysteroscopy procedures more efficiently. Effective functioning of RACs depends on skilled staff, proper facilities and good communication with other services. This model of care could be replicated in other Women's Health services or other specialty outpatient clinics across New Zealand.

The impact of Individual Placement and Support on employment, health and social outcomes: quasi-experimental evidence from Aotearoa New Zealand

Moira Wilson, Fiona Cram, Sheree Gibb, Sarah Gray, Keith McLeod, Debbie Peterson, Helen Lockett

Individual Placement and Support (IPS) is an approach to helping people receiving mental health and addiction treatment who want to work into paid employment. There is very good evidence from overseas that IPS employment support programmes work well in helping people to get and stay in jobs. This research explored whether it is effective in the New Zealand context. We found that people who participate in IPS programmes spend more time in employment, are more likely to gain qualifications, have higher income and pay more taxes. Combined with evidence from overseas, these results suggest that expanding access to IPS programmes to make sure that they are available in all parts of New Zealand would be beneficial.

Untutored learning curve for endoscopic submucosal dissection in New Zealand

Tara Fox, Masato Yozu, Sze-Lin Peng, Cameron Schauer, Anurag Sekra

Our study shows it is feasible and safe to learn endoscopic submucosal dissection (a specialised technique to remove cancerous and precancerous growths within the gastrointestinal tract) within a New Zealand hospital. Potentially, this will pave the way for a more formalised training process for this technique.

Effectiveness of COVID-19 vaccines against hospitalisation, death and infection over time in Aotearoa New Zealand: a retrospective cohort study

James F Mbinta, Andrew A Sporle, Jan Sheppard, Aliitasi Su'a-Tavila, Binh P Nguyen, Nigel French, Colin R Simpson

Our study analysed data from over 5 million people to understand the effectiveness of COVID-19 vaccines over time. The COVID-19 vaccine was found to have sustained protection against death from COVID-19 over the study period and was most effective at preventing hospitalisation and infection in the initial months after each dose. In later months, the second booster vaccine dose, which initially reduced hospitalisations by 81.8%, decreased to 49.0% by month 6. Similarly, protection against infection dropped from 57.4% to 9.9% during the same period. This decline in vaccine effectiveness was observed across all groups in the study.

Faecal immunochemical test (FIT) based prioritisation of new patient symptomatic cases referred for colorectal investigation

James Falvey, Catherine M Stedman, Joel Dunn, Chris Sies, Susan Levin

Patients with bowel symptoms who were referred by their GP to the hospital for bowel investigation, and who would have otherwise been accepted for non-urgent colonoscopy, were asked to provide a stool sample for faecal immunochemical test (FIT) testing. The FIT detects tiny, invisible amounts of blood in the stool. Patients with very low or no detectable blood in the stool were then investigated by CT scan of the bowel, a sensitive but less invasive test for colorectal cancer. Patients with higher levels of blood in the stool were investigated by colonoscopy, a camera test of the bowel. Patients with very high levels of blood were investigated urgently. By following this pathway, we achieved both faster colorectal cancer diagnosis and reduced the total number of colonoscopies performed on the group. Because colonoscopy capacity is limited, the FIT pathway is expected to have reduced waiting time for all other patients on the colonoscopy waiting list. Our results are comparable with similar pathways in other countries.

Accuracy of ethnicity records at primary and secondary healthcare services in Waikato region, Aotearoa New Zealand

Brooke Blackmore, Marianne Elston, Belinda Loring, Papaarangi Reid, Jade Tamatea

The quality of ethnicity data in health records is critical to monitoring population health needs and health service outcomes, and allocating resources. Within this cohort, health records had discordant ethnicity when compared to a research cohort. Māori ethnicity or a record of multiple ethnicities were both associated with lower ethnicity data accuracy. Ongoing effort is required to ensure compliance with Ministry of Health ethnicity data standards.

Dreaming of a Māori hospital: Mehemea, ka moemoea ahau, ko ahau anake. Mehemea, ka moemoea tātou, ka taea e tātou

Marama Muru-Lanning, Hilary Lapsley

This article makes a case for Māori organisations to investigate developing hospitals in addition to current hauora primary care services. During our programme of research on kaumātua health and wellbeing, we heard from older Māori who experienced hospital stays as detrimental to their wellbeing. Our observations are backed up by other research demonstrating adverse outcomes for Māori at New Zealand's public hospitals. Historical attempts to develop Māori hospitals were stymied by the health authorities of the time. We argue that hospitals developed by and for Māori are a long-held dream that could well be enacted in today's health service environment.

Compartment syndrome resulting from carbon monoxide poisoning: a case report

Darlene Edwards, Arthur Cavan, Ankur Gupta

Carbon monoxide (CO) poisoning is known to cause complications of the neuro-logical, respiratory and cardiac systems. Rhabdomyolysis, acute kidney injury (AKI) and compartment syndrome (CS) are rarer complications. We herein present a patient who had CO poisoning and developed all these complications.

Pacific people living in New Zealand are most commonly referred to dermatologists with eczema

Miriam Karalus, Amanda Oakley

This study looks into skin conditions in Pacific patients referred to a dermatology clinic between 2016 and 2022. Only 1.7% of the referrals were from Pacific patients, which is lower than expected based on local population data. The most common diagnosis was eczema, affecting 36% of these patients, followed by benign growths and cysts in 11% and skin infections in 8.3%.

Commissioners or board—which is best for the role of Health New Zealand – Te Whatu Ora?

Frank Frizelle

Over the last 40 years the most noticeable feature of the structure of the Aotearoa New Zealand health system has been repeatedly restructured looking for effectivities. We have had Area Health Boards (1983–1989), the Regional Health Authorities and Crown Health Enterprises (1993–1997) and the Health Funding Authority (HFA) and Hospital and Health Services (1998–2001). Subsequent to this, we had the District Health Boards (DHBs; 2001–30 June 2022).

Now we have Health New Zealand – Te Whatu Ora, which replaced the country's 20 DHBs as the primary publicly funded healthcare system of New Zealand. The stated objectives of Health New Zealand – Te Whatu Ora are to plan and deliver health services at national, regional and local levels across New Zealand.[1] This is outlined in the document *Te Whatu Ora Statement of Performance Expectations 2023–2024*. While the details are worth reading it is beyond what can be reproduced in this editorial, but in summary it states:

"Our strategic direction is articulated in the Pae Ora (Healthy Futures) Act 2022, the Interim Government Policy Statement on Health 2022-2024 (the iGPS), and Te Pae Tata | the Interim New Zealand Health Plan 2022. Importantly, all these strategic foundation documents include a strong focus on embedding Te Tiriti o Waitangi.

The Pae Ora (Healthy Futures) Act 2022 sets out the broad objectives of the public health sector, to

a. *protect, promote, and improve the health of all New Zealanders; and*
b. *achieve equity in health outcomes among New Zealand's population groups, including by striving to eliminate health disparities for Māori; and*
c. *build towards pae ora (healthy futures) for all New Zealanders.*

The iGPS is a public statement of what the Government expects the health sector to deliver and achieve. It identifies six priorities for Aotearoa New Zealand's public health sector:

1. *Achieve equity in health outcomes*
2. *Embed Te Tiriti o Waitangi across the health system*
3. *Keep people well in their communities*
4. *Develop the health workforce of the future*
5. *Lay the foundations for the ongoing success of the health system*
6. *Ensure a financially sustainable health system.*

Te Pae Tata, the interim New Zealand Health Plan, was jointly developed by Te Whatu Ora and Te Aka Whai Ora. Te Pae Tata outlines the actions we are taking to implement our part of the health system reform as reflected in the Government's six health sector priorities (iGPS), through to 2024. Te Pae Tata is an interim plan up to July 2024, which is when a fully costed three-year New Zealand Health Plan will take effect.

Te Pae Tata includes six priority actions that respond to the iGPS and deliver on the Government commitment to the major shifts required to improve the New Zealand's public health system:

- *Priority action 1 – Place whānau at the heart of the system to improve equity and outcomes*
- *Priority action 2 – Embed Te Tiriti o Waitangi across the health sector*
- *Priority action 3 – Develop an inclusive health workforce*
- *Priority action 4 – Keep people well in their communities*
- *Priority action 5 – Develop greater use of digital services to provide more care in homes and communities, and*
- *Priority action 6 – Establish Te Whatu Ora and Te Aka Whai Ora to support a financially sustainable system.*

Te Whatu Ora has prioritised as part of Te Pae

Tata the development of a full and representative set of consumer and whānau voice measures, as well as further work that will enable effective measurement of clinical quality and safety."[2]

The previous various health structure organisations and Health New Zealand – Te Whatu Ora have had governance boards, the purpose of which had been to provide good governance of the entity by engaging with the relevant minister on strategic direction of the organisation, to monitor performance and risk of the relevant heath sector and to work cooperatively with the senior management team to do so. The Health New Zealand – Te Whatu Ora Board has had a difficult time achieving these aims and trying to overcome the challenges it has faced.

The history of the Health New Zealand – Te Whatu Ora Board is complicated. It started in mid-September 2021, when the then-Labour Government announced the interim board members of Health New Zealand – Te Whatu Ora. The agency was to be chaired by the economist Rob Campbell. Other board members included Sharon Shea, Amy Adams, Cassandra Crowley, Mark Gosche, Karen Poutasi, Vanessa Stoddart and Dr Curtis Walker. In late February 2023, Health New Zealand – Te Whatu Ora's Chair Rob Campbell criticised the National Party's proposal to scrap the Labour Government's Three Waters reform programme. The then-Prime Minister Chris Hipkins stated that Campbell's Three Waters remarks were "inappropriate". On 28 February, Health Minister Dr Ayesha Verrall used her discretionary powers under section 36 of the *Crown Entities Act 2004* to relieve Campbell of his position as head of Health New Zealand – Te Whatu Ora. Subsequently, Dame Karen Poutasi was appointed as chair. In December 2023, after the change in government, Health Minister Dr Shane Reti appointed Ken Whelan as a Crown observer to Health New Zealand – Te Whatu Ora, citing ongoing challenges that the agency was facing following the previous Labour Government's 2022 health reforms. Roger Jarrold was brought onto the Health New Zealand – Te Whatu Ora Board in March via a notice in the *New Zealand Gazette* on 25 March for a 3-year term starting 29 March. Poutasi subsequently resigned as chair and board member in April 2024, but remained in the role until a successor could be appointed in May 2024. This successor was Dr Lester Levy. In July 2024, three Health New Zealand – Te Whatu Ora Board members—Amy Adams, Vanessa Stoddart and Dr Curtis Walker—had decided not to renew their terms, while two others—Naomi Ferguson and Dr Jeff Lowe—resigned prior to the end of their terms. So, in 2 years the board has had three chairs and now is down to two board members: Lester Levy and Roger Jarrold.[3]

On 22 July, the Minister of Health Dr Shane Reti released a ministerial statement that said, "*In response to serious concerns around oversight, overspend and a significant deterioration in financial outlook, the Board of Health New Zealand will be replaced with a Commissioner … 'The previous government's botched health reforms have created significant financial challenges at Health NZ that, without urgent action, will lead to an estimated deficit of $1.4 billion by the end of 2024/25 – despite this Government's record investment in health of $16.68 billion in this year's Budget … Health NZ first reported a deteriorating financial position to me in March 2024, despite earlier repeated assurances by the organisation that it was on target to make savings in 2023/24 … In the months since, the situation has worsened. Health NZ is currently overspending at the rate of approximately $130 million a month … That's why today I am announcing the appointment of Professor Lester Levy, the recently appointed Chair of Health NZ, as Commissioner for a 12-month term. This is the strongest ministerial intervention available under the Pae Ora Act and not a decision I have taken lightly, however the magnitude of the issue requires such action … The issues at Health NZ stem from the previous government's mismanaged health reforms, which resulted in an overly centralised operating model, limited oversight of financial and non-financial performance, and fragmented administrative data systems which were unable to identify risks until it was too late … Professor Levy is tasked with implementing a turnaround plan with a savings objective of approximately $1.4 billion to ensure financial balance, and actions to strengthen governance and management … Operational responsibility for the turnaround plan will sit with the Commissioner, however I have made it clear that it should focus on cost efficiencies in areas such as any back-office bureaucracy which has blown out, particularly in middle management, as a result of the previous government's damaging reforms … As one example between March 2018 and March 2024, back-office staff numbers which formerly sat at district health board level grew by around 2,500 … As a Government, we've made it clear that our first and foremost priority in health is improving the delivery and quality of frontline services. We have already invested very significantly*

in health, with $16.68 billion announced in the Budget to support frontline healthcare services … As Minister, I am not confident I would have adequate oversight of that spend if the existing Board structure at Health NZ were to remain in place … Today's move to appoint a Commissioner is one of several steps our Government has been forced to take over the past eight months due to concerns about the governance of Health NZ and resulting performance issues, including health workforce and hospital wait times … Previously, I have appointed a Crown Observer, a new Chair and a Board member with financial expertise. Through those measures we have been able to identify long-standing issues with the existing governance and operating model … Lester Levy has assured me there will be no adverse impacts on the delivery of care in implementing a turnaround plan – rather, he and Health NZ will be seeking to bring the front-line closer to decision-making … Following today's announcement, the Ministry of Health will continue its monitoring role and play a key part in reporting on the Commissioner's performance in lifting Health NZ's financial position, both to me and to New Zealanders … Today's announcement is in no way a reflection on the work of frontline staff in our hospitals and health care facilities. As always, I thank them for their professionalism and want to reassure them that we are taking these steps to secure a better future for health in New Zealand,' says Dr Reti."[4]

With Dr Lester Levy installed as commissioner, three assistant commissioners have been appointed: Roger Jarrold, Ken Whelan and Kylie Clegg. The deputy commissioner roles include strategic oversight of Health New Zealand – Te Whatu Ora's financial turnaround, development and implementation of the turnaround plan and ensuring Health New Zealand – Te Whatu Ora has robust financial management and accountability across the organisation.[5]

What happened to cause the failure of the governance infrastructure is uncertain. Numerous theories have been proposed on news and social media, which include ministerial interference, the impact of the change in government, the lack of robust financial experience of board members and the impact of COVID-19 on the health system (affecting demand and staffing), to name a few. The present Health Minster Dr Reti stated that a commissioner was required because of the "*mismanaged health reforms, which resulted in an overly centralised operating model, limited oversight of financial and non-financial performance, and fragmented administrative data systems that were unable to identify risks until it was too late.*"[4] In the end, someone will analyse this failure of the board as it is substantial, and the outcome of this analysis would be relevant to the future of such bodies.

We now have Dr Lester Levy as the Health New Zealand – Te Whatu Ora commissioner, and no board. His job and that of his assistants will be challenging, with the Government's repeated statements that the front line of the health sector has to be improved, waiting lists have to be reduced, new health targets have to be met and Health New Zealand – Te Whatu Ora has to run to budget. The financial focus of the new commissioner and assistants may well achieve the financial requirements (priority action 6 of *Te Whatu Ora Statement of Performance Expectations 2023–2024*) given their track record and the promised funding increase of NZ$16.68 billion across three Budgets; however, it will be interesting to see if they make the health delivery requirements and the other five priority actions with the present structure given the lack of clinical input into its governance. Perhaps a clinical advisory group to advise the commissioner may help?

COMPETING INTERESTS
Nil.

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REFERENCES

1. Health New Zealand – Te Whatu Ora. Our whakapapa [Internet]. 2024 Jan 3 [cited 2024 Aug 30]. Available from: https://www.tewhatuora.govt.nz/corporate-information/about-us/our-whakapapa/
2. Health New Zealand – Te Whatu Ora. Te Whatu Ora Statement of Performance Expectations 2023–2024 [Internet]. 2023 Jun 30 [cited 2024 Sep 2]. Available from: https://www.tewhatuora.govt.nz/publications/te-whatu-ora-statement-of-performance-expectations-2023-2024/
3. Wikipedia. Te Whatu Ora [Internet]. 2024 Aug 5 [cited 2024 Aug 30]. Available from: https://en.wikipedia.org/wiki/Te_Whatu_Ora
4. Reti S. Commissioner replaces Health NZ Board [Internet]. New Zealand Government: 2024 Jul 22 [cited 2024 Aug 30]. Available from: https://www.beehive.govt.nz/release/commissioner-replaces-health-nz-board
5. Health New Zealand – Te Whatu Ora. Our leadership and structure [Internet]. [cited 2024 Aug 30]. Available from: https://www.tewhatuora.govt.nz/corporate-information/about-us/our-leadership-and-structure/our-commissioner/

When do you need to get ethical approval for your research?

Frank Frizelle

I am surprised to have to write on this topic; however, there appears to still be some confusion among a few authors who wish to submit their manuscript to the *New Zealand Medical Journal* (*NZMJ*) about whether ethics approval was required for their study. The answer, if you wish to publish in the *NZMJ*, is that it usually is required, and this should be arranged before the study has been undertaken.

The recommendations of the International Committee of Medical Journal Editors (ICMJE) states, "*All investigators should ensure that the planning, conduct, and reporting of human research are in accordance with the Helsinki Declaration as revised in 2013. All authors should seek approval to conduct research from an independent local, regional or national review body (e.g., ethics committee, institutional review board), and be prepared to provide documentation when requested by editors*."[1]

The main point of confusion among those submitting to the *NZMJ* seems to be research undertaken with quality assurance data. Collection of quality assurance data for quality assurance projects are exempt from the need to obtain ethics approval in New Zealand;[2] however, the secondary use of this data for research does need ethics approval to be published.

Quality assurance projects are undertaken primarily for the purpose of evaluating current or slightly new practices, and the primary aim is to inform current care in a localised scope, rather than generate generalisable information. These data are meant for those involved in the patient care pathway, not those outside of it. Full discussion about this can be obtained here: https://neac.health.govt.nz/national-ethical-standards/part-two/18-quality-improvement

However, when data are acquired for quality assurances projects and are then subsequently used for research and published in the *NZMJ*, then ethics approval is required. When quality assurance data are published as research in a journal, they are available to those outside of the patient care pathway, and in the case of the *NZMJ* the data are then available to the public as we have an open access policy. As such, we require ethical approval to be obtained.

If you wish to use quality assurance data in research and publish it in the *NZMJ*, please obtain ethical approval before you undertake your research.

COMPETING INTERESTS
Nil.

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REFERENCES

1. International Committee of Medical Journal Editors. Protection of Research Participants [Internet]. [cited 2024 Aug 30]. Available from: https://www.icmje.org/recommendations/browse/roles-and-responsibilities/protection-of-research-participants.html
2. Health and Disability Ethics Committees. General frequently asked questions [Internet]. 2024 Feb 22 [cited 2024 Aug 30]. Available from: https://ethics.health.govt.nz/frequently-asked-questions
3. National Ethics Advisory Committee. 18. Quality improvement [Internet]. 2021 Apr 27 [cited 2024 Aug 30]. https://neac.health.govt.nz/national-ethical-standards/part-two/18-quality-improvement

A quality improvement project: Rapid Access Hysteroscopy Clinics with nurse pre-procedural telephone support in the outpatient setting

Lucy Wong, Catherine Askew, Katherine Sowden, Kieran Dempster-Rivett, Valerio Malez

ABSTRACT

AIM: Endometrial cancer (EC) is increasing in incidence in women across Aotearoa New Zealand as risk factors such as obesity and diabetes become more prevalent. In 2022, a Rapid Access Clinic (RAC) for hysteroscopy was implemented at Te Whatu Ora Counties Manukau District to increase early detection of EC.

METHOD: Plan-Do-Study-Act (PDSA) cycles were used to test and implement RAC supported by a nurse pre-procedural phone consultation. Quantitative data was collected alongside patient experiences of the pre-procedural telephone call.

RESULTS: A total of 207 women successfully completed RAC, which enabled one less visit to clinic per patient, subsequent travel cost savings (NZ$35,959) and a decrease in CO_2 emissions (1,782kg). Lead time from first specialist appointment (FSA) to outpatient (OP) hysteroscopy, previously 25 days (SD: 21 days), was eliminated. Wait time from referral to provisional diagnosis increased from 26 days to 31 days; however, standard variation reduced from 30 days to 15 days. Clinician productivity increased by 25% per hysteroscopy session. Twenty-six out of 30 patients reported positive experiences of their pre-procedural RAC phone consultation. Twenty-seven out of 207 women were diagnosed with endometrial cancer from RAC.

CONCLUSION: RAC are patient-centric and have demonstrated valuable benefits for both clinicians and women with a high suspicion of EC.

Endometrial cancer (EC) is the most common gynaecological cancer in women in Aotearoa New Zealand and is increasing in incidence each year.[1,2] This upward trend is believed to be closely linked to an increasing prevalence of risk factors such as obesity, diabetes and an ageing population.[1,2] While the risk of developing EC is growing among post-menopausal women, there is a concerning rise in the number of pre-menopausal women diagnosed with EC.[2] These women are broadly classified as having abnormal uterine bleeding (AUB), often belonging to the Pacific peoples ethnic group.[1,2]

Hysteroscopy is the gold standard investigation for women with post-menopausal bleeding (PMB).[3] It allows for the visualisation of any abnormalities inside the uterine cavity and identification of endometrial polyps (which may be missed if only a pipelle biopsy is obtained).[4] Waiting to attend hysteroscopy after a first specialist appointment (FSA) can not only cause delays to diagnosis but anxiety for patients.[3] Rapid access pathways for hysteroscopy are well stipulated in the literature to expedite time through cancer pathways for women.[3,5] Rapid access clinics (RAC) are safe, cost effective and efficient, however they are not yet widely adopted as a "one-stop shop" service across Aotearoa New Zealand for diagnostic investigation for women with a high suspicion for gynaecological cancers.[3,4,6]

Prior to 2014, Counties Manukau District Health Board (DHB) offered direct access hysteroscopy for women referred by their general practitioners (GPs). However, an audit revealed that a considerable number of these women subsequently required general anaesthetic (GA) hysteroscopy, primarily due to issues like cervical stenosis or polyps. Additionally, flaws in the triaging process resulted in inappropriate clinic attendance by women that had undergone prior hysterectomies, experienced difficulty tolerating a speculum during GP visits, or were not sexually active.

To address these challenges, the clinics were changed to a two-step process involving an FSA followed by a hysteroscopy. Criteria for the follow-up hysteroscopy included the patient's tolerance of a pipelle biopsy. While hysteroscopy was suitable for an OP setting, many follow-ups

continued to be scheduled as GA procedures, with little oversight of wait times, thereby increasing clinical risk. In 2016, MyoSure and local anaesthetic blocks were introduced at Counties Manukau, enabling the removal of polyps in the outpatient (OP) setting and significantly reducing subsequent GA hysteroscopy cases.

The Health New Zealand – Te Whatu Ora Faster Cancer Treatment (FCT) indicators aim for 90% of high suspicion of cancer (HSC) patients with confirmed cancer to receive treatment within 62 days of referral.[7] Between July 2020 and September 2021, the rolling average of compliance of gynaecology patients to be treated within the 62-day target was 41.5% in the Counties Manukau district. This prompted the Women's Health department to engage with Ko Awatea, Counties Manukau's Centre for Innovation and Improvement. Our project targeted the front-end of the FCT pathway where there was an appetite to re-trial a Rapid Access Clinic (RAC) to expedite time from referral to diagnosis. The aim of this project was to increase the number of HSC women to receive earlier access to hysteroscopy through RAC by June 2023.

Methods

The existing standard process from referral to first treatment was mapped by key stakeholders working in the FCT gynaecology pathway (Appendix 1 Figure 1). Retrospective wait time data was collected between key pathway steps and shared with clinicians across three workshops where they brainstormed reasons and root causes for delays.

Stakeholders brainstormed change ideas that would help to reduce time in the pathway and prioritised the ideas with the highest perceived impact. A RAC for hysteroscopy with pre-procedural nurse telephone support was identified as a key change idea to test, and it was hypothesised that such clinics would reduce wait time between referral and provisional diagnosis.

A project team of senior gynaecologists, a clinical nurse specialist (CNS), women's health service manager and an improvement advisor were assembled to set up and test RAC for OP hysteroscopy.

Criteria were developed to assist clinicians in grading patients into RAC, which included:

- Abnormal uterine bleeding (AUB) or post-menopausal bleeding (PMB)
- Post-menopausal—recent ultrasound scan demonstrating an endometrial thickness of ≥5mm
- Pre-menopausal—recent ultrasound scan demonstrating an endometrial thickness of ≥20mm or evidence of polyp or mass
- Pre-menopausal identified as high risk with BMI >35, haemoglobin <100, diabetes, failed hormonal management, Tamoxifen or known genetic risk, e.g., Lynch syndrome
- Ability to tolerate a speculum examination
- High suspicion of cancer

A RAC-specific waiting list and clinic template were created on the patient management system to ensure that HSC women were prioritised over those requiring routine OP hysteroscopy.

The project team developed a telephone script (Appendix 2 Figure 1) to assist the gynaecology CNS in conducting phone consultations up to a week prior to the patient's clinic appointment. The patient's medical history and hysteroscopy counselling were documented on an electronic clinic template in Clinical Portal and could be reviewed by a gynaecologist prior to the appointment. Following the phone consultation, a hysteroscopy information leaflet was emailed to the patient, providing supplementary information about the procedure.

We used Plan-Do-Study-Act (PDSA) cycles to test the RAC model.

The first pilot began in late October 2022 with four patients scheduled for RAC each week. CNS time of 0.1 FTE was allocated to conducting and documenting pre-procedural phone consultations. The benefits of RAC were recognised in the early weeks of the pilot by the senior gynaecologists, which led to waitlist numbers exceeding the planned clinic capacity by the end of November. Following the Christmas break, a second pilot explored the use of cancelled operating theatre lists to supplement the four weekly RAC slots on an *ad-hoc* basis. Although repurposing the theatre capacity worked well initially, it was not a sustainable long-term solution. To cater to the growing clinic demand, we increased the number of available RAC slots to 10 per week by March 2023. This expansion also required an increase in CNS time to 0.2 FTE per week to accommodate the growing demand.

A dashboard of referral and clinic demand and a written guideline about RAC were implemented to help sustain these changes.

Quantitative data of the RAC were collected between 20 October 2022 and 31 May 2023 and

statistically analysed to understand changes in median wait time pre-RAC and during the trial. Thirty women or a whānau member rated their experience of the pre-procedural nurse phone call on a five-point Likert scale, justified their rating and identified any further opportunities for improvement. To ensure objective and unbiased responses, surveys were completed by Ko Awatea, independent of the Women's Health team. Responses were de-identified to ensure participant anonymity. Ethical principles were observed throughout the survey process. Participants were fully informed about the purpose of the survey, provided their consent and were informed of their right to withdraw from the survey at any stage if they chose to do so.

The cost reduction benefit for the patient was calculated based on distance travelled from the patient's home address to the outpatient department. Standard car petrol usage was used to calculate petrol costs. The travel time was based on off peak traffic volumes to calculate a conservative estimate of time saved. Hospital cost–benefit analysis was calculated by using standard costs and times for senior medical officers and hysteroscopies, as provided by the local Population Health department and via a time and motion study that was part of this project.

Attendance

Between 20 October 2022 and 31 May 2023, 231 women attended RAC with only one non-attendance. FSA clinic attendance rates improved from 91% pre-RAC to 99% with RAC. The improvement of attendance during the trial was of high statistical significance (p=0.00).

A total of 207 (89.6%) patients successfully tolerated RAC hysteroscopy, while 24 (10.4%) patients were required to complete the procedure under general anaesthetic.

Wait time outcomes

The lead time between FSA and OP hysteroscopy reduced from 25 days (SD: 21 days) to 0. Wait time from referral to provisional diagnosis increased from 26 days (SD: 30 days) to 31 days

Table 1: Demographics of women who completed the Rapid Access Clinics (n=207).

Ethnic group	Abnormal uterine bleeding	Post-menopausal bleeding	Total	Percentage of total
NZ European	6	66	72	34.8%
NZ Māori	4	29	33	15.9%
Samoan	3	19	22	10.6%
Tongan	4	9	13	6.3%
Indian	1	10	11	5.3%
Chinese	2	8	10	4.8%
Niuean	3	5	8	3.9%
Other European		8	8	3.9%
Fijian	3	4	7	3.4%
Cook Islands Māori	2	4	6	2.9%
Other Asian		5	5	2.4%
South East Asian		5	5	2.4%
Middle Eastern		4	4	1.9%
Tokelauan		2	2	1.0%
South African		1	1	0.5%

(SD: 15 days) following implementation of 10 RAC slots. Wait time between referral to grading and grading to provisional diagnosis remained relatively unchanged. There was a reduction in the standard variation of wait time, with the largest impact between grading and FSA, demonstrating an improvement in process stability at this step.

Histology outcomes

We were able to diagnose 13% (27/207) of women with EC through RAC, up from 6% (18/308) diagnosed in the previous 9 months at FSA. This increase was attributed to more diagnostic hysteroscopies being performed, allowing for more opportunities to undertake endometrial sampling. One hundred and eighty women that did not have EC were removed from the FCT pathway once this result was determined.

Patient experience

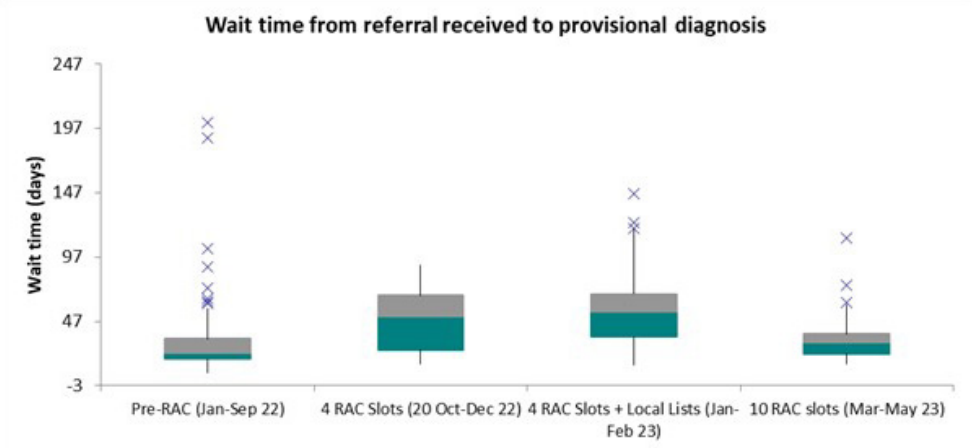
Thirty women were surveyed about their experience of the pre-procedural CNS phone consultation. Twenty-six women rated the nurse phone consultation positively, noting that the information they were given about the clinic and procedure was explained well, as reflected in feedback from a patient and a whānau member:

> *"She [the nurse] explained everything I needed to know, everything was very clear. I wasn't expecting that kind of procedure." – Cook Islands Māori patient*

> *"The nurse painted a thorough picture of what would take place, describing the position that my mum's legs would need to be in to ensure she could have the procedure. It was really good to get an idea of what was going to happen, i.e., local anaesthetic, tools that would be used. The experience couldn't get better than this. This is a lot better than other appointments." – Tongan family member*

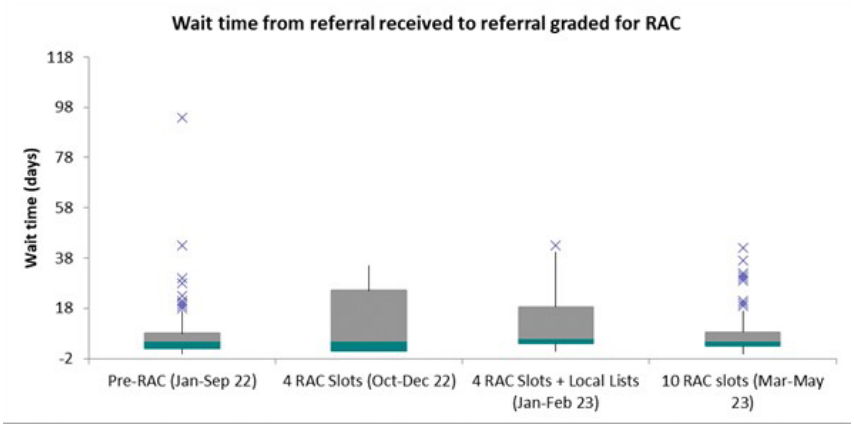
Of the four women who rated their experience as "okay", two women wanted further information about what to expect during the procedure and how to adequately manage their pain post-procedure. All women felt that their concerns and questions were adequately answered by the nurse.

Figure 1: Box and whisker plot showing wait time from referral received to provisional diagnosis pre-RAC, during testing, then implementation.



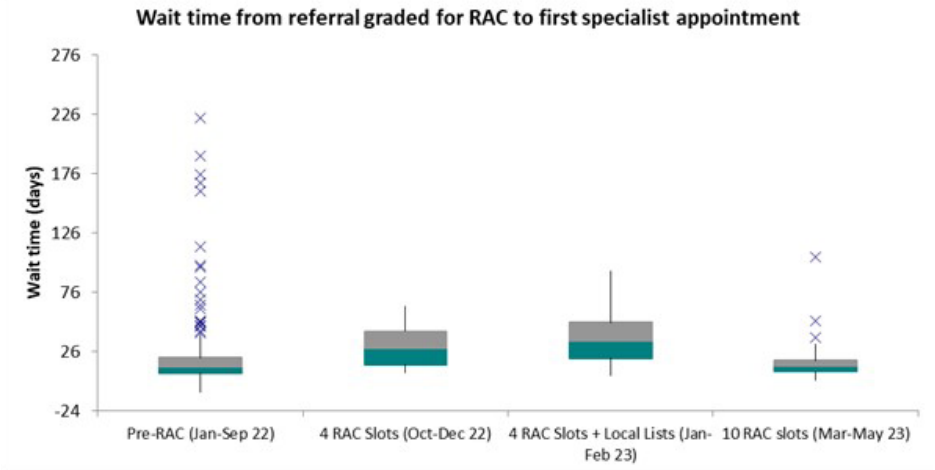
	Pre-RAC	Four RAC slots	Four RAC slots + local lists	10 RAC slots
Mean (days)	31.1	48.3	55.3	32.7
ST DEV	29.6	23.2	25.8	15.3
Median (days)	22.6	50.5	54.5	30.5
No. patients (n=)	97	36	80	76

Figure 2: Box and whisker plot showing wait time from referral received to grading pre-RAC, during testing, then implementation.



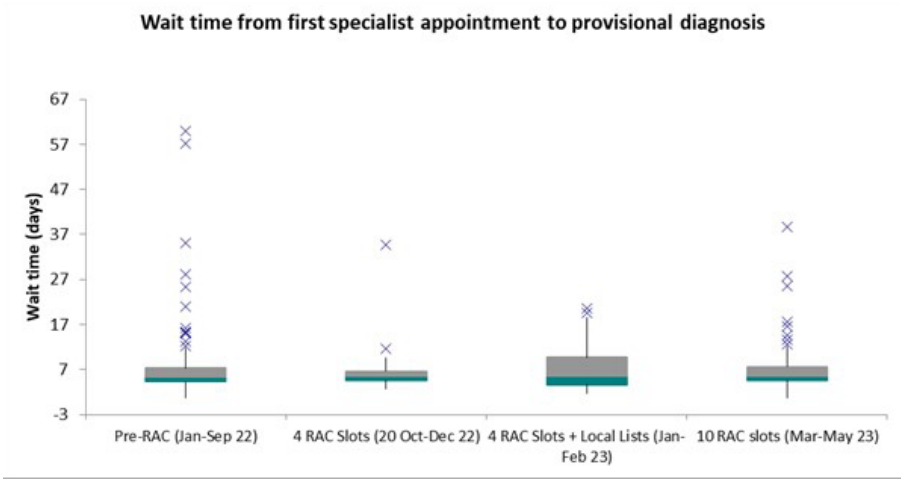
	Pre-RAC	Four RAC slots	Four RAC slots + local lists	10 RAC slots
Mean (days)	5.9	10.6	10.8	8
ST DEV	7.6	11.8	9.7	8.8
Median (days)	5	5	6	5
No. patients (n=)	280	41	87	79

Figure 3: Box and whisker plot showing wait time from graded for FCT first specialist appointment pre-RAC, during testing, then implementation.



	Pre-RAC	Four RAC slots	Four RAC slots + local lists	10 RAC slots
Mean (days)	19.2	29.7	38.1	16.4
ST DEV	27.3	15.9	21.8	13
Median (days)	13	29	35	14
No. patients (n=)	280	41	87	79

Figure 4: Box and whisker plot showing wait time from first specialist appointment to provisional diagnosis pre-RAC, during testing, then implementation.



	Pre-RAC	Four RAC slots	Four RAC slots + local lists	10 RAC slots
Mean (days)	8.2	6.8	7.2	7.7
ST DEV	9.1	5.1	4.3	6
Median (days)	5.6	6	6	6
No. patients (n=)	97	36	80	76

Table 2: Demographics of women diagnosed with endometrial cancer through RAC (n=27).

Ethnicity	Abnormal uterine bleeding	Post-menopausal bleeding	Total	Percentage of total
NZ European		8	8	29.6%
NZ Māori	1	4	5	18.5%
Samoan	1	3	4	14.8%
Tongan	1	1	2	7.4%
Cook Islands Māori	1	1	2	7.4%
Fijian		2	2	7.4%
Chinese		1	1	3.7%
Indian		1	1	3.7%
Niuean		1	1	3.7%
Other Asian		1	1	3.7%

Table 3: Demographics of women surveyed for pre-procedural phone consultation experience.

Ethnicity	Number of women surveyed (n=30)
NZ European	10
NZ Māori	4
Samoan	4
Chinese	3
Other	3
Tongan	2
Cook Islands Māori	1
Cook Islands/Tahitian	1
Pakistan	1
Niuean	1

Benefits

The RAC pathway has made it possible for more HSC women to receive hysteroscopy in a timely manner, improving patient safety. Of the women that were referred for RAC, 89.6% (207/231) successfully underwent the OP hysteroscopy procedure. These women saved one additional trip to the Manukau SuperClinic and reduced median wait time from FSA to hysteroscopy from 25 days to 0. The combined appointments saved our patients a total of NZ$35,959 in travel costs. The reduction in the number of visits has also led to a significant decrease in CO_2 emissions (-1,782kg), which is equivalent to the amount of CO_2 offset by 71 trees.

Financial impact

The annual number of HSC hysteroscopies has increased by 456%, from 70 to 359. Cancelled theatre slots repurposed for RAC made up 43% of the RAC slots delivered across the trial. The cost of delivering these procedures has increased accordingly from NZ$86,529 to NZ$364,745 (NZ$278,215 increase). However, this increase in cost is due to past underperformance. Counties Manukau Women's Health clinical governance expects all eligible women with a high suspicion of cancer to receive rapid access to hysteroscopy.

RAC delivery is also more cost effective when compared with the previous pathway. Based on the new number of referrals, by having direct access to OP hysteroscopy, the Women's Health Service saved nearly NZ$62K per year due to increased clinic session productivity, with an additional hysteroscopy patient seen by a gynaecologist per FCT FSA session (from four to five).

Discussion

Rapid access clinics (RAC) have been explored across various outpatient services; however, they have not consistently been adopted across Aotearoa New Zealand to support the diagnosis of women with a high suspicion for EC.[3] Our project is the first to report on the outcomes of RACs for hysteroscopy with embedded pre-procedural CNS support. RACs are patient-centric, allowing for one less clinic visit, which reduced the time patients and whānau needed to take away from work or other priorities and results in savings in travel costs.[5,6] Furthermore, system cost savings due to increased productivity meant that gynaecologists and nursing staff could see patients in other clinics.

While the RACs did not reduce overall wait time from referral to provisional diagnosis, there was an improvement in process consistency, indicated by a reduction in the number of outliers and standard variation (from 30 days to 15 days), notably between grading and FSA. Flow through the rapid access pathway was in part hindered by a small number of clinicians grading incoming

gynaecology referrals. This resulted in delays in scheduling appointments and subsequent consultations with gynaecologists for patients. In response, we recently trained and expanded the scope of several CNSs to support our gynaecologists with the grading of incoming referrals. We are yet to determine the impact of this on time to FSA and whether this could subsequently expedite time to diagnosis, but it is likely the allocation of additional resources to grading would help to make this part of the process quicker.

We provided RACs through a combination of planned OP clinics slots and capacity from cancelled operating theatre lists. This allowed our team to perform more pipelle biopsies and, subsequently, diagnose more women with EC. In some cases, where a polyp was solely identified during hysteroscopy, the patient could be treated immediately and discharged to her GP, avoiding the need for an additional clinic visit or GA hysteroscopy.

Pacific peoples made up approximately 22% of the Counties Manukau catchment area in 2021–2022.[8] In our trial, Pacific women (41%) had the highest incidence of EC compared to any other ethnic group accessing RAC. These findings are consistent with previous studies that demonstrate that Pacific women are disproportionately affected by EC, likely due to the effects of socio-economic deprivation and obesity with associated diseases.[2]

Pre-procedural nurse telephone consultations are widely used in practice to reduce day-of-surgery cancellations and improve patient experience by ensuring patients are fully informed about their procedures.[9] We adapted a similar premise in the outpatient setting tailored to RAC. In our project, telephone consultations also served to verify the suitability of women graded into RAC, ensuring that those with specific requirements received adequate support. Women deemed unsuitable were referred for hysteroscopy under GA. Pre-procedural telephone consultations also improved clinician productivity by enabling the CNS to undertake medical histories and provide explanations of the procedure to patients and whānau in advance. This gave clinicians more time to perform hysteroscopies, increasing the number of procedures from four to five per session.

Overall, patient and whānau feedback regarding the RAC pre-procedural telephone consultation was positive and was believed to have played a key role in enhancing attendance rates from 91% to 99%. This improvement was further supported by the proactive assistance of clinic schedulers and nurses, who liaised with patients to allocate them into preferred clinic times. Where appropriate, Māori and Pacific peoples CNSs also offered tailored support to RAC patients from these ethnic groups to attend appointments.

Furthermore, the functioning and speed of RAC for hysteroscopy is dependent upon multiple factors including the availability and skill-mix of both medical and nursing staff, the physical space of procedure and clinic rooms, equipment and sterilisation services.[10,11] Effective communication between care providers and the capacity of other services, such as radiology and pathology, are also integral components to ensuring timely care through the FCT pathway.[10,11]

Strengths and limitations

Clinician buy-in and collaboration drove and enabled successful implementation of RAC. We applied the Awareness Desire Knowledge Ability Reinforcement (ADKAR) Model to engage with relevant clinicians.[12] Initially, senior clinicians resisted participating in quality improvement activities due to feelings of frustration resulting from a lack of transparency and feeling unheard by the management team. Despite our initial analysis identifying the greatest opportunity to reduce wait time variation was between decision-to-treat and first treatment, we prioritised the RAC testing with support from senior clinicians, aligning with the "desire" element of ADKAR.[12] The pilot of RAC boosted clinician morale, as they witnessed its benefits for women, which was reinforced by positive feedback from patients and other staff in the clinic.

Our initial baseline quantitative data analysis was undertaken during the COVID-19 pandemic. Wait times for FSA, pathology, radiology and surgery were significantly impacted by COVID-19 pandemic-related lockdowns. The analysis revealed significant variation in wait times between decision-to-treat and first treatment. This indicated a need for further improvement initiatives to expedite activities in the latter stages of the pathway to ensure timely treatment.

Although we gathered patient experiences of the pre-procedural phone call, it would be valuable to collect further insights about the entire RAC experience. Anecdotal reports from clinicians suggest improvements in their experiences, however conducting further surveys among them would help to strengthen this work.

Conclusion

The implementation of RAC for women with a high suspicion of gynaecological cancer has demonstrated valuable benefits for both patients and clinicians. While it has not yet demonstrated wait time reductions from referral to provisional diagnosis, the clinics have demonstrated patient-centric values, reducing the number of visits to clinic saving time from work and associated cost savings. Additionally, patients felt well-supported and informed of their hysteroscopy through the CNS pre-procedural phone consultation. RAC facilitates an earlier shift to focus care on those with cancer and expedites the removal of patients without cancer diagnoses from the FCT pathway.

This model of care is straightforward and can be easily replicated in other Women's Health services across New Zealand and adapted for various specialty outpatient clinics.

COMPETING INTERESTS
Nil.

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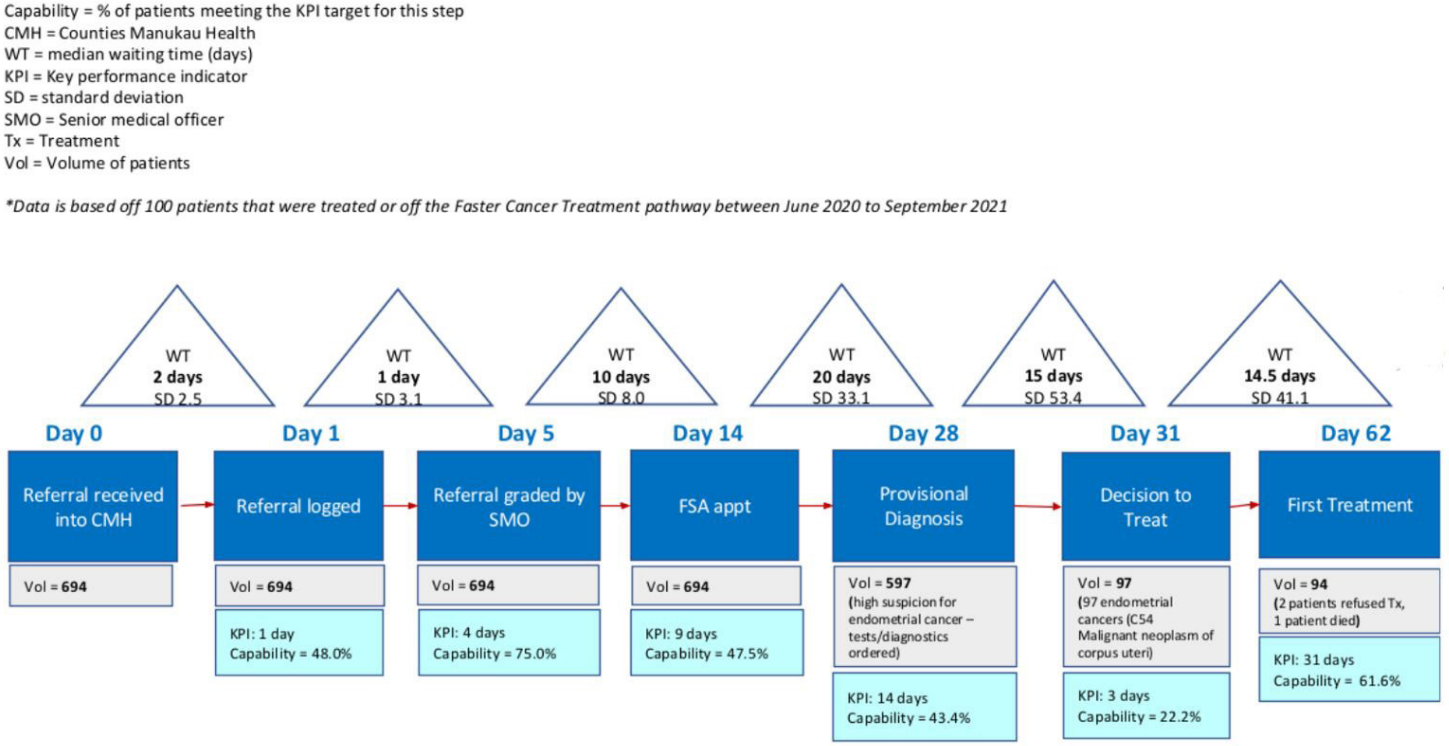
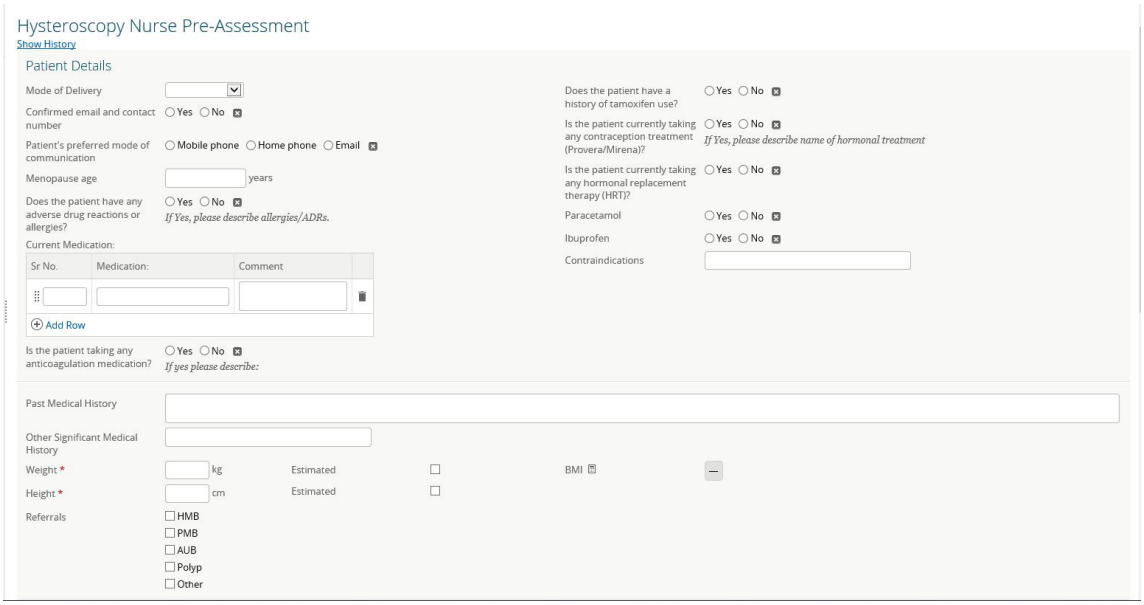
REFERENCES
1. Te Whatu Ora – Health New Zealand. Historical cancer data [Internet]. Wellington (NZ): Te Whatu Ora – Health New Zealand; 2022 [cited 2023 Nov 23]. Available from: https://www.health.govt.nz/publication/cancer-historical-summary-1948-2020
2. Bigby SM, Tin Tin S, Eva LJ, et al. Increasing incidence of endometrial carcinoma in a high-risk New Zealand community. Aust N Z J Obstet Gynaecol. 2020;60(2):250-257. doi: 10.1111/ajo.13108.
3. Kershaw V, Figueiredo S, Russell M. Should every Rapid Access Clinic have outpatient hysteroscopy facilities as part of a one-stop service? An audit into the investigation and management of patients with postmenopausal bleeding. BJOG. 2016;1(123):103.
4. Jones ER, O'Flynn H, Njoku K, Crosbie EJ. Detecting endometrial cancer. Obstet Gynaecol. 2021;23(2):103-12. doi: 10.1111/tog.12722.
5. Aggarwal A, Lilley A, Sproston T. Outpatient hysteroscopy audit. BJOG. 2013;1(120):445-446.
6. Boyens H, Ooi C. Rapid Access Clinic: Is It Rapid Enough? Outcomes of Women with High Suspicion of Cancer in a One-stop Gynaecology Clinic. Aust N Z J Obstet Gynaecol. 2019;1(59):103-104.
7. Te Whatu Ora – Health New Zealand. Faster Cancer Treatment Indicators: Business Rules and Data Definitions. [Internet]. Wellington (NZ): Te Whatu Ora - Health New Zealand; 2023 [cited 2023 Sep 21]. Available from: https://www.tewhatuora.govt.nz/our-health-system/data-and-statistics/nz-health-statistics/data-references/data-dictionaries
8. Te Whatu Ora – Health New Zealand. Annual Report 2021/22: Counties Manukau Health [Internet]. Wellington (NZ): Te Whatu Ora – Health New Zealand; 2023 [cited 2023 Oct 12]. Available from: https://www.tewhatuora.govt.nz/assets/Uploads/Annual-Report-2021-22-Counties-Manukau.pdf
9. Haufler K, Harrington M. Using nurse-to-patient telephone calls to reduce day-of-surgery cancellations. AORN J. 2011;94(1):19-26. doi: 10.1016/j.aorn.2010.12.024.
10. Nosib H, James R. Fast-track rapid access pathways for the diagnosis of gynaecological cancers. J Reprod Med. 2021;31(10):275-81.
11. Jones KD, Butler-Manuel SA. Improving the care pathway for women with endometrial cancer. Trends Urology, Gynaecol Sexual Health. 2010;15(3):46-50.
12. Prosci. Applying the ADKAR Model When Change Management is New [Internet]. Prosci; 2023 [cited 2022 Sep 22]. Available from: https://www.prosci.com/blog/applying-the-adkar-model-when-change-management-is-new

Appendix

Appendix 1 Figure 1: Median wait time through gynaecology faster cancer treatment pathway.



Appendix 1 Figure 2: Nurse pre-procedural phone consultation script.



Hysteroscopy Nurse Pre-Assessment

Show History

Patient Details

Mode of Delivery

Confirmed email and contact number ○ Yes ○ No

Patient's preferred mode of communication ○ Mobile phone ○ Home phone ○ Email

Menopause age years

Does the patient have any adverse drug reactions or allergies? ○ Yes ○ No
If Yes, please describe allergies/ADRs.

Current Medication:

Sr No.	Medication:	Comment

Add Row

Is the patient taking any anticoagulation medication? ○ Yes ○ No
If yes please describe:

Does the patient have a history of tamoxifen use? ○ Yes ○ No

Is the patient currently taking any contraception treatment (Provera/Mirena)? ○ Yes ○ No
If Yes, please describe name of hormonal treatment

Is the patient currently taking any hormonal replacement therapy (HRT)? ○ Yes ○ No

Paracetamol ○ Yes ○ No

Ibuprofen ○ Yes ○ No

Contraindications

Past Medical History

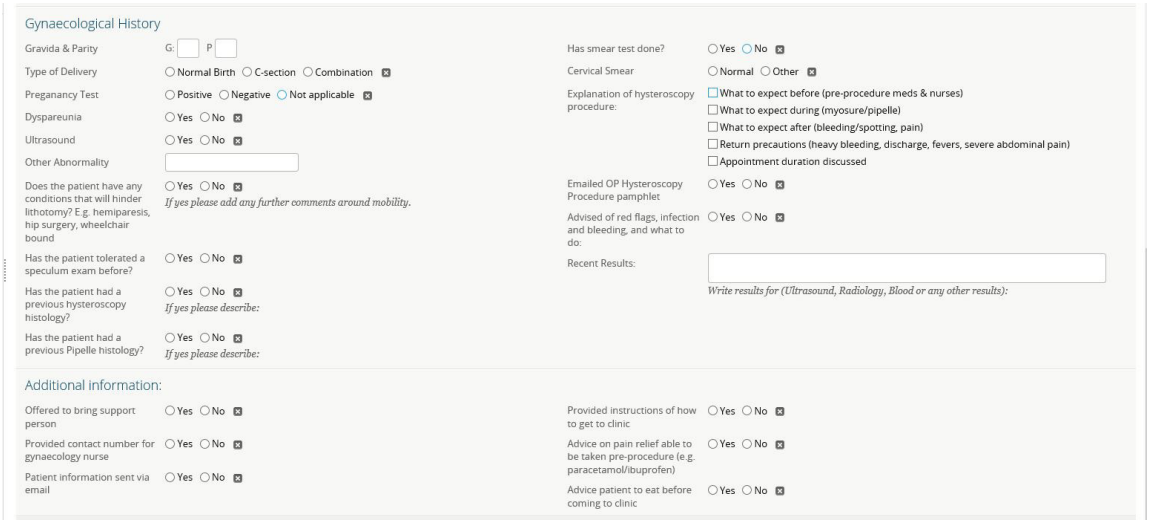
Other Significant Medical History

Weight * kg Estimated ☐

Height * cm Estimated ☐

BMI —

Referrals
☐ HMB
☐ PMB
☐ AUB
☐ Polyp
☐ Other



Gynaecological History

Gravida & Parity G: P

Type of Delivery ○ Normal Birth ○ C-section ○ Combination

Preganancy Test ○ Positive ○ Negative ○ Not applicable

Dyspareunia ○ Yes ○ No

Ultrasound ○ Yes ○ No

Other Abnormality

Does the patient have any conditions that will hinder lithotomy? E.g. hemiparesis, hip surgery, wheelchair bound ○ Yes ○ No
If yes please add any further comments around mobility.

Has the patient tolerated a speculum exam before? ○ Yes ○ No

Has the patient had a previous hysteroscopy histology? ○ Yes ○ No
If yes please describe:

Has the patient had a previous Pipelle histology? ○ Yes ○ No
If yes please describe:

Has smear test done? ○ Yes ○ No

Cervical Smear ○ Normal ○ Other

Explanation of hysteroscopy procedure:
☐ What to expect before (pre-procedure meds & nurses)
☐ What to expect during (myosure/pipelle)
☐ What to expect after (bleeding/spotting, pain)
☐ Return precautions (heavy bleeding, discharge, fevers, severe abdominal pain)
☐ Appointment duration discussed

Emailed OP Hysteroscopy Procedure pamphlet ○ Yes ○ No

Advised of red flags, infection and bleeding, and what to do: ○ Yes ○ No

Recent Results:
Write results for (Ultrasound, Radiology, Blood or any other results):

Additional information:

Offered to bring support person ○ Yes ○ No

Provided contact number for gynaecology nurse ○ Yes ○ No

Patient information sent via email ○ Yes ○ No

Provided instructions of how to get to clinic ○ Yes ○ No

Advice on pain relief able to be taken pre-procedure (e.g. paracetamol/ibuprofen) ○ Yes ○ No

Advice patient to eat before coming to clinic ○ Yes ○ No

The impact of Individual Placement and Support on employment, health and social outcomes: quasi-experimental evidence from Aotearoa New Zealand

Moira Wilson, Fiona Cram, Sheree Gibb, Sarah Gray, Keith McLeod, Debbie Peterson, Helen Lockett

ABSTRACT

AIM: To examine the impact of integrated employment support and mental health treatment (Individual Placement and Support, or "IPS") on Aotearoa New Zealand participants' employment, income, health, education and justice outcomes.

METHOD: De-identified linked data from the Stats NZ Integrated Data Infrastructure and propensity score matching were used to estimate effects.

RESULTS: In total, 1,659 IPS participants were matched to 1,503 non-participants. Compared with matched non-participants, matched participants were 1.6 times more likely to be in employment at 12 months. Over 3 years, matched IPS participants had more earnings, more time in employment, greater total income and were more likely to gain qualifications. They also had more face-to-face contacts with mental health teams, mental health-related inpatient stays and mental health service crisis contacts than matched non-participants. Effects for Māori were similar in direction and scale to the overall results.

CONCLUSION: Our results show that people with mental health conditions or problematic substance use who receive employment support made available together with mental health and addiction treatment have more employment, gains in qualifications and more independent income when compared to similar people who do not receive this support. More research is needed to understand differences in engagement with mental health services and effects on participants' health and wellbeing.

Mental health conditions and problematic substance use are the leading cause of health-related income loss among working-aged adults in Aotearoa New Zealand, accounting for 30% of the total.[1] For people most severely affected, income losses and employment penalties are large.[2,3] Many report a desire to work and a need for additional assistance to maintain or return to work.[4] In an Australian national survey of people with a psychosis diagnosis, a third of all respondents and 45% of 18–34-year-olds reported lack of employment as one of their biggest challenges.[5]

Individual Placement and Support (IPS) is an internationally used, evidence-based, voluntary approach to helping people receiving mental health and addiction treatment who want to work into employment. The programme logic is to "place-and-then-support"—job search is rapid, and training and support is provided as needed once participants are in employment. This contrasts with commonly practiced vocational supports that assume that training, job preparation activities or sheltered work is needed before employment.[3] IPS has been available in parts of Aotearoa New Zealand for nearly 2 decades, funded by health regions and the Ministry of Social Development (MSD), but does not have national coverage.[6,7]

With IPS, an employment consultant is included in the clinical team and employment support is integrated with mental health and addiction treatment. Assistance the employment consultant provides includes: help finding jobs that fit a person's preferences and skills; working with local employers to identify job opportunities; and "benefits counselling" to explain the impact of paid employment on income support payments and facilitate connections with local Work and Income services. Personalised supports continue for as long as the person wants, including support to keep their job, find another job or advance their career. Mental health and addiction practitioners

may refer people to the employment consultant, or people can self-refer. Work experience, diagnosis, symptoms, current or previous substance use and convictions do not affect access.[3]

There is evidence from overseas randomised controlled trials (RCTs) that IPS participants are more likely to obtain competitive employment than those in control conditions (often train-first vocational programmes or non-integrated supported employment). Rate ratios across seven meta-analyses range between 1.6 and 2.5.[3] Evidence on outcomes such as mental health and quality of life is still developing.[3,8] Recent Aotearoa New Zealand research has found that IPS programmes can achieve employment outcomes at and above international benchmarks, but the absence of an RCT means that Aotearoa New Zealand evidence on efficacy is limited.[6]

The aim of this paper is to examine effects of IPS on employment, income, health, education and justice outcomes in Aotearoa New Zealand.

Methods

Data were sourced from Stats NZ's Integrated Data Infrastructure (IDI). The IDI is a database containing linked individual-level microdata.[9] Data come from a range of government and non-government administrative and survey sources, and are probabilistically linked and de-identified. For more information about the IDI, see https://www.stats.govt.nz/integrated-data/integrated-data-infrastructure.

The base study population was adults who had face-to-face contact with a publicly funded secondary mental health or addiction team over the 3 years to 31 March 2018, as recorded in Programme for the Integration of Mental Health Data (PRIMHD). Face-to-face contact included all contacts except those coded as audiovisual, other social media/E-therapy, telephone, SMS text messaging, written correspondence or unknown/other location.

The study population was split into two cohorts: those who participated in IPS and those who did not. The IPS cohort was those who commenced IPS in the 3 years to 31 March 2018 in the former Taranaki, Lakes, Waikato, Auckland or Counties Manukau district health boards (DHBs). These areas had established IPS services at that time. A matched cohort of people who did not commence receiving IPS over the same period was identified from the same regions. The approach of matching within regions with IPS was chosen so that matched controls faced the same local labour market and mental health service delivery conditions and drew from the same location-specific demographic groups. Potential for over-statement of effects due to positive selection bias as a result of drawing IPS participants and matched controls from the same regions was assessed by examining sensitivity to drawing matched controls from areas with no IPS.

Matching methods are described below. To approximate study populations in RCTs, participants aged over 62, in employment, or receiving Accident Compensation Corporation (ACC) weekly compensation at referral were excluded. Effects were estimated for all participants, for Māori participants, and separately for males and females.

The following outcomes were examined over a 3-year follow-up from IPS referral.

- Employment and benefit receipt. Inland Revenue (IR) data were used to identify months with paid employment, defined as periods receiving income from wages or salaries or self-employment. MSD data were used to identify months in receipt of main working-age benefits (Jobseeker Support, Supported Living Payment and Sole Parent Support).
- Income and transfers. IR and MSD data were used to calculate real (NZ$ 2021) income. Total net income was examined, as well as net income from: employment (including self-employment); MSD benefits; and other transfer payments such as Working for Families tax credits and ACC weekly compensation. IR data were used to calculate taxes paid. Net government transfers were calculated as net income from benefits and other transfers, less taxes paid.
- Justice. Department of Corrections data were used to identify time spent serving any corrections sentence, and time spent serving custodial sentences.
- Study and qualifications. Time participants spent enrolled in education or training and highest qualification based on the National Qualifications Framework (NQF) were established using Ministry of Education data.
- Health service usage. PRIMHD data were used to identify face-to-face contact with mental health or addiction teams and IPS teams, and admissions to inpatient

psychiatric facilities. Data from the Ministry of Health's National Minimum Dataset (NMDS) were used to identify public hospital admissions. These were categorised into mental health-related, non-mental health-related, and hospitalisations for self-harm. National Non-Admitted Patient Collection (NNPAC) data were used to identify emergency department attendances.

IPS participants were matched to similar people who did not participate using propensity score matching (Appendix 1) and selected exact-match criteria.[10] Matching variables included a range of variables that could influence selection into IPS and/or the outcomes of interest, including age, gender, level-1 ethnic groups, number of children and age of youngest, neighbourhood deprivation, rural–urban status, past mental health diagnoses and service use, co-occurring health conditions, having a private or commercial driver's licence, previous participation in IPS before the start of the study period, type of benefit received (if any), the percentage of time since age 18 receiving benefit and time spent overseas (see Appendix 2). Matching variables also included the employment, income and transfer, education, justice and health service usage measures listed above derived for a 3-year look-back period (excluding the 2 months immediately prior to referral).

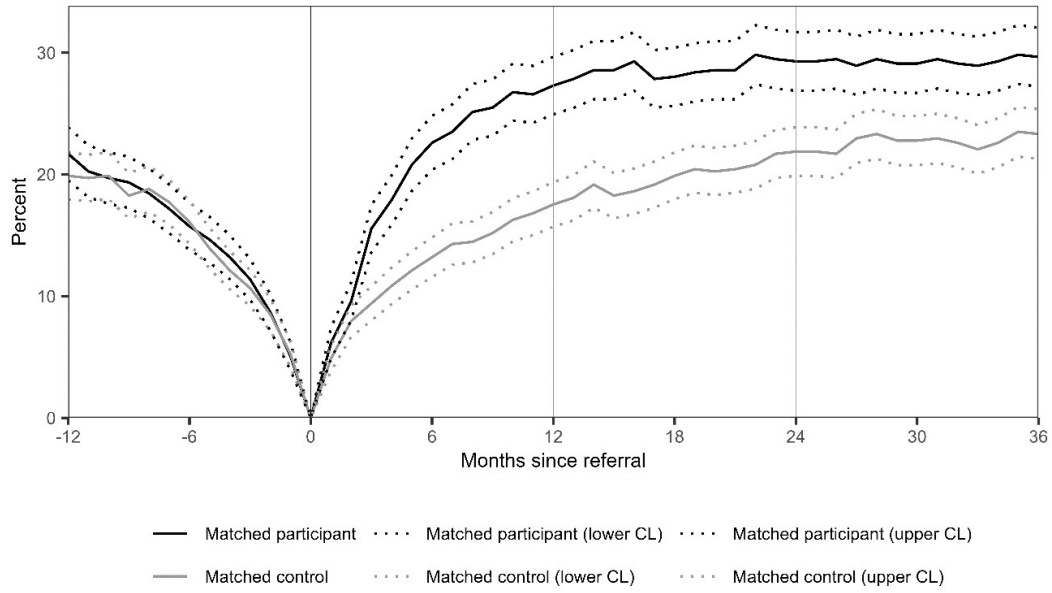
One-to-one nearest neighbour matching on propensity score was used (with replacement so that one non-participant could match with multiple participants), with exact matching on the calendar quarter of referral, broad benefit type, whether the person identified as Māori or Pacific peoples and whether the person's DHB was in Auckland. IPS non-participants were considered a potential match in each calendar quarter they had a face-to-face meeting with a mental health or addiction service.

The "average treatment effect on the treated" was estimated comparing mean outcomes for the matched groups, using a weighted two-sample variance formula.[11] This method accounts for bias caused by repeated matches in matching with replacement. We tested different matching criteria before settling on a caliper width of 0.2 times the pooled standard deviation of the logit of the propensity score, recommended by Austin (2011).[12]

Because we examined multiple outcomes across multiple populations, some estimated effects could be statistically significant by chance. We accounted for this by assessing statistical significance using false discovery rate adjusted q-values.[13]

The study was reviewed by the MSD Research Ethics Panel. This included review of the use of de-identified data for the purposes of the research without specific consent. IDI data access was approved by Stats NZ. Data were accessed from the October 2022 refresh of the IDI. Data were extracted and analysed using SAS Enterprise Guide version 7.1.

Figure 1: Percentage in employment before and after participation, matched IPS participant and control cohorts.



Results

For the 1,839 IPS participants in the study population there were 28,797 people in the same former DHBs who could act as potential controls. Matches could not be found for 9.8% of participants (Appendix 3, Table 1). Those unmatched were dropped from the study population. In total, 1,659 participants were matched to 1,503 controls. Standardised mean differences in propensity scores were all less than 0.25 and variance ratios were between 0.5 and 2, within the range recommended by Rubin (2001).[14]

Appendix 3 Figure 1 shows the common support between the matched samples—propensity scores were almost identically distributed. Characteristics were also similar (Table 1; Appendix 3 Table 2–5), suggesting the matched samples were well balanced. Unmatched participants had higher propensity scores, indicating difficulty finding matches for participants with characteristics that made them very likely to participate. They also had characteristics suggesting higher employment barriers, including being more likely to have a diagnosis of schizophrenia or bipolar disorder, to have been prescribed anti-psychotic medication and to have had mental health-related hospitalisations.

Figure 1 shows monthly employment rates for the matched groups. Matched IPS participants had significantly higher rates of employment than matched controls. The gap was largest after around 1 year and narrowed towards the end of the 3-year follow-up. Effects on employment while on a main benefit were largest in the first year; effects on employment while independent of main benefits were largest in the second year (Appendix 3 Figure 2–3).

Table 1 shows cumulative outcomes in the 3 years post-IPS referral for the matched groups. The IPS group had significantly greater time in employment. They spent almost three more months employed (2.78, 95% CI 1.85, 3.70). Around a third of this was increased employment while on main benefits, with the remainder increased employment while independent of main benefits. Average time on main benefits was not significantly different.

Income from all sources was NZ$4,221 higher for the IPS group (95% CI NZ$899, NZ$7,542). There was an increase of NZ$5,056 in employment income. IPS participants paid NZ$753 more in tax.

The IPS group was more likely to gain a qualification at NQF level 2 or above after starting IPS (2.17 percentage point increase, 95% CI 0.80, 3.54). There was no significant difference in the time spent enrolled in education and training. Differences in time serving corrections sentences were not statistically significant.

The IPS group had more face-to-face contacts with mental health and addiction teams and, as would be expected, more contacts with IPS teams, especially in the 12 months following referral to IPS (Appendix 3 Figure 4 and 5), and more mental health-related inpatient stays and mental health service crisis contacts. Emergency department visits, hospital discharges for self-harm and non-mental health hospitalisations were not significantly different.

Estimated effects for Māori IPS participants were similar in direction and scale to the overall results; while estimated effects on employment, months with face-to-face contacts with mental health and addiction teams, and the percentage with mental health service crisis contacts were significant, other estimates were non-significant, which may reflect the increased uncertainty in estimation due to smaller participant numbers (Table 2).

Effects differed for people who identify as male versus female (Appendix 3 Table 6 and 7). Females had no increase in income from all sources, despite larger estimated effects on employment and employment income than for males. This was due to reduction in net government transfers. Females, but not males, had increased likelihood of having mental health-related inpatient stays and reduced likelihood of having non-mental health-related inpatient stays.

In our sensitivity test, drawing matched controls from areas with no IPS service at the time (and therefore less potential for selection bias), matches could be found for 83% of IPS participants (Appendix 3 Table 1). Results were similar to the main analysis (Appendix 3 Table 8).

Discussion

This paper examined the differences between matched IPS participants and non-participants in employment, income, health, education and justice outcomes in Aotearoa New Zealand.

IPS participants had more employment income, longer employment duration and a higher rate of employment (which reduced over time as employment in the control cohort increased). This is consistent with international evidence.[3,15] IPS participants also had higher total income, after accounting for losses of benefits and other

Table 1: Outcomes over a 36-month follow-up, total cohort.

	Matched participants	Matched controls	Difference in means	Confidence limits
Employment and benefits				
In employment at 12 months (%)	27.31	17.54	9.83**	(6.38, 13.27)
In employment at 24 months (%)	29.29	21.88	7.35**	(3.70, 11.01)
In employment at 36 months (%)	29.66	23.33	6.21**	(2.49, 9.92)
Any employment (months)	9.43	6.65	2.78**	(1.85, 3.70)
Employment on benefit (months)	2.77	1.74	1.03**	(0.61, 1.44)
Employment independent of benefit (months)	6.66	4.91	1.75**	(0.92, 2.58)
Time on main benefit (months)	24.25	23.25	1.01	(-0.21, 2.22)
Income and transfers (NZ$ 2021)				
Net income from all sources	67,568	63,347	4,221*	(899, 7,542)
Net income from employment	22,573	17,517	5,056**	(1,992, 8,120)
Net income from MSD benefits	42,061	41,509	552	(-1,880, 2,984)
Net income from other transfer payments	2,376	3,531	-1,155	(-2,497, 187)
Net tax	-8,509	-7,756	-753*	(-1,382, -124)
Net government transfers (net tax+net income from transfers)	35,928	37,284	-1,355	(-4,360, 1,650)
Justice				
Any corrections sentence (months)	1.65	2.04	-0.39	(-0.91, 0.13)
Custodial sentence (months)	0.21	0.37	-0.16	(-0.35, 0.03)
Study and qualifications				
Enrolled (months)	2.89	2.56	0.33	(-0.16, 0.83)
Gained a qualification	6.51	4.52	1.99	(0.11, 3.87)
Gained at least a level 2 qualification	4.16	1.99	2.17**	(0.80, 3.54)
Gained at least a level 3 qualification	3.98	2.53	1.45	(-0.01, 2.90)
Gained at least a level 4 qualification	2.71	2.71	0.00	(-1.38, 1.38)
Health service usage				
Mental health service face-to-face contact (months)	16.70	12.31	4.39**	(3.34, 5.45)
Mental health service face-to-face contacts (count)	92.26	72.88	19.39*	(4.95, 33.82)

Table 1 (continued): Outcomes over a 36-month follow-up, total cohort.

	Matched participants	Matched controls	Difference in means	Confidence limits
IPS team face-to-face contacts (months)	5.14	0.17	4.97**	(4.70, 5.23)
IPS team face-to-face contacts (count)	11.04	0.36	10.68**	(10.00, 11.37)
Mental health inpatient stay (%)	23.33	17.54	5.79**	(2.41, 9.17)
Mental health inpatient stay (count)	0.70	0.48	0.22*	(0.09, 0.35)
Non-mental health inpatient stay (%)	30.02	31.83	-1.81	(-5.77, 2.16)
Non-mental health inpatient stay (count)	0.93	0.89	0.03	(-0.15, 0.22)
Emergency department visit (%)	57.32	53.89	3.44	(-0.82, 7.69)
Emergency department visit (count)	2.53	2.10	0.43	(-0.03, 0.90)
Hospital discharge for self-harm (%)	8.32	5.79	2.53*	(0.41, 4.66)
Hospital discharge for self-harm (count)	0.23	0.13	0.09	(0.01, 0.18)
Mental health service crisis contact (%)	49.19	38.52	10.67**	(6.47, 14.87)
Mental health service crisis contacts (count)	6.35	4.18	2.17*	(1.20, 3.13)

Note: significance is based on false discovery rate adjusted q-values (*q<0.05, **q<0.01).

Table 2: Outcomes over a 36-month follow-up, Māori participants.

	Matched participants	Matched controls	Difference in means	Confidence limits
Employment and benefits				
In employment at 12 months (%)	24.26	15.38	8.45*	(2.58, 14.31)
In employment at 24 months (%)	23.08	17.16	6.29	(0.32, 12.25)
In employment at 36 months (%)	26.04	21.30	4.72	(-1.67, 11.10)
Any employment (months)	7.66	5.57	2.08*	(0.66, 3.51)
Employment on benefit (months)	2.91	1.88	1.02*	(0.32, 1.72)
Employment independent of benefit (months)	4.76	3.69	1.06	(-0.15, 2.27)
Time on main benefit (months)	27.11	26.05	1.06	(-0.91, 3.02)
Income and transfers (NZ$ 2021)				
Net income from all sources	66,803	63,603	3,187	(-2,365, 8,739)
Net income from employment	16,470	12,477	3,977	(-112, 8,066)
Net income from MSD benefits	47,233	46,415	815	(-3,207, 4,837)
Net income from other transfer payments	3,077	4,753	-1,670	(-4,650, 1,310)

Table 2 (continued): Outcomes over a 36-month follow-up, Māori participants.

	Matched participants	Matched controls	Difference in means	Confidence limits
Net tax	-7,842	-7,136	-703	(-1,483, 76)
Net government transfers (net tax+net income from transfers)	42,468	44,032	-1,559	(-6,835, 3,718)
Justice				
Any corrections sentence (months)	2.68	3.10	-0.42	(-1.56, 0.71)
Custodial sentence (months)	0.50	0.72	-0.23	(-0.76, 0.31)
Study and qualifications				
Enrolled (months)	2.78	2.14	0.64	(-0.16, 1.44)
Gained a qualification	6.51	2.96	3.54	(0.45, 6.62)
Gained at least a level 2 qualification	4.73	2.37	2.36	(-0.29, 5.01)
Gained at least a level 3 qualification	4.14	1.78	2.16	(-0.20, 4.52)
Gained at least a level 4 qualification	2.37	1.18	1.18	(-0.71, 3.07)
Health service usage				
Mental health service face-to-face contact (months)	18.18	14.18	3.98**	(2.09, 5.86)
Mental health service face-to-face contacts (count)	110.34	91.81	18.46	(-9.12, 46.04)
IPS team face-to-face contacts (months)	4.58	0.29	4.27**	(3.82, 4.73)
IPS team face-to-face contacts (count)	9.29	0.58	8.68**	(7.56, 9.79)
Mental health inpatient stay (%)	29.59	24.85	4.52	(-2.20, 11.24)
Mental health inpatient stay (count)	0.91	0.70	0.17	(-0.05, 0.40)
Non-mental health inpatient stay (%)	29.59	30.18	-0.79	(-7.79, 6.22)
Non-mental health inpatient stay (count)	0.75	0.91	-0.14	(-0.36, 0.09)
Emergency department visit (%)	61.54	57.99	3.93	(-3.58, 11.44)
Emergency department visit (count)	2.48	2.23	0.23	(-0.36, 0.82)
Hospital discharge for self-harm (%)	8.28	5.92	2.16	(-1.68, 6.00)
Hospital discharge for self-harm (count)	0.16	0.09	0.07	(-0.02, 0.16)
Mental health service crisis contact (%)	54.44	44.38	10.22*	(2.63, 17.80)
Mental health service crisis contacts (count)	6.06	5.92	0.09	(-2.01, 2.18)

Note: significance is based on false discovery rate adjusted q-values (*q<0.05, **q<0.01).

transfers and taxes, and gained more qualifications. Few previous studies have examined effects on these outcomes.[3,7] Total income was not higher for females, however, because higher employment income was offset by lower transfer income. This result is concerning because income support policy aims to ensure income is higher in employment if people receive the in-work benefits and other transfers they can qualify for. It suggests a need to strengthen benefits counselling, and/or improve design and delivery of income support.

Actively looking for work brings stresses that may increase the need for mental health support,[16] as might trying out jobs to see if they fit.[17] IPS is intentionally designed to support mental health and employment needs together, recognising these potential stressors. An increase in mental health support in the transition to employment is a function of the programme design. On average, we find that IPS participants had similar levels of previous face-to-face contacts with mental health and addiction teams. In the follow-up they had more face-to-face contacts, mental health-related inpatient stays and crisis contacts. One possible interpretation is that this reflects IPS operating to increase engagement with mental health and addiction treatment and care in the transition to employment, resulting in people being more readily able to access needed services, and/or clinicians engaging more proactively with IPS participants. That females but not males had a higher likelihood of having mental health-related inpatient stays may reflect the additional stressors that transitioning to employment brings when people have primary care of children and/or flow on effects of the lack of income gain for females suggested by our results.

Another possible explanation is that the results partly reflect uncontrolled selection effects whereby people with greater need for mental health and addiction services were more likely to be referred to and participate in IPS. Overall, our findings do not show strong support for this explanation, with the matched IPS and control groups having broadly similar levels of prior mental health and addiction service use.

A limitation of this study is that we were not able to measure mental health directly. Evidence on the effects of IPS participation on mental health symptoms and broader wellbeing is limited. One RCT reported no substantive effects on psychiatric symptoms or self-reported quality of life despite IPS participants having more contacts with mental health services than the control group, and more use of emergency care and psychiatric evaluation.[18] Meta-analysis of the few studies with results for quality of life, global functioning and mental health suggests positive effects, but with confidence intervals that include the null, and heterogeneity between studies.[8] However, maintaining employment is a good marker for functional recovery. Research to better understand the interactions between IPS, engagement with mental health and addiction services, and mental health and quality of life would enhance knowledge of recovery and broader wellbeing.[3,8,19]

As far as we are aware, no previous studies have examined efficacy and effectiveness of IPS for Indigenous peoples. Despite increased uncertainty in the estimation due to smaller participant numbers, we find significant increases in employment and two measures showing increased mental health service engagement for Māori. Positive effects on employment are notable given the high levels of labour market and mental health disadvantage.[4,20,21] For Māori wellbeing, sustainable employment and economic prosperity and security sit alongside a range of culturally-valued aspirations, ways of working and outcomes.[22] While our results suggest that IPS provides effective employment support for Māori, further research is needed to identify, and support strengthening of, the cultural principles underpinning implementation for Māori.[23,24] Estimated programme effects for IPS compare favourably with those for other employment assistance.[25] However, it is not possible to compare effectiveness of IPS with that of programmes for which impact evaluation evidence is sparse, including Kaupapa Māori initiatives.

Our results show that people with mental health conditions and problematic substance use who receive employment support made available together with mental health and addiction treatment have more employment, gains in qualifications and more independent income when compared with similar people who do not receive this support. These are outcomes that many people affected by mental health conditions and problematic substance say they want.[4] Expanding access to evidence-based integrated employment support has been recommended in several reports,[4,22,26–27] including a 2023 framework that identifies integrated employment support as a core component to be offered through secondary mental health and addiction services.[27] Despite recent expansion, IPS is not available in all regions, and is not available at sufficient

levels to meet demand in others, with limited availability in addiction services.[6,7] To achieve national scale-up, a sustainable cross-government funding stream for IPS programmes, national and local-level co-ordination, and implementation support systems would be needed.[28]

A particular strength of our study was the ability to examine outcomes across a range of domains beyond employment using linked administrative data. These data allowed a longitudinal perspective, avoided non-response and recall bias, and provided a comprehensive sample of the population of interest. Despite this, sample size was not large enough to examine impacts for Pacific peoples or other policy-relevant subgroups. Recent expansions of IPS means that numbers will be large enough to include these subgroups in future, and to examine newer services. These have had more implementation support to improve fidelity to IPS evidence-based practices. Positive impacts on employment may be larger as a result.

Without an experimental design, this study is subject to potential bias from unobserved factors that influence selection into IPS. These could include caring responsibilities, motivation, employment preferences and experiences of colonisation, trauma and discrimination that may affect engagement with government programmes. Nonetheless, quasi-experimental designs are a useful tool when RCTs are not available, and results from propensity score matching can replicate RCTs.[29]

A further limitation is that matches could not be found for 9.8% of IPS participants overall and 12.4% of Māori participants. Unmatched participants were more likely to have a diagnosis of schizophrenia or bipolar disorder, to have been prescribed anti-psychotic medication and to have had mental health-related hospitalisations than matched participants. Meta-analysis of RCTs shows that IPS is effective in increasing employment irrespective of diagnostic, clinical, functional and personal characteristics. The effect also appears to be greatest for populations with diagnoses of mental health conditions such as schizophrenia and bipolar disorder, and for those with lower symptom severity independent of diagnosis.[30] This suggests that IPS would have positive effects for unmatched participants, but it remains uncertain whether those effects would be larger or smaller than those for matched participants.

This investigation suggests IPS supports employment and improves income and qualifications for people in contact with Aotearoa New Zealand mental health and addiction services. Combined with international evidence, this suggests that expanded IPS availability would be beneficial. More research to understand the effects on mental health symptoms and broader wellbeing and support of cultural responsiveness is needed, alongside repeated impact evaluation.

COMPETING INTERESTS
Wilson and Gray are employed by agencies that fund IPS. Lockett is employed by a non-government organisation that is associated with organisations that deliver IPS and IPS implementation support.
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Disclaimer: These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI), which is carefully managed by Stats NZ. For more information about the IDI please visit https://www.stats.govt.nz/integrated-data/. The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the *Tax Administration Act 1994* for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes and is not related to the data's ability to support Inland Revenue's core operational requirements. The views, opinions, findings and recommendations expressed in this report are those of the authors. They do not necessarily reflect the views of the Ministry of Social Development, or people involved in the peer review process. Any errors or omissions are our own.

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REFERENCES
1. Blakely T, Sigglekow F, Irfan M, et al. Disease-related income and economic productivity loss in New Zealand: A longitudinal analysis of linked individual-level data. PLoS Med. 2021;30(11);18:e1003848. doi: 10.1371/journal.pmed.1003848.
2. Gibb S, Brewer N, Bowden N. Social impacts and costs of schizophrenia: a national cohort study using New Zealand linked administrative data. N Z Med J. 2021;134(1537):66-83.
3. Drake RE, Bond GR. Individual placement and support: history, current status, and future directions. PCN Rep. 2023;2(3):e122. doi: 10.1002/pcn5.122.
4. He Ara Oranga. He Ara Oranga: Report of the Government Inquiry into Mental Health and Addiction [Internet]. NZ: He Ara Oranga; 2018 [cited 2023 Oct]. Available from: www.mentalhealth.inquiry.govt.nz/inquiry-report
5. Morgan VA, Waterreus A, Carr V, et al. Responding to challenges for people with psychotic illness: Updated evidence from the Survey of High Impact Psychosis. Aust N Z J Psychiatry. 2017;51(2):124-140. doi: 10.1177/0004867416679738.
6. Cram F, Jury S, Kokaua J, et al. Individual Placement and Support (IPS) in Aotearoa New Zealand – new insights from linked administrative data [Internet]. Wellington (NZ): Ministry of Social Development; 2020 [cited 2023 Oct]. Available from: https://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/research/individual-placement-and-support/ips-new-findings-report.pdf
7. WorkCounts. IPS in New Zealand [Internet]. Hamilton (NZ): WorkCounts; date unknown [cited 2023 Oct]. Available from: https://www.workcounts.co.nz/ips-in-new-zealand/

8. Frederick DE, VanderWeele TJ. Supported employment: meta-analysis and review of randomized controlled trials of individual placement and support. PLoS One. 2019;14(2):e0212208. doi: 10.1371/journal.pone.0212208.
9. Milne BJ, Atkinson J, Blakely T, et al. Data resource profile: the New Zealand Integrated Data Infrastructure (IDI). Int J Epidemiol. 2019;48(3):677-677e. doi: 10.1093/ije/dyz014.
10. Rosenbaum PR, Rubin DB. The central role of the propensity score in observational studies for causal effects. Biometrika. 1983;70(1):41-55. doi: 10.1093/biomet/70.1.41.
11. Hill J, Reiter JP. Interval estimation for treatment effects using propensity score matching. Stat Med. 2006;25(13):2230-56. doi: 10.1002/sim.2277.
12. Austin PC. An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies. Multivariate Behav Res. 2011;46(3):399-424. doi: 10.1080/00273171.2011.568786.
13. Benjamini Y, Krieger A, Yekutieli D. Adaptive linear step-up procedures that control the false discovery rate. Biometrika. 2006;93(3):491-507.
14. Rubin DB. Using propensity scores to help design observational studies: application to the tobacco litigation. Health Serv Outcomes Res Methodol. 2001;2(3):169-188. doi: 10.1023/A:1020363010465.
15. Pichler EM, Stulz N, Wyder L, et al. Long-term effects of the Individual Placement and Support intervention on employment status: 6-year follow-up of a randomized controlled trial. Front Psychiatry. 2021;12:709732. doi: 10.3389/fpsyt.2021.709732.
16. Virgolino A, Costa J, Santos O, et al. Lost in transition: a systematic review of the association between unemployment and mental health. J Ment Health. 2022;31(3):432-444. doi: 10.1080/09638237.2021.2022615.
17. Sonnentag S, Tay L, Nesher Shoshan H. A review on health and well-being at work: more than stressors and strains. Pers Psychol. 2023;76:473-510. doi: 10.1111/peps.12572.
18. Gold PB, Meisler N, Santos AB, et al. Randomized trial of supported employment integrated with assertive community treatment for rural adults with severe mental illness. Schizophr Bull. 2006;32(2):378-95. doi: 10.1093/schbul/sbi056.
19. Lockett H, Waghorn G, Kydd R. A framework for improving the effectiveness of evidence-based practices in vocational rehabilitation. J Vocat Rehabil. 2018;49(1):15-31. doi: 10.3233/JVR-180951.
20. Cunningham R, Kvalsvig A, Peterson D, et al. Stocktake report for the Mental Health and Addiction Inquiry - A background report prepared for the Inquiry panel [Internet]. Wellington (NZ): EleMent Research Group, University of Otago Wellington; 2018 [cited 2023 Oct]. Available from: https://mentalhealth.inquiry.govt.nz/assets/Summary-reports/Otago-stocktake.pdf
21. OECD. Mental health and work: New Zealand. Paris (FR): OECD Publishing; 2018. doi: 10.1787/9789264307315-en.
22. Inquiry into Mental Health and Addiction. Oranga Tāngata, Oranga Whānau: A Kaupapa Māori Analysis of Consultation with Māori for the Government Inquiry into Mental Health and Addiction. Wellington (NZ): Department of Internal Affairs; 2019 [cited 2023 Oct]. Available from: https://mentalhealth.inquiry.govt.nz/assets/Uploads/Summary-of-submissions-featuring-Maori-voice.pdf
23. Fadyl J, Levack W, Anstiss D, et al. Support for gaining paid work for people living with a long-term condition: Systematic literature review. Summary of findings [Internet]. Auckland (NZ) AUT Centre for Person Centred Research; 2020 [cited 2023 Oct]. Available from: https://cpcr.aut.ac.nz/__data/assets/pdf_file/0006/376071/Summary_LTC_GainWork.pdf
24. Priest B, Lockett H. Working at the interface between science and culture: The enablers and barriers to individual placement and support implementation in Aotearoa/New Zealand. Psychiatr Rehabil J. 2020;43(1):40-52. doi: 10.1037/prj0000388.
25. MSD. Employment Assistance Evidence Catalogue [Internet]. Wellington (NZ): Ministry of Social Development; date unknown [cited 2023 Oct]. Available from: https://ea.analytics.msd.govt.nz/
26. MSD. Working matters: an action plan to ensure disabled people and people with health conditions have an equal opportunity to access employment [Internet]. Wellington (NZ): Ministry of Social Development; 2020 [cited 2023 Oct]. Available from: https://msd.govt.nz/what-we-can-do/disability-services/disability-employment-action-plan/
27. Ministry of Health – Manatū Hauora. Oranga hinengaro system and service framework [Internet]. Wellington (NZ): Ministry of Health – Manatū Hauora; 2023 [cited 2023 Oct]. Available from: https://www.health.govt.nz/publication/oranga-hinengaro-system-and-service-framework
28. Lockett H, Waghorn G, Kydd R. Policy barriers to evidence-based practices in vocational rehabilitation for people with psychiatric disabilities in New Zealand. Work. 2018;60(3):421-

435. doi: 10.3233/WOR-182752.
29. Wang SV, Schneeweiss S; RCT-DUPLICATE Initiative. Emulation of randomized clinical trials with nonrandomized database analyses: results of 32 clinical trials. JAMA. 2023;329(16):1376-1385. doi: 10.1001/jama.2023.4221.
30. de Winter L, Couwenbergh C, van Weeghel J, et al. Who benefits from individual placement and support? A meta-analysis. Epidemiol Psychiatr Sci. 2022;31:e50. doi: 10.1017/S2045796022000300.

Appendices

Appendix 1: Propensity score matching

The probability of IPS participation was estimated as follows:

$Pr(I_i=1 \mid Z_i)=\Phi(\beta_0+\beta_1 Z_i)$

Where $I_i=1$ if the person participated in IPS, and 0 if not; Z_i was a vector of observed characteristics that could predict treatment (IPS participation) and $\Phi(.)$ was the cumulative standard normal distribution function. Using the estimated betas from the first stage, a propensity score for the sample who did not participate in IPS was calculated.

Appendix 2: Derivation of selected matching variables

Demographics

Age (18–24, 25–34, 35–44, 45–54, 55–62 years), gender (male/female) (numbers were too low to include the "another gender" group) and ethnicity were sourced from the personal detail table in the IDI. Ethnicity was recorded in total response format (so an individual can identify with more than one ethnic group) and, for this study, restricted to Level 1 groupings (European, Māori, Pacific peoples, Asian, Middle Eastern, Latin American and African [MELAA] and other). The number of children and age of youngest child were derived from birth records from the Department of Internal Affairs (DIA) and MSD benefit data.

Neighbourhood deprivation

Address notification data were used to identify meshblock of residence and the corresponding New Zealand Index of Deprivation 2018 (NZDep 2018) score.[1] Deprivation scores were collapsed into deciles, with 1 representing the least deprived and 10 the most deprived.

Rural–urban status

Address notification data was also used to identify rural or urban location. Urban areas were further classified by population size (small urban areas with a population of at least 1,000 and up to 10,000, medium to large urban areas with a population of at least 10,000 and up to 100,000 and major urban areas with a population of at least 100,000).

Mental health diagnoses and service use

PRIMHD data were used to flag whether there was a diagnosis recorded in that data source. Diagnosis data in PRIMHD are known to be of varying quality and completeness, with the proportion of clients with a diagnosis recorded at the time of their activity showing wide variation across health regions and across teams within health regions. Previous analysis showed the likelihood of mental health diagnoses being recorded was positively associated with IPS participation.[2] To avoid potential for bias that would occur if this relationship was causal, we only considered diagnoses recorded in PRIMHD more than 6 months prior to IPS commencing. The presence or absence of selected diagnoses was derived from International Classification of Disease (ICD) codes (schizophrenia, bipolar affective disorder, other non-organic psychosis, alcohol or drug use, or any mental health diagnosis). In addition, diagnoses recorded on medical certificates completed by medical practitioners for welfare benefit purposes were used to identify the presence or absence of the selected diagnoses.

A count of inpatient bed nights was calculated using PRIMHD data. These included the following activity type codes: T02, T03, T04, T05, T11, T12, T13, T14, T16, T20, T21. A count of months receiving mental health and addiction services (counted as any face-to-face contact) and the number of crisis contacts in the last 3 years was calculated using PRIMHD data, as was the number of days since the most recent face-to-face contact.

Pharmaceutical collection data from the Ministry of Health – Manatū Hauora was used to identify any prescriptions issued in the previous 3 years for anti-depressant or anti-psychotic medications.

Co-occurring health conditions

These were identified using the Elixhauser standards, adapted to include the primary diagnosis. ICD codes for hospital events were used to determine presence or absence of conditions that have been shown to be associated with reduced income and/or employment.[3] The number of such conditions were identified for each individual, as was the number of non-mental health-related conditions recorded from medical certificates for benefit purposes.

Other matching variables

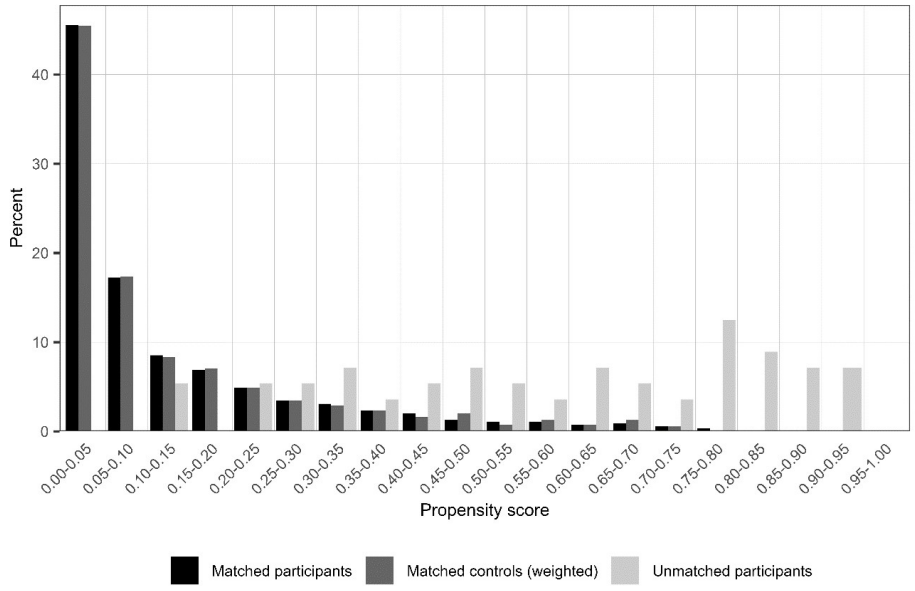
Several other variables were used in the matching, including whether the individual held a private or commercial driver licence, whether the individual had ever participated in IPS before the start of the study period, the type of benefit the person received (if any), the percentage of time since age 18 that the individual had received a benefit and any time spent overseas.

APPENDIX 2 REFERENCES

1. Atkinson J, Salmond C, Crampton P. NZDep2018 Index of Deprivation [Internet]. Wellington (NZ): Department of Public Health, University of Otago; 2020 [cited 2023 Oct]. Available from: https://www.otago.ac.nz/wellington/otago823833.pdf
2. Cram F, Jury S, Kokaua J, et al. Individual Placement and Support (IPS) in Aotearoa New Zealand – new insights from linked administrative data [Internet]. Wellington (NZ): Ministry of Social Development; 2020 [cited 2023 Oct]. Available from: https://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/research/individual-placement-and-support/ips-new-findings-report.pdf
3. Elixhauser A, Steiner C, Harris DR, Coffey RM. Comorbidity measures for use with administrative data. Med Care. 1998;36(1):8-27. doi: 10.1097/00005650-199801000-00004.

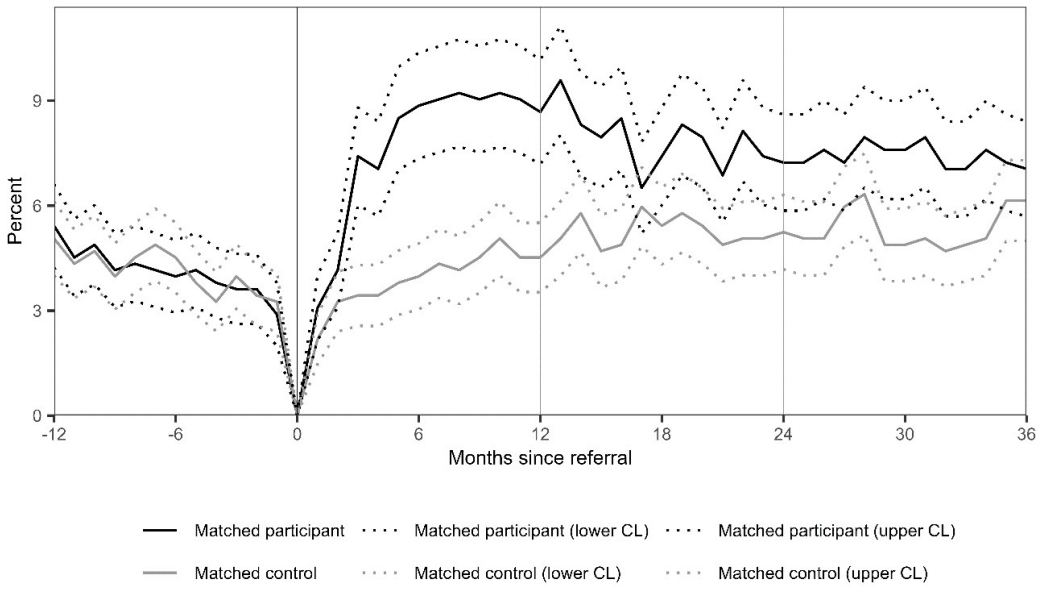
Appendix 3: Other results

Appendix 3 Figure 1: Distribution of propensity scores for matched and un-matched participants, and matched control cohort (weighted to the matched participant population).

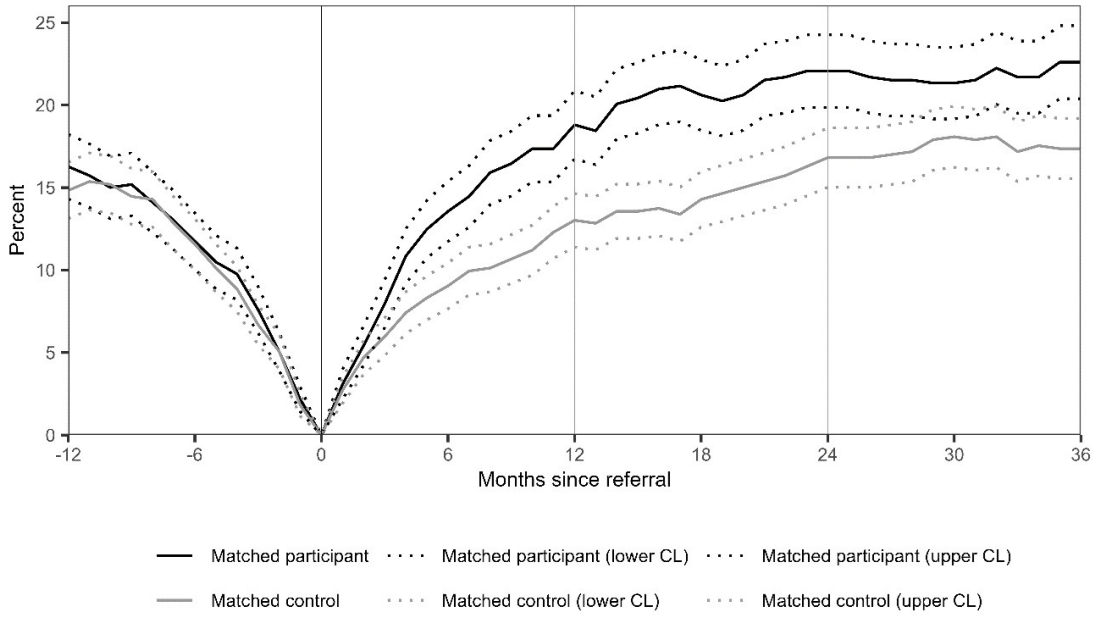


Note: weighting accounts for some non-participants being matched to more than one participant.

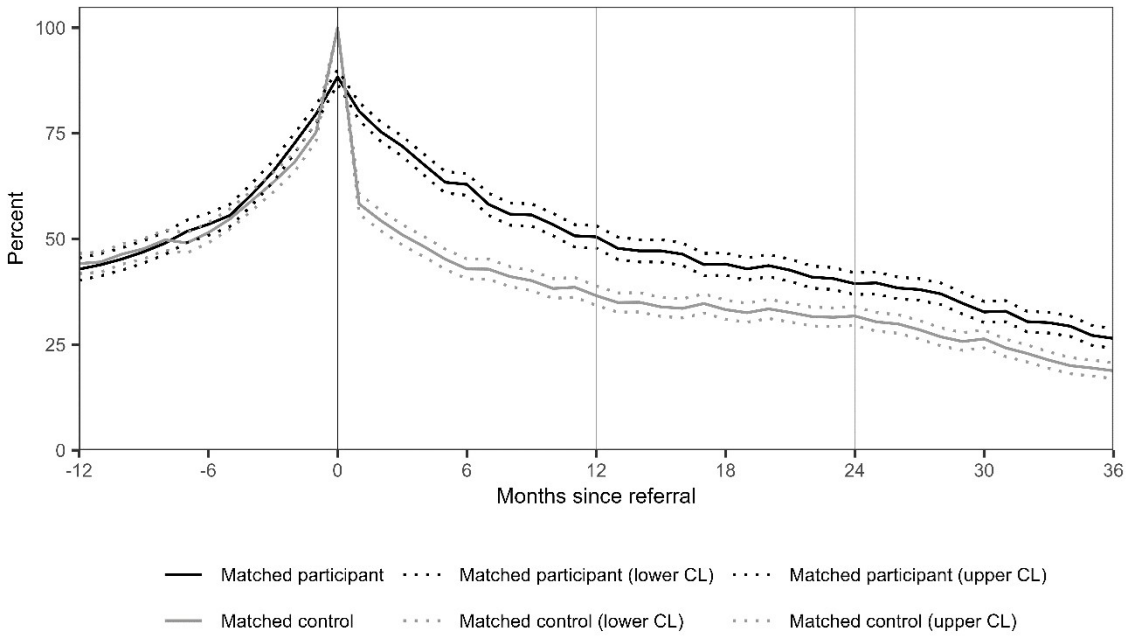
Appendix 3 Figure 2: Percentage in employment and receiving a main benefit before and after participation, matched IPS participant and control cohorts.



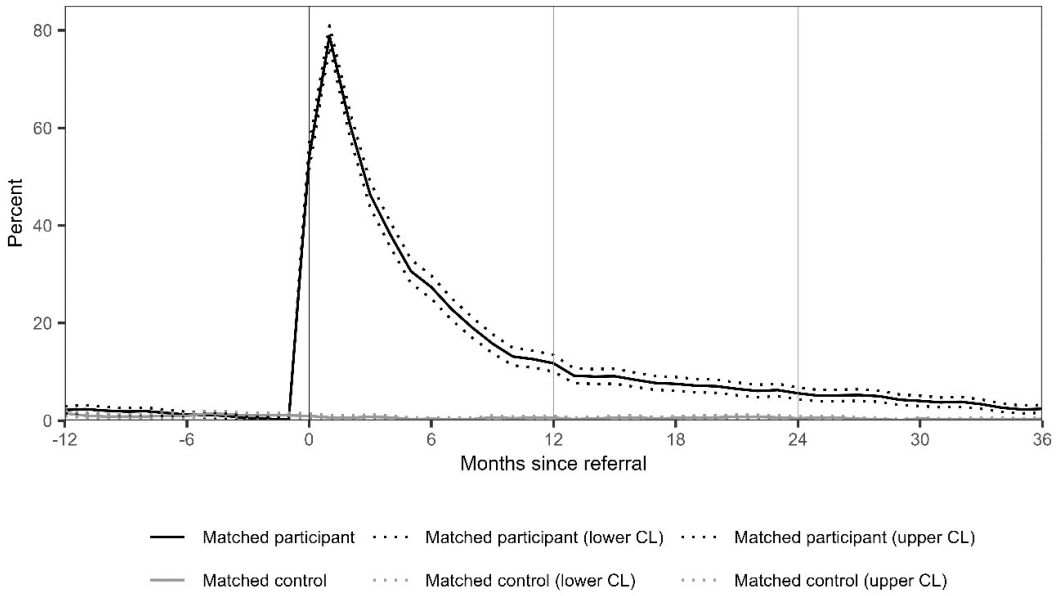
Appendix 3 Figure 3: Percentage in employment and not receiving a main benefit before and after participation, matched IPS participant and control cohorts.



Appendix 3 Figure 4: Percentage with a face-to-face activity with a mental health team before and after participation, matched IPS participant and control cohorts.



Appendix 3 Figure 5: Percentage with a face-to-face activity with an IPS team before and after participation, matched IPS participant and control cohorts.



Note: the very low but non-zero face-to-face activity with an IPS team among the matched control cohort represents cases where a person spent some time in another DHB with IPS (outside of the five IPS DHBs examined here) and had IPS contact in that DHB.

Appendix 3 Table 1: Match rates, total participant population and sub-populations.

	Total participants	Matched participants	Matched controls	Percent of participants matched
All participants	1,839	1,659	1,503	90.2
Māori participants	579	507	468	87.6
Female participants	801	669	621	83.5
Male participants	1,038	876	801	84.4
Matching with non-IPS areas	1,839	1,527	1,398	83.0

Note: matched female and male sub-populations do not sum to the total matched counts because matching was conducted afresh for each of the sub-groups to ensure samples matched on gender.

Appendix 3 Table 2: Socio-demographic profile of IPS cohort and matched control cohort, total cohort.

Characteristic	Matched participant (%)	Matched control, weighted (%)	Unmatched participant (%)
Female	**44.4**	**43.5**	**38.3**
Age at participation			
18–24 years old	24.6	24.3	25.0
25–34 years old	24.3	23.9	28.3
35–44 years old	23.6	24.8	25.0
45–54 years old	19.9	20.3	16.7
55–62 years old	8.0	7.1	5.0
One or more children	25.0	27.4	25.0
Living in Auckland	38.2	38.2	55.0
New Zealand Index of Deprivation (NZDep)			
Deciles 1–2 (least deprived)	6.5	7.1	8.3
Deciles 3–4	10.5	11.2	13.3
Deciles 5–6	15.6	14.3	15.0
Deciles 7–8	25.9	26.1	26.7
Deciles 9–10 (most deprived)	39.1	38.2	38.3
Māori ethnicity	31.0	31.0	40.0
Pacific peoples ethnicity	8.0	8.0	21.7
European ethnicity	73.7	74.6	66.7
Asian ethnicity	8.5	8.9	11.7
MELAA ethnicity	2.9	2.9	0.0
Received a main benefit in past month	80.3	80.6	80.0
Received Supported Living Payment	27.0	26.8	25.0
Received Jobseeker Support—Health and Disability	38.9	38.4	45.0
In education or training in month before participation	7.4	7.8	5.0
Served a community sentence in past 3 years	28.8	29.2	26.7
Served a prison sentence in past 3 years	13.0	14.7	13.3
One or more offences committed in past 3 years	41.5	41.7	55.0

Appendix 3 Table 2 (continued): Socio-demographic profile of IPS cohort and matched control cohort, total cohort.

Services in past 3 years			
Prescribed anti-depressant medication	56.7	58.0	76.7
Prescribed anti-psychotic medication	54.9	55.1	98.3
Schizophrenia diagnosis in PRIMHD	16.1	15.2	45.0
Bipolar disorder diagnosis in PRIMHD	17.2	16.7	28.3
Substance use disorder diagnosis in PRIMHD	7.2	7.1	30.0
Four or more crisis contacts with mental health service	66.7	65.2	90.0
Any mental health diagnosis in PRIMHD	58.0	55.3	95.0
One or more mental health-related hospitalisations	33.2	31.7	65.0
One or more non-mental health-related hospitalisations	33.3	34.2	31.7
One or more self-harm related hospitalisations	8.3	7.6	10.0
One or more emergency department visits	58.9	60.3	68.3
Population (n)	1,656	1,656	180

Note: weighting accounts for some non-participants being matched to more than one participant.

Appendix 3 Table 3: Profile of matched IPS participant and control cohorts, Māori participants.

Characteristic	Matched participant (%)	Matched control (weighted %)
Female gender	41.8	43.8
Age at participation		
18–24 years old	24.7	24.3
25–34 years old	27.6	25.4
35–44 years old	24.1	27.8
45–54 years old	17.6	17.8
55–62 years old	5.9	4.1
One or more children	32.4	33.7
Living in Auckland	28.2	27.8
New Zealand Index of Deprivation (NZDep)		
Deciles 1–2 (least deprived)	2.4	4.1
Deciles 3–4	5.3	4.1
Deciles 5–6	10.0	14.8

Appendix 3 Table 3 (continued): Profile of matched IPS participant and control cohorts, Māori participants.

Deciles 7–8	25.9	26.0
Deciles 9–10 (most deprived)	52.9	46.7
Māori ethnicity	100.0	100.0
Pacific peoples ethnicity	7.6	7.7
European ethnicity	52.9	49.7
Asian ethnicity	1.8	3.6
MELAA ethnicity	2.4	3.6
Received a main benefit in past month	87.6	87.6
Received Supported Living Payment	34.1	34.3
Received Jobseeker Support—Health and Disability	36.5	33.7
In education or training in past month	7.1	5.9
Served a community sentence in past 3 years	42.4	47.3
Served a prison sentence in past 3 years	21.8	23.1
One or more offences committed in past 3 years	55.3	58.6
Services in past 3 years		
Prescribed anti-depressant medication	44.1	43.2
Prescribed anti-psychotic medication	60.6	60.4
Schizophrenia diagnosis in PRIMHD	21.2	26.0
Bipolar disorder diagnosis in PRIMHD	19.4	20.1
Substance use disorder diagnosis in PRIMHD	8.2	8.9
Four or more crisis contacts with mental health service	69.4	70.4
Any mental health diagnosis in PRIMHD	59.4	59.2
One or more mental health-related hospitalisations	38.8	41.4
One or more non-mental health-related hospitalisations	32.9	34.9
One or more self-harm related hospitalisations	8.2	10.1
One or more emergency department visits	62.4	66.9
Population (n)	510	510

Note: weighting accounts for some non-participants being matched to more than one participant.

Appendix 3 Table 4: Profile of matched IPS participant and control cohorts, those identifying as female.

Characteristic	Matched participant (%)	Matched control (weighted %)
Female gender	100.0	100.0
Age at participation		
18–24 years old	22.8	24.2
25–34 years old	22.8	23.8
35–44 years old	22.3	21.5
45–54 years old	22.3	22.9
55–62 years old	8.9	7.6
One or more children	30.4	32.7
Living in Auckland	37.9	37.7
New Zealand Index of Deprivation (NZDep)		
Deciles 1–2 (least deprived)	7.6	9.0
Deciles 3–4	11.2	11.7
Deciles 5–6	15.6	17.0
Deciles 7–8	25.9	28.7
Deciles 9–10 (most deprived)	36.6	32.3
Māori ethnicity	28.6	28.7
Pacific peoples ethnicity	6.7	6.7
European ethnicity	76.3	78.0
Asian ethnicity	9.8	9.9
MELAA ethnicity	1.8	2.2
Received a main benefit in past month	75.9	76.2
Received Supported Living Payment	21.0	21.1
Received Jobseeker Support—Health and Disability	36.2	35.4
In education or training in past month	9.4	10.8
Served a community sentence in past 3 years	16.1	17.5
Served a prison sentence in past 3 years	5.4	5.8
One or more offences committed in past 3 years	30.4	31.4

Appendix 3 Table 4 (continued): Profile of matched IPS participant and control cohorts, those identifying as female.

Services in past 3 years		
Prescribed anti-depressant medication	63.4	63.2
Prescribed anti-psychotic medication	47.3	50.7
Schizophrenia diagnosis in PRIMHD	8.0	9.0
Bipolar disorder diagnosis in PRIMHD	16.5	16.1
Substance use disorder diagnosis in PRIMHD	6.3	5.8
Four or more crisis contacts with mental health service	64.7	64.6
Any mental health diagnosis in PRIMHD	55.8	56.1
One or more mental health-related hospitalisations	31.7	30.5
One or more non-mental health-related hospitalisations	39.7	42.2
One or more self-harm related hospitalisations	11.6	12.1
One or more emergency department visits	61.6	63.2
Population (n)	672	672

Note: weighting accounts for some non-participants being matched to more than one participant.

Appendix 3 Table 5: Profile of matched IPS participant and control cohorts, those identifying as male.

Characteristic	Matched participant (%)	Matched control (weighted %)
Female gender	0.0	0.0
Age at participation		
18–24 years old	26.1	27.1
25–34 years old	25.1	23.7
35–44 years old	23.4	23.0
45–54 years old	18.2	18.6
55–62 years old	7.9	7.6
One or more children	20.6	23.0
Living in Auckland	37.8	37.8
New Zealand Index of Deprivation (NZDep)		
Deciles 1–2 (least deprived)	5.8	4.5
Deciles 3–4	10.3	9.6
Deciles 5–6	14.4	15.1

Appendix 3 Table 5 (continued): Profile of matched IPS participant and control cohorts, those identifying as male.

Deciles 7–8	25.4	26.1
Deciles 9–10 (most deprived)	41.6	40.5
Māori ethnicity	32.0	32.0
Pacific peoples ethnicity	7.9	8.2
European ethnicity	71.1	71.5
Asian ethnicity	6.9	7.2
MELAA ethnicity	3.8	3.1
Received a main benefit in past month	83.5	83.8
Received Supported Living Payment	30.6	30.6
Received Jobseeker Support—Health and Disability	41.2	42.6
In education or training in past month	6.2	5.5
Served a community sentence in past 3 years	39.9	39.5
Served a prison sentence in past 3 years	20.3	19.9
One or more offences committed in past 3 years	51.9	51.2
Services in past 3 years		
Prescribed anti-depressant medication	49.5	50.5
Prescribed anti-psychotic medication	56.0	55.0
Schizophrenia diagnosis in PRIMHD	19.2	21.0
Bipolar disorder diagnosis in PRIMHD	16.5	17.2
Substance use disorder diagnosis in PRIMHD	7.9	7.6
Four or more crisis contacts with mental health service	66.3	63.9
Any mental health diagnosis in PRIMHD	56.4	54.6
One or more mental health-related hospitalisations	32.0	30.6
One or more non-mental health-related hospitalisations	27.1	25.8
One or more self-harm related hospitalisations	6.2	6.2
One or more emergency department visits	55.7	57.7
Population (n)	873	873

Note: weighting accounts for some non-participants being matched to more than one participant.

Appendix 3 Table 6: Outcomes over a 36-month follow-up, those identifying as female.

	Matched participants	Matched controls	Difference in means	Confidence limits
Employment and benefits				
In employment at 12 months (%)	29.15	15.70	13.58**	(8.56, 18.60)
In employment at 24 months (%)	31.39	21.97	9.40**	(3.94, 14.86)
In employment at 36 months (%)	31.84	24.66	7.01*	(1.40, 12.63)
Any employment (months)	10.03	6.59	3.43**	(2.04, 4.83)
Employment on benefit (months)	3.10	1.82	1.28**	(0.69, 1.87)
Employment independent of benefit (months)	6.93	4.77	2.15**	(0.89, 3.41)
Time on main benefit (months)	23.06	24.42	-1.36	(-3.17, 0.46)
Income and transfers (NZ$ 2021)				
Net income from all sources	68,980	69,331	-351	(-5,669, 4,966)
Net income from employment	21,840	14,783	7,047**	(2,901, 11,192)
Net income from MSD benefits	42,635	47,502	-4,860*	(-8,861, -860)
Net income from other transfer payments	3,564	6,022	-2,454	(-5,212, 303)
Net tax	-8,312	-7,674	-637	(-1,469, 196)
Net government transfers (net tax+net income from transfers)	37,887	45,850	-7,951**	(-13,150, -2,753)
Justice				
Any corrections sentence (months)	0.91	1.12	-0.21	(-0.71, 0.30)
Custodial sentence (months)	0.03	0.06	-0.03	(-0.11, 0.05)
Study and qualifications				
Enrolled (months)	3.90	3.49	0.41	(-0.41, 1.23)
Gained a qualification	8.52	5.83	2.84	(-0.28, 5.95)
Gained at least a level 2 qualification	5.83	3.14	2.54	(0.10, 4.98)
Gained at least a level 3 qualification	5.38	3.59	1.64	(-0.84, 4.12)
Gained at least a level 4 qualification	4.04	3.59	0.30	(-2.08, 2.68)
Health service usage				
Mental health service face-to-face contact (months)	15.69	11.43	4.26**	(2.78, 5.74)
Mental health service face-to-face contacts (count)	87.85	67.57	20.25	(-0.94, 41.45)

Appendix 3 Table 6 (continued): Outcomes over a 36-month follow-up, those identifying as female.

IPS team face-to-face contacts (months)	5.38	0.14	5.23**	(4.80, 5.67)
IPS team face-to-face contacts (count)	11.72	0.30	11.41**	(10.29, 12.53)
Mental health inpatient stay (%)	21.52	15.70	6.27**	(1.46, 11.08)
Mental health inpatient stay (count)	0.61	0.43	0.15**	(-0.05, 0.36)
Non-mental health inpatient stay (%)	35.43	43.95	-8.06*	(-14.24, -1.88)
Non-mental health inpatient stay (count)	1.25	1.51	-0.19	(-0.58, 0.19)
Emergency department visit (%)	58.30	59.64	-1.19	(-7.40, 5.01)
Emergency department visit (count)	3.08	2.74	0.32	(-0.54, 1.17)
Hospital discharge for self-harm (%)	9.42	8.52	0.75	(-2.85, 4.34)
Hospital discharge for self-harm (count)	0.32	0.21	0.11	(-0.08, 0.30)
Mental health service crisis contact (%)	49.33	42.15	7.16	(0.90, 13.42)
Mental health service crisis contacts (count)	7.26	4.65	1.66	(-0.21, 3.54)

Note: significance is based on false discovery rate adjusted q-values (*q<0.05, **q<0.01).

Appendix 3 Table 7: Outcomes over a 36-month follow-up, those identifying as male.

	Matched participants	**Matched controls**	**Difference in means**	**Confidence limits**
Employment and benefits				
In employment at 12 months (%)	26.46	18.90	7.32*	(2.54, 12.11)
In employment at 24 months (%)	28.18	21.31	6.75*	(1.78, 11.72)
In employment at 36 months (%)	27.84	22.34	5.61	(0.60, 10.61)
Any employment (months)	9.11	6.85	2.26**	(0.98, 3.54)
Employment on benefit (months)	2.38	1.45	0.93**	(0.47, 1.39)
Employment independent of benefit (months)	6.73	5.40	1.33	(0.15, 2.50)
Time on main benefit (months)	25.06	23.58	1.47	(-0.14, 3.09)
Income and transfers (NZ$ 2021)				
Net income from all sources	67,029	61,006	6,016*	(2,048, 9,984)
Net income from employment	23,842	18,928	4,909	(528, 9,289)
Net income from MSD benefits	41,388	39,700	1,686	(-1,305, 4,676)
Net income from other transfer payments	1,477	1,763	-286	(-1,379, 808)
Net tax	-8,778	-7,848	-929	(-1,841, -17)

Appendix 3 Table 7: Outcomes over a 36-month follow-up, those identifying as male.

Net government transfers (net tax+net income from transfers)	34,086	33,614	471	(-2,972, 3,915)
Justice				
Any corrections sentence (months)	2.26	2.92	-0.66	(-1.50, 0.18)
Custodial sentence (months)	0.29	0.65	-0.36	(-0.71, -0.01)
Study and qualifications				
Enrolled (months)	2.07	2.25	-0.18	(-0.79, 0.43)
Gained a qualification	4.81	3.78	1.37	(-0.92, 3.66)
Gained at least a level 2 qualification	3.09	1.37	1.83	(0.21, 3.45)
Gained at least a level 3 qualification	3.09	1.72	0.92	(-0.82, 2.65)
Gained at least a level 4 qualification	2.06	2.41	-0.46	(-2.20, 1.28)
Health service usage				
Mental health service face-to-face contact (months)	16.87	12.73	4.14**	(2.66, 5.61)
Mental health service face-to-face contacts (count)	93.69	77.02	16.66	(-1.97, 35.29)
IPS team face-to-face contacts (months)	5.05	0.19	4.86**	(4.49, 5.22)
IPS team face-to-face contacts (count)	10.82	0.38	10.42**	(9.51, 11.33)
Mental health inpatient stay (%)	23.02	19.93	3.32**	(-1.44, 8.08)
Mental health inpatient stay (count)	0.71	0.53	0.16**	(-0.01, 0.32)
Non-mental health inpatient stay (%)	26.80	27.49	-0.92	(-6.13, 4.30)
Non-mental health inpatient stay (count)	0.66	0.68	-0.02	(-0.21, 0.17)
Emergency department visit (%)	56.36	55.33	0.80	(-5.02, 6.62)
Emergency department visit (count)	2.20	2.05	0.15	(-0.37, 0.67)
Hospital discharge for self-harm (%)	6.87	4.81	1.95	(-0.73, 4.62)
Hospital discharge for self-harm (count)	0.14	0.07	0.06	(0.00, 0.11)
Mental health service crisis contact (%)	47.42	42.61	4.92	(-0.89, 10.73)
Mental health service crisis contacts (count)	5.19	4.45	0.48	(-0.91, 1.87)

Note: significance is based on false discovery rate adjusted q-values (* q<0.05, ** q<0.01).

Appendix 3 Table 8: Outcomes and costs over a 36-month follow-up, matching with non-IPS areas.

	Matched participants	Matched controls	Difference in means	Confidence limits
Employment and benefits				
In employment at 12 months (%)	28.09	19.84	8.31**	(4.64, 11.98)
In employment at 24 months (%)	30.45	23.38	6.94**	(3.09, 10.79)
In employment at 36 months (%)	30.65	23.77	6.68**	(2.81, 10.54)
Any employment (months)	9.78	7.49	2.29**	(1.31, 3.27)
Employment on benefit (months)	2.74	1.92	0.82**	(0.41, 1.22)
Employment independent of benefit (months)	7.04	5.56	1.47**	(0.58, 2.36)
Time on main benefit (months)	23.91	23.97	-0.56	(-1.29, 1.18)
Income and transfers (NZ$ 2021)				
Net income from all sources	68,213	63,957	4,254*	(914, 7,595)
Net income from employment	23,622	17,992	5,627**	(2,548, 8,705)
Net income from MSD benefits	41,316	42,054	-738	(-3,189, 1,714)
Net income from other transfer payments	2,477	3,206	-729	(-2,162, 704)
Net tax	-8,694	-7,712	-982**	(-1,598, -366)
Net government transfers (net tax+net income from transfers)	35,098	37,549	-2,449	(-5,499, 602)
Justice				
Any corrections sentence (months)	1.66	1.76	-0.10	(-0.60, 0.39)
Custodial sentence (months)	0.18	0.34	-0.16	(-0.35, 0.03)
Study and qualifications				
Enrolled (months)	2.99	2.94	0.05	(-0.50, 0.59)
Gained a qualification	6.68	5.89	0.72	(-1.40, 2.84)
Gained at least a level 2 qualification	4.32	2.16	2.03*	(0.54, 3.52)
Gained at least a level 3 qualification	4.13	2.95	1.11	(-0.48, 2.71)
Gained at least a level 4 qualification	2.95	4.32	-1.44	(-3.13, 0.25)
Health service usage				
Mental health service face-to-face contact (months)	15.95	11.25	4.70**	(3.67, 5.73)

Appendix 3 Table 8: Outcomes and costs over a 36-month follow-up, matching with non-IPS areas.

Mental health service face-to-face contacts (count)	86.42	73.76	12.66	(-4.13, 29.45)
IPS team face-to-face contacts (months)	5.08	0.02	5.06**	(4.79, 5.32)
IPS team face-to-face contacts (count)	10.95	0.04	10.90**	(10.23, 11.57)
Mental health inpatient stay (%)	22.00	18.07	4.06*	(0.58, 7.54)
Mental health inpatient stay (count)	0.65	0.53	0.11	(-0.04, 0.25)
Non-mental health inpatient stay (%)	31.04	32.22	-1.18	(-5.29, 2.94)
Non-mental health inpatient stay (count)	0.94	0.89	0.04	(-0.15, 0.22)
Emergency department visit (%)	57.76	51.28	6.35*	(1.95, 10.75)
Emergency department visit (count)	2.51	2.78	-0.26	(-1.30, 0.78)
Hospital discharge for self-harm (%)	8.25	6.68	1.44	(-0.84, 3.72)
Hospital discharge for self-harm (count)	0.22	0.15	0.07	(-0.04, 0.17)
Mental health service crisis contact (%)	47.94	39.69	8.25**	(3.90, 12.60)
Mental health service crisis contacts (count)	6.26	4.93	0.84	(-0.55, 2.22)

Note: significance is based on false discovery rate adjusted q-values (*q<0.05, **q<0.01).

Untutored learning curve for endoscopic submucosal dissection in New Zealand

Tara Fox, Masato Yozu, Sze-Lin Peng, Cameron Schauer, Anurag Sekra

ABSTRACT

INTRODUCTION: Endoscopic submucosal dissection (ESD) is a specialised endoscopic technique in the treatment of large pre-cancerous and early cancerous gastrointestinal lesions that avoids the need for surgical resections. The objective of this study was to assess the feasibility, efficacy and safety of learning ESD in an untutored approach in a prevalence-based setting within New Zealand.

METHODS: Over a 4-year period, 80 ESD procedures were performed at a single tertiary centre within New Zealand. We retrospectively reviewed basic demographics of the patients, along with successful *en bloc* resection rates, dissection speeds, histological diagnoses (including margin assessments) and complications.

RESULTS: We captured 80 procedures. Within this database we achieved an *en bloc* resection of 88.7% (71 out of 80 cases) and an R0 resection of 72.5% (58 out of 80 cases). The international benchmark for dissection speed of 9cm^2/h was achieved within the first block of 20 cases and was maintained throughout. There was a perforation rate of 6.25% (five patients), with one patient (1.25%) requiring emergency surgery for a rectal perforation.

CONCLUSIONS: Our study shows it is feasible and safe to learn ESD within a low-volume tertiary centre within New Zealand via a prevalence-based approached. The majority of patients were able to have *en bloc* resection and a R0 resection. Our intent is that this data be used to help design a more formalised training process for learning ESD within a New Zealand setting.

Endoscopic submucosal dissection (ESD) is an organ-preserving surgery performed for *en bloc* resection of pre-cancerous and early cancerous gastrointestinal (GI) lesions with a curative intent.[1] It has been performed in Japan since the 1990s and is now increasingly acquired by Western countries for management of early GI cancers.[2] It allows *en bloc* resection of the lesions and higher rates of R0 resection (clear vertical and radial margins histopathologically), which may result in curative resection of these cancers and preclude need for radical surgery or any other additional treatment.[3]

There is no structured programme for training in ESD in New Zealand. There is no screening programme for detection of early gastric cancer in New Zealand, which is considered an ideal target for commencement of ESD training. There is also a higher risk of complications with ESD in comparison to endoscopic mucosal resection (EMR). These factors have contributed to poor uptake of ESD in New Zealand and in Western countries in general.[4]

Studies from high-volume Japanese centres with a structured training programme with availability of gastric lesions suggest early ESD proficiency is acquired after 30–40 procedures; however, in a Western setting with much lower volumes, achieving the same number of procedures in the setting of unstructured training is usually not possible.[5,6] Data from Western countries show that dissection speed and *en bloc* resection rates continuously improve during the course of 40 to more than 100 procedures.[4,7–9]

The aim of this study is to assess the learning curve of ESD applicable to the New Zealand setting where ESD is currently performed untutored. This study can serve as a useful guide to devise a training programme for ESD in New Zealand.

Methods

A prospective database of all ESD procedures is maintained at Middlemore Hospital, a tertiary referral centre in Auckland, New Zealand. We retrospectively analysed the outcomes for all consecutive ESD procedures performed by a single endoscopist (AS) over a 4-year period from February 2019 to January 2023. We captured patient demographics, location of the ESD, specimen size, *en bloc* resection rates, R0 resection rates, dissection speed and complications. We

analysed the learning curve using the accepted international benchmarks.

Patient selection

All cases put forward to undergo ESD were discussed at a multidisciplinary meeting (MDM). The majority of cases were referred with intent of curative resection; however, some cases were referred for staging, rather than for curative intent. These were cases with unclear level of invasion on imaging but suspected, based on endoscopic appearances, to be beyond cure with ESD.

Operator experience and training

The operator had 7 years' experience of performing extensive endoscopic mucosal resection throughout the GI tract. Preclinical training for ESD included the operator observing approximately 10 live cases of ESD being performed by Japanese and European experts. Following this, ESD was practised in *ex vivo* models (approximately 8 hours) and live porcine models (approximately 20 hours). The operator also watched more than 100 hours of ESD case videos in entirety performed by Japanese experts.

The first ESD procedure was carried out in February 2019. Each ESD procedure was videoed in its entirety. The first 15 cases were sent to local expert in ESD (CS), who reviewed each case and provided feedback directly to the operator after each ESD.

ESD procedure

Procedures were undertaken using either conscious sedation with fentanyl and midazolam or under general anaesthesia. Oesophageal and gastric lesions were marked prior to ESD and lifted with standard lifting solutions. Colorectal lesions were not marked and were lifted with standard lifting solution. ESD was performed using DualKnife J (Olympus America). The ESD bed was examined carefully post-procedure and haemostasis was achieved with thermal coagulation using the knife or coagulation graspers. Intraoperative perforation was closed using either standard clips or over-the-scope clip (Ovesco OTSC®).

Endoscopic outcomes and definitions

En bloc resection was defined as removal of the lesion in a single piece. For carcinomas, R0 resection was defined as a resection specimen with radial and deep margins clear of dysplasia or cancer, while R1 was defined as a specimen with presence of dysplasia or cancer at the margin. A curative resection was defined as per European Society of Gastrointestinal Endoscopy guidelines.[10] For non-cancerous lesions R0 resection was considered curative. For cancerous lesions the definition of a curative resection was more complex, defined as R0 with absence of vascular and lymphatic involvement, low tumour budding and a varying limit of depth of invasion according to the location and histology of the lesion. For oesophageal squamous cell carcinoma (SCC) the depth of invasion deemed to be curative was <200 µm from muscularis mucosa, for oesophageal or gastric adenocarcinoma the depth of invasion deemed to be curative was <500 µm from muscularis mucosa and for colorectal adenocarcinoma the depth of invasion deemed to be curative was <1000 µm from muscularis mucosa.[10]

Pathological specimen review

Each ESD specimen was pinned to a corkboard, placed in formalin, processed and then reviewed by a specialised GI pathologist (MY). Histology was reported with assessment of radial and deep margins for all lesions to determine whether the resection met R0 criteria. In the case of a cancer, depth of invasion of cancer was reported from muscularis mucosae along with tumour budding, cancer grade based on differentiation and presence or absence of lymphovascular invasion. Lesions were considered curative as per the definitions used for curative resection as above. All histology results were reviewed in an MDM.

Statistical analysis methods

Categorical data were presented as counts and proportions while continuous data were presented as means and standard deviations. We chose the internationally accepted benchmarks of dissection speed ≥9cm^2/h, ≥90% *en bloc* resection rate and ≥80% R0 resection rate as markers to assess the proficiency of the ESD operator.[11]

ESD duration (in hours) was estimated as the time between submucosal injection and specimen retrieval, and dissection speed was estimated as dissection lesion size (in cm^2) divided by ESD duration. The average dissection speed for sequential 20-case blocks was calculated, and the trend was shown by using a 20-case moving average graph. In addition, the rates of *en bloc* resection and R0 resection were further calculated for sequential 20-case blocks. A cohort bar plot was used to visualise average speed per case block and rates of *en bloc* and R0 resections in

comparison with the internationally accepted benchmark speed in different organs and case blocks. Furthermore, the Mann–Kendall test was implemented using *trend* R package in order to determine whether or not, overall, there was a monotonic trend in the dissection speed of the single operator.[12] R programming language version 4.3.1 was used to carry out these analyses.[13]

Results

We retrospectively analysed the outcomes for 80 ESD procedures performed by a single endoscopist over a 4-year period. The average age of patients undergoing ESD was 68 years and 67.5% of our patients were male. The majority of patients were NZ European (57.5%), 15% were Asian, 16.25% were Pacific peoples and 5% were Māori (Table 1).

The 80 cases comprised 6 oesophageal, 20 gastric, 18 colonic and 36 rectal lesions (Figure 1).

Pathology

Adenocarcinoma comprised 25% of the cases (20 patients), with most of the remaining cases being made up of tubulovillous adenomas with low-grade dysplasia (18.8%, 15 cases) and tubular adenomas with low-grade dysplasia (18.8%,

Table 1: Demographics including age, gender and ethnicity of all patients undergoing ESD in our case series, as well as location.

	N (%)
Age	
<60	14 (17.5)
60–69	30 (37.5)
70–79	27 (33.75)
≥80	9 (11.25)
Gender	
Female	26 (32.5)
Male	54 (67.5)
Ethnicity	
European	46 (57.5)
Māori	4 (5)
Pacific peoples	13 (16.25)
Asian	12 (15)
MELAA	1 (1.25)
Other	4 (5)
Location	
Rectum	36 (45)
Stomach	20 (25)
Colon	18 (22.5)
Oesophagus	6 (7.5)

Figure 1: ESD cases by location—showing the majority of cases were undertaken in the rectum, with stomach being the next most common location, closely followed by colon, while oesophagus made up the fewest number of our ESD cases.

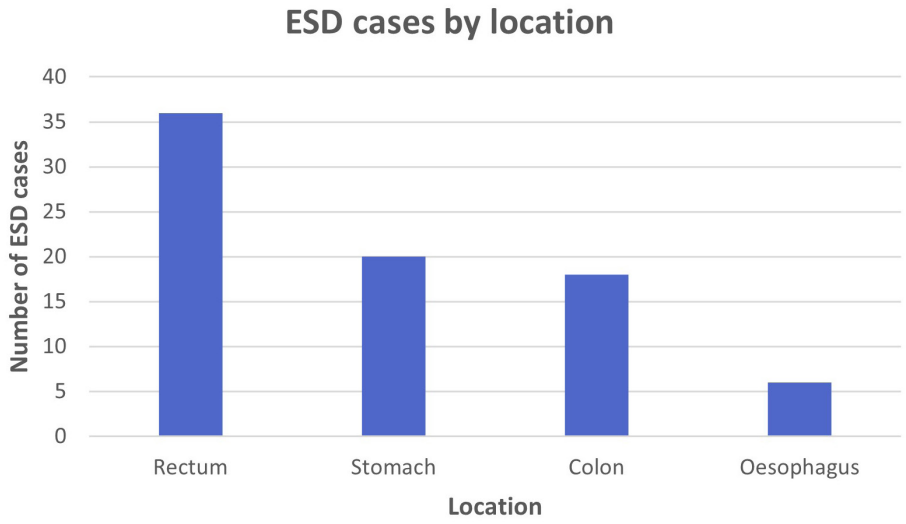
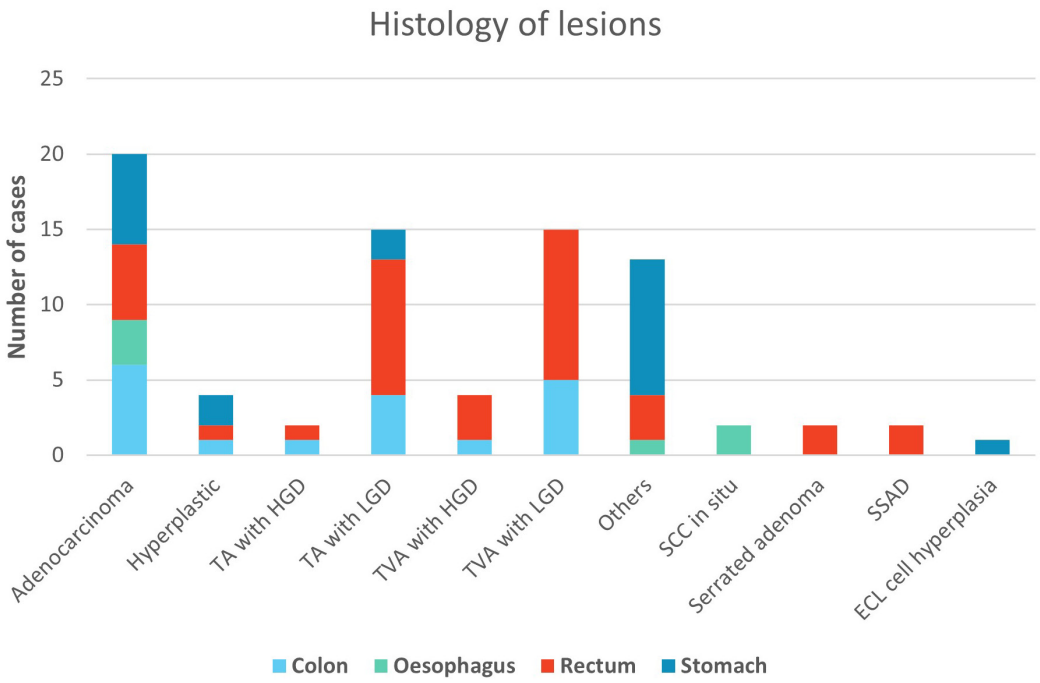


Figure 2: Histology of ESD-treated lesions by organ.



TA = tubular adenoma; HGD = high-grade dysplasia; LGD = low-grade dysplasia; TVA = tubulovillous adenoma; SCC = squamous cell carcinoma; SSAD = sessile serrated adenoma with dysplasia; ECL = enterochromaffin-like.

Figure 3: Average dissection speed calculated in 20-case sequential blocks, showing a statistically significant increase in the average dissection speed between the first and the last blocks.

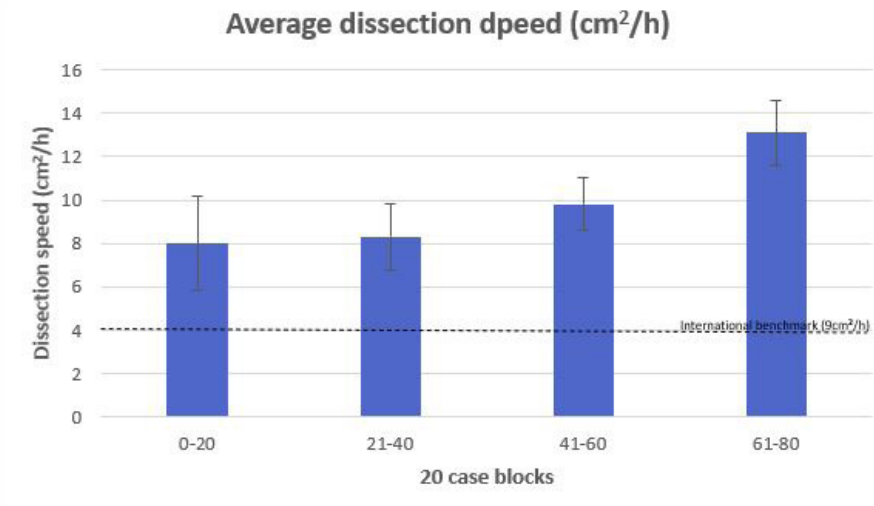
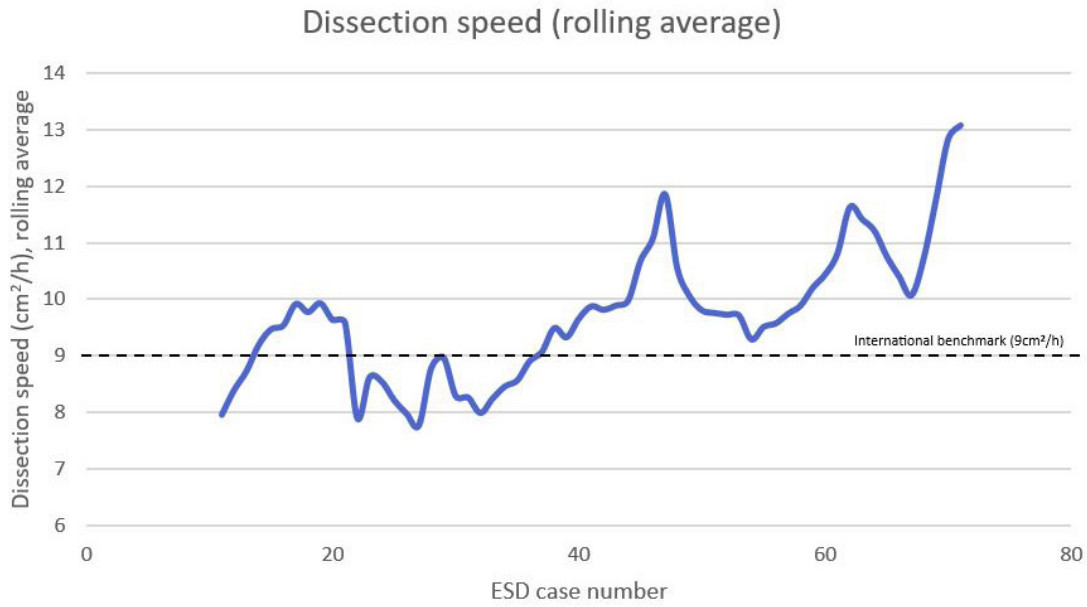


Figure 4: Dissection speed calculated as a rolling average, showing an increase in dissection speed as more ESD cases were completed.



15 cases). There were two cases (2.5%) of tubular adenomas with high-grade dysplasia and four (5%) cases of tubulovillous adenoma with high-grade dysplasia. There were small numbers of oesophageal SCC *in situ*, enterochromaffin-like (ECL) cell hyperplasia, serrated adenomas, hyperplastic polyps and sessile serrated adenoma with dysplasia (SSAD) (Figure 2).

Dissection speed

Our results have shown that average dissection speed increased sequentially as experience improved. This became statistically significant (p=0.00002) after 60 procedures and extended beyond the international benchmark in the 61–80 case sequential block (Figure 3). The moving average of dissection speed improved over time as the operator gained more experience (Figure 4).

The speed of dissection greatly varied between organs, with the fastest dissection speed being in colorectal lesions (Figure 5). This may be attributed to the fact that two thirds of the lesions

Figure 5: Dissection speed by organ, showing faster average dissection speed in colonic lesions compared to oesophageal ESD, as well as a trend towards significance for dissection speed in rectum and stomach lesions compared to colonic lesions.

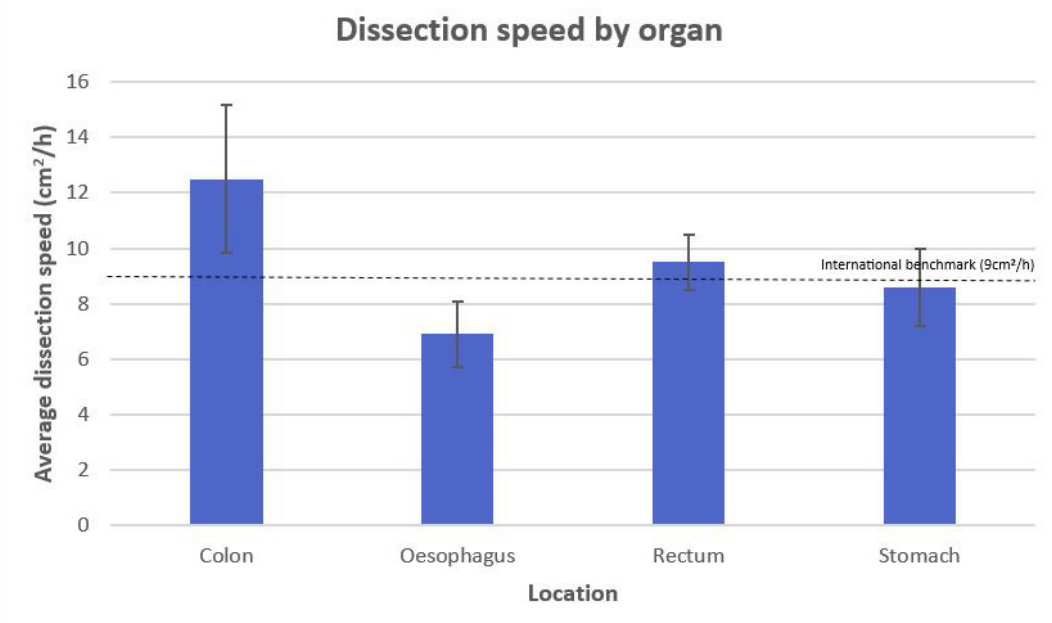
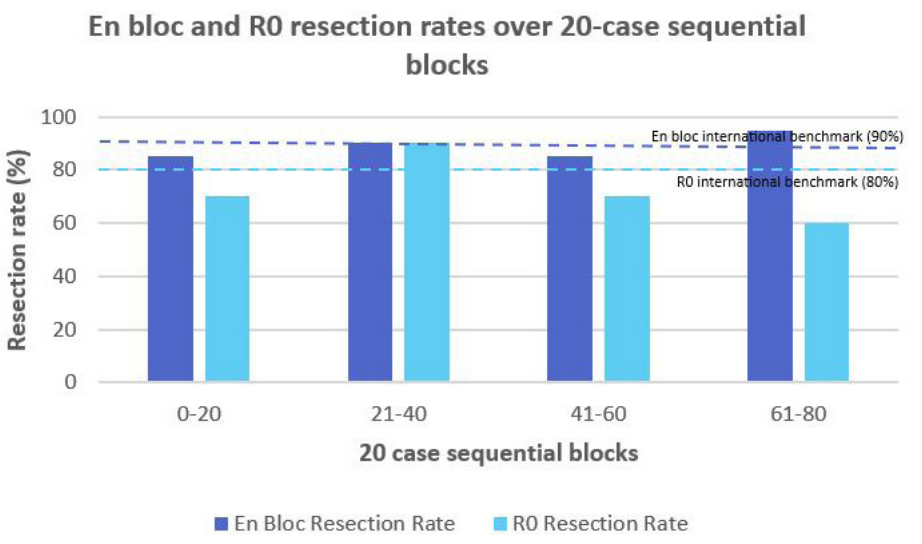


Figure 6: *En bloc* and R0 resection rates shown in 20-case sequential blocks with international benchmarks of 90% *for en bloc* resection rates and 80% for R0 resection rates included.[11]

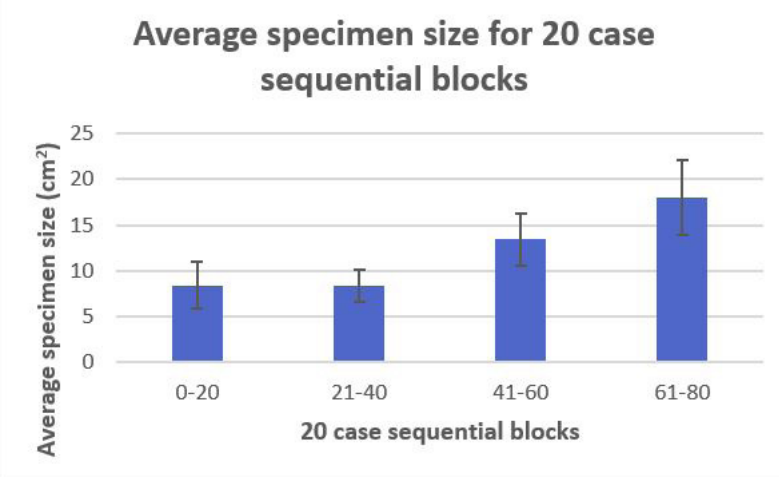


were colorectal, with more experience in treating these lesions potentially resulting in faster dissection speed.

En bloc and R0 rates

En bloc resection was possible in 88.7% of cases (71 out of 80 cases). In the remainder of cases, ESD was converted to EMR to achieve full resection of the lesion. R0 resection was achieved in 72.5% of cases (58 out of 80 cases). A curative rate of 67.5% was achieved (54 out of 80 cases). There were several cases that were undertaken for staging purposes rather than curative intent, but these data were not captured prospectively.

Figure 7: Average specimen size, calculated in 20-case blocks, showing a continuous increase in size of specimens being resected. This could be due to larger lesions being accepted for ESD as operator experience and skill increased over time.



The *en bloc* resection rates achieved proficient level by the end of our series to above 90%. R0 resection rates met the international benchmark of 80% by the second block of 20 but dropped below this in the last two sequential blocks (Figure 6). This could be due to the fact the lesion size steadily increased (p=0.002) over 80 cases (Figure 7), more challenging cases were accepted for ESD, an increasing number of cases were accepted for staging purposes, or a combination of the aforementioned.

Complications

There was a perforation rate of 6.25% (five patients). Four of the perforations were recognised intraoperatively and closed with standard clips, received intravenous antibiotics and required no further intervention. One patient (1.25%) required emergency surgery for an unrecognised rectal perforation, undergoing a low anterior resection with a length of stay of 9 days. One patient (1.25%) had delayed bleeding requiring three units of blood but no endoscopic or surgical intervention. One patient (1.25%) had oesophageal stricturing after a circumferential oesophageal ESD, managed with serial dilatations. Two patients had post-ESD inflammatory syndrome and were managed with antibiotics.

Eighteen patients (22.5%) were admitted to the hospital for observation after ESD for a mean of 2.3 days (range 1–9 days). There were no deaths in our cohort.

Discussion

This study demonstrates feasibility, efficacy and safety of an untutored, prevalence-based approach of a single operator. The slow uptake of ESD in the West, despite the advantages it offers over EMR, has been attributed to a lack of structured training programmes, a lack of suitable target lesions and a higher risk of complications with ESD.[4] Many Asian countries such as Japan, on the other hand, have structured training programmes where trainees perform ESD under expert supervision, as well as an abundance of gastric lesions that are recognised as more suitable lesions for the initial learning curve of ESD due to the improved accessibility and thickness of the stomach layer.[14] Consequently, proficiency in ESD in Western countries must be attained in an alternative fashion, as these settings are unable to provide the same environs available in countries such as Japan. A recent meta-analysis showed that *en bloc* and R0 resection rates in the Eastern studies were significantly higher at 95% and 89% respectively compared to Western studies where it dropped to 85% and 74% respectively. The percentage of perforations requiring surgery was significantly greater in Western countries (0.53%) compared to Eastern countries (0.01%). ESD procedure times were longer in Western countries (110 min vs 77 min).[15]

In most Japanese centres, trainees begin ESD on

gastric lesions. Oda et al. showed that 30 cases in the stomach were sufficient to gain competence in a supervised, tutored setting.[5] The learning curve to achieve proficiency in colorectal ESD has been demonstrated. However, most operators in these studies had a prior experience of gastric ESD.[9] Forty colorectal ESDs were required to gain competence with prior experience of gastric ESD. A study from Korea evaluated colorectal ESD training without prior experience in gastric ESD in a supervised setting. This study suggests that more than 100 cases are required to gain competence.[16]

These data, however, cannot be as readily applied to New Zealand, as there is no supervised training and the cases referred are a mix of oesophageal, gastric and colorectal lesions. Thus, an untutored prevalence-based approach is more realistic and pragmatic. Similar issues have been encountered in Europe and America. Untutored learning of ESD in Europe was first reported by Berr et al. performing ESD with a prevalence-based approach.[17] The *en bloc* resection in the 50 cases evaluated in this study was 76%. Recent data from the US have shown that approximately 250 procedures are required to attain all parameters for ESD proficiency in all organs in an untutored, prevalence-based approach.[4]

We achieved the international benchmark of proficiency of *en bloc* resection rates and dissection speed with our ESD cohort. R0 resection rates are still below proficiency level; however, they are consistent with reported R0 resection rates at this level of ESD experience in Western studies.[18] Our R0 resection rates may have been lower due to acceptance of more complex cases, larger size of the lesions in the latter part of the study and, in particular, cases accepted for staging where R0 resection is not an expectation.

Our complication rates were similar to those reported Western studies but higher than studies from Japan.[19] This may be attributable to our prevalence-based approach rather than gradual progression of easier gastric antrum lesions to more difficult lesions.

The strength of this study is that it demonstrates a real-world picture of the ESD learning curve in New Zealand. The prevalence-based approach is employed due to the case mix with variable lesion location and pathology, previously manipulated lesions and lack of supervision. Despite this, proficiency can be achieved safely with acceptable complication rates.

One of the limitations of our study is that it highlights the experience of a single endoscopist and may not translate to other endoscopists due to variability of technical skills and previous experience in advanced endoscopy. Nevertheless, similar models in Western studies have reported similar results.[4,19] Regardless, it is likely that most larger centres in New Zealand will have only a few endoscopists who will take up ESD due to limited cases and this study will be generalisable to these centres.

Conclusion

Our study shows that there is a learning curve in ESD, with consistent improvement in dissection speed and *en bloc* resection rates in an untutored prevalence-based setting. Proficiency in ESD in most aspects can be achieved after 80 cases and is not site-specific. Higher numbers of ESD and careful lesion selection are required to reach the international benchmark for proficiency in R0 resection.

Finally, these data can help design the training programmes for ESD in centres where a prevalence-based approach is necessary.

COMPETING INTERESTS
Nil.

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REFERENCES
1. Kakushima N, Fujishiro M. Endoscopic submucosal dissection for gastrointestinal neoplasms. World J Gastroenterol. 2008 May 21;14(19):2962-7. doi: 10.3748/wjg.14.2962.
2. Friedel D, Stavropoulos SN. Introduction of endoscopic submucosal dissection in the West. World J Gastrointest Endosc. 2018 Oct 16;10(10):225-38. doi: 10.4253/wjge.v10.i10.225.
3. Bhatt A, Abe S, Kumaravel A, et al. Indications and Techniques for Endoscopic Submucosal Dissection. Am J Gastroenterol. 2015 Jun;110(6):784-91. doi: 10.1038/ajg.2014.425.
4. Zhang X, Ly EK, Nithyanand S, et al. Learning Curve for Endoscopic Submucosal Dissection With an Untutored, Prevalence-Based Approach in the United States. Clin Gastroenterol Hepatol. 2020 Mar;18(3):580-588.e1. doi: 10.1016/j.cgh.2019.06.008.
5. Oda I, Odagaki T, Suzuki H, et al. Learning curve for endoscopic submucosal dissection of early gastric cancer based on trainee experience. Dig Endosc. 2012 May 25;24 Suppl 1:129-32. doi: 10.1111/j.1443-1661.2012.01265.x.
6. Yamamoto Y, Fujisaki J, Ishiyama A, et al. Current status of training for endoscopic submucosal dissection for gastric epithelial neoplasm at Cancer Institute Hospital, Japanese Foundation For Cancer Research, a famous Japanese hospital. Dig Endosc. 2012 May 25;24 Suppl 1:148-53. doi: 10.1111/j.1443-1661.2012.01278.x.
7. Kakushima N, Fujishiro M, Kodashima S, et al. A learning curve for endoscopic submucosal dissection of gastric epithelial neoplasms. Endoscopy. 2006 Oct 20;38(10):991-5. doi: 10.1055/s-2006-944808.
8. Probst A, Golger D, Anthuber M, et al. Endoscopic submucosal dissection in large sessile lesions of the rectosigmoid: learning curve in a European center. Endoscopy. 2012 Jul 23;44(7):660-7. doi: 10.1055/s-0032-1309403.
9. Sakamoto T, Saito Y, Fukunaga S, et al. Learning curve associated with colorectal endoscopic submucosal dissection for endoscopists experienced in gastric endoscopic submucosal dissection. Dis Colon Rectum. 2011 Oct;54(10):1307-12. doi: 10.1097/DCR.0b013e3182282ab0.
10. Pimentel-Nunes P, Dinis-Ribeiro M, Ponchon T, et al. Endoscopic submucosal dissection: European Society of Gastrointestinal Endoscopy (ESGE) Guideline. Endoscopy. 2015 Aug 28;47(9):829-54. doi: 10.1055/s-0034-1392882.
11. Oyama T, Yahagi N, Ponchon T, et al. How to establish endoscopic submucosal dissection in Western countries. World J Gastroenterol. 2015;21(40):11209-20. doi: 10.3748/wjg.v21.i40.11209.
12. Pohlert T. Non-Parametric Trend Tests and Change-Point Detection [Internet]. 2018 Oct 10 [cited 2024 Feb]. Available from: https://cran.r-project.org/web/packages/trend/vignettes/trend.pdf.
13. Pohlert T, RD team. Package 'trend' [Internet]. 2023 Oct 10 [cited 2024 Feb]. Available from: https://cloud.r-project.org/web/packages/trend/trend.pdf
14. Uraoka T, Parra-Blanco A, Yahagi N. Colorectal endoscopic submucosal dissection: Is it suitable in western countries? J Gastroenterol Hepatol. 2013 Mar 26;28(3):406-14. doi: 10.1111/jgh.12099.
15. Daoud DC, Suter N, Durand M, et al. Comparing outcomes for endoscopic submucosal dissection between Eastern and Western countries: A systematic review and meta-analysis. World J Gastroenterol. 2018 Jun 21;24(23):2518-36. doi: 10.3748/wjg.v24.i23.2518.
16. Yang DH, Jeong GH, Song Y, et al. The Feasibility of Performing Colorectal Endoscopic Submucosal Dissection Without Previous Experience in Performing Gastric Endoscopic Submucosal Dissection. Dig Dis Sci. 2015 Nov 19;60(11):3431-41. doi: 10.1007/s10620-015-3755-0.
17. Berr F, Wagner A, Kiesslich T, et al. Untutored learning curve to establish endoscopic submucosal dissection on competence level. Digestion.

2014;89(3):184-93. doi: 10.1159/000357805.
18. Probst A, Golger D, Arnholdt H, Messmann H. Endoscopic submucosal dissection of early cancers, flat adenomas, and submucosal tumors in the gastrointestinal tract. Clin Gastroenterol Hepatol. 2009 Feb;7(2):149-55. doi: 10.1016/j.cgh.2008.09.005.
19. Fleischmann C, Probst A, Ebigbo A, et al. Endoscopic Submucosal Dissection in Europe: Results of 1000 Neoplastic Lesions From the German Endoscopic Submucosal Dissection Registry. Gastroenterology. 2021 Oct;161(4):1168-78. doi: 10.1053/j.gastro.2021.06.049.

Effectiveness of COVID-19 vaccines against hospitalisation, death and infection over time in Aotearoa New Zealand: a retrospective cohort study

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ABSTRACT

AIMS: This study aimed to evaluate the effectiveness of COVID-19 vaccines in preventing COVID-19 outcomes when the Omicron variant was predominant in Aotearoa New Zealand.

METHODS: We conducted a retrospective cohort study using routinely available data (8 December 2020–28 February 2023). We evaluated the vaccine effectiveness (VE) of COVID-19 vaccines using the Cox proportional-hazards model, adjusting for covariates.

RESULTS: The VE against COVID-19 hospitalisation (VE_H) for the second booster dose compared to no vaccination was found to be 81.8% (95% confidence interval [95% CI]: 73.6–87.5) after 1 month post-vaccination. After 4 months, VE_H was 72.2% (95% CI: 58.5–81.4), and after 6 months VE_H was 49.0% (95% CI: 7.9–71.8). Similarly, VE_H decreased after the first booster dose (1-month VE_H=81.6% [95% CI: 75.6–86.1]; 2 months VE_H=74.7% [95% CI: 68.2–79.9]; and 6 months VE_H=57.4% [95% CI: 45.8–66.6]). VE against COVID-19 death (VE_D) was 92.9% (95% CI: 82.1–97.2) 2 months after the first booster vaccination, with VE_D being sustained until months 5 and 6 (VE_D=87.2%; 95% CI: 67.4–94.9). The VE after the second dose of the vaccine against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection (VE_I) (real-time polymerase chain reaction [RT-PCR]) was sustained at 5 months post-vaccination (40.6%; 95% CI: 25.6–52.5).

CONCLUSION: We provide a comprehensive quantification of both VE and VE waning. These findings can guide policymakers to help evaluate the COVID-19 vaccination programme and minimise the effect of future COVID-19 in Aotearoa New Zealand.

Between the confirmation of the first COVID-19 case in Aotearoa New Zealand and October 2023, there were over 2,470,435 cases, with 31,119 hospitalisations, 878 intensive care unit admissions and 4,849 deaths.[1] The risk of severe COVID-19 and mortality increases with age, relative socio-economic deprivation, disability status and comorbidity, and the age-adjusted COVID-19 mortality is higher among Māori and Pacific peoples compared to the general population.[2–5] At the outset, the Aotearoa New Zealand Government pursued a strategy focussed on suppressing the community spread of SARS-CoV-2 and ultimately achieved extremely low or zero COVID-19 incidence.[3] Throughout the pandemic, the Government adjusted the approach to match the evolving virus, transitioning from elimination to mitigation and ultimately prioritising vaccination.[6]

The national medical regulatory agency granted provisional approval for using the Pfizer–BioNTech COVID-19 vaccine (Comirnaty) on 3 February 2021. The vaccine rollout commenced with priority groups (border and managed isolation and quarantine workers, their household contacts and families) on 20 February 2021.[2] From January 2022, all individuals aged 5 and older in Aotearoa New Zealand became eligible for vaccination. Additionally, in February 2023, vaccination eligibility was extended to certain infants as young as 6 months old.[2] Several additional vaccines were approved and administered to a limited segment of the vaccinated population. These included AstraZeneca (Vaxzevria, approved in July 2021), Janssen (July 2021), Novavax (Nuvaxovid, March 2022) and Bivalent mRNA-CVs (December 2022).[2]

Accurately evaluating vaccine effectiveness (VE) and subsequent VE waning (understanding when VE declines) helps to inform public health decision making during an evolving pandemic. Understanding the waning of VE after the first, second and booster vaccine doses can also help identify who is most likely to benefit from further booster doses or other vaccines or interventions to reduce risk. For instance, a previous United

Kingdom (UK) study found that significant vaccine waning occurred 25 weeks after the second dose of the vaccine.[7] This observational study, among others, contributed to the evidence that was used to design the UK COVID-19 vaccine booster programme.

Using data from the Ministry of Health's national COVID-19 surveillance platform and building on our previous work using routinely collected data in Aotearoa New Zealand,[8–10] we evaluated the VE of COVID-19 vaccines in preventing COVID-19 outcomes (hospitalisation, mortality and infection) over time since vaccination.

Study design

A retrospective, whole-population, matched-cohort study was conducted to evaluate the effectiveness of COVID-19 vaccines and vaccine waning (i.e., the decline in VE) using the national data collections provided by the Ministry of Health in Aotearoa New Zealand.

Data sources

The data used in this study were sourced from the Ministry of Health and the Institute of Environmental Science and Research (ESR; Figure 1 and Appendix Table 1). Additional data were sourced from the 2018 Census, Department of Internal Affairs (DIA) and core data derived by Statistics New Zealand (Stats NZ), including full death dates and address notifications.

A National Health Index (NHI) number is a unique identifier assigned to individuals accessing healthcare services in Aotearoa New Zealand.[11] It serves as a comprehensive record for data linkage and demographic data, encompassing crucial information such as name, address, date of birth, gender, resident or citizenship status, place of birth, ethnicity and, if applicable, date of death.

The Eclair Clinical Data Repository is a national reporting application in Aotearoa New Zealand, created by the Data and Informatics team at the ESR.[12] It compiles COVID-19 test reports, both positive and negative, from various sources across the country. Initially designed for COVID-19 reporting, it was expanded to support eOrdering for polymerase chain reaction (PCR) test and rapid antigen test (RAT) recording via the Eclair RAT Reporting system. This application managed and shared testing data with the government, Eclair users and partners (including researchers).

The COVID-19 Immunisation Register (CIR) is an application based on the National Contact Tracing Solution platform with robust security and authorisation controls.[13] It includes information for monitoring immunisation coverage and the progress of the immunisation campaign. The creation of the CIR in 2020 stemmed from the limitations of the existing National Immunisation Register, which hindered its suitability for promptly facilitating a COVID-19 vaccination rollout on a national scale. It records the immunisations people have received or chosen not to receive. The data collected were necessary for health management, public safety, healthcare planning, research, professional training, statistical reporting and government service enhancement. The COVID-19 vaccination data were released to the public by the Ministry of Health.[14] This was updated weekly to include recent changes in the values of those vaccinated and/or boosted. The spreadsheet released by the Ministry of Health contains a breakdown by district health board (DHB), territorial authority, health service utilisation population, ethnicity, vaccine type and cumulative values. DHBs are used to determine the area of residence for individuals included in this study.

EpiSurv is a secure national reporting and data repository system in Aotearoa New Zealand that tracks notifiable diseases (significant public health risk).[15] It is operated by ESR on behalf of the Ministry of Health and is utilised by public health units for reporting cases. EpiSurv gathers up-to-date information encompassing baseline patient characteristics, clinical presentation, determinants and inter-case relationships used for disease surveillance.

The National Minimum Dataset (NMDS) is a comprehensive repository of hospital discharge information in Aotearoa New Zealand, encompassing data from both public and private healthcare facilities for inpatients and day patients and containing public and private hospitalisation data from 1997 onwards.[16]

The Pharmaceutical Collection is a comprehensive data repository that manages community-dispensed pharmaceutical subsidies in Aotearoa New Zealand and contains over 469 million claims.[17]

The Mortality Collection serves as a data repository on causes of death established in Aotearoa New Zealand.[18] It includes electronic death and stillbirth registrations, medical certificates, data from hospital discharges and other agencies.

Population

The vaccinated cohort included everyone who received the COVID-19 vaccine (Comirnaty) between 8 December 2020 and 28 February 2023 (end of study). Medsafe, the nation's medical regulatory agency, granted provisional approval for the use of Comirnaty in Aotearoa New Zealand on 3 February 2021. The vaccine rollout commenced with priority groups on 20 February 2021.[2] Our start date, 8 December 2020, was when the first COVID-19 vaccine doses were administered outside clinical trials.[19] This date accounts for individuals who might have received the vaccine and returned to Aotearoa New Zealand before its official licensure. The unvaccinated cohort was comprised of people who did not receive any dose of the COVID-19 vaccine during the study period (Figure 2).

We matched vaccinated individuals with unvaccinated individuals based on age, sex, ethnicity and DHB to reduce confounding over time. This resulted in improved precision of estimates of VE. Due to the high vaccination rates in adults, there was a small pool of potential unvaccinated matches for adult vaccine recipients.

Exposure to vaccination

We studied the first and second vaccine doses and boosters (first and second). Most of the Aotearoa New Zealand population received the Pfizer–BioNTech (Comirnaty) vaccine.[2] Vaccination status was ascertained from codes provided directly by the Ministry of Health up to 28 February 2023, the latest date of available records.

Exposure (vaccination) status was defined as time-varying, with an individual defined as exposed from the date of immunisation. Our primary comparison of interest was the time elapsed since receiving the vaccine compared to not having received one. The unvaccinated cohort consisted of individuals who did not receive the vaccine. Controls who had not received a COVID-19 vaccine by the end of the study period were matched 1:1 based on socio-demographic characteristics.

Outcomes

COVID-19 hospitalisation was defined as being admitted to the hospital within 14 days of a confirmed SARS-CoV-2 infection or having an International Classification of Disease-10 (ICD-10) code for COVID-19. COVID-19 hospitalisations were derived as whether someone had never (0) or ever (1) been hospitalised for COVID-19 (with any COVID-related ICD-10-AM code) within 14 days of a positive COVID-19 test, for positive tests up to 28 February 2023 (end of follow-up).[4] They were coded as first, second and third hospitalisations.

COVID-19 death was defined as having COVID-19, an underlying ICD-10 cause of death recorded on the death certificate, or any cause of death within 28 days of a confirmed SARS-CoV-2 infection.[1]

COVID-19 infection was defined as cases of COVID-19 with a positive SARS-CoV-2 test. COVID-19 infection was used as a secondary outcome to determine whether an individual had ever (1) or never (0) recorded a positive COVID-19 test result, either before (PCR) or after (RAT) 16 February 2022. This cutoff point marked the beginning of unsupervised self-testing. As a result, positive or negative test results may not have been officially recorded uniformly, potentially inflating the ratio of positive to negative tests beyond this point.[4] On 6 March 2022, the COVID-19 response minister cautioned that the reported daily case numbers might significantly under-estimate the actual cases due to self-reporting with RATs and delays in reporting results, emphasising that COVID-19 hospitalisations are considered a more reliable tracker of the pandemic.[20]

Covariates

Comorbidity and multimorbidity encompass the presence of multiple distinct health conditions within an individual and are associated with increased healthcare burden, reduced quality of life and poor health outcomes.[21] Multimorbidity was assessed using the Pharmaceutical Prescribing Profile mortality risk index (P3 index) and the MultiMorbidity Measure index (M3 index).[22,23] Age in years, birth month/year and sex (0=men, 1=women) were obtained from the Ministry of Health. Age was divided into 16 age groups. Ethnicity was divided into Māori, Pacific peoples, European, Asian and Middle Eastern, Latin American or African (MELAA). Māori ethnicity was coded for those recorded as Māori only or Māori and at least one other ethnic group.

Statistical analysis

The process of 1:1 matching was conducted using the Reclin2 package,[24] a set of tools designed for probabilistic record linkage. It consisted of the

following steps: Pairs of records were generated from vaccinated and unvaccinated cohorts using two blocking variables (age group and sex). The generated pairs of records were compared on a set of variables (ethnicity and DHB) in both datasets (vaccinated and unvaccinated cohorts). The pairs were scored using the expectation–maximisation algorithm to estimate the m- and u-probabilities for each of the linkage variables (ethnicity and DHB). Pairs with a high likelihood were selected, i.e., pairs that met a predetermined threshold (effectively matched according to the potential confounding variables). Finally, using the selected pairs, the final linked dataset was generated.[24] This process was conducted four times (first dose vs unvaccinated, second dose vs unvaccinated, first booster vs unvaccinated and second booster vs unvaccinated).

Baseline patient characteristics, such as age, sex, ethnicity, comorbidity and multimorbidity (M3 score and P3 score), infectiousness, level of susceptibility, immunity (hybrid, infection induced and vaccine induced) and location (DHBs), were presented as frequencies and percentages for the matched cohorts (vaccinated and unvaccinated).

For the vaccinated cohort(s), the index date was the date of vaccination. Each vaccinated individual was monitored from the index date until they either developed the outcome of interest or received the next vaccine dose, or until the end of the study (28 February 2023). Unvaccinated individuals were assigned a pseudo-vaccination date (index date) that matched their paired vaccinated counterparts. The unvaccinated cohort was then monitored from this index date until they either developed the outcome of interest or until the end of the study.

For each outcome (primary and secondary), we evaluated the VE of COVID-19 vaccines (first and second doses, first and second booster doses) using the Cox proportional-hazards model. For each outcome, we fitted a model at each time point during the follow-up period (e.g., 1, 2, 3, 4, 5 and 6 months). Estimating the overall VE is unnecessary and may be misleading, as the impact of COVID-19 vaccines on outcomes depends on the time since vaccination. Our approach aimed to elucidate the trajectory (if any) of waning COVID-19 VE.[25] The model was adjusted for multiple confounders through the process of matching/probabilistic linking and the addition of covariates, including age, sex, ethnicity, DHB, comorbidity and multimorbidity, and numeric variables derived from the agent-based model (infection-induced immunity, vaccine-induced immunity, hybrid immunity, infectiousness and level of susceptibility; Appendix Table 1).

Subgroup analyses were performed by age group, sex and ethnicity. The models were similar, but in situations where there were fewer cases, we concatenated the time-since-vaccination indicators (e.g., 1–3 and 4–6 months, etc.). For each outcome, we estimated an adjusted hazard ratio (aHR) and 95% confidence intervals (CI) for each time-since-vaccination interval in comparison to the unvaccinated group. The VE was estimated as one minus the aHR, scaled as a percentage (1 - aHR * 100). Statistical analyses were carried out using R/R Studio (version R-4.2.2).[26]

Results

Baseline characteristics of the population

A total of 5,269,015 people were included in the analysis. The mean age was 38.8 (standard deviation [SD] =23.2, range = 0–113) years. Between 8 December 2020 and 28 February 2023, a total of 4,318,211 (82.0%) individuals received the COVID-19 vaccine first dose, 4,158,014 (78.9%) received the second dose, 2,737,890 (52.0%) received the first booster dose and 755,107 (14.3%) received the second booster dose of COVID-19 vaccine (Table 3, Appendix Table 2). During the follow-up period, 413,310 (9.5%) individuals aged 15 and above were unvaccinated. Vaccination rates across all doses were highest among older adults, females, Europeans, Asians and people resident in the Capital and Coast DHB. The median times between the first and second doses, the second dose and the first booster dose, and the first and second booster doses were 4 weeks, 5 months and 7 months, respectively (Table 2).

During the follow-up period, there were 1,248,548 recorded COVID-19 infections, 24,370 hospitalisations and 1,006 deaths within 28 days of a positive test for SARS-CoV-2. A total of 5,375 (0.4%) people had a second infection, and 26 had a third. Additionally, 0.7% (169) of hospitalised individuals were readmitted for a second time (Table 1).

The trajectory of the second booster dose VE over time

The estimates of VE against hospitalisation (VE_H) and infection (VE_I) are shown in Table 3. No deaths occurred in the vaccinated cohort after the second booster dose, so death was not included in

the analysis. Against COVID-19 hospitalisation, VE_H was 81.8% (95% CI: 73.6–87.5) in the 1st month, decreased to 72.2% (95% CI: 58.5–81.4) in the 4th month and then further decreased to 49.0% (95% CI: 7.9–71.8) in the 6th month. In the 1st month, the VE against COVID-19 infection was 57.4% (95% CI: 48.4–64.7). By the 4th month, it had decreased to 25.7% (95% CI: 04.8–42.1), and in the 6th month, it further decreased to 9.9% (95% CI: -25.8–35.4).

Waning VE was observed across all sub-groups (Appendix Table 3). The second booster dose VE against COVID-19 hospitalisation for the Māori population was 81.1% (95% CI: 46.0–93.4) in the 1st month, decreased to 51.9% (95% CI: 7.6–74.9) in the 2nd–3rd month and then further decreased to 36.6% (95% CI: -16.8–63.4) in the 4th–6th month. The second booster dose VE against COVID-19 hospitalisation for Pacific peoples was 92.2% (95% CI: 36.6–98.9) in the 1st month and decreased to 56.7% (95% CI: -0.7–81.3) in the 4th to 6th month.

The trajectory of the first booster dose VE over time

For each outcome of interest, VE was highest in the 1st month post-vaccination, then waned over time (Table 4). Against hospitalisation, VE_H was 81.6% (95% CI: 75.6–86.1) in the 1st month, was 74.7% (95% CI: 68.2–79.9) in the 3rd month and decreased to 57.4% (95% CI: 45.8–66.6) by the 6th month. Against COVID-19 death, there was sustained protection over the follow-up period. The VE_D was 92.9% (95% CI: 82.1–97.2) in the 2nd month and was 87.2% (95% CI: 67.4–94.9) during months 5–6 post-vaccination.

Against infection confirmed with real-time polymerase chain reaction (RT-PCR), VE_I was 54.0% (95% CI: 38.8–65.4) in the 1st month and dramatically decreased to 20.0% (95% CI: -88.1–66.0) in the 3rd month. Against infection (determined by both RAT and RT-PCR), VE_I was 20.2% (95% CI: 17.7–22.7) in the 1st month and decreased to 18.9% (95% CI: 16.7–21.0) 2 months post-vaccination. Additional findings on VE by subgroup can be found in the supplemental material (Appendix Table 4).

The trajectory of the second dose VE over time

For each outcome, VE for the second dose was highest in the 1st month post-vaccination, then waned over time (Table 5). Against hospitalisation, VE_H was 92.9% (95% CI: 86.4–96.3) in the 1st month, decreased to 74.7% (95%CI: 63.2–82.6) in the 3rd month and was 72.5% (95% CI: 64.9–78.5) by the 6th month. Against death, there was sustained protection over the follow-up period. The VE_D was 87.3% (95% CI: 53.8–96.5) in the 3rd month and was 86.1% (95% CI: 50.6–96.1) by the 6th month post-vaccination. VE_I against COVID-19 infection confirmed with RT-PCR was 88.2% (95% CI: 85.3–90.5) in the 1st month and decreased to 40.6% (95% CI: 25.6–52.5) in the 5th month. Vaccine waning was similar across all the sub-groups (Appendix Table 5).

The trajectory of the first dose VE over time

The estimates of VE against the outcomes of interest and sub-group analysis are shown in Appendix Table 6. Against hospitalisation, VE_H was 69.6% (95% CI: 50.1–81.5) in the 1st month and increased to 88.5% (95% CI: 80.6–93.1) in the 2nd month. Against death, there was sustained protection over the follow-up period, a VE_D of 87.6% (95% CI: 38.9–97.5). The VE against infection (RT-PCR confirmed) was 63.2% (95% CI: 56.1–69.2) during the follow-up period (1 month).

Discussion

We found that VE against hospitalisation and mortality was most robust in the early post-vaccination period, with VE against hospitalisation waning over time. A moderate waning of VE against death was found. Against COVID-19 infection, there were declines in VE, most notably at 3 months post-vaccination.

Our findings were broadly consistent with those of previous observational studies.[25,27–30] Evidence from a comprehensive systematic review and meta-analysis of 11 randomised control trials involving 161,388 participants and 46 observational studies involving 55,367,053 participants showed that 11 COVID-19 vaccines were effective against five SARS-CoV-2 variants of concern: Alpha, Beta, Gamma, Delta and Omicron.[27] This systematic review found that in the primary COVID-19 vaccine series, the summary measure of overall VE was 88.0% against the Alpha variant, 77.8% against the Delta variant, 73.0% against the Beta variant, 63.0% against the Gamma variant and 55.9% against the Omicron variant. Against the Delta variant, the VE of the booster vaccination was 95.5%, and against the Omicron variant, the summary VE of the booster vaccination was 80.8%.

In a recent systematic review and meta-analysis involving 68 studies from more than

23 countries, VE for the primary COVID-19 vaccine series at baseline (14–42 days) was 92% for hospitalisations and 91% for mortality. This effectiveness was reduced to 79% at 224–251 days for hospitalisations and 86% at 168–195 days for mortality.[28] Against all documented infections, VE was 83% at baseline (14–42 days), decreased to 62% by 112–139 days and then decreased gradually to 47% by 280–307 days. At baseline, the booster doses of the COVID-19 vaccines showed 70% effectiveness in preventing infections and 89% effectiveness in preventing hospitalisations. However, this effectiveness decreased to 43% against infections and 71% against hospitalisations after ≥112 days.

Similarly, a large observational study conducted by Lin et al. described the trajectory of the waning effectiveness of the COVID-19 vaccine (double dose regiment) over 9 months (11 December 2020–8 September 2021) in North Carolina, United States of America.[25] The three vaccines assessed were BNT162b2, mRNA-1273 and Ad26.COV2.S. The VE against COVID-19 infections was 74.8–85.5% in the 1st month, increased to 71.4–95.9% in the 2nd month, then waned gradually to 67.8–77.8% by the 8th month. Against hospitalisations, the VE was 85.8–96.4% in the 2nd month and decreased to 81.7–94.3 by the 6th month. Against mortality, VE ranged from 65.5% to 91.6% in the 1st month, increased to 82.2% to 98.6% in the 2nd month, and gradually decreased to 71.2% to 92.5% during the 6th month.

A strength of our study is that we conducted a 1:1 matched retrospective cohort study using nationwide individual-level data from the Ministry of Health and the ESR, improving the accuracy and completeness of vaccination status, COVID-19 cases, hospitalisation and mortality data. Additionally, we controlled for demographic factors, comorbidity and multimorbidity, susceptibility, infectiousness and immunity (vaccine induced, infection induced and hybrid immunity). This allowed us to control for confounding and enabled us to examine the trajectory of COVID-19 VE as a function of time since vaccination. We have previously used this approach to assess the effectiveness of shingles vaccines in Aotearoa New Zealand.[8]

Our study weaknesses include vaccine coverage being very high in Aotearoa New Zealand, with VE as a function of time post-vaccination in the sub-group analysis becoming under-powered because of the dwindling numbers of eligible unvaccinated populations. Also, under-reporting and unmeasured confounding, particularly in the study when the unvaccinated population was small, may have resulted in an under-estimation or over-estimation of the VE point estimates.[31,32] Potential confounders that are not included in our model but could increase point estimates for VE include personal behaviours (i.e., if the vaccinated had higher mask use and greater social distancing) and antivirals (made available for at-risk populations from May 2022).

Although multiple vaccines are approved and available in Aotearoa New Zealand, almost all people received Pfizer–BioNTech (Comirnaty). However, we could not access the data required to perform a sub-group analysis by vaccine type. Also, VE against specific variants could not be assessed as the Omicron variant predominated during the study period.

RATs were included in our estimates for VE against infection (after 16 February 2022). RATs were used by the public to enable self-management and their use was therefore subject to individual testing behaviours (rather than PCR tests used systematically in clinical settings e.g., to influence treatment options). For instance, individuals may have tested with RATs more frequently if they lived in households with individuals at greater risk of severity (e.g., older adults and/or persons with compromised immune systems).[33] Vaccinated individuals were also twice as likely as unvaccinated individuals to express their intention to undergo COVID-19 testing and report being tested in the past month.[33]

Our findings suggest that COVID-19 vaccines provided longer-term protection against hospitalisation and mortality and shorter-term protection against infection. VE decreased gradually as a function of time post-vaccination, especially against SARS-CoV-2 infection. These findings are based on the use of historical time frames (i.e., up to 28 February 2023). This may lead to discrepancies when compared to alternative analyses or official data (e.g., that which encompass the most up-to-date COVID-19 data).

Future observational studies using well-powered national data will be needed to assess the effectiveness of COVID-19 vaccines beyond 6 months post-vaccination. It is vital to evaluate VE by vaccine type and variant. Additionally, there is a need to understand how VE differs for immunosuppressed people at different stages of disease and treatment. Policymakers, clinicians and patients will be reassured by the VE estimates found for the COVID-19 vaccine, particularly against severe outcomes (hospitalisation

and death). Given the waning effectiveness of these vaccines over time, however, further surveillance should be undertaken to monitor vaccine uptake among groups and the VE of future booster doses (including for bivalent vaccines) or combination vaccines. Also, there is a need to evaluate the cost effectiveness of COVID-19 vaccinations and booster doses specifically in Aotearoa New Zealand. Economic evaluation evidence could help guide decisions on routine annual vaccination coverage, particularly in situations with limited vaccine supply. This information could also inform whether the government should prioritise alternative strategies, like improving ventilation in public settings.

Figure 1: Summary of data sources.

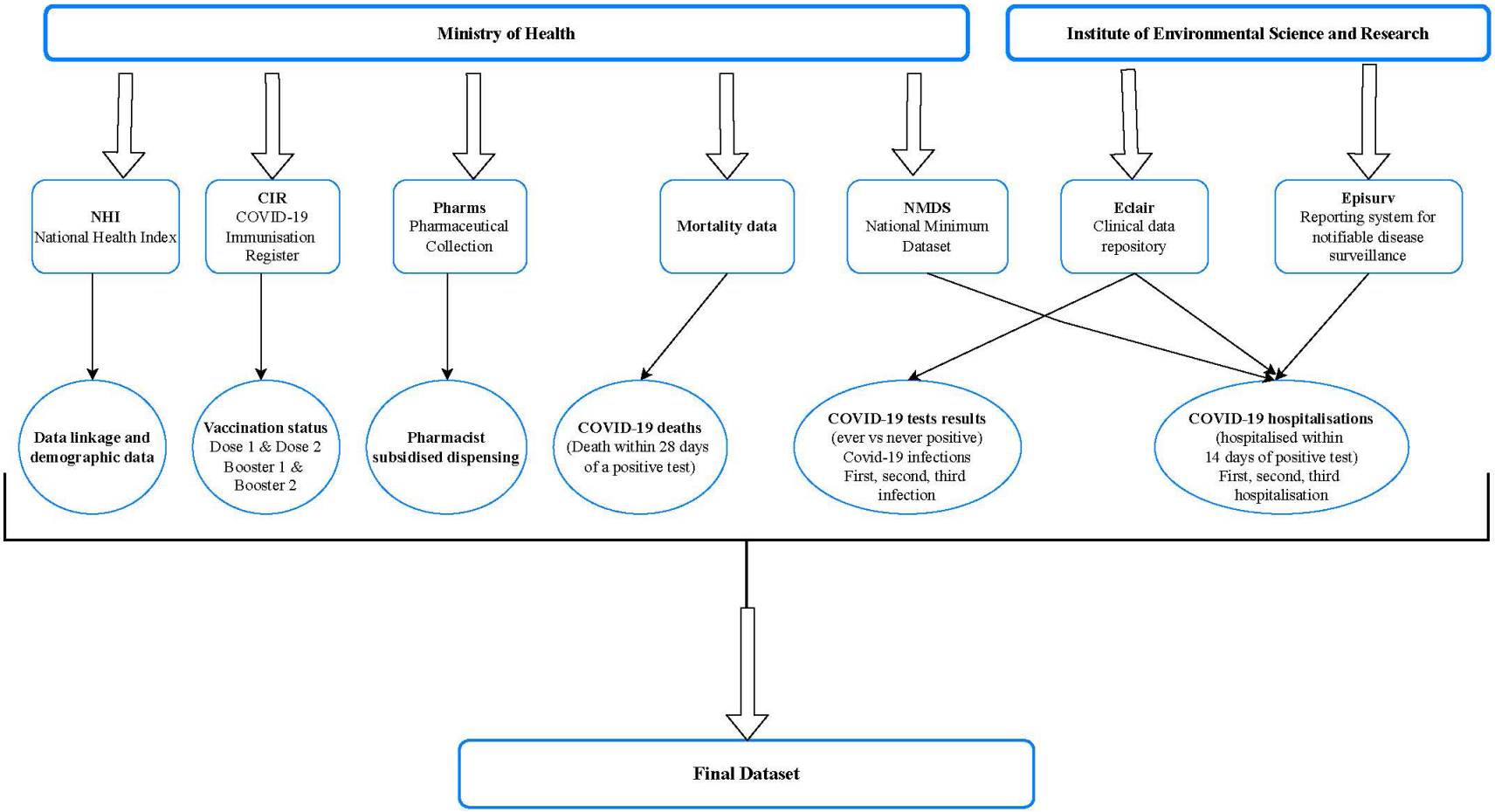
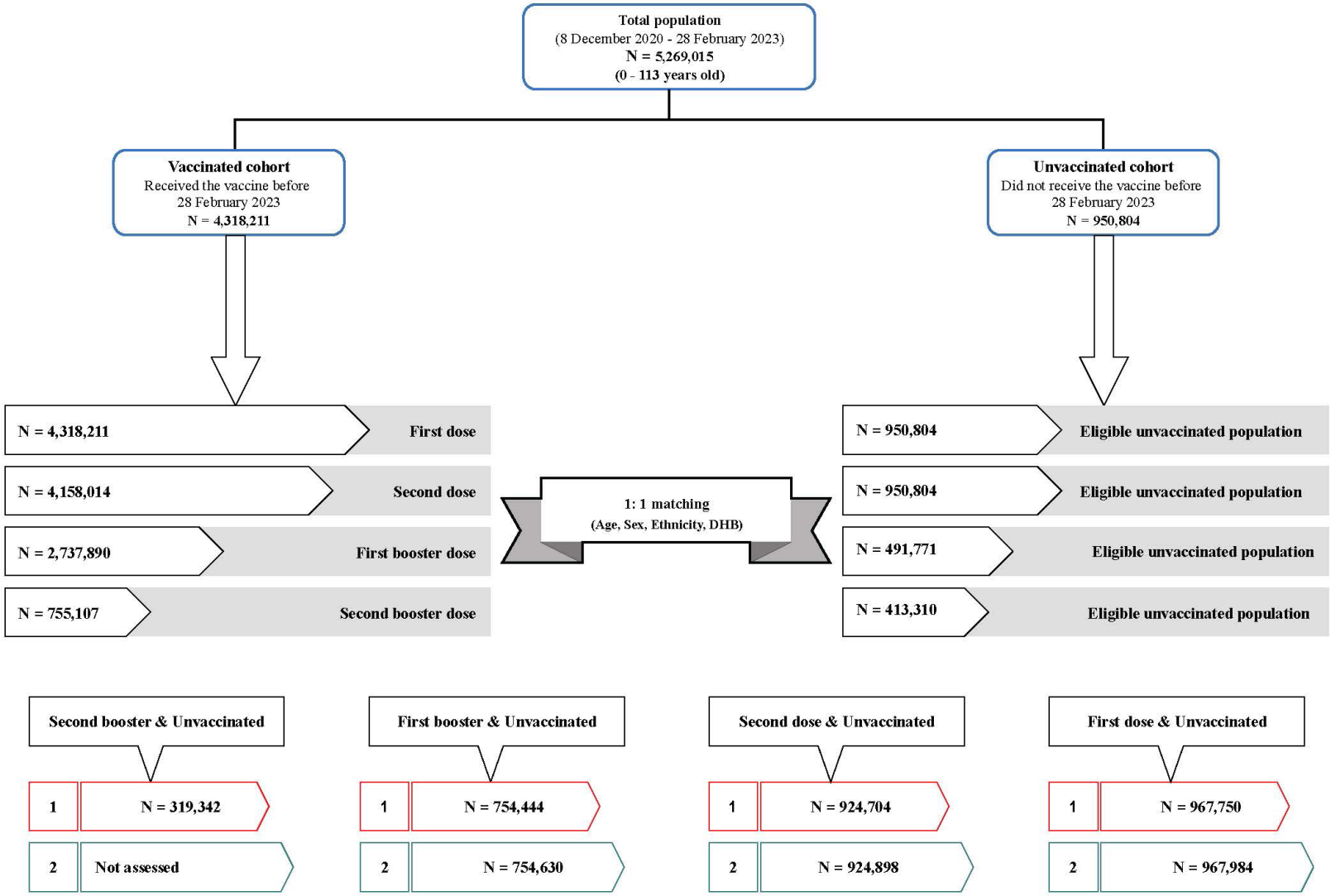


Figure 2: Data flowchart.



Red box: outcomes = infection and hospitalisation. Blue box: outcomes = COVID-19 death.

Table 1: Baseline characteristics of study participants.

Characteristics	Vaccinated cohort								Unvaccinated cohort	
	First dose		Second dose		First booster		Second booster			
Age										
Median	10		26		43		68		10	
Interquartile range	9		25		26		17		34	
Mean	16.5		29.6		44.7		66.9		21.9	
Standard deviation	17.3		17.8		17.0		12.7		23.3	
Age group										
0–4	5,179	1.7%	4,975	1.6%	0	0.0%	0	0.0%	301,225	96.7%
5–9	74,478	22.4%	100,682	30.2%	9	0.003%	0	0.0%	157,808	47.4%
10–14	38,916	11.3%	227,906	66.0%	229	0.1%	≤5	0.001%	78,461	22.7%
15–19	4,495	1.4%	195,614	61.3%	92,010	28.8%	752	0.2%	26,237	8.2%
20–24	4,755	1.4%	138,274	41.3%	157,780	47.1%	1,991	0.6%	32,163	9.6%
25–29	5,366	1.4%	145,276	38.0%	181,311	47.4%	3,522	0.9%	47,367	12.4%
30–34	5,255	1.3%	136,060	33.6%	204,571	50.5%	8,155	2.0%	50,714	12.5%
35–39	4,202	1.2%	104,264	29.0%	200,194	55.7%	9,171	2.6%	41,330	11.5%
40–44	3,216	1.0%	81,594	25.1%	193,389	59.6%	12,471	3.8%	33,910	10.5%
45–49	2,795	0.9%	70,921	21.8%	198,071	60.8%	23,388	7.2%	30,735	9.4%
50–54	2,532	0.8%	62,755	18.6%	180,527	53.5%	60,969	18.1%	30,764	9.1%

Table 1 (continued): Baseline characteristics of study participants.

Characteristics	Vaccinated cohort								Unvaccinated cohort	
	First dose		Second dose		First booster		Second booster			
55–59	2,109	0.7%	49,146	15.1%	169,752	52.1%	76,372	23.5%	28,298	8.7%
60–64	1,712	0.6%	36,105	11.8%	145,642	47.7%	96,650	31.7%	25,185	8.3%
65–69	1,257	0.5%	23,635	9.1%	92,189	35.4%	122,470	47.0%	20,979	8.1%
70–74	915	0.4%	15,721	7.0%	66,309	29.6%	125,571	56.0%	15,673	7.0%
75+	3,015	0.8%	27,196	7.3%	100,800	26.9%	213,621	57.0%	29,955	8.0%
Sex										
Female	75,619	2.9%	656,005	24.8%	1,038,879	39.3%	410,991	15.5%	465,211	17.6%
Male	84,455	3.2%	762,175	29.1%	941,015	36.0%	343,995	13.1%	485,128	18.5%
Indeterminate	≤5	1.3%	100	31.2%	184	57.3%	27	8.4%	6	1.9%
Unknown	119	2.3%	1,844	35.3%	2,705	51.8%	94	1.8%	459	8.8%
All deaths										
No	157,160	3.0%	1,404,631	26.9%	1,972,085	37.8%	755,099	14.5%	927,275	17.8%
Yes	3,037	5.8%	15,493	29.4%	10,698	20.3%	8	0.02%	23,529	44.6%
COVID-19 death*										
Yes	29	2.9%	249	24.8%	583	58.0%	0	0.0%	145	14.4%
No	3,008	5.8%	15,244	29.5%	10,115	19.5%	8	0.02%	23,384	45.2%
Prioritised ethnicity (level 1)										
Māori	39,675	4.9%	273,421	33.9%	194,579	24.1%	57,136	7.1%	241,535	23.0%

Table 1 (continued): Baseline characteristics of study participants.

Characteristics	Vaccinated cohort								Unvaccinated cohort	
	First dose		Second dose		First booster		Second booster			
Pacific peoples	17,936	4.6%	134,271	34.2%	124,544	31.7%	26,884	6.9%	89,086	22.7%
European	74,637	2.4%	743,203	24.1%	1,208,638	39.2%	601,011	19.5%	454,489	14.8%
Asian	23,663	2.8%	223,519	26.8%	393,761	47.1%	58,737	7.0%	135,903	16.3%
MELAA	3,044	3.1%	31,087	32.0%	37,366	38.5%	4,482	4.6%	21,197	21.8%
Other ethnicity	366	2.3%	3,798	24.0%	6,417	40.6%	2,082	13.2%	3,162	20.0%
Residual categories	876	2.2%	10,825	27.5%	17,478	44.4%	4,775	12.1%	5,432	13.8%
Ethnicity										
Māori	39,675	4.9%	273,421	33.9%	194,579	24.1%	57,136	7.1%	241,535	30.0%
Pacific peoples	22,132	4.9%	154,107	34.2%	132,837	29.5%	28,021	6.2%	113,49	25.2%
European	96,803	2.8%	863,902	25.0%	1,296,585	37.5%	624,469	18.1%	572,862	16.6%
Asian	25,108	2.9%	231,859	26.8%	405,253	46.8%	61,258	7.1%	142,785	16.5%
MELAA	3,352	3.3%	32,301	31.9%	38,129	37.6%	4,620	4.6%	22,928	22.6%
Others	538	2.8%	4,816	24.7%	7,556	38.8%	2,326	12.0%	4,234	21.8%
District health boards										
Auckland	12,272	2.4%	130,635	25.0%	225,975	43.3%	72,112	13.8%	81,428	15.6%
Bay of Plenty	9,349	3.4%	79,175	28.7%	89,348	32.4%	37,742	13.7%	60,336	21.9%
Canterbury	16,422	2.7%	154,143	25.7%	239,602	39.9%	98,266	16.4%	91,848	15.3%

Table 1 (continued): Baseline characteristics of study participants.

Characteristics	Vaccinated cohort								Unvaccinated cohort	
	First dose		Second dose		First booster		Second booster			
Capital and Coast	7,542	2.3%	74,161	22.6%	142,653	43.4%	61,172	18.6%	42,907	13.1%
Counties Manukau	21,753	3.5%	186,303	30.0%	227,546	36.6%	65,046	10.5%	121,349	19.5%
Hawke's Bay	6,538	3.6%	50,519	27.5%	62,529	34.0%	28,364	15.4%	35,881	19.5%
Hutt Valley	5,016	3.1%	41,352	25.7%	62,267	38.7%	27,095	16.9%	25,017	15.6%
Lakes	4,261	3.6%	34,884	29.2%	37,875	31.6%	16,042	13.4%	26,631	22.3%
MidCentral	6,039	3.2%	50,958	26.7%	68,712	36.0%	30,226	15.8%	34,976	18.3%
Nelson Marlborough	4,976	3.0%	42,000	25.2%	58,654	35.2%	31,322	18.8%	29,750	17.9%
Northland	7,129	3.5%	54,032	26.5%	64,649	31.8%	26,433	13.0%	51,355	25.2%
South Canterbury	2,002	3.2%	15,888	25.1%	23,990	37.9%	10,925	17.2%	10,551	16.7%
Southern	10,126	2.9%	91,813	26.0%	140,401	39.8%	54,623	15.5%	55,978	15.9%
Tairāwhiti	2,073	3.9%	16,100	30.1%	17,016	31.8%	6,748	12.6%	11,633	21.7%
Taranaki	4,014	3.1%	37,142	28.8%	42,985	33.4%	17,701	13.7%	26,979	20.9%
Waikato	15,272	3.4%	131,853	29.1%	155,198	34.3%	57,150	12.6%	93,229	20.6%
Wairarapa	1,758	3.5%	13,178	26.0%	17,323	34.1%	9,830	19.4%	8,657	17.1%
Waitematā	19,545	3.0%	178,541	27.1%	259,553	39.3%	86,158	13.1%	116,115	17.6%
West Coast	974	2.9%	8,900	26.6%	12,180	36.4%	4,968	14.9%	6,418	19.2%
Whanganui	2,200	3.1%	18,191	25.7%	23,075	32.6%	11,950	16.9%	15,340	21.7%
Not specified	936	3.3%	10,356	36.7%	11,252	39.9%	1,234	4.4%	4,426	15.7%

Table 1 (continued): Baseline characteristics of study participants.

Characteristics	Vaccinated cohort								Unvaccinated cohort	
	First dose		Second dose		First booster		Second booster			
Number of infections										
0	108,605	2.7%	993,236	24.7%	1,466,287	36.5%	642,062	16.0%	810,277	20.2%
1	51,469	4.1%	425,093	34.2%	514,053	41.4%	112,546	9.1%	139,986	11.3%
2	123	2.3%	1,787	33.3%	2,430	45.2%	496	9.2%	539	10.0%
3	0	0.0%	8	30.8%	13	50.0%	≤5	11.5%	≤5	7.7%
Hospitalisations										
0	159,667	3.0%	1,415,270	27.0%	1,973,042	37.6%	749,869	14.3%	946,797	18.1%
1	522	2.2%	4,821	19.9%	9,668	40.0%	5,210	21.5%	3,978	16.4%
2	8	4.7%	32	18.8%	73	42.9%	28	16.5%	29	17.1%
3	0	0.0%	≤5	100.0%	0	0.0%	0	0.0%	0	0.0%
MultiMorbidity Measure Index (M3 index)										
0–<1	5,587	1.7%	62,077	18.3%	129,980	38.4%	106,010	31.3%	34,812	10.3%
1–<2	1,350	2.5%	10,389	18.8%	18,465	33.5%	16,699	30.3%	8,304	15.0%
2–<3	672	3.0%	4,446	19.9%	6,529	29.3%	5,206	23.3%	5,470	24.5%
3+	313	4.5%	1,699	24.3%	1,458	20.8%	979	14.0%	2,550	36.4%
NA	152,275	3.1%	1,341,513	27.7%	1,826,351	37.7%	626,213	12.9%	899,668	18.6%
Pharmaceutical Prescribing Profile Mortality Risk Index (P3 index)										
0–<1	30,712	1.6%	377,763	20.1%	822,703	43.7%	464,744	24.7%	186,652	9.9%

Table 1 (continued): Baseline characteristics of study participants.

Characteristics	Vaccinated cohort								Unvaccinated cohort	
	First dose		Second dose		First booster		Second booster			
1–<2	4,137	1.3%	57,924	18.0%	133,228	41.3%	102,397	31.8%	24,587	7.6%
2–<3	1,317	2.0%	11,216	16.9%	24,101	36.3%	22,042	33.2%	7,812	11.8%
3+	825	4.0%	4,738	23.1%	5,701	27.8%	4,866	23.7%	4,391	21.4%
NA	123,206	4.1%	968,483	32.5%	997,050	33.5%	161,058	5.4%	727,362	24.4%

*COVID-19 death was defined as having COVID-19, an underlying ICD-10 cause of death recorded on the death certificate or any cause of death within 28 days of a confirmed SARS-CoV-2 infection.

Table 2: Interval between vaccine doses.

Time interval	Frequency	Percentage	Cumulative frequency	Cumulative percentage
First and second doses				
1 week	939	0.02%	939	0.02%
2 weeks	501	0.01%	1,440	0.04%
3 weeks	850,471	20.5%	851,911	20.5%
4 weeks	1,113,769	26.8%	1,965,680	47.3%
5 weeks	509,041	12.2%	2,474,721	59.5%
6 weeks	781,353	18.8%	3,256,074	78.3%
7 weeks	413,169	9.9%	3,669,243	88.2%
8 weeks	186,214	4.5%	3,855,457	92.7%
9 weeks	116,927	2.8%	3,972,384	95.5%
10 weeks	52,226	1.3%	4,024,610	96.8%
11 weeks	30,025	0.7%	4,054,635	97.5%
12 weeks	20,872	0.5%	4,075,507	98.0%
13 weeks	14,863	0.4%	4,090,370	98.4%
14 weeks	10,874	0.4%	4,101,244	98.6%
15 weeks	56,763	1.4%	4,158,007	100.0%
Second dose and first booster dose				
1 month	185	0.01%	185	0.01%
2 months	175	0.01%	360	0.01%
3 months	5,171	0.2%	5,531	0.20%
4 months	469,043	17.1%	474,574	17.3%
5 months	1,089,849	39.8%	1,564,423	57.1%
6 months	505,700	18.5%	2,070,123	75.6%
7 months	393,794	14.4%	2,463,917	90.0%
8 months	138,705	5.1%	2,602,622	95.1%
9 months	65,051	2.4%	2,667,673	97.4%
10 months	28,352	1.0%	2,696,025	98.5%
11 months	13,779	0.53%	2,709,804	99.0%
12 months	8,105	0.3%	2,717,909	99.3%

Table 2 (continued): Interval between vaccine doses.

13 months	6,318	0.2%	2,724,227	99.5%
14 months	5,266	0.2%	2,729,493	99.7%
15 months	8,390	0.3%	2,737,883	100.0%
First and second boosters				
1 month	97	0.01%	97	0.01%
2 months	28	0.004%	125	0.02%
3 months	148	0.02%	273	0.03%
4 months	981	0.1%	1,254	0.2%
5 months	847	0.1%	2,101	0.3%
6 months	33,976	4.5%	36,077	4.8%
7 months	385,729	51.1%	421,806	55.9%
8 months	134,297	17.8%	556,103	73.6%
9 months	60,770	8.0%	616,873	81.7%
10 months	57,511	7.6%	674,384	89.3%
11 months	46,550	6.2%	720,934	95.5%
12 months	23,537	3.1%	744,471	98.6%
13 months	8,701	1.22%	753,172	99.7%
14 months	1,682	0.2%	754,854	100.0%
15 months	253	0.03%	755,107	100.0%

Table 3: Vaccine effectiveness of second booster dose against COVID-19 hospitalisation and infection.

Months since the second booster dose	Vaccine effectiveness (95% confidence interval)	
	COVID-19 hospitalisation	COVID-19 infection (PCR+RAT)*
1	81.8% (73.6–87.5)	57.4% (48.4–64.7)
2	79.4% (66.8–87.2)	33.1% (12.7–48.7)
3	72.2% (58.5–81.4)	04.6% (-29.1–29.4)
4	75.5% (64.4–83.2)	25.7% (04.8–42.1)
5	36.1% (4.0–57.5)	-14.8% (-50.2–12.3)
6	49.0% (7.9–71.8)	09.9% (-25.8–35.4)

*Rapid antigen tests (RATs) were introduced on 16 February 2022.
NB: Deaths were not considered as there was no COVID-related death in the vaccinated cohort (second booster dose) during the follow-up period.

Table 4: Vaccine effectiveness as a function of time elapsed since the first booster dose.

Months since first booster dose	Vaccine effectiveness (95% confidence interval)			
	Hospitalisation	Death	Infection (RT-PCR)	Infection (RT-PCR+RAT)*
1	81.6% (75.6–86.1)	NA**	54.0% (38.8–65.4)	20.2% (17.7–22.7)
2	80.8% (76.0–84.6)	92.9% (82.1–97.2)	45.4% (-7.5–72.3)	18.9% (16.7–21.0)
3	74.7% (68.2–79.9)	89.2% (78.3–94.5)	20.0% (-88.1–66.0)	-10.71% (-14.25–-7.28)
4	65.4% (55.9–72.9)	88.9% (76.7–94.7)	-	-29.10% (-34.02–-24.63)
5	60.7% (49.5–69.4)	87.2% (67.4–94.9)	-	-48.41% (-57.67–-39.69)
6	57.4% (45.8–66.6)			-30.40% (-42.30–-18.75)

*Rapid antigen tests (RATs) were introduced on 16 February 2022.
**Deaths were not considered as there was no COVID-related death in the vaccinated cohort (first booster dose) during the first month.

Table 5: Vaccine effectiveness as a function of time elapsed since the second dose.

Months since second dose	Vaccine effectiveness (95% confidence interval)		
	Hospitalisation	Death	Infection (RT-PCR)
1	92.9% (86.4–96.3)	NA*	88.2% (85.3–90.5)
2	91.1% (83.1–95.3)	87.3% (53.8–96.5)	89.9% (87.5–91.9)
3	74.7% (63.2–82.6)		79.1% (74.3–83.1)
4	72.6% (62.4–80.1)	84.2% (41.4–95.7)	49.3% (39.0–57.8)
5	72.4% (64.1–78.7)	86.6% (69.1–94.2)	40.6% (25.6–52.5)
6	72.5% (64.9–78.5)	86.1% (50.6–96.1)	-

*Deaths were not considered as there was no COVID-related death in the vaccinated cohort (second dose) during the first month.

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Ethics approval (number: 30627) was obtained from the Human Ethics Committee of Te Herenga Waka – Victoria University of Wellington, New Zealand.

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REFERENCES
1. Health New Zealand – Te Whatu Ora. COVID-19: Case demographics [Internet]. 2024 [cited 2024 Feb 12]. Available from: https://www.tewhatuora.govt.nz/our-health-system/data-and-statistics/covid-19-data/covid-19-case-demographics/#details-of-covid-19-deaths
2. Health New Zealand – Te Whatu Ora. Immunisation Handbook 2024, version 1 [Internet]. New Zealand; 2024 [cited 2024 Apr 17]. Available from: https://www.tewhatuora.govt.nz/for-health-professionals/clinical-guidance/immunisation-handbook
3. Jefferies S, French N, Gilkison C, et al. COVID-19 in New Zealand and the impact of the national response: a descriptive epidemiological study. Lancet Public Health. 2020;5(11):e612-e23. doi: 10.1016/S2468-2667(20)30225-5.
4. Satherley N, Diamond T, Sporle A. More than just living in a deprived area: An equity-focused analysis of policy amenable factors associated with Māori COVID-19 outcomes. Auckland, New Zealand: iNZight Analytics Ltd, The National Hauora Coalition; 2023.
5. Sonder G, Grey C, Mischewski B, Ryan D. Pacific COVID-19 Intelligence Gathering and Analysis Project: Evaluation of the August 2020 outbreak [Internet]. Ministry of Health – Manatū Hauora; 2022 [cited 2023 Oct 30]. Available from: https://www.health.govt.nz/about-ministry/information-releases/general-information-releases/

pacific-covid-19-intelligence-gathering-and-analysis-project-evaluation-august-2020-outbreak
6. Ministry of Health – Manatū Hauora. COVID-19: Protecting Aotearoa New Zealand [Internet]. 2023 [cited 2023 Oct 30]. Available from: https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-protecting-aotearoa-new-zealand
7. Katikireddi SV, Cerqueira-Silva T, Vasileiou E, et al. Two-dose ChAdOx1 nCoV-19 vaccine protection against COVID-19 hospital admissions and deaths over time: a retrospective, population-based cohort study in Scotland and Brazil. Lancet. 2022;399(10319):25-35. doi: 10.1016/S0140-6736(21)02754-9.
8. Mbinta JF, Wang AX, Nguyen BP, et al. Herpes zoster vaccine effectiveness against herpes zoster and postherpetic neuralgia in New Zealand: a retrospective cohort study. Lancet Reg Health West Pac. 2022 Sep 26;31:100601. doi: 10.1016/j.lanwpc.2022.100601.
9. Mbinta JF, Wang AX, Nguyen BP, et al. Herpes zoster vaccine safety in the Aotearoa New Zealand population: a self-controlled case series study. Nat Commun. 2023;14(1):4330. doi: 10.1038/s41467-023-39595-y.
10. Nguyen T, Adnan M, Nguyen BP, et al. COVID-19 vaccine strategies for Aotearoa New Zealand: a mathematical modelling study. Lancet Reg Health West Pac. 2021;15:100256. doi: 10.1016/j.lanwpc.2021.100256.
11. Health New Zealand – Te Whatu Ora. National Health Index [Internet]. 2023 [cited 2023 Oct 3]. Available from: https://www.tewhatuora.govt.nz/our-health-system/digital-health/health-identity/national-health-index
12. Institute of Environmental Science and Research. Clinical Data Repository [Internet]. [cited 2023 Oct 3]. Available from: https://www.esr.cri.nz/expertise/public-health/health-information-systems/#ClinicalDataRepository
13. Health New Zealand – Te Whatu Ora. National Immunisation Registers [Internet]. [cited 2023 Oct 3]. Available from: https://www.tewhatuora.govt.nz/health-services-and-programmes/vaccine-information/national-immunisation-registers
14. Health New Zealand – Te Whatu Ora. COVID-19 vaccine data [Internet]. 2024 [cited 2024 Feb 12]. Available from: https://www.tewhatuora.govt.nz/our-health-system/data-and-statistics/covid-vaccine-data/
15. Institute of Environmental Science and Research. EpiSurv Notifiable Disease Database [Internet]. [cited 2023 Oct 3]. Available from: https://www.esr.cri.nz/expertise/public-health/health-information-systems/#EpiSurvnotifiablediseasedatabase
16. Health New Zealand – Te Whatu Ora. National Minimum Dataset (hospital events) [Internet]. [cited 2023 Oct 3]. Available from: https://www.tewhatuora.govt.nz/for-health-professionals/data-and-statistics/nz-health-statistics/national-collections-and-surveys/collections/national-minimum-dataset-hospital-events/
17. Health New Zealand – Te Whatu Ora. Pharmaceutical Collection [Internet]. 2021 [cited 2023 Oct 3]. Available from: https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/pharmaceutical-collection
18. Health New Zealand – Te Whatu Ora. Mortality Collection [Internet]. Wellington, New Zealand: Ministry of Health; 2024 Jan [cited 2023 Oct 3]. Available from: https://www.tewhatuora.govt.nz/for-health-professionals/data-and-statistics/nz-health-statistics/national-collections-and-surveys/collections/mortality-collection/
19. Watson OJ, Barnsley G, Toor J, et al. Global impact of the first year of COVID-19 vaccination: a mathematical modelling study. Lancet Infect Dis. 2022;22(9):1293-1302. doi: 10.1016/S1473-3099(22)00320-6.
20. Health New Zealand – Te Whatu Ora. News and updates [Internet]. [cited 2023 Sep 28]. Available from: https://www.tewhatuora.govt.nz/corporate-information/news-and-updates/
21. Valderas JM, Starfield B, Sibbald B, et al. Defining comorbidity: implications for understanding health and health services. Ann Fam Med. 2009;7(4):357-63. doi: 10.1370/afm.983.
22. Stanley J, Doughty RN, Sarfati D. A Pharmaceutical Dispensing-based Index of Mortality Risk From Long-term Conditions Performed as well as Hospital Record-based Indices. Med Care. 2020;58(2):e9-e16. doi: 10.1097/MLR.0000000000001217.
23. Stanley J, Sarfati D. The new measuring multimorbidity index predicted mortality better than Charlson and Elixhauser indices among the general population. J Clin Epidemiol. 2017;92:99-110. doi: 10.1016/j.jclinepi.2017.08.005.
24. van der Laan DJ. reclin2: a Toolkit for Record Linkage and Deduplication. R Journal. 2022;14(2):320-328.
25. Lin DY, Gu Y, Wheeler B, et al. Effectiveness of Covid-19 Vaccines over a 9-Month Period in North

Carolina. N Eng J Med. 2022;386(10):933-41. doi: 10.1056/NEJMoa2117128.
26. R Core Team. R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing; 2022.
27. Zeng B, Gao L, Zhou Q, et al. Effectiveness of COVID-19 vaccines against SARS-CoV-2 variants of concern: a systematic review and meta-analysis. BMC Med. 2022;20(1):200. doi: 10.1186/s12916-022-02397-y.
28. Wu N, Joyal-Desmarais K, Ribeiro PAB, et al. Long-term effectiveness of COVID-19 vaccines against infections, hospitalisations, and mortality in adults: findings from a rapid living systematic evidence synthesis and meta-analysis up to December, 2022. Lancet Respir Med. 2023;11(5):439-52. doi: 10.1016/S2213-2600(23)00015-2.
29. Ghazy RM, Ashmawy R, Hamdy NA, et al. Efficacy and Effectiveness of SARS-CoV-2 Vaccines: A Systematic Review and Meta-Analysis. Vaccines (Basel). 2022;10(3):350. doi: 10.3390/vaccines10030350.
30. Harder T, Koch J, Vygen-Bonnet S, et al. Efficacy and effectiveness of COVID-19 vaccines against SARS-CoV-2 infection: interim results of a living systematic review, 1 January to 14 May 2021. Euro Surveill. 2021;26(28):2100563. doi: 10.2807/1560-7917.ES.2021.26.28.2100563.
31. Brookmeyer R, Morrison DE. Estimating Vaccine Effectiveness by Linking Population-Based Health Registries: Some Sources of Bias. Am J Epidemiol. 2022;191(11):1975-80. doi: 10.1093/aje/kwac145.
32. Nørgaard M, Ehrenstein V, Vandenbroucke JP. Confounding in observational studies based on large health care databases: problems and potential solutions - a primer for the clinician. Clin Epidemiol. 2017;9:185-93. doi: 10.2147/CLEP.S129879.
33. Glasziou P, McCaffery K, Cvejic E, et al. Testing behaviour may bias observational studies of vaccine effectiveness. J Assoc Med Microbiol Infect Dis Can. 2022;7(3):242-6. doi: 10.3138/jammi-2022-0002.

Appendix

Appendix Table 1: Data dictionary.

Variable	Variable type	Definition
master_hcu_id	Character	Character variable indicating unique identifier for observation (i.e., primary NHI [Master HCU ID])
gender_code	Character	Character variable denoting gender (M=male or F=female)
date_of_birth	Date	Date variable indicating date of birth
date_of_death	Date	Date variable indicating date of death (where applicable)
age	Numeric	Numeric variable indicating age
ethnicity_priority_l1	Character	Character variable indicating priority 1 ethnicity
ethnicity_priority_l2	Character	Character variable indicating priority 2 ethnicity
ethnicity_is_euro	Numeric	Binary variable indicating whether the observation ethnicity is European
ethnicity_is_maori	Numeric	Binary variable indicating whether the observation ethnicity is Māori
ethnicity_is_pacific	Numeric	Binary variable indicating whether the observation ethnicity is Pacific
ethnicity_is_asian	Numeric	Binary variable indicating whether the observation ethnicity is Asian
ethnicity_is_melaa	Numeric	Binary variable indicating whether the observation ethnicity is MELAA
ethnicity_is_other	Numeric	Binary variable indicating whether the observation ethnicity is Other
dhb_domicile_name	Character	Character variable indicating DHB name
date_last_infected	Date	Date variable indicating date of last infection
dose_1	Date	Date variable indicating date of first dose
dose_2	Date	Date variable indicating date of second dose
booster_1	Date	Date variable indicating date of booster 1 dose
booster_2	Date	Date variable indicating date of booster 2 dose
first_infection	Date	Date variable indicating date of first infection
second_infection	Date	Date variable indicating date of second infection
third_infection	Date	Date variable indicating date of third infection
fourth_infection	Date	Date variable indicating date of fourth infection
most_recent_hospital-isation	Date	Date variable indicating date of most recent hospitalisation

Appendix Table 1 (continued): Data dictionary.

primary_clinical_code	Character	Character variable indicating primary_clinical as at code
primary_category_ short_description	Character	Character variable indicating primary_category_short as at description
primary_category_ long_description	Character	Character variable indicating primary_category_long as at description
vaccination_status	Character	Character variable indicating the number of doses and boosters received (i.e., dose 1, dose 2 etc.)
date_last_vaccinated	Date	Date variable indicating date of the last vaccination
age_group	Character	Character variable indicating age group (5-year age bands)
number_of_infections	Numeric	Numeric variable indicating number of infections
m3score	Numeric	Numeric variable indicating m3 score—indices for adjusting for comorbidity and multimorbidity
p3score	Numeric	Numeric variable indicating p3 score—indices for adjusting for comorbidity and multimorbidity
infectious	Numeric	Binary variable indicating whether the observation is infected or not (1=yes, 0=no)
immunity_hybrid	Numeric	Numeric variable derived from an ABM (agent-based model) indicating level of hybrid immunity (greater the number i.e., closer 1, the more hybrid immunity)
immunity_infection_ induced	Numeric	Numeric variable derived from an ABM indicating level of infection-induced immunity (greater the number i.e., closer 1, the more infection-induced immunity)
immunity_vaccine_ induced	Numeric	Numeric variable derived from an ABM indicating level of vaccine-induced immunity (greater the number i.e., closer 1, the more vaccine-induced immunity)
susceptible	Numeric	Numeric variable derived from an ABM indicating level of susceptibility to infection (greater the number i.e., closer 1, the more susceptible)

Appendix Table 2: Uptake of COVID-19 vaccines.

Cohorts	Received dose	Total number	Percentage	Cumulative percentage
Vaccinated cohort				
First dose	160,197	4,318,211	3.0%	82.0%
Second dose	1,420,124	4,158,014	27.0%	78.9%
First booster	1,982,783	2,737,890	37.6%	52.0%
Second booster	755,107	755,107	14.3%	14.3%
Unvaccinated cohort				
Unvaccinated	N/A	950,804	18.0%	

NB: This table represents the vaccine uptake for everyone in Aotearoa New Zealand across all age groups, ranging from 0–113 years.

Appendix Table 3: Vaccine effectiveness as a function of time elapsed since the second booster dose (sub-group analysis).

Baseline characteristic	Vaccine effectiveness (95% CI)	
	Hospitalisation	Infections (PCR+RAT)*
Age (10–49 years)		
1	89.4% (71.6–96.0)	53.2% (31.8–68.3)
2	47.9% (5.3–71.3)	23.4% (-43.5–59.1)
3		-23.2% (-117.30–30.2)
4		-7.1% (-119.2–47.6)
5		34.0% (-9.9–60.4)
6		
Age (50–69 years)		
1	85.9% (75.1–92.2)	61.8% (49.4–71.2)
2	81.0% (58.1–91.4)	35.1% (3.9–56.2)
3	77.6% (59.3–89.7)	-4.4% (-66.0–34.4)
4	79.2% (60.7–89.7)	18.1% (-20.7–44.4)
5	62.0% (34.8–76.7)	-22.0% (-87.6–20.6)
6		12.5% (-42.2–46.1)
Age (≥70 years)		
1	73.9% (54.2–85.2)	61.0% (43.3–73.1)
2	79.0% (58.8–89.3)	48.8% (18.3–67.9)
3	78.3% (55.8–89.6)	25.6% (-28.1–56.8)
4	34.3% (56.4–86.4)	17.2% (-12.1–38.8)
5		
6		-9.1% (-79.2–33.6)
Sex (female)		
1	72.0% (54.3–82.8)	51.5% (35.6–63.4)
2	82.3% (65.8–90.9)	29.1% (0.2–49.6)
3	64.8% (37.7–80.1)	-5.8% (-60.0–30.0)
4	74.5% (58.7–84.6)	20.0% (-15.7–44.7)
5	53.7% (25.6–71.2)	-0.6% (-40.7–28.1)
6		26.2% (-14.5–52.4)

Appendix Table 3 (continued): Vaccine effectiveness as a function of time elapsed since the second booster dose (sub-group analysis).

Baseline characteristic	Vaccine effectiveness (95% CI)	
	Hospitalisation	Infections (PCR+RAT)*
Sex (male)		
1	89.0% (80.3–93.9)	62.0% (50.4–70.8)
2	75.5% (50.6–90.8)	38.2% (5.2–59.7)
3	77.6% (60.3–89.3)	12.1% (-39.2–44.5)
4	41.9% (16.6–59.5)	30.4% (-0.4–51.8)
5		-29.5% (-89.5–11.5)
6		-10.3% (-67.8–27.5)
Ethnicity (Māori)		
1	81.1% (46.0–93.4)	55.4% (21.4–74.7)
2	51.9% (7.6–74.9)	65.0% (21.7–84.4)
3		10.9% (-84.4–56.9)
4	36.6% (-16.8–63.4)	37.8% (0.4–61.2)
5		
6		
Ethnicity (Pacific peoples)		
1	92.2% (37.6–98.9)	75.8% (43.5–89.6)
2	80.2% (23.8–95.2)	64.9% (1.0–87.5)
3		24.5% (-59.6–64.3)
4	56.7% (-0.7–81.3)	-55.6% (-148.6–50.7)
5		
6		
Ethnicity (European)		
1	79.8% (69.2–87.7)	56.9% (45.6–65.9)
2	84.0% (71.7–92.6)	33.5% (8.0–52.0)
3	73.8% (57.2–83.6)	-6.6% (-58.3–28.2)
4	75.7% (62.0–84.5)	12.0% (-6.1–27.0)
5	40.8% (01.2–64.5)	
6	45.9% (-7.5–29.3)	

Appendix Table 3 (continued): Vaccine effectiveness as a function of time elapsed since the second booster dose (sub-group analysis).

Baseline characteristic	Vaccine effectiveness (95% CI)	
	Hospitalisation	Infections (PCR+RAT)*
Ethnicity (Asian and MELAA)		
1	83.4% (54.5–93.9)	42.2% (7.0–64.1)
2	61.6% (12.9–73.0)	9.3% (-93.2–57.4)
3		26.2% (-58.0–65.6)
4		24.4% (-12.9–49.5)
5	17.0% (-136.6–70.9)	
6		

*Rapid antigen tests (RATs) were introduced on 16 February 2022.
NB: Deaths were not considered as there was no COVID-19-related death in the vaccinated cohort (second booster dose) during the follow-up period.

Appendix Table 4: Vaccine effectiveness as a function of time elapsed since first booster dose (sub-group analysis).

Baseline characteristic	Vaccine effectiveness (95% confidence interval)			
	Hospitalisation	Death	Infection (PCR)	Infection (PCR+RAT)*
Age (10–49 years)				
1	86.8% (72.2–93.4)	-	42.8% (21.5–58.2)	30.6% (25.4–35.5)
2	83.7% (72.6–90.3)	-		19.9% (15.0–24.4)
3	59.8% (22.9–79.0)	-		-11.4% (-19.9–-3.6)
4	47.5% (18.5–66.2)	-	-	-28.9% (-40.1–-18.5)
5		-	-	-48.7% (-72.0–-28.6)
6		-	-	-41.6% (-76.0–-24.0)
Age (50–69 years)				
1	79.3% (61.5–88.8)	-	68.9% (50.6–80.4)	32.7% (26.3–38.5)
2	81.6% (72.5–92.5)	83.8% (60.2–93.4)		28.0% (23.3–32.3)
3	80.5% (71.2–86.7)			9.1% (2.9–14.8)
4	75.3% (61.4–84.2)	92.8% (67.1–98.4)	-	-12.4% (-20.8–-4.5)
5	61.8% (38.6–76.3)		-	-38.7% (-53.8–-25.0)
6	66.9% (50.8–77.8)		-	-11.3% (-29.8–4.6)
Age (≥70 years)				
1	92.4% (79.6–97.2)	-	40.0% (-90.8–81.1)	46.4% (27.4–60.4)
2	89.2% (80.7–93.9)	92.0% (83.3–96.2)		27.6% (14.2–38.9)
3	86.2% (77.0–91.7)			17.9% (5.5–28.6)

Appendix Table 4 (continued): Vaccine effectiveness as a function of time elapsed since first booster dose (sub-group analysis).

Baseline characteristic	Vaccine effectiveness (95% confidence interval)			
	Hospitalisation	**Death**	**Infection (PCR)**	**Infection (PCR+RAT)***
4	68.6% (50.6–80.1)	85.8% (73.7–92.3)	-	-24.2% (-43.9–-7.3)
5	64.0% (44.6–76.7)		-	-65.2% (-96.6–-38.0)
6	54.7% (32.9–69.4)		-	-13.1% (-41.6–9.6)
Female				
1	81.7% (73.7–87.7)	-	56.4% (37.4–69.6)	19.2% (15.7–22.6)
2	79.9% (73.1–85.1)	96.9% (77.7–99.6)		20.7% (17.8–23.5)
3	74.6% (65.4–81.4)	91.1% (73.7–97.0)		-6.5% (-11.1–-2.0)
4	61.3% (46.8–71.4)	92.1% (73.3–97.7)	-	-22.1% (-28.3–-16.2)
5	59.0% (41.9–71.1)	92.2% (65.5–98.2)	-	-44.1% (-56.1–-33.0)
6	53.8% (34.6–67.4)		-	-28.3% (-44.0–-14.3)
Male				
1	81.3% (70.6–88.8)	-	45.1% (21.1–61.8)	21.4% (17.8–24.8)
2	82.2% (75.0–88.0)	89.0% (67.2–96.3)		16.6% (13.3–19.9)
3	74.8% (64.6–82.1)	87.7% (67.8–95.3)		-16.2% (-21.8–-10.9)
4	70.4% (56.7–79.8)	87.0% (63.2–94.7)	-	-39.1% (-47.3–-31.3)
5	62.2% (45.9–73.8)	80.3% (25.0–94.8)	-	-53.8% (-68.7–-40.2)
6	59.7% (43.5–71.2)		-	-33.4% (-52.7–-16.5)

Appendix Table 4 (continued): Vaccine effectiveness as a function of time elapsed since first booster dose (sub-group analysis).

Baseline characteristic	Vaccine effectiveness (95% confidence interval)			
	Hospitalisation	Death	Infection (PCR)	Infection (PCR+RAT)*
Māori				
1	77.5% (62.4–86.5)	-	75.1% (52.0–87.1)	22.8% (18.0–27.2)
2	84.0% (75.4–89.6)	95.6% (66.1–99.4)		21.5% (17.2–26.6)
3	70.2% (52.0–80.5)			-11.2% (-19.2–-3.7)
4	61.6% (38.3–76.1)	93.5% (44.1–99.3)	-	-29.1% (-41.0–-18.3)
5	53.0% (30.2–68.4)		-	-55.6% (-81.2–-33.5)
6		-	-	-47.8% (-86.2–-17.4)
Pacific peoples				
1	83.5% (71.3–90.4)	-	37.8% (5.2–59.2)	15.9% (9.1–22.2)
2	91.0% (83.8–95.0)	95.5% (83.0–98.8)		2.0% (-6.8–10.1)
3	76.7% (56.1–76.7)	94.4% (47.4–99.4)		-19.4% (-34.5–-6.0)
4	80.6% (60.7–80.6)	85.4% (44.3–96.2)	-	-68.0% (-97.9–-42.5)
5	61.6% (7.8–77.0)		-	-84.8% (-145.2–-58.6)
6	61.6% (5.0–75.0)		-	-41.1% (-105.2–-70.0)
European				
1	84.4% (76.0–89.9)	-	68.6% (51.2–79.8)	26.5% (23.5–29.5)
2	77.7% (70.1–83.3)	89.6% (53.0–97.7)		24.0% (21.5–26.4)
3	78.2% (70.8–82.2)	83.8% (64.0–92.7)		-5.8% (-9.7–-1.9)
4	66.3% (54.4–73.1)	89.1% (70.9–95.9)	-	-27.7% (-33.4–-22.3)

Appendix Table 4 (continued): Vaccine effectiveness as a function of time elapsed since first booster dose (sub-group analysis).

Baseline characteristic	Vaccine effectiveness (95% confidence interval)			
	Hospitalisation	Death	Infection (PCR)	Infection (PCR+RAT)*
5	63.4% (50.4–72.9)	90.5% (66.9–97.3)	-	-47.5% (-58.2–-37.5)
6	52.8% (36.9–64.7)		-	-33.6% (-48.3–-20.4)
Asian and MELAA				
1	80.5% (56.6–91.3)	-	37.4% (-18.9–62.6)	-18.2% (-32.9–-5.2)
2	72.5% (43.2–86.6)	92.3% (62.0–98.4)		-22.1% (-35.1–-10.3)
3	61.6% (10.5–83.5)	93.4% (63.8–98.8)		-54.0% (-74.0–-36.3)
4	61.5% (9.4–90.6)		-	-26.2% (-43.4–-11.0)
5	54.3% (5.4–80.0)	-	-	-41.9% (-72.0–-17.1)
6	69.1% (36.1–85.0)	-	-	-10.6% (-41.1–-58.9)

*Rapid antigen tests (RATs) were introduced on 16 February 2022.

Appendix Table 5: Vaccine effectiveness as a function of time elapsed since the second dose (sub-group analysis).

Baseline characteristic	Vaccine effectiveness (95% confidence interval)		
	Hospitalisation	Infection (PCR)	Infection (PCR+RAT)*
Age (10–49 years)			
1	91.2% (82.6–95.6)	87.55% (84.31–89.88)	75.56% (65.64–82.62)
2	88.9% (77.4–94.6)	89.65% (86.94–91.80)	60.20% (48.22–69.40)
3	71.0% (55.6–81.0)	77.07% (71.35–81.65)	22.44% (6.56–35.62)
4	73.2% (61.4–81.4)	43.39% (30.72–53.64)	22.87% (13.30–31.29)
5	72.6% (62.6–79.9)	34.45% (15.68–49.05)	48.03% (43.50–52.30)
6	67.3% (54.8–76.3)	-	71.26% (68.81–73.52)
Age (50–69 years)			
1	98.8% (90.8–99.8)	92.35% (87.73–95.23)	77.04% (69.71–82.59)
2		92.83% (86.37–96.22)	77.25% (68.95–84.86)
3	92.9% (78.2–97.7)	88.75% (79.93–93.69)	46.40% (32.46–57.45)
4	71.5% (34.9–87.5)	75.17% (59.13–85.31)	19.13% (5.33–30.92)
5	75.9% (58.1–86.2)	67.61% (44.65–81.04)	54.71% (49.65–59.65)
6	79.9% (67.2–87.6)	-	76.80% (74.44–79.45)
Age (≥70 years)			
1	86.0% (23.8–97.4)	84.95% (25.34–96.70)	75.64% (-12.20–87.80)
2			-0.60% (-233.90–-69.71)
3	60.0% (10.7–82.1)	78.76% (-17.00–96.15)	51.68% (-11.90–88.10)
4		36.32% (-282.20–89.39)	30.01% (-24.60–60.68)
5	61.5% (35.5–77.1)	-69.70% (-4663.00–49.12)	36.62% (7.94–56.37)
6		-	69.89% (57.35–78.74)
Female			
1	91.7% (79.5–96.7)	85.45% (80.53–89.13)	61.51% (58.15–64.61)
2	86.8% (68.6–94.5)	88.26% (84.26–91.24)	40.98% (35.68–46.84)
3	70.9% (51.8–82.5)	77.34% (70.94–82.68)	11.60% (5.17–17.60)
4	68.3% (52.9–78.6)	52.47% (38.88–63.80)	2.97% (-2.10–7.90)
5	69.1% (56.8–77.8)	44.63% (23.03–60.17)	29.85% (27.58–32.58)
6	69.9% (58.8–78.1)	-	51.44% (49.43–53.37)

Appendix Table 5 (continued): Vaccine effectiveness as a function of time elapsed since the second dose (subgroup analysis).

Baseline characteristic	Vaccine effectiveness (95% confidence interval)		
	Hospitalisation	Infection (PCR)	Infection (PCR+RAT)*
Male			
1	93.9% (84.5–97.6)	90.82% (87.10–92.90)	57.82% (54.23–60.12)
2	94.0% (84.4–97.0)	91.56% (88.30–93.92)	43.01% (38.09–47.53)
3	78.6% (62.5–87.7)	81.07% (74.24–84.92)	10.74% (4.15–16.88)
4	78.9% (63.6–87.7)	45.70% (28.79–58.60)	2.56% (-2.80–7.60)
5	77.0% (64.9–84.9)	36.32% (13.43–53.17)	23.56% (20.43–26.56)
6	76.2% (64.6–84.0)	-	45.3% (43.0–47.5)
Māori			
1	90.0% (69.9–96.7)	83.7% (78.1–87.9)	50.9% (44.6–56.4)
2	86.1% (65.0–94.6)	93.4% (90.3–95.5)	42.7% (36.3–48.4)
3	65.2% (37.8–80.5)	85.4% (78.1–89.1)	4.3% (-3.4–9.6)
4	79.2% (63.0–88.3)	75.6% (64.1–83.3)	0.0% (-6.1–6.4)
5	70.9% (49.2–82.5)	67.7% (44.9–75.9)	23.4% (19.2–27.3)
6	73.1% (56.4–83.5)	-	41.3% (37.8–44.6)
Pacific peoples			
1	91.2% (72.7–97.2)	86.5% (79.0–91.3)	54.6% (46.8–62.0)
2	95.8% (79.6–99.1)	84.6% (78.1–89.1)	46.6% (37.5–54.3)
3	75.6% (50.0–88.1)	68.3% (56.2–77.0)	0.83% (-11.5–8.8)
4	60.7% (23.1–79.9)	30.6% (3.2–50.3)	-11.4% (-21.9–-1.8)
5	73.5% (56.3–84.0)	22.4% (-10.6–37.6)	13.4% (6.9–19.3)
6	79.2% (61.6–88.8)	-	34.3% (28.1–40.9)
European			
1	94.6% (84.2–98.1)	93.4% (90.1–95.5)	60.0% (57.1–62.7)
2	90.5% (76.6–96.1)	92.7% (89.1–95.1)	36.7% (31.6–41.5)
3	87.2% (74.8–93.5)	87.2% (80.7–91.5)	18.4% (12.6–23.9)
4	73.3% (56.3–83.7)	53.7% (36.5–64.6)	8.1% (3.4–13.6)
5	62.7% (46.2–74.1)	53.4% (30.0–69.9)	32.7% (30.2–35.0)
6	75.1% (65.4–82.0)	-	51.9% (50.2–53.6)

Appendix Table 5 (continued): Vaccine effectiveness as a function of time elapsed since the second dose (subgroup analysis).

Baseline characteristic	Vaccine effectiveness (95% confidence interval)		
	Hospitalisation	Infection (PCR)	Infection (PCR+RAT)*
Asian and MELAA			
1	85.4% (12.5–97.6)	77.0% (53.2–60.3)	65.4% (59.0–70.8)
2	90.5% (20.8–98.9)	87.5% (73.0–94.2)	51.6% (41.8–59.8)
3	74.5% (45.7–88.0)	74.4% (54.2–54.8)	39.4% (26.8–49.8)
4		24.7% (-27.1–75.3)	6.9% (-8.9–20.4)
5	68.1% (39.2–83.2)	34.9% (-8.4–58.4)	7.4% (-2.9–17.1)
6		-	31.3% (24.2–37.8)

*Rapid antigen tests (RATs) were introduced on 16 February 2022.

Appendix Table 6: Vaccine effectiveness as a function of time elapsed since the first dose.

Months	Vaccine effectiveness (95% confidence interval)			
	Hospitalisation	Death	Infection (PCR)	Infection (PCR + RAT)*
1	69.6% (50.1–81.5)	87.6% (38.9–97.5)	63.2% (56.1–69.2)	46.4% (43.0–49.6)
2	88.5% (80.6–93.1)		-	46.5% (44.6–48.5)
3	-		-	-

Baseline characteristics	Vaccine effectiveness (95% confidence interval)		
	Hospitalisation	Infection (PCR)	Infection (PCR+RAT)*
Age (10–49 years)			
1	69.1% (46.6–82.1)	63.8% (56.5–69.9)	61.7% (39.4–75.7)
2	87.5% (78.4–92.8)	-	93.6% (89.2–96.2)
Age (50–69 years)			
1	71.0% (9.3–90.7)	65.0% (32.3–68.3)	53.2% (19.2–72.9)
2	96.4% (72.0–99.5)	-	86.7% (76.8–92.3)
Age (≥70 years)			
1	92.1% (22.7–99.2)	-	-
2		-	-
Female			
1	76.1% (50.7–88.4)	65.5% (55.5–73.2)	50.1% (45.8–54.5)
2	86.5% (72.6–93.3)	-	46.5% (43.6–49.3)

Appendix Table 6: Vaccine effectiveness as a function of time elapsed since the first dose.

Male			
1	61.3% (22.3–80.8)	60.8% (49.7–69.4)	42.5% (37.4–47.2)
2	90.1% (79.4–95.2)	-	46.2% (43.4–48.9)
Māori			
1	77.2% (47.0–90.2)	54.3% (41.3–64.5)	35.0% (27.4–41.8)
2	84.9% (64.9–93.5)	-	45.7% (41.2–49.8)
Pacific peoples			
1	54.6% (-13.9–81.7)	54.8% (38.2–66.9)	51.0% (45.3–56.4)
2	87.9% (64.9–95.9)	-	52.1% (47.0–56.7)
European			
1	78.7% (49.5–91.0)	67.9% (55.1–77.1)	41.5% (36.5–46.5)
2	83.9% (68.2–91.9)	-	40.4% (37.7–43.0)
Asian and MELAA			
1	72.4% (-6.2–93.8)	82.4% (72.2–88.9)	61.6% (55.5–66.8)
2	84.8% (41.1–96.1)	-	50.5% (45.7–54.7)

*Rapid antigen tests (RATs) were introduced on 16 February 2022.

Faecal immunochemical test (FIT) based prioritisation of new patient symptomatic cases referred for colorectal investigation

James Falvey, Catherine M Stedman, Joel Dunn, Chris Sies, Susan Levin

ABSTRACT

AIM: Quantitative faecal haemoglobin (fHb) measurement by faecal immunochemical test (FIT) is a powerful biomarker for colorectal cancer (CRC) and is incorporated in referral, prioritisation and triage protocols for symptomatic cases in other countries. We report our use of FIT to prioritise new patient symptomatic cases referred for colorectal investigation.

METHOD: Cases referred for investigation of new colorectal symptoms who were aged ≥50 years (≥40 years Māori/Pacific peoples), who would otherwise be triaged to non-urgent colonoscopy, were asked to provide a stool sample for FIT. Following FIT testing, cases were re-triaged to either urgent colonoscopy, non-urgent colonoscopy or computed tomography colonography (CTC) depending on fHb concentration (measured in micrograms haemoglobin per gram of stool [mcg/g]) and incorporating clinical judgement. At pathway initiation, cases already waiting for colonoscopy on the non-urgent new patient waiting list were approached first, and then new patient (NP) referrals for colonoscopy could be triaged to the pathway at the discretion of the triaging consultant.

RESULTS: Out of 739 cases, 715 (97%) returned FIT samples, and 691 cases completed colorectal investigations. Overall FIT positivity ≥10mcg/g was 17.1%. Fifteen colorectal cancers (CRC) were detected (2.2%). The sensitivity and specificity of FIT ≥10mcg/g for CRC were 80.0% (54.0–93.7%) and 84.3 (81.4–86.9%) respectively. A total of 432 cases (62.5%) completed the pathway without recourse to colonoscopy, and the median time to CRC diagnosis for NP from referral was 25 days.

CONCLUSION: FIT based prioritisation of cases referred with symptoms concerning for CRC is feasible and reduces time to CRC diagnosis.

The incidence of colorectal cancer (CRC) in Aotearoa New Zealand is among the highest in the world,[1] and the diagnosis is usually established by diagnostic colonoscopy, which allows biopsy of suspicious lesions as well as removal of precancerous polyps. However, colonoscopy capacity in New Zealand is finite, and waiting times often exceed Health New Zealand – Te Whatu Ora targets. Many patients are referred for colonoscopy due to concern that symptoms may indicate an underlying CRC. In current practice, referrals are made, received and triaged according to symptom, age and haemoglobin criteria as defined in the New Zealand Ministry of Health Direct Access Outpatient Colonoscopy or Computed Tomography Colonography (CT colonography, or CTC) guidelines (hereafter the direct access criteria).[2] However, these criteria have a low specificity for CRC,[3] and this results in many New Zealanders undergoing colonoscopy with no significant finding, thus depleting the limited colonoscopy capacity.

In contrast to these criteria, quantitative faecal haemoglobin (fHb) measurement by the faecal immunochemical test (FIT) is a powerful biomarker for colorectal disease, with high sensitivity and specificity for CRC.[4,5] In the United Kingdom, FIT is incorporated into the primary care assessment and referral pathway for patients presenting with colorectal symptoms concerning for CRC, and has been proven to improve case detection, reduce time to colorectal investigation and also to identify patients with low risk of colorectal cancer who do not need to proceed directly to colonoscopy.[6] In Waitaha Canterbury, our group have contributed to this field by reporting the diagnostic outcomes of the current direct access criteria,[3] and by demonstrating how FIT could be incorporated into the assessment, referral and prioritisation of such cases in order to improve access to definitive investigation for patients at greatest risk of disease.[5] Here we report on an interim clinical pathway (pending a national solution to the use of FIT in symptomatic

individuals) that incorporates FIT in the triage of non-urgent cases who were referred for investigation of colorectal symptoms. The pathway was developed with the goals of reducing time to definitive investigation for those at greatest risk of malignancy, and to redirect patients with low risk of CRC from investigation with colonoscopy to investigation with CTC, a less invasive procedure with similar sensitivity for colorectal cancer,[7] and in so doing, reduce overall waiting times for colonoscopy in our region.

Methods

The FIT pathway was developed in consultation with Māori and Pacific health practitioners, primary care, general and colorectal surgeons, radiology and laboratory staff. Patients referred for investigation of new colorectal symptoms, aged ≥50 years, who would otherwise be triaged to non-urgent colonoscopy were asked to provide a stool sample for FIT. Once the FIT result was available, cases were re-triaged by a FIT team clinician (Gastroenterology Department liaison GP, Gastroenterology fellow, or Gastroenterology consultant), incorporating the FIT result into the triaging process. The suggested usual outcomes followed this algorithm: fHb ≥150 micrograms haemoglobin per gram of stool (mcg/g)—urgent colonoscopy <2 weeks; 10–149mcg/g—colonoscopy <6 weeks; <10mcg/g—computed tomography colonography (CTC). For reference, the National Bowel Screening Programme FIT threshold is fHb 200ng/ml buffer, approximately equivalent to fHb 40mcg/g stool.[8] CTCs were performed in house through funding for additional out of hours lists and had no impact on usual CT capacity or waiting lists.

At pathway initiation, patients already waiting for colonoscopy on the non-urgent new patient waiting list were contacted first, and thereafter new referrals for colonoscopy could be triaged to the pathway by the triaging consultant gastroenterologist at their discretion. Waiting list review followed strict age parameters, however thereafter, age thresholds for entry to the pathway were not strictly enforced, allowing clinicians to exercise clinical judgement. All public referrals for direct access colonoscopy and CTC within our region are triaged by consultant gastroenterologists. The threshold for accepting new referrals for investigation were adjusted 10 years younger for Māori and Pacific peoples to reflect lower age at CRC presentation.[9,10] Patients were excluded from the FIT pathway if they had a definite indication for colonoscopy including screening, surveillance or on clinical grounds (e.g., history or concern for inflammatory bowel disease or microscopic colitis), or if urgent investigation was required. Patients were contacted by phone or text message by administrative staff (up to three times by differing modes and time of day including evening) and invited to participate in the pathway. Phone contact was followed by posting a FIT kit, which included a letter of invitation, instructions, a standard stool collection pottle and laboratory form. Stool samples were returned fresh, Monday to Friday, via delivery to central laboratory, community laboratories or General Practitioner (GP) surgeries. Samples were tested on the same day or frozen for later analysis. Patients not returning a sample within 21 days were followed up by phone. Thereafter, patients who did not return a sample were returned to the non-urgent colonoscopy waiting list.

FIT analysis was performed at Canterbury Health Laboratories using a Beckman Coulter DXC 700 AU, with limit of quantification 3mcg/g. Results below 3mcg/g were recorded as undetectable. FIT results were reported quantitatively and reviewed by a FIT team clinician daily and re-triaged as above. Clinical staff were encouraged to use clinical judgement over suggested "per protocol" outcomes where appropriate. CTC results were reviewed by the same medical team and actioned accordingly (e.g., referral for colonoscopy or flexible sigmoidoscopy for colonic findings, or follow on imaging, or referral to other specialties for incidental findings). Primary care was notified by letter at each stage in the pathway. A Microsoft Teams Excel spreadsheet was used to track patients and results, and for prospective audit. In analysis, advanced polyp includes adenomas with villous architecture, or high-grade dysplasia (HGD), a sessile serrated polyp (SSP) with dysplasia, or an adenoma or SSL ≥10mm. All other polyps were considered simple polyps. Endoscopically or histological demonstrated inflammation that is not attributable to inflammatory bowel disease is termed inflammation not otherwise specified (NOS). Analysis is largely descriptive; however, where appropriate, 95% confidence intervals have been calculated using the modified Wald method. Mean fHb in pathological groups are described by the mean and standard deviation. The audit was authorised by the Health New Zealand – Te Whatu Ora Waitaha Canterbury Research Office.

Results

From 6 July 2022 to 16 April 2023, 776 cases were referred to the pathway, 116 from the pre-existing waiting list and 660 via new patient triage. On review or first contact, 37 were found to be not appropriate for further investigation via the pathway. A flow diagram of case inclusion and loss is shown in Figure 1. Thereafter 715/739 (97%) of cases returned a stool sample, of whom 691 completed the investigation pathway. Of the 739 cases, the median age was 62 years (range 22–85) and 39.7% were male. Ethnicity data and rate of sample return are shown in Table 1. There was no significant difference in sample return rate between population groups. Of 691 cases completing investigation, primary symptom at presentation was anaemia in 61 (8.8%), rectal bleeding in 188 (27.2%), change in bowel habit 417 (60.3%) and other symptoms in 25 (3.6%).

Among 691 cases, 15 were found to have CRC (2.2%) and 57 had advanced polyps (8.2%). The investigational route for cases included in the pathway is shown in Figure 2. The overall fHb positivity rate (threshold of ≥10mcg/g) was 17.1% and is shown according to age in Figure 3. Colorectal findings by fHb threshold are shown in Table 2. The rate of CRC diagnosis was 22% for those with fHb ≥150mcg/g, 6.6% when fHb between 10 and 149mcg/g, and 0.5% when fHb <10mcg/g. Among 547 CTCs, there were 47 non-colonic radiological findings that required further investigation or referral: 12 gynaecological, 12 pulmonary, nine renal, eight hepatobiliary, two adrenal, two hernias, one aneurysm and one mesenteric mass. The median time to CRC diagnosis (from date of referral to colonoscopy) for new referrals triaged to the pathway was 25 days (n=11, range 22 to 79 days), shown in Figure 4. The sensitivity and specificity of FIT ≥10mcg/g for CRC were 80.0% (54.0–93.7%) and 84.3 (81.4–86.9%) respectively. Three CRC had FIT <10mcg/g. One was a CRC in the transverse colon in a patient who presented with rectal bleeding and anaemia (fHb 0mcg/g), and two were polyp cancers, the first a 3mm focus of cancer in a 11mm rectosigmoid tubular adenoma with high grade dysplasia, who presented with PR bleeding (FIT 3mcg/g), and the second a 2mm focus of cancer in a rectal tubulovillous adenoma in a patient who also presented with rectal bleeding (FIT 0mcg/g).

Discussion

Incorporating FIT into the assessment, referral and triage pathway for New Zealanders with colorectal symptoms promises to streamline access to definitive colorectal investigation and make better use of our constrained colonoscopy resource.[5] In the hiatus before a national directive on the use of FIT in patients presenting with colorectal symptoms, this local initiative has provided an interim solution for a proportion of the patients referred to our service. Compared with a usual colonoscopy waiting time of between 4 and 6 months (at pathway initiation for patients triaged to non-urgent care), the median time to cancer diagnosis for new patients in our pathway was 25 days. Only 2 of 10 new case referrals waited for more than 30 days for colonoscopy. In addition, while we do not propose that a national solution should triage all cases with a FIT≤10mcg/g to CTC, by doing so here, we have reduced colonoscopy demand in this population by 63%, freeing capacity for other patients and improving access across the board. Two CRC cases were detected via the CTC route, justifying the use of a robust safety net for this early adoption of FIT in symptomatic cases in New Zealand.

Within the international literature a fHb threshold of ≥10mcg/g has become the *de facto* rule-out threshold for FIT in symptomatic cases. The sensitivity and specificity for CRC at this threshold are estimated to be 89.0% and 80.1% respectively.[5] Below this threshold, there is a disproportionate loss of specificity for every point gain of sensitivity, and a very low cancer detection rate for cases with symptoms but fHb detectable below 10mcg/g, making investigation of these cases uneconomic.[11] We used the *de facto* threshold because it reflects international practice,[6] and also because patients with FIT below threshold were offered CTC, providing a diagnostic safety net for the 10% of CRCs that are missed at this threshold.[5] If the pathway had not used CTC for patients with a "negative" FIT, then a lower threshold might have been more appropriate. The FIT thresholds in the symptomatic and screening populations differ. In the bowel screening programme, a relatively higher threshold (40mcg/g) is applied to an asymptomatic population with a low prior probability of cancer (~0.2% in the New Zealand bowel screening target population),[12] with the intention of detecting as many cancers as possible while limiting the number of false positive results. The bowel screening threshold is a "rule in" threshold. In the symptomatic population, the prior probability of colorectal cancer is much higher (4% in all direct access referrals to

Canterbury in 2018),[3] and a much lower threshold test is needed to effectively and safely "rule out" colorectal cancer, detecting as many cancers as possible while minimising false negative results. The sensitivity for colorectal cancer in our dataset is lower than previous reports, albeit not significantly so.[11,13] This difference likely relates to low CRC case numbers, which was to be expected given our method of case identification, which favoured inclusion of low risk (for organic disease) patients based on specialist triage. Furthermore, two of the "missed" CRC were microscopic foci within adenomatous polyps, highlighting the lower sensitivity of FIT for advanced polyps, as previously reported, and emphasising the need for rigorous safety net practice, including primary care follow-up and repeat FIT testing where necessary.[11] While it is perhaps inevitable that polyp cancers should predominate in cases of malignancy with low or negative FIT results, it should be recognised that only three of 573 cases with fHb <10mcg/g had CRC, a prevalence of 0.52%, four times lower than the rate of cancer found among referrals to our service who fell outside of the national direct access criteria (2.1%).[3] It follows that some patients who have a low or undetectable fHb should not undergo further investigation due to very low likelihood of significant pathology, real risk of harm from the investigation and economic considerations.[5,6]

Inevitably there were a number of non-colorectal findings on CT imaging that required additional imaging or referral to another specialty, some of which were highly significant. While we have not investigated causality between symptom presentation and radiological finding, our data does raise a question regarding how general practitioners should further investigate the clinical suspicion of organic disease in the face of negative FITs. In this group, CTC may be preferred due to both the low probability of luminal organic disease, the facility to detect non-luminal pathology and acceptability to patients, both as a less invasive test and because with evolution in scanning technology, modern CTC requires relatively low levels of radiation exposure.[14,15]

The successful implementation of a FIT in symptomatic pathway is dependent on a high level of patient participation. Our pathway had a high rate of sample return. We attribute this to the appropriate resourcing, efforts and personal qualities of our administration team, to the quality of our written resources and to the emphasis placed on the importance of the test result to determine the next step of investigation during contact with patients. Of particular note, our administration team were sympathetic to individual patient needs, and volunteered to make and respond to calls outside of office hours. In addition, they had sufficient local knowledge to help patients troubleshoot sample return. The equivalent of one full-time administrator was required to manage the initial waiting list cohort, and thereafter, the pathway was managed with approximately 0.2 full-time equivalent's administration work. We found no significant difference in rate of sample return between population groups in our cohort; however, a larger cohort would be needed to confirm that this approach delivers equity. Previous work by our group found a strong preference for FIT testing in primary care, as it was believed this would encourage sample return, improve patient centredness and streamline care.[5] Such an approach has not, however, been investigated in New Zealand.

In planning our pathway we estimated that the prevalence of CRC in cases with positive FIT would be high, and that their investigations should be prioritised.[5] Indeed, despite the low overall prevalence of CRC in our dataset (2.2%), the risk of CRC among those with FIT ≥10mcg/g was 10%, greater even than that for patients presenting for colonoscopy within the New Zealand National Bowel Cancer Screening Programme and justifying our decision to award priority to these patients.[16]

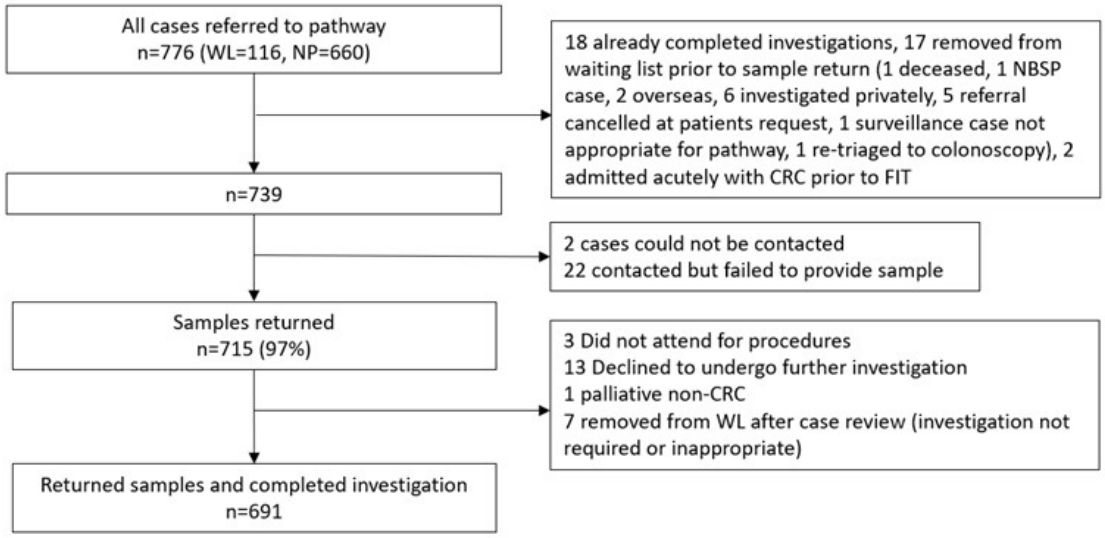
This prospective audit gathered data regarding those who were referred to the pathway and completed investigation following FIT. A more complete picture of departmental activity would have been achieved if we had collected referral and outcome data on all new patients referred for investigation of colorectal symptoms, irrespective of whether they were accepted for investigation or completed investigation. In addition, it would be of interest to understand how those who were triaged to the pathway differed from those who were not; however, this data was not collected. A recent audit from our department does provide some historical context to the current work.[3]

Since the end of this reporting period, April 2023, the pathway has undergone iterative change to embed it in business-as-usual pending national advice on the use of FIT in patients presenting with colorectal symptoms. First of all, the standard stool pottle has been substituted for a buffered FIT collection device, which reduces the risk of Hb degradation prior to analysis and potentially

increases the sensitivity of the test. In addition, this change relaxes the need for same day delivery of the sample to the laboratory, which we believe should further facilitate patient engagement. Thereafter, the pathway was incorporated in usual eTriage process, obviating the need for parallel (to usual hospital process) spreadsheet-based tracking, and involving all triaging consultants in FIT interpretation and re-triage.

Informal feedback regarding the pathway has been universally positive, albeit with some criticism that general practitioners cannot yet request the test directly. Nevertheless, we anticipate with enthusiasm a national directive on the use of FIT in patients presenting with colorectal symptoms, a work in progress under the supervision of the national bowel cancer working group, which we hope will revolutionise the assessment, referral and triage of these cases, and help obtain the greatest benefit from our colonoscopy resource.

Figure 1: Case inclusion and loss.

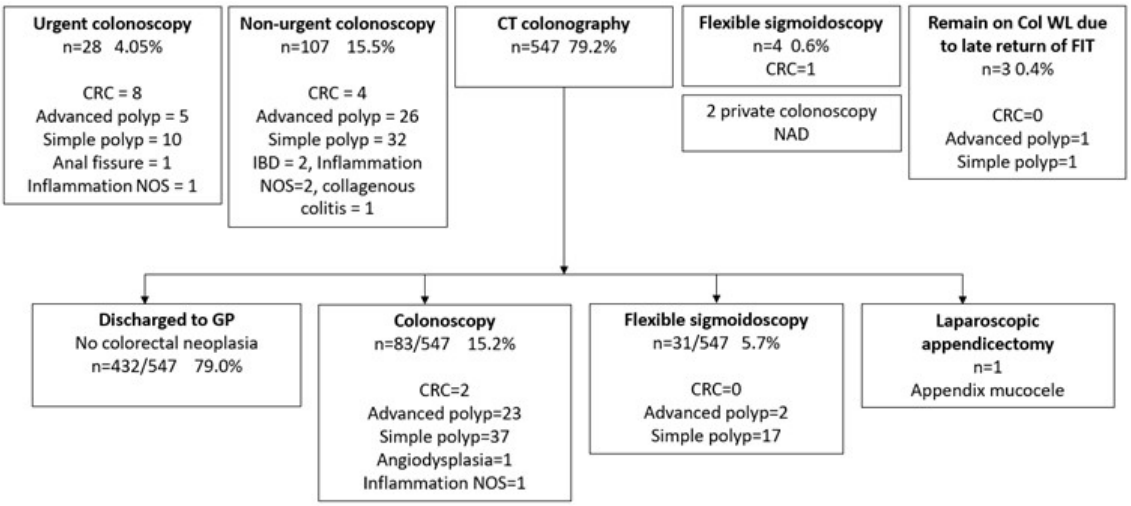


Waiting list = WL; New patient referral = NP; colorectal cancer = CRC; Faecal immunochemical test = FIT.

Table 1: Cohort ethnicity and sample return rate (confidence interval [CI]).

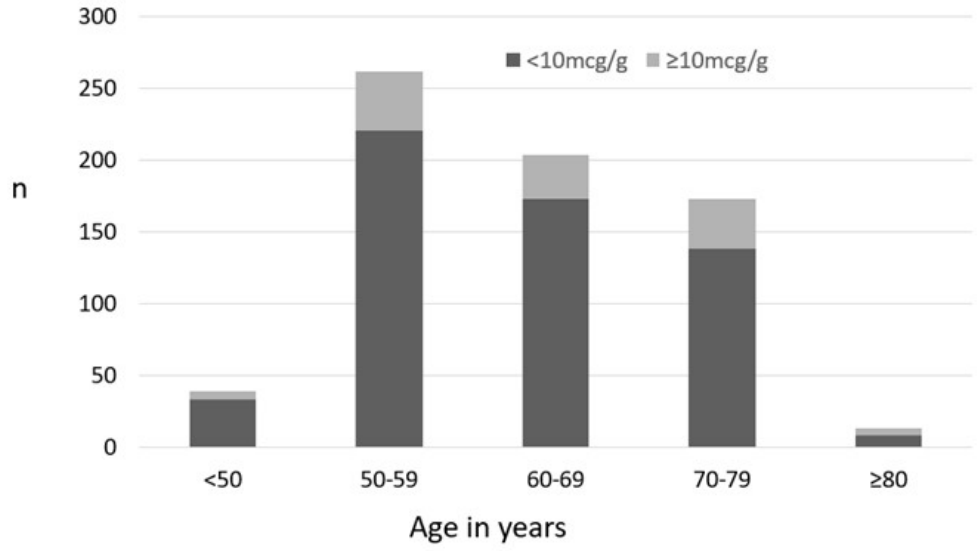
Ethnicity	Percent of cohort	Returned/invited	Return % (95% CI)
Māori	6.5	44/48	92 (80–97)
Pacific peoples	0.9	6/7	86 (47–99)
NZ Other	92.6	665/684	97 (96–98)
Total	100	715/739	97 (95–98)

Figure 2: Investigational route and findings for cases completing investigation.



Waiting list = WL; computed tomography = CT; colorectal cancer = CRC; not-otherwise specified = NOS; no abnormality detected = NAD.

Figure 3: Faecal immunochemical test positivity (≥10mcg/g) by age.

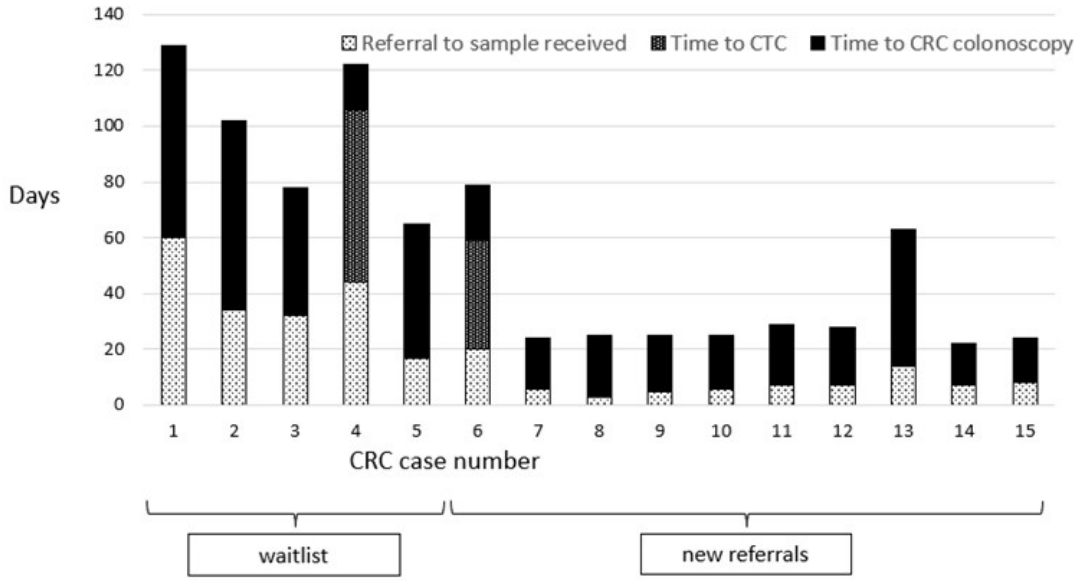


	<50	50-59	60-69	70-79	≥80
n	39	262	204	173	13
% ≥10mcg/g	15.4	15.6	15.2	20.2	38.4

Table 2: Colorectal pathology by faecal haemoglobin threshold.

	Faecal haemoglobin mcg/g			
	≥150mcg/g n=27 (3.9%)	**10–149mcg/g n=91 (13.2%)**	**Detectable <10mcg/g n=22 (3.2%)**	**Undetectable n=551 (79.7%)**
Colorectal cancer	6 (22%)	6 (6.6%)	1 (4.5%)	2 (0.36%)
Advanced polyp	6 (22%)	22 (24.2%)	2 (9.1%)	27 (4.9%)
Simple polyp	10 (37%)	29 (31.9%)	6 (27.3%)	51 (9.3%)
Other	1 anal fissure, 1 non-specific inflammation	1 non-specific inflammation, 2 inflammatory bowel disease	1 non-specific inflammation	1 each; collagenous colitis, angiodysplasia, appendiceal mucocele, non-specific inflammation
No neoplasia or inflammation	3 (11%)	31 (34%)	12 (54.5%)	467 (84.8%)

Figure 4: Time to colorectal cancer diagnosis from initial referral.



COMPETING INTERESTS
The authors have no competing interests.

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REFERENCES
1. World Health Organization. International Agency for Research on Cancer – Age-standardized rate (world) per 100,000, incidence, both sexes, in 2022 [Internet]. Lyon (FR): World Health Organization; 2022 [cited 2024 Apr 18]. Available from: https://gco.iarc.fr/today/en/dataviz/maps-heatmap?mode=population&cancers=41
2. Ministry of Health – Manatū Hauroa. Referral Criteria for Direct Access Outpatient Colonoscopy or Computed Tomography Colonography [Internet]. Wellington (NZ): Ministry of Health – Manatū Hauora; 2019 [cited 2024 Apr 18]. Available from: https://www.health.govt.nz/system/files/documents/publications/referral-criteria-direct-access-outpatient-colonoscopy-computed-tomography-colonography-feb19-v2.pdf
3. John RA, Wang H, Sylevych V, Falvey JD. Improving early detection of colorectal cancer in Aotearoa New Zealand; how do the direct access criteria perform? N Z Med J. 2022;135(1564):31-40.
4. Saw KS, Liu C, Xu W, et al. Faecal immunochemical test to triage patients with possible colorectal cancer symptoms: meta-analysis. Br J Surg. 2022;109(2):182-90. doi: 10.1093/bjs/znab411.
5. Falvey J, Frampton CMA, Gearry RB, et al. Incorporating faecal haemoglobin measurement using the faecal immunochemical test (FIT) in the referral, triage, and prioritisation pathway for patients with colorectal symptoms. N Z Med J. 2023;136(1578):55-76.
6. Monahan KJ, Davies MM, Abulafi M, et al. Faecal immunochemical testing (FIT) in patients with signs or symptoms of suspected colorectal cancer (CRC): a joint guideline from the Association of Coloproctology of Great Britain and Ireland (ACPGBI) and the British Society of Gastroenterology (BSG). Gut. 2022;71(10):1939-62. doi: 10.1136/gutjnl-2022-327985.
7. Pickhardt PJ, Hassan C, Halligan S, Marmo R. Colorectal cancer: CT colonography and colonoscopy for detection-systematic review and meta-analysis. Radiology. 2011;259(2):393-405. doi: 10.1148/radiol.11101887.
8. Love T, Poynton M, Swansson J. The cost effectiveness of bowel cancer screening in New Zealand: a cost-utility analysis based on pilot results [Internet]. AU/NZ: Sapere Research Group; 2016 [cited 2024 Apr 18]. Available from: https://www.health.govt.nz/system/files/documents/publications/appendix4-cost-utility-analysis-based-on-findings-of-the-pilot-results.pdf
9. McLeod M, Harris R, Paine SJ, et al. Bowel cancer screening age range for Māori: what is all the fuss about? N Z Med J. 2021;134(1535):71-7.
10. Waddell O, Pearson J, McCombie A, et al. The incidence of early onset colorectal cancer in Aotearoa New Zealand: 2000–2020. BMC Cancer. 2024;24(1):456. doi: 10.1186/s12885-024-12122-y.
11. D'souza N, Georgiou Delisle T, Chen M, et al. Faecal immunochemical test is superior to symptoms in predicting pathology in patients with suspected colorectal cancer symptoms referred on a 2WW pathway: a diagnostic accuracy study. Gut. 2021;70(6):1130-8. doi: 10.1136/gutjnl-2020-321956.
12. Ministry of Health – Manatū Hauora. Selected cancers 2015, 2016, 2017 [Internet]. Wellington (NZ): Ministry of Health – Manatū Hauora; 2019 [cited 2024 Jun 6]. Available from: https://www.health.govt.nz/publication/selected-cancers-2015-2016-2017
13. Booth R, Carten R, D'Souza N, et al. Role of the

faecal immunochemical test in patients with risk-stratified suspected colorectal cancer symptoms: A systematic review and meta-analysis to inform the ACPGBI/BSG guidelines. Lancet Reg Health Eur. 2022;23:100518. doi: 10.1016/j.lanepe.2022.100518.
14. Iball GR, Tolan D, Avery GR, et al. Improving practice in radiology: a quality-improvement project examining CT colonography patient dose and scanning technique. Clin Radiol. 2021;76(8):626.e13-626.e21. doi: 10.1016/j.crad.2021.02.010.
15. Ojidu H, Palmer H, Lewandowski J, et al. Patient tolerance and acceptance of different colonic imaging modalities: an observational cohort study. Eur J Gastroenterol Hepatol. 2018;30(5):520-5. doi: 10.1097/MEG.0000000000001090.
16. Health New Zealand. About colonoscopy [Internet]. Wellington (NZ): Time to Screen; date unknown [cited 2024 Apr 18]. Available from: https://www.timetoscreen.nz/bowel-screening/your-bowel-screening-test-result/about-colonoscopy/

Accuracy of ethnicity records at primary and secondary healthcare services in Waikato region, Aotearoa New Zealand

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ABSTRACT

AIMS: Ethnicity is an important variable, and in Aotearoa New Zealand it is used to monitor population health needs, health services outcomes and to allocate resources. However, there is a history of undercounting Māori. The aim of this study was to compare national and primary care ethnicity data to self-reported ethnicity from a Kaupapa Māori research cohort in the Waikato region.

METHODS: Through individual record linkage, prospective self-reported ethnicity, collected using New Zealand Census and Ministry of Health – Manatū Hauora ethnicity protocol as a "gold standard", was compared to ethnicity in secondary and primary healthcare datasets. Logistic regression analyses were used to determine if demographic variables such as age, ethnicity and deprivation are associated with inaccuracies in ethnicity recording.

RESULTS: Māori were undercounted in secondary NHI (32.5%) and primary care (31.3%) datasets compared to self-reported (34.6%). Between 9.5–11% of individuals had a different ethnicity recorded in health datasets than self-reported. Multiple ethnicities were less often recorded (secondary NHI [5.3%] and primary care [5.8%]) compared to self-reported (8.7%). Māori ethnicity (p=0.039) and multiple ethnicity (p<0.001) were associated with lower ethnicity data accuracy.

CONCLUSION: Routine health datasets fail to adequately collect ethnicity, particularly for those with multiple ethnicities. Inaccuracies disproportionately affect Māori and urgent efforts are needed to improve compliance with ethnicity data standards at all levels of the health system.

In Aotearoa New Zealand, ethnicity is defined as the "ethnic group or groups that people identify with or feel they belong to".[1] Ethnicity is a social construct, self-perceived, can change over one's lifetime and recognises that people can identify with more than one ethnic group.[1] In Aotearoa New Zealand healthcare, accurate ethnicity data collection is essential for public health prioritisation, policy planning/making, monitoring, eligibility for services and resource allocation. Inaccurate data collection of ethnicity impacts these processes, effects access and outcomes for populations and adversely impacts the Crown's obligation to Te Tiriti o Waitangi to achieve health equity, as well as Māori rights to monitor the Crown.[2] The 2017 updated Ethnicity Data Protocols released by the then Ministry of Health[3] aimed to build on the earlier 2004 iteration[4] to standardise the collection, recording and output of ethnicity data within the Health and Disability sector, in-line with the Statistics NZ statistical standard for ethnicity that applies to the Census and across government agencies.[5] Despite these protocols being in place since 2004 in the Aotearoa New Zealand public healthcare system, multiple subsequent groups have reported high levels of inaccuracy and undercounting of Māori.[6–10]

This research used prospectively in-person collected self-reported ethnicity data, gathered as part of the "Te Whakangungu Rākau" study[11] investigating thyrotoxicosis, to audit the accuracy of ethnicity recording in primary care and national hospital accessed datasets. As an issue central to Indigenous rights, this analysis focusses on the accuracy of ethnicity data for Māori.

Method

Ethical approval was obtained from the National Health and Disability Ethics Committee (HDEC), Waikato DHB and Te Puna Oranga prior to commencing the study (13/NTB/4).

Self-identified ethnicity data were gathered from 475 participants between March 2013 and December 2014 as part of the "Te Whakangungu Rākau" (WNR) studies (353 participants from

prospective incidence cohort study[11] and 122 additional participants from a prospective radioactive iodine cohort). Eligible participants were identified from patients referred to a public or private specialist endocrine service in the Waikato region of Aotearoa New Zealand. The WNR study collected in-person ethnicity data from participants using a standardised written questionnaire paralleling the Aotearoa New Zealand Census question[5] and as recommended by Ministry of Health – Manatū Hauora ethnicity protocol.[3] Multiple responses were allowed for (as many as required), and results were recorded at the most detailed/disaggregated level 4 ethnicity classification.[3] This ethnicity is considered the gold standard for this study and is referred to as "self-reported WNR ethnicity" from here on.

For all participants who consented for their information to be used in future studies (one participant excluded, n=474), their self-reported WNR ethnicity was compared against two different datasets at primary and secondary healthcare levels, with data extracted over the summer of 2018–2019. Primary care ethnicity data was requested from Hauraki Primary Health Organisation (n=157) and Pinnacle Primary Health Organisation (n=213) and from a handful of single general practices (GPs) (n=10) for patients registered with these primary care services. The remaining patients (n=94) were not registered with a GP, or there was no record of a registered GP. From 2016, primary care practices have been able to link their practice management systems with the National Health Index (NHI), enabling them to access and update the ethnicity recorded in the NHI.[12] Secondary healthcare ethnicity data was extracted from the Waikato District Health Board i.Patient Manager (iPM), which was able to draw live from the NHI dataset. This dataset is referred to hereafter in this manuscript as the "secondary NHI" dataset.

Excluding ethnicity, all other demographic data was taken from the WNR studies. Age was calculated from the date of birth to 1 January 2019, when this project's new data was extracted. Experience of material deprivation was collected prospectively during the WNR studies (therefore 2013–2014), using the New Zealand Index of Deprivation (NZDep) eight-point individual questionnaire.[13]

Ethnicity within each dataset was extracted at the most granular level available (level 4 for self-reported and level 2 for national, secondary and primary datasets). When necessary, this was coded to appropriate level 1 ethnicity groupings as per protocol.[3] Ethnicity was categorised and compared as total ethnicity, and to manage multiple ethnicity both prioritised ethnicity and sole/combination (nine possible categories: European, Māori, Pacific peoples, Asian, Other, Māori/European, Māori/Pacific peoples, "Two groups Not Elsewhere Identified" or "Three groups") as per protocol.[3] Both different datasets (primary and secondary) were compared to the self-reported ethnicity data to assess the accuracy of ethnicity within these commonly used datasets. For prioritised and sole/combination ethnicity outputs, these were considered either concordant (i.e., the same) or discordant (i.e., not exactly the same.) Given multiple ethnicity potential within total ethnicity output, congruence was considered concordant (all recorded ethnicity/ethnicities the same), partially concordant (at least one, but not all ethnicity/ethnicities the same), or discordant (none of the ethnicity/ethnicities the same). Participant demographics (age, gender and NZDep) were used to investigate factors associated with congruence. As the primary care cohort was incomplete (n=380), they were compared to the self-reported WNR ethnicity responses of the same individuals.

When aggregating ethnicity to level 1, some individuals with multiple ethnicity responses became allocated to single ethnicity response categories (e.g., at level 2 one individual is Niuean and Tongan, which becomes one Pacific peoples ethnicity). This did not happen in the self-reported WNR cohort but occurred four times in the secondary NHI dataset (three European, one Pacific peoples), and three times in the primary care (all European). Where the level 1 ethnicity matched the gold standard self-reported WNR ethnicity, this was considered congruent (even though at the lowest level these where not actually congruent). The eight "not stated" responses for second ethnicity in the primary care dataset were not counted as multiple ethnicities, as this was considered a void statement, while "response unidentifiable" were.

Statistical analysis was performed on Stata/SE 16 (StataCorp. 2019. College Station, TX: StataCorp LLC) using Chi-squared tests for count variables to compare congruence between dataset and Mann–Whitney for non-parametric variables. A logistic regression analysis of prioritised ethnicity concordance compared to discordance was used to determine if demographic variables such as age, ethnicity and deprivation are associated with

any inaccuracies seen.

Results

The cohort consisted of 474 participants, of which 390 (82.3%) were females, the median age was 55 years (range 19 years to 98 years) and using the NZDep, 29.1% of individuals lived with two or more measures of material hardship (8.6% lived with five or more). Collectively, the 474 individuals had 515 self-reported WNR ethnicities, with the total response ethnicity at each of the four ethnicity levels presented in Table 1.

Secondary NHI ethnicity records were available for all 474 participants. Primary care ethnicity records were available for all participants (n=380) requested. The level 1 total response ethnicity from the three datasets are shown below in Table 2. Total response ethnicity at level 2 is available in Appendix Table 1.

There was a net difference of 6.1% fewer Māori recorded in the national secondary NHI dataset and 5.6% fewer in the primary care dataset when compared to self-reported WNR ethnicity (secondary NHI 10 fewer and primary care 7 fewer individuals) (Table 2). Pacific peoples were also under-represented at level 1, although numbers are small. Table 3 presents the overall accuracy of records, with some discrepancy in record noted in 9.5% of secondary NHI records and 11.1% of individuals in primary care records when compared to their self-reported WNR ethnicities.

Multiple ethnicity

At the most disaggregated available level, 60 individuals (12%) had more than one ethnicity documented in at least one of the datasets. Māori were more likely to report multiple ethnicity (23.9% of Māori reported multiple ethnicity). The self-reported WNR cohort recorded higher multiple ethnicity (8.7%) compared to secondary NHI dataset (5.3%), and primary care dataset (5.8%) (Table 2). Māori and European (level 1) ethnic grouping was the most common combination (self-reported in 6.5% of the WNR cohort).

Table 3 illustrates discordance of ethnicity records compared to self-reported ethnicity when multiple ethnicities are managed by categorisation using total response, prioritisation or sole/combination. For all three datasets, prioritised ethnicity had the highest amount of concordance with self-reported WNR ethnicities, ranging between 93.7–95.1% concordance. Total response and sole/combination (9 options) had similar concordance (88.9–90.5%), but had different ways of managing the discordance.

Factors influencing ethnicity discordance

Individuals who self-reported more than one ethnicity (41 individuals) had more discordance in the datasets than those who reported a single ethnicity (Figure 1). The concordance for the group of individuals with multiple ethnicity was improved from ~36% full concordance with either total ethnicity or single/combination ethnicity to 70.7–75.8% with prioritised response (Figure 1), as the most common discordance was the exclusion of one ethnicity in an individual with multiple ethnicities.

Figure 2 demonstrates differences in concordance between the two datasets when compared to the self-reported WNR prioritised level 1 ethnicity of Māori, European and a conglomerate of all other ethnicity options ("Other"). Māori had much lower amounts of concordance (~78%), similar to the Other group (77–84%), while European individuals had records with 97–99% concordance ($p<0.005$ for both the secondary NHI records and the primary care records). For Māori, when self-reported WNR ethnicity was compared to secondary NHI records, 31 individuals were partly congruent (24 individuals with multiple ethnicities not having one of their ethnicities recorded, one individual with multiple ethnicities having a different ethnicity recorded and six individual's single ethnicity having an additional ethnicity recorded) and three were discordant (two recorded as European and one residual categories). For non-Māori, three were partly concordant and eight discordant (two residual categories were recorded as European and one European was recorded as residual categories, two Pacific peoples were recorded Māori, one Asian as Pacific peoples, one Asian as Māori and MELAA as European).

Comparing self-reported WNR total ethnicity to the secondary NHI total ethnicity, the discordant cohort was more likely to have identified as Māori in the self-reported study (70.7% compared with 29.3%, $p<0.001$) and be of a younger age (median age 45.1 years [IQR 21.4] compared with 50.1 years [24.3], $p=0.035$), but the relationship to gender ($p=0.062$) or deprivation ($p=0.069$) was not clearly explained. Logistic regression comparing self-reported total ethnicity to national records total ethnicity (Table 4) demonstrates Māori ethnicity and reporting multiple ethnicities were the only factors independently associated with discordance of ethnicity.

Discussion

The accuracy of ethnicity in administrative datasets has been and continues to be an issue in Aotearoa New Zealand, particularly for Māori and other non-European ethnic groups. In 2022, Harris et al. found that when individually linked ethnicity data were compared to the Census ethnicity, the NHI under-counted 16% of Māori. Swan et al. reported in 2006 that only 72.2% of Māori were correctly recorded in hospital records compared to 99.3% of non-Māori.[8] Riddell, in 2008, also shows that primary care records were correct for only 64.9% Māori and 90.9% for New Zealand Europeans.[7] Rumball, in 2011, showed the same inaccuracies, as Māori had only 71.2% of their ethnic groups recorded accurately and non-Māori had 99.3% accurately recorded.[9] Meanwhile in 2018, and also within the Waikato District Health board, accuracy was recorded at 79.3–82.8% for Māori patients who presented with a traumatic injury.[6] In the current study, the discordance rates were similar to these historical reviews, with accuracy ranging from 75–91.5% for Māori, with discordance also seen in other minority ethnic groups, and Māori ethnicity (self-reported, prioritised) was associated with a 0.36 odds ratio (p=0.039) of having ethnicity concordance in the secondary NHI dataset. Despite strict and clear policy on the collection of ethnicity data within the healthcare system, an unacceptable amount of inaccuracy still remains.

Our study shows that when gold-standard ethnicity collection is used, people report more ethnicities than are currently recorded in health datasets. This indicates our current health data systems are failing to fully capture ethnic affiliations, especially for Māori, who are more likely to report multiple ethnicities. In addition to Māori or other non-European ethnicities, identifying with more than one ethnicity was strongly associated with likelihood of discordant ethnicity health records (odds ratio 0.05, p<0.001). Ethnicity records must be able to accurately collect and document multiple ethnicity options. In this cohort, 8.6% of those in the self-reported WNR data identified with more than one ethnicity. Twenty-four percent of the Māori WNR cohort identified with more than one ethnicity. Despite the Ministry of Health Ethnicity Protocols[3] explicitly stating that ethnicity should be collected and stored at level 4 disaggregation, and with up to six potential ethnicities per individual, both primary care and secondary NHI datasets had only level 2 specificity data, and only three potential ethnicities per individual. In the Census and other key datasets, reporting of multiple ethnicities is common, especially for Māori and younger peoples, so is an issue that impacts these groups more if this is not being captured accurately. As such, the healthcare datasets need to be able to appropriately represent this population as accurately as it does those with a single ethnicity.

Our study demonstrates a concerning level of discrepancy between self-reported ethnicity and that recorded in administrative datasets, with 9.5–11.1% of individuals having at least some inaccuracy in their ethnicity recorded in health datasets when compared to self-reported WNR data. While the net degree of inaccuracy was similar across both datasets, it is important to note that they were not in the same individuals. This finding indicates that all administrative health datasets continue to have quality issues, and that data integration through the common NHI record is not yet in practice.

Appropriate reporting of multiple ethnicity entries continues to be a matter of discussion in Aotearoa New Zealand.[14] Total ethnicity continues to be the preferred manner of ethnicity reporting in research and population data. In this cohort, total ethnicity reporting of secondary NHI ethnicity datasets led to a net 5.6–6.1% undercount of Māori. It is not clear how much of this is due to the undercounting of Māori in multiple ethnicities and how much of this is due to people who only identify as Māori being misclassified as another ethnicity. This needs to be considered when presenting ethnicity information from these datasets. The use of prioritisation, as a system to manage multiple ethnicities, had higher overall concordance (93.7–95.1%) and Māori ethnicity concordance (89.0–91.5%).

These discrepancies in the quality of the healthcare datasets in Aotearoa New Zealand have significant implications for public health prioritisation, policy planning/making, monitoring and resource allocation and are a breach of the Crown's obligation to Te Tiriti o Waitangi to achieve health equity. It is impossible to measure the impact of policies that are focussed on health inequities between different ethnicities without accurate and high-quality ethnicity data. A timely reminder of this was the COVID-19 pandemic and the healthcare response to it. Many measures that were monitored to document the national experience of COVID-19 used national ethnicity data, e.g., PCR testing, positive cases, hospitalisations

and deaths. The national roll out of the COVID-19 vaccination also relied on national healthcare ethnicity records (e.g., NHI) to monitor the equity of vaccination coverage in Māori and Pacific peoples communities, who were priority target groups. Inaccuracies in these datasets will likely cause critical flaws in this approach, resulting in inaccurate coverage data and Māori individuals missing out on targeted services.

This study adds further evidence of inaccuracies in ethnicity data recording, and discrepancies in ethnicity between Aotearoa New Zealand key health datasets. This provides information relevant to addressing numerator-denominator bias i.e., demonstrating an undercount for Māori and poor collection of multiple ethnicities in health data, with implications for the use of different types of outputs. As each of the data sources assessed in this study are used for research and policy, the ability to compare across them is a strength of this paper. In addition, this is one of the first projects to consider the impact of different approaches to multiple ethnicities on the accuracy of ethnicity within a cohort. The fact that the original cohort was part of a Kaupapa Māori research project that prioritised the importance of excellent quality ethnicity data is also a strength.

The discrepancies found in our study are above and beyond what could be explained by other factors. Ethnicity mobility has been used to describe how ethnicity can change over time. There was a 5-year time difference between the collection of the self-reported WNR ethnicity and the primary and secondary NHI dataset extraction. As such, ethnicity may have changed for some individuals. Evidence shows that this mobility is generally low in Aotearoa New Zealand, with just over 5% of Māori individuals changing ethnicity between each Census, with minimal net change to the Māori population numbers at an aggregate level.[15] Ethnicity responses may differ due to a range of factors, such as the environment the question is asked, question design and the perceived benefit or consequence that may come with the question.[3,15] It is therefore possible that the Kaupapa Māori research environment of the self-reported WNR ethnicity led to some variation in expression compared to healthcare interactions. However, the ethnicity record from secondary NHI and primary care records were taken from a single time-period, so mobility may be even less a factor. The inconsistencies between these datasets raises quality concerns, especially as the individuals with discordant ethnicity were not the same across both databases. Further investigation is needed to determine whether this is due to deviating health service approaches to ethnicity data collection, or differences in the perceived safety of reporting Māori ethnicity in healthcare settings. Moreover, the NHI database is now a centralised computerised record, which all levels of the health system should be accessing and updating. So, a discrepancy between primary care and NHI ethnicity indicates that these systems are not fully integrated in practice. The ethnicity protocols stipulate that ethnicity should be asked every 3 years, and that at each healthcare interaction (whether in hospitals or primary care) there is the opportunity to update the patient's self-reported ethnicity in the NHI record. More work is needed to improve ethnicity data recoding in every healthcare setting.

This paper examines ethnicity data quality by investigating differences in prioritised, total and sole/combination ethnicity outputs from primary and secondary care data compared to gold-standard collection of ethnicity in the WNR study. However, it does not suggest a preferred option for the analysis of ethnicity data. This will depend on the purpose of the research and an understanding of the strengths and limitations of the datasets, including regarding ethnicity data.[16]

The study participants themselves were not representative of the total population, being drawn from a cohort of all local adults (>15 years of age) presenting with a first diagnosis of thyrotoxicosis between January 2013 and October 2014. As a result, the participants were predominantly (>80%) female—ethnicity inaccuracy[10] and mobility[15] have been found to be markedly higher for Māori males, so our study is likely to underestimate the inaccuracy of ethnicity data for the total Māori population. This study also samples only individuals who are health service users, and thus may not be representative of the total population, especially for Māori, who are less likely than non-Māori to receive health services.[17]

Nevertheless, our study shows that ethnic identity is recorded less accurately for Māori, for other non-European individuals and for those who have multiple ethnicities. Self-reported ethnicity collection is paramount to achieving correct ethnicity reporting. More effort is needed to improve ethnicity data collection, in particular for those who identify as having multiple ethnicities recording and reporting to improve the accuracy of counting Māori in health datasets.

Specifically, health services at all levels must implement the existing national ethnicity protocols, and compliance should be a core focus for regular self-audit, as well as a requirement for accreditation and funding. Staff training in ethnicity data collection and cultural safety is needed to ensure it is safe for Māori to report ethnicity data in all healthcare settings, and data are collected (and updated) accurately. Software barriers to the appropriate recording of multiple ethnicities in health datasets must be urgently addressed. The findings of this study further underscore the urgent need to implement the actions called for by Te Aka Whai Ora – Māori Health Authority, in its *Action plan for achieving high quality ethnicity data in the health and disability sector* released in 2023.[18]

Table 1: Total response self-reported WNR ethnicity at level 1 through to level 4, as per the Health Information Standards Organisation.[3]

Level 1		Level 2		Level 3		Level 4	
Ethnicity category	**n (%)**	**Ethnicity category**	**n**	**Ethnicity category**	**n**	**Ethnicity category**	**n**
European	310 (65.4%)	New Zealand European	290	New Zealand European	290	New Zealand European	290
		Other European	20	British and Irish	9	British NFD	3
						English	3
						Irish	1
						Welsh	1
						British NEC	1
				Greek	1	Greek	1
				South Slav	1	Macedonian	1
				Australian	1	Australian	1
				Other European	8	Hungarian	1
						Romanian	1
						Russian	1
						Spanish	1
						Swiss	1
						Ukrainian	1
						South African European	2

Table 1 (continued): Total response self-reported WNR ethnicity at level 1 through to level 4, as per the Health Information Standards Organisation.[3]

Māori	163 (34.4%)	Māori	163	Māori	163	Māori	163
Pacific peoples	17 (3.6%)	Samoan	4	Samoan	4	Samoan	4
		Cook Islands Māori	10	Cook Islands Māori	10	Cook Islands Māori	10
		Niuean	2	Niuean	2	Niuean	2
		Other Pacific peoples	1	Other Pacific peoples	1	Kiribati	1
Asian	23 (4.9%)	Southeast Asian	6	Filipino	3	Filipino	3
				Cambodian	2	Cambodian	2
				Vietnamese	1	Vietnamese	1
		Chinese	7	Chinese	7	Chinese NFD	7
		Indian	10	Indian	10	Indian NFD	9
						Sri Lankan	1
Middle Eastern/Latin American/African	2 (0.4%)	Middle Eastern	1	Middle Eastern	1	Turkish	1
		African	1	African	1	Somali	1
Residual categories	1	Not stated	1	Not stated	1	Not stated	1

Number = n; percentage of participant = %; not further defined = NFD; not elsewhere classified = NEC. Note: Percentages equal greater than 100% due to multiple ethnicity options.

Table 2: Total response ethnicity (level 1) from self-reported WNR, secondary NHI and primary care data.

	Self-reported WNR	Secondary NHI	Self-reported WNR—primary care*	Primary care
	n=474	n=474	n=380	n=380
Māori	164 (34.6%)	154 (32.5%)	126 (33.2%)	119 (31.3%)
European	310 (65.4%)	307 (64.8%)	258 (67.9%)	247 (65.0%)
Pacific peoples	17 (3.6%)	14 (3.0%)	16 (4.2%)	13 (3.4%)
Asian	22 (4.6%)	21 (4.4%)	20 (5.3%)	18 (4.7%)
MELAA	2 (0.4%)	2 (0.4%)	1 (0.3%)	2 (0.5%)
Other Ethnicity	0	0	0	1 (0.3%)
Residual categories	1 (0.2%)	2 (0.4%)	1 (0.3%)	5 (1.3%)
TOTAL response	516	500	422	405
Individuals with multiple ethnicity	41 (8.7%)	25 (5.3%)	38 (10.0%)	22 (5.8%)
Individuals reporting Māori & European	34 (6.5%)	21(4.2%)	27 (7.1%)	22 (5.8%)
Undercount Māori#	-	10 (6.1%)	-	7 (5.6%)

*WNR ethnicity data for those participants where primary care ethnicity records were available—for direct comparison.
#Percentage undercount of Māori individuals within the cohort as compared to self-reported WNR data.
Note: Percentages equal greater than 100% due to multiple ethnicity options.

Table 3: Accuracy of ethnicity records in secondary NHI or primary care datasets compared to self-reported WNR ethnicity, by method of managing multiple responses.

	Secondary NHI			Primary care*		
	Total response	**Sole/ Combination%**	**Prioritised**	**Total response**	**Sole/ Combination%**	**Prioritised**
Concordant	429 (90.5%)	429 (90.5%)	451 (95.1%)	338 (88.9%)	338 (88.9%)	356 (93.7%)
Partially concordant	34 (7.2%)	-	-	29 (7.6%)	-	-
Discordant	11 (2.3%)	45 (9.5%)	23 (4.9%)	13 (3.4%)	41 (10.8%)	24 (6.3%)

*Primary care comparisons are made directly against WNR ethnicity data for those participants where primary care ethnicity records were available.
% Sole/combination = 9 possible categories: European, Māori, Pacific peoples, Asian, Other, Māori/ European, Māori/Pacific peoples, "Two groups Not Elsewhere Identified" or "Three groups".

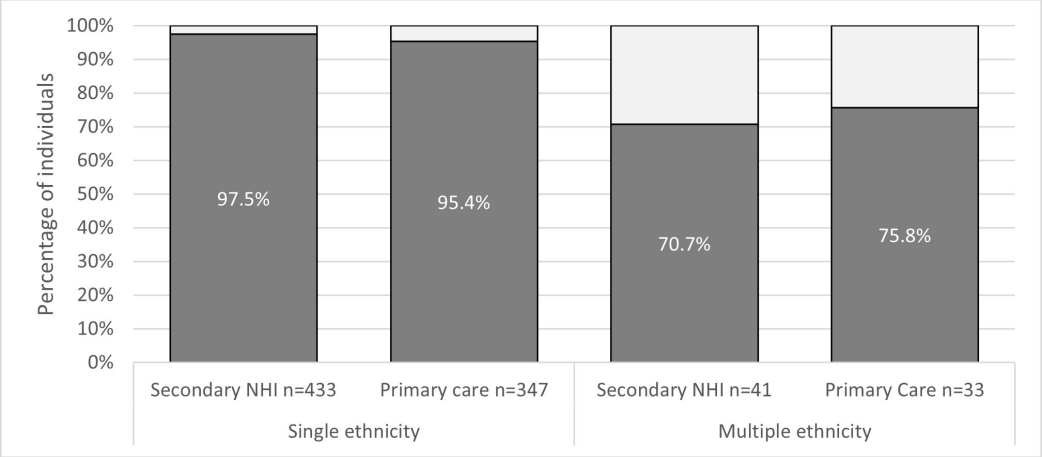
Table 4: Self-reported prioritised WNR ethnicity compared to secondary NHI prioritised ethnicity; Logistic regression—concordant ethnicity vs discordant ethnicity.

	Odds ratio (95% CI)	p-value
Māori ethnicity*	0.36 (0.13, 0.35)	0.039
Multiple ethnicity*	0.05 (0.02, 0.11)	<0.001
Gender	1.70 (0.45, 5.36)	0.361
Age	1.00 (0.98, 1.03)	0.750
NZDep	0.93 (0.71, 1.22)	0.627

*Self-reported ethnicity.

Figure 1: Proportion of concordance of ethnicity by single and multiple ethnicity groupings (as per self-reported WNR ethnicity) in secondary NHI and primary healthcare records.

A) Prioritised ethnicity



B) Sole/combination ethnicity

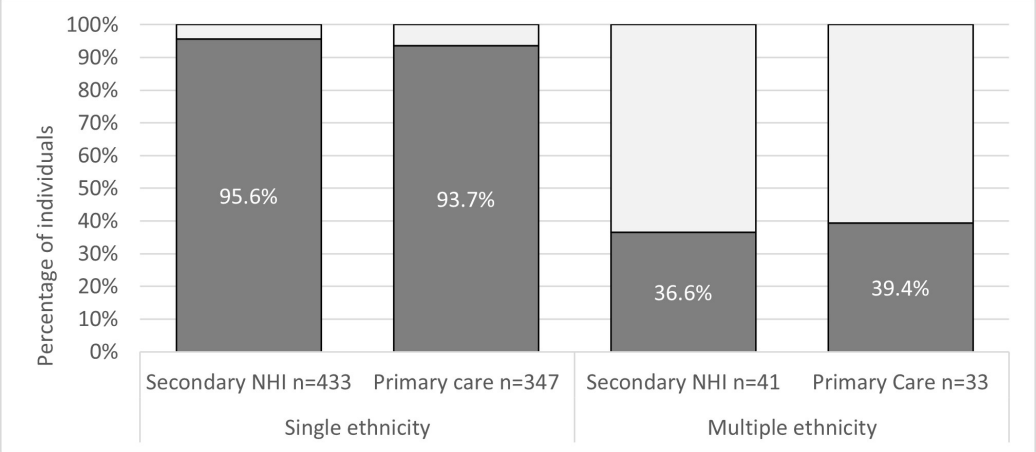


Figure 1 (continued): Proportion of concordance of ethnicity by single and multiple ethnicity groupings (as per self-reported WNR ethnicity) in secondary NHI and primary healthcare records.

C) Total ethnicity

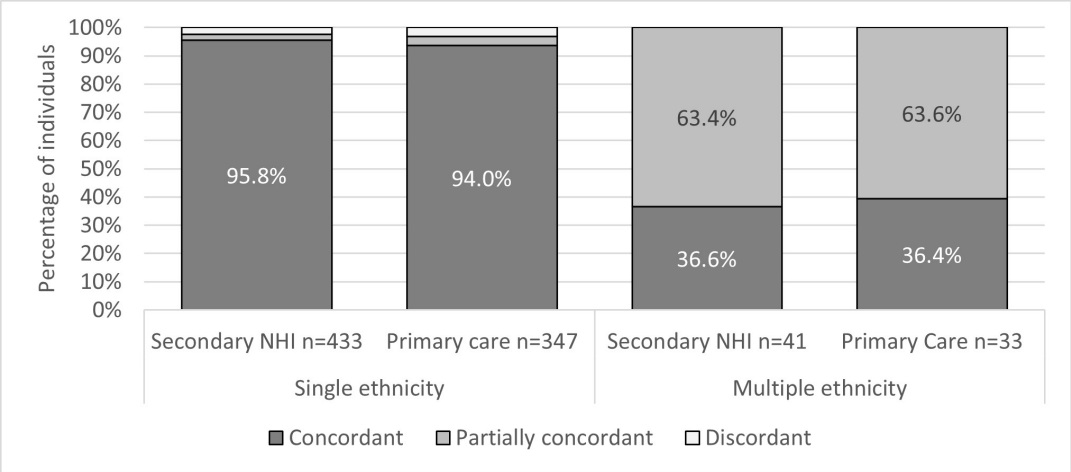
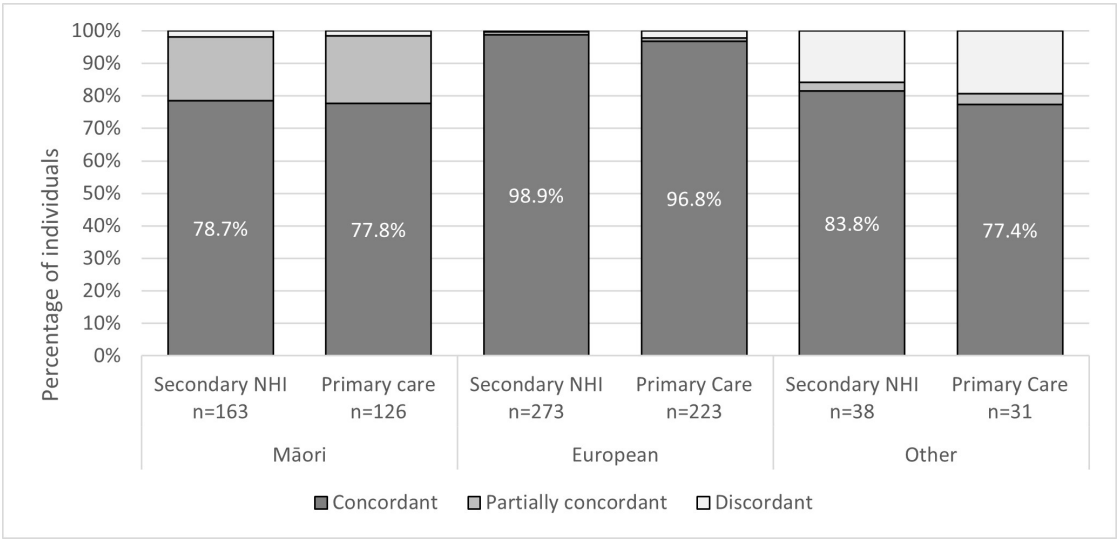


Figure 2: Proportion of concordance of total ethnicity by Māori, European and Other ethnicity (as per self-reported WNR ethnicity) in secondary NHI and primary healthcare records.



COMPETING INTERESTS
Nil noted.

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URL
https://nzmj.org.nz/journal/vol-137-no-1602/accuracy-of-ethnicity-records-at-primary-and-secondary-healthcare-services-in-waikato-region-aotearoa-new-zealand

REFERENCES
1. Statistics New Zealand. Ethnicity [Internet]. Wellington (NZ): Statistics NZ; 2021 [cited 2021 Mar 25]. Available from: https://www.stats.govt.nz/topics/ethnicity
2. Simmonds S, Robson B, Cram F, Purdie G. Kaupapa Māori Epidemiology. Australas Epidemiol. 2008;15(1):3-6.
3. Ministry of Health – Manatū Hauora. Health Information Standards Organisation HISO 10001:2017. Ethnicity Data Protocols. Wellington (NZ): Ministry of Health – Manatū Hauora; 2017.
4. Ministry of Health. Ethnicity Data Protocols for the Health and Disability Sector. Wellington (NZ): Ministry of Health; 2004.
5. Statistics New Zealand. Statistical Standard for Ethnicity. Wellington (NZ): Statistics NZ; 2010.
6. Scott N, Clark H, Kool B, et al. Audit of ethnicity data in the Waikato Hospital Patient Management System and Trauma Registry: pilot of the Hospital Ethnicity Data Audit Toolkit. N Z Med J. 2018;131(1483):21-9.
7. Riddell T, Lindsay G, Kenealy T, et al. The accuracy of ethnicity data in primary care and its impact on cardiovascular risk assessment and management--PREDICT CVD-8. N Z Med J. 2008;121(1281):40-8.
8. Swan J, Lillis S, Simmons D. Investigating the accuracy of ethnicity data in New Zealand hospital records: still room for improvement. N Z Med J. 2006;119(1239):U2103.
9. Rumball-Smith J, Sarfati D. Improvement in the accuracy of hospital ethnicity data. N Z Med J. 2011;124(1340):96-7.
10. Harris R, Paine SJ, Atkinson J, et al. We still don't count: the under-counting and under-representation of Māori in health and disability sector data. N Z Med J. 2022;135(1567):54-78.
11. Tamatea JAU, Reid P, Conaglen JV, Elston MS. Thyrotoxicosis in an Indigenous New Zealand Population - a Prospective Observational Study. J Endocr Soc. 2020;4(3):bvaa002. doi: 10.1210/jendso/bvaa002.
12. Health New Zealand – Te Whatu Ora. Information for Health Providers. Wellington (NZ): Ministry of Health – Manatū Hauora; 2022 [cited 2023 Apr 20]. Available from: https://www.health.govt.nz/our-work/health-identity/national-health-index/nhi-information-health-providers#phoenrol
13. Salmond C, Crampton P, King P, Waldegrave C. NZiDep: a New Zealand index of socioeconomic deprivation for individuals. Soc Sci Med. 2006;62(6):1474-85. doi: 10.1016/j.socscimed.2005.08.008.
14. Cormack D, Robson C. Classification and output of multiple ethnicities: issues for monitoring Māori health. Wellington (NZ): Te Rōpū Rangahau Hauora a Eru Pōmare; 2010 [cited 2024 May 17]. Available from: https://www.fmhs.auckland.ac.nz/assets/fmhs/Te%20Kupenga%20Hauora%20M%C4%81ori/docs/classification.pdf
15. Didham R. Ethnic mobility in the New Zealand census, 1981–2013: a preliminary look. New Zealand Population Review. 2016;42:27-42.
16. McLeod M, Harris R, Curtis ET, Loring B. Considerations for Māori Data Analyses, A report for

Te Aka Whai Ora [Internet]. Wellington (NZ): Health New Zealand – Te Whatu Ora; 2023 [cited 2024 May 17]. Available from: https://www.tewhatuora.govt.nz/assets/Publications/Maori-health/Ethnicity-analysis-report-Sept-2023.pdf

17. Reid P, Paine S-J, Te Ao B, et al. Estimating the economic costs of Indigenous health inequities in New Zealand: a retrospective cohort analysis. BMJ Open. 2022;12(10):e065430. doi: 10.1136/bmjopen-2022-065430.
18. McLeod M, Harris R. Action plan for achieving high quality ethnicity data in the health and disability sector, A report for Te Aka Whai Ora: Māori Health Authority [Internet]. Auckland (NZ): Te Aka Whai Ora; 2023 [cited 2024 May 17]. Available from: https://www.tewhatuora.govt.nz/assets/Publications/Maori-health/Ethnicity-Data-Action-Plan.pdf

Appendix

Appendix Table 1: Total response ethnicity (level 2) from self-reported WNR, secondary NHI and primary care data.

	Self-reported WNR	Secondary NHI	Self-reported WNR—primary care*	Primary care
	n=474	n=474	n=380	n=380
Māori	164 (34.6%)	154 (32.5%)	126 (33.2%)	119 (31.3%)
European NFD	0	5 (1.1%)	0	7 (1.8%)
New Zealand European	290 (61.2%)	277 (58.4%)	233 (61.3%)	225 (59.2%)
Other European	20 (4.2%)	28 (5.9%)	19 (5.0%)	18 (4.7%)
Samoan	4 (0.8%)	3 (0.6%)	4 (1.1%)	4 (1.1%)
Cook Islands Māori	10 (2.1%)	5 (1.1%)	7 (1.8%)	4 (1.2%)
Tongan	1 (0.2%)	1 (0.2%)	0	0
Niuean	2 (0.4%)	1 (0.2%)	2 (0.5%)	2 (0.5%)
Fijian	0	1 (0.2%)	0	1 (0.3%)
Other Pacific peoples	1 (0.2%)	3 (0.6%)	1 (0.3%)	2 (0.5%)
Southeast Asian	6 (1.3%)	2 (0.4%)	5 (1.3%)	0
Chinese	6 (1.3%)	6 (1.3%)	5 (1.3%)	5 (1.3%)
Indian	9 (1.9%)	8 (1.7%)	9 (2.4%)	8 (2.1%)
Other Asian	1 (0.2%)	5 (1.1%)	1 (0.3%)	5 (1.3%)
Middle Eastern	1 (0.2%)	0	1 (0.3%)	1 (0.3%)
Latin American	0	1 (0.2%)	0	0
African	1 (0.2%)	1 (0.2%)	0	0
Other Ethnicity	0	0	0	1 (0.3%)
Response Unidentifiable	0	1 (0.2%)	0	2 (0.5%)
Not stated	1 (0.2%)	1 (0.2%)	1 (0.3%)	2 (0.5%)
Imputing error#	0	0	0	1 (0.3%)
TOTAL	516	500	414	407

*WNR ethnicity data for those participants where primary care ethnicity records were available—for direct comparison.
#Imputing error—result drawn from dataset not consistent with an ethnicity within the Ministry of Health ethnicity protocols.
Percentages equal greater than 100% due to multiple ethnicity options.

Dreaming of a Māori hospital: Mehemea, ka moemoea ahau, ko ahau anake. Mehemea, ka moemoea tātou, ka taea e tātou

Marama Muru-Lanning, Hilary Lapsley

ABSTRACT

This article makes a case for Māori organisations to investigate developing hospitals in addition to hauora primary care services. Our programme of research on kaumātua hauora has involved ten noho wānanga in Te Tai Tokerau, Waikato and Tauranga Moana. During our wānanga and associated kānohi-ki-kānohi interviews, we heard from older Māori who experienced hospital stays as detrimental to their wellbeing. At a whakahoki kōrero with Waikato kaumātua, we were requested to investigate the rationale for a Māori hospital, a wish that has historical roots in Princess Te Puea Herangi's efforts to create a small hospital at Tūrangawaewae Marae. Her project was stymied by the health authorities of the time. Our observations are backed up by other research demonstrating adverse outcomes for Māori at New Zealand's public hospitals. A small international literature offers some pointers for success in developing hospitals for Indigenous populations. While there are many aspects that would need thorough investigation in a development process (e.g., tikanga, scope, sites, architecture, development finance, cost structures, staffing, clientele and accessibility), we argue that hospitals developed by and for Māori are a long-held dream that could well be enacted in today's health service environment.

Three years ago, in April 2021, the kaumātua hauora research team from James Henare Research Centre met with kaumātua and kuia from Waikato iwi (see Glossary for list of te reo Māori terms).[1] The first day of our noho wānanga coincided with the official announcement of the establishment of a Māori Health Authority, or Te Aka Whai Ora as it came to be known.

Two of our kaumātua participants, Matua Taitimu and Whaea Ramari Maipi, arrived late after being present at the Māori Health Authority announcement in Wellington. They were full of the news, and we rearranged our programme to allow for a presentation from Matua Taitimu on the history of Māori health activism. He spoke to us about a number of initiatives, going back to the historic fern collection of King Tāwhiao, the second Māori king. This collection identified rongoā uses of different species. Prepared as koha to a Canadian doctor in 1888, it is now housed in Te Papa Tongarewa.[2] He spoke of Princess Te Puea Herangi's mission to improve the health of Waikato Māori, which is well acknowledged[3,4] and well remembered. Matua Maipi then reminisced on his own involvement with championing Māori health, beginning in the 1970s with the activist group Ngā Tamatoa. He and Whaea Ramari have worked alongside others to promote the development of hauora services, and, more recently, Matua Taitimu played a central role in initiating a series of hauora claims to the Waitangi Tribunal.[5] That initial claim led to a kaupapa inquiry of greater scope, whose first report was released in 2019 and later finalised in 2023.[6,7] The first report, coupled with the then Labour Government's 2020 *Health and Disability System Review*,[8] prompted the creation of the Māori Health Authority in 2021. The Authority was recently disestablished by the new Coalition government.

Matua Taitimu told our wānanga that through their Waitangi claims Māori have made three demands: 1) Mana Motuhake, or Māori control of Māori initiatives, 2) an apology from the Crown for 200 years of suppression, genocide and racism, and 3) a legislative act for Māori control of their health. That their third demand was realised in the new Māori Health Authority announcement gave him hope for the future.

Recognising the efforts of Matua Taitimu and Whaea Ramari, our kaumātua endorsed their kaupapa with a rousing waiata. A champion of the group paid tribute, saying (in te reo) that Te Puea's legacy is *"steeped into your heart. You saw the condition of your people who were dying*

around you. You devoted yourself to this legacy. I pay tribute to you [Taitimu].” She concluded, *“Today all your dreams have become a reality … The challenge in my heart is, how do we set up the house that Tāwhiao envisaged?”* The house refers to a proverb by King Tāwhiao, the second Māori king, about the need for reconstruction following the severe losses of the Waikato people after confiscation of their lands, a project that became Princess Te Puea’s life work.

Princess Te Puea, who was a living presence during the youth of the kaumātua, continues to be of great significance to the Waikato group, who have devoted much energy and aroha throughout their lives to the Kīngitanga. Princess Te Puea was the mokopuna of King Tāwhiao, who dedicated her life to safeguarding the Kīngitanga and its people. She followed the Pai Mārire faith, opposed conscription in the First World War, envisioned and built Tūrangawaewae Marae and did much to develop an economic base for Waikato Māori. Following the influenza pandemic of 1918, when a quarter of the population at Mangatāwhiri died, Princess Te Puea organised the historic move from Te Paina/Mercer to Ngāruawāhia. There she established makeshift homes for the many orphans and supporters who followed her. Concerned about future epidemics, she began fundraising for a hospital for Māori, and this led to the erection of the tūpuna whare at Tūrangawaewae, Māhinārangi. Opened in 1929, Māhinārangi was to provide rongoā as well as Western medical treatments in a building that looked reassuringly like a meeting house. In the hospital, tikanga would be observed. It would be open to any Māori, not just those from Waikato.[3,4,9]

It was devastating that, after all of Princess Te Puea’s efforts, the application for a licence for Māhinārangi to be used as a private hospital was declined by the health authorities.[3,4,9] Māori had apparently been refused treatment at Waikato Hospital when it first opened, seeding decades of mistrust in public health services and providing a further argument for a hospital at Tūrangawaewae.[4] After this disappointment, Māhinārangi was repurposed as a place for Waikato Ariki to host manuwhiri. Hers was not the only disappointment, however. During the early twentieth century, Dr Māui Pōmare promoted the vision of a network of Māori hospitals, consulting iwi leaders. The plans were supported by Dr Peter Buck/Te Rangi Hīroa, Āpirana Ngata and James Carroll, funds were raised and sites donated, but government funding, despite promises, never came through.[4,10]

The announcement of Te Aka Whai Ora – Māori Health Authority gave hope to kaumātua in our study that health inequities and discriminatory health services, experienced over their lifetimes in the Waikato and by Māori across Aotearoa, might finally be remedied.[3,11,12] In 2022, following on our initial wānanga with a whakahoki kōrero, we discussed the report we had prepared.[1] It was at this kōrero that the James Henare Research Centre was challenged to investigate the concept of a Māori hospital. What would be key for the success of a Māori hospital? We were told that it must operate according to tikanga and that it should serve the health needs of Waikato Māori. Further, our group emphasised that it is kaumātua who are the guardians of tikanga, so they should be central to decision-making in any project to develop a hospital.

From the original Waikato wānanga, and in our kānohi-ki-kānohi interviews with participants, we heard of unpleasant experiences in our public hospitals. Their stories were echoed at other sites (in Te Tai Tokerau, Tāmaki Makaurau and Tauranga Moana) of our ongoing research programme on kaumātua health and wellbeing. There is a common thread in these narratives of adverse hospital experiences, identifiable from our database of kaumātua discourse on health and wellbeing. This is the lack of manaakitanga shown to our kaumātua, as well as other breaches of tikanga, including some experiences labelled by participants as racist. Access to hospitals and treatment delays, particularly experienced by northern kaumātua living at a distance from services, were also perceived as lacking manaakitanga.

Manaakitanga, or respectful reciprocal relationships, is fundamental to Māori life. It is the culturally appropriate ways of doing things. Not putting effort into manaakitanga or breaching tikanga in other ways can hurtfully diminish mana and cause whakamā, embarrassment or shame,[13] resulting in mistrust and reluctance to engage with hospitals.

Kaumātua tell us that in hospital they like someone to sit with them and talk slowly, taking the time to explain things. Instances of kindness and thoughtfulness from Pākehā as well as Māori staff were recounted, but they love to see Māori faces: *“I go to the brown face because I feel safe.”* In Tāmaki Makaurau hospitals, we were told with pride, there are *“clever people like our mokopunas who graduate … we have heaps of our mokopunas working in there [the hospital] now.”*

Two sites of hospital care spoken highly of by

our participants were Hokianga (Rawene) Hospital and the kaupapa ward at Tauranga Hospital. Hokianga, a small cottage hospital, was founded early in the twentieth century and is now run by the Hokianga Health Enterprise Trust, a Māori-owned hauora health provider. Hokianga participants included kaumātua who had served on the Trust or modelled culturally appropriate patient care such as karakia, blessings, comforting patients with te reo and ensuring appropriate protocol around deaths. At Tauranga:

> *"… The kaupapa ward is different because when we have patients that are really māuiui, they do put you into a separate place so that your whānau can come in and awhi you and do the grieving before."*

One participant said that, when discharged from a regional hospital:

> *"I could not wait until they discharged me into Rawene. When I got to Rawene I was quite content there. Felt like you were important and they cared about you. The other place seemed like you were in a factory and you were passed on to the next part."*

At the regional hospital a nurse had *"chucked in the bin"* a rongoā preparation his wife had brought in, saying, *"We don't allow that sort of thing here."* Now that Rawene is relaxed about Māori patients using rongoā, he told us, *"… The old people are frequenting the hospital a lot more than they were before … They never went before."*

We also heard stories of kaumātua, as patients or visitors, helping other Māori:

> *"… As Māori we do respond to a brown face. One of my football mates died when I was in hospital with pneumonia too. I got out of my bed and went down to the room because I could hear them all crying … when they settled a bit I ran a karakia for them."*

One said about a friend that *"the kōrero had come back that he was being a hōhā to his caregivers, to the nurses."* Three of them went in, saw that the nurses were Pākehā, waited until they had finished what they were doing and *"started with a karakia,"* and then spoke to him in te reo:

> *"Once he heard te reo Māori away he went. He started talking about whatever you wanted to talk about. We just let him talk. I'd just prod him along and then away he went again."*

Hospitals were described as busy places where communications were inadequate: *"They don't understand what I'm saying, where I'm coming from"*; *"They don't help you understand."* Seeing a number of different specialists could be confusing. Staff busyness meant that whānau sometimes had to help with care, such as showering. Pressure on services could also mean waiting for admission. As one said, *"I could be dead by then."* Early discharges occurred, too, because *"they needed the bed."*

The emotional tenor of interactions in a busy ward could lead participants to feel that *"nobody cared."* One who spent *"the worst five days of my life"* in a busy hospital said *"nobody smiles."* She responded to other patients when they called for help, and nobody came. On one occasion, after being *"rushed out of the room and put with another person,"* she came back to the ward where there was an empty bed. She asked a nurse if the patient had died, but despite our participant having *"spent a day and most of a night with them"* the nurse told her, *"I'm sorry we can't divulge that information."*

Other stories involved not allowing someone who wanted to *"put her feet on Papatūanuku"* to leave the ward; not allowing a carer to provide food for her father when the whānau had been waiting for hours in emergency; and being told, when someone wanted to complain about their treatment, that there were no forms in the ward.

Participants felt badly if they were *"spoken down to,"* or if staff treated them as *"slow,"* or if they *"don't take your word for what's wrong."* One kaumātua with cancer said he would tell the doctor he felt fine even if he didn't. His wife usually intervened, but when he was told by doctors that there was nothing more they could do for him, he was on his own. *"I was fine until I sat down in the car and then it hit me, and I was crying because I realised that we weren't expecting that."*

Mixed gender wards could be distressing, especially for kuia. One felt so strongly that she would now refuse to go to the local hospital after her campaign about mixed wards as culturally unsafe did not lead to changes.

Transport was a major issue for those living in rural areas. Discharges could involve being placed, while still quite ill, on a shuttle bus for a trip of

several hours. Whānau caring for kaumātua found it difficult to fit hospital visits around work and obligations to other whānau, let alone transport and accommodation expenses, which could be higher than the reimbursements available. We were also told by one kaumātua, holidaying in a city several hours away from home, that he was refused treatment at a local GP practice and at the local hospital despite severe pain. His wife drove him for 3 hours to a small hospital near home, where he was immediately put into an ambulance and driven an hour back in the direction they had come from to the regional hospital, where immediate surgery identified bowel cancer. While difficulties in rural service provision may not be understood by providers as lacking in manaakitanga, it may well be experienced by patients that way.

We were told that a common attitude among older Māori was that *"you only go to hospital to die."* Some participants felt that was changing, but that it nevertheless explained reluctance of some to go to hospital.

The experiences we heard about while conducting our research are documented in other studies. Wilson,[14] in a New Zealand case study, found that:

> *"Marginalisation of Indigenous peoples in public hospitals was evident in both the interviews undertaken and the literature reviewed. Participants believed hospitals were not conducive to healing and negative experiences contributed to decisions to seek an early discharge."*[14]

Espiner,[15] summarising relevant literature, described hospital services for Māori as hostile and racist. Graham and Awatere,[16] examining the literature on adverse events experienced by Māori in health settings found that *"for many Māori, the existing public health system is experienced as hostile and alienating."*

Therefore, it is not surprising that many studies show that Māori, when compared with non-Māori, arrive later at hospitals, present with more serious symptoms, have more avoidable hospitalisations, are more likely to receive suboptimal care, have more preventable adverse events in hospital, more often discharge themselves early, are admitted more frequently after discharge and have poorer health outcomes after surgery.[17,18,19] Focussing specifically on older Māori, research found that, particularly in rural areas, they were significantly more likely to experience *"treatment injury and complication hospitalisations"* than non-Māori.[20] Negative events experienced by kaumātua themselves, whānau and friends, and historical memories of such experiences, diminish trust in hospital care,[15] and surely have a causal relationship to these documented disparities. They also feed into the wider picture of health and longevity inequities for older Māori compared with non-Māori.[21]

Now is the time, we argue, for Māori organisations to develop hospitals to provide Māori, particularly older Māori, with culturally safe care. Moreover, kaumātua must play an authoritative role in the development of Māori hospitals, as it is they who carry the responsibility for tikanga.

The idea of an Indigenous hospital is not without precedent. There are examples from other countries, the 170-bed Alaskan Native American hospital at Anchorage being the most often cited. That hospital and its associated Southcentral Foundation health clinics took over local control from the nationwide Indian Health Service and developed the innovative Nuka System of Care for the 70,000 Native American population of the district.[11,22,23] The Cherokee Indian Hospital in South Carolina, serving a smaller population of 12,000 Cherokee Indians, is another example, a 20-bed hospital with associated specialist clinics and a hospice. It was developed with finance from the tribe's own resources, breaking away from the Indian Health Service.[24,25] Both these hospitals embed tribal values into their patient-centred systems of care.

The Queen's Medical Center in Honolulu offers a different model. It is a city hospital of the highest quality, with 575 acute care beds and a comprehensive range of specialties, open to patients of all ethnicities. A non-profit, founded in 1859 by Queen Emma and King Kamehameha IV, it is now the backbone of the Queen's Health System, which runs several smaller hospitals and delivers *"comprehensive health care services and programs to Native Hawaiians and all people of Hawai'i."*[26] Indigenous frameworks of healthcare are recognised in its programmes.

In Canada there was once a network of Indian hospitals, historically connected with missionary endeavours. Their poor reputation (understaffing, overcrowding, abusive practices) led to closures from the 1970s onwards.[27] This unfortunate legacy may well be the reason that there does not appear to be a movement in Canada towards culturally appropriate Indigenous hospitals. Australia also seems to provide few, if any, models.

In Asian countries where colonisation never

occurred or where independence put Indigenous people in charge again, many fine hospitals provide services equivalent in most respects to those in Western countries. These may incorporate treatments seen as "alternative" in the West, with acupuncture in Chinese hospitals as a well-known example.[28] In an example of incorporating cultural values, Thai respect for elders has led to the interesting phenomenon of some Western families sending elders to Thailand for quality end of life dementia care.[29]

In Aotearoa hauora is embedded in a system of primary care for Māori, underfunded though it is.[7] We have mentioned two hospital settings, albeit small, that provide kaupapa Māori services, and as well, there is the historic Te Puia Springs hospital, a Ngāti Porou hauora. A mixture of iwi, private and public health funding could provide for the development of new, state-of-the-art hospitals. On the disestablishment of Te Aka Whai Ora – Māori Health Authority, the current government promised to devolve that health funding to iwi and should be held to its promise. The private hospital system in this country is expanding, meaning that there is investor capacity and expertise to be sourced. It is worth noting that some iwi already provide health insurance for kaumātua, and one at least provides for all its members, another way of making a private hospital model affordable. Imagination is required. Looking to overseas models of Indigenous hospital financing may not be helpful, as historical backgrounds and current policy settings are very different in Aotearoa New Zealand.

A key feature of current hauora services for Māori is that they are available to non-Māori as well, and that policy could be necessary for successful Māori hospital development. A service emphasising manaakitanga and tikanga Māori could well be attractive to non-Māori patients.

Scope, as well as funding, is an issue requiring much thought. A hospital can be a small facility, these days usually no less than 60 beds. It could offer specialised care for mate wareware, surgical specialties, maternity or end of life, to name several possibilities. However, any visions for a large general hospital should not be dismissed out of hand. In the Waikato, possibilities arise from pressures on Middlemore and Waikato hospitals, populations of Auckland expanding southwards and Hamilton northwards, and the prospect of a new medical school at the University of Waikato. In the north, smaller general hospitals, guided by tikanga Māori, could be repurposed and enlarged into providing a wider range of services. Staffing, of course, would be a major issue, but just as with patients, we would expect that a Māori hospital would be staffed by suitable professionals of any ethnicity.

Historically, hospitals in many cultures were located in healing places, such as near springs, rivers or other natural or cultural features imbued with significance. Design of a Māori hospital should incorporate tikanga Māori, a realistic goal since Māori architecture is blossoming, with private practices and incorporation of Māori expertise into some of the larger firms. Accessibility is a key aspect of hospital location, but placing hospitals in the midst of a city centre is not the only solution to transport issues.

Thinking about Indigenous hospitals in this country is already underway. Shortly before the nationwide hui for Māori in January 2024, Rahui Papa, a spokesperson for Kīngi Tūheitia, called for a Māori hospital, referencing Princess Te Puea and saying:

> *"In her view, and the argument still stands strong today, that if Māori can see themselves in the medical system, then they will engage a little bit better."*[30]

At the hui Kīngi Tūheitia concluded his speech:

> *"Be who we are, live our values, speak our reo, care for our mokopuna, our awa, our maunga, just be Māori. Māori all day, every day … Our time is now, kotahitanga is the way."*[31]

And the last words to Princess Te Puea, who famously said, *"Mehemea, ka moemoea ahau, ko ahau anake. Mehemea, ka moemoea tātou, ka taea e tatou," "If I dream, I dream alone; if we dream together we shall achieve."*[32]

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REFERENCES
1. Muru-Lanning M, Pouwhare R, Dawes T, et al. Ko ngā kaumātua ō tātou taonga: Supporting kaumātua health in a changing world: Noho wānanga with kaumātua from Waikato-Tainui [Internet]. Auckland (NZ): James Henare Research Centre; 2024 [cited 2024 Aug 28]. Available from: https://bpb-ap-se2.wpmucdn.com/blogs.auckland.ac.nz/dist/8/940/files/2024/07/Waikato-Tainui-report-for-website.pdf
2. Museum of New Zealand Te Papa Tongarewa. King Tāwhiao's ferns [Internet]. Wellington (NZ): Te Papa Tongarewa; date unknown [cited 2024 Apr 18]. Available from: https://collections.tepapa.govt.nz/topic/2154
3. King M. Te Puea: a biography. Auckland (NZ): Hodder and Stoughton; 1977.
4. Lange R. May the people live: A history of Maori health development 1900-1920. Auckland (NZ): Auckland University Press; 1999.
5. Waitangi Tribunal. WAI 2575, #3.3.3 [Internet]. Wellington (NZ): Ministry of Justice; 2018 [cited 2024 May 2]. Available from: https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_143000339/Wai%202575%2C%203.3.003.pdf
6. Waitangi Tribunal. Hauora: Report on Stage One of the Health Services and Outcomes Kaupapa Inquiry. Wellington (NZ): Waitangi Tribunal; 2019.
7. Waitangi Tribunal. Hauora: Report on Stage One of the Health Services and Outcomes Kaupapa Inquiry. Lower Hutt (NZ): Legislation Direct; 2023.
8. Manatū Hauora – Ministry of Health. Health and Disability System Review – Final Report [Internet]. Wellington (NZ): Health and Disability System Review; 2020 [cited 2024 Aug 28]. Available from: https://www.health.govt.nz/system/files/documents/publications/health-disability-system-review-final-report.pdf
9. Parsonson A. Hērangi, Te Kirihaehae Te Puea [Internet]. NZ: Te Ara – the Encyclopedia of New Zealand; c1996 [cited 2024 Apr 18]. Available from: https://teara.govt.nz/en/biographies/3h17/herangi-te-kirihaehae-te-puea
10. Dow DA. Māori health and government policy 1840-1940. Wellington (NZ): Victoria University Press; 1999.
11. Chin MH, King PT, Jones RG, et al. Lessons for achieving health equity comparing Aotearoa/New Zealand and the United States. Health Policy. 2018;122(8):837-853. doi: 10.1016/j.healthpol.2018.05.001.
12. Waikato District Health Board. Rapua Te Ara Matua Equity Report [Internet]. Hamilton (NZ): Waikato District Health Board; 2021 [cited 2024 Aug 31]. Available from: https://www.waikatodhb.co.nz/assets/Docs/About-Us/Key-Publications/Reports/Equity-Report-Rapua-Te-Ara-Matua-2021.pdf

13. Cram F, Te Huia B, Te Huia T, et al. Oranga and Māori Health Inequities, 1769-1992 [Internet]. Auckland (NZ): Katoa Limited; 2019 [cited 2024 Aug 31]. Available from: https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_152096130/Wai%202575%2C%20B025.pdf
14. Wilson D, Barton P. Indigenous hospital experiences: a New Zealand case study. J Clin Nurs. 2012;21(15-16):2316-26. doi: 10.1111/j.1365-2702.2011.04042.x.
15. Espiner E, Paine SJ, Weston M, Curtis E. Barriers and facilitators for Māori in accessing hospital services in Aotearoa New Zealand. N Z Med J. 2021;134(1546):47-58.
16. Graham R, Masters-Awatere B. Experiences of Māori of Aotearoa New Zealand's public health system: a systematic review of two decades of published qualitative research. Aust N Z J Public Health. 2020;44(3):193-200. doi: 10.1111/1753-6405.12971.
17. Davis P, Lay-Yee R, Dyall L, et al. Quality of hospital care for Māori patients in New Zealand: retrospective cross-sectional assessment. Lancet. 2006;367(9526):1920-5. doi: 10.1016/S0140-6736(06)68847-8.
18. Health Quality & Safety Commission. Ngā Taero a Kupe: Ngā wheako pānga kino ki ngā whānau Māori i rō hōhipera l Whānau Māori experiences of in-hospital adverse events [Internet]. Wellington (NZ): Health Quality & Safety Commission; 2020 [cited 2024 May 9]. Available from: https://www.hqsc.govt.nz/assets/Our-work/System-safety/Adverse-events/Publications-resources/Nga_Taero_a_Kupe_final_web.pdf
19. Rumball-Smith JM. Not in my hospital? Ethnic disparities in quality of hospital care in New Zealand: a narrative review of the evidence. N Z Med J. 2009;122(1297):68-83.
20. Svensen G, Hikaka J, Cavadino A, Kool B. Ethnic variation in hospitalisation due to treatment injury and complications of healthcare in older adults residing in New Zealand. N Z Med J. 2023;136(1579):70-85. doi: 10.26635/6965.6065.
21. Kerse N, Lapsley H, Moyes S, et al. Health, independence and caregiving in advanced age: Findings from LiLACS NZ [Internet]. Auckland (NZ): The University of Auckland; 2016 [cited 2024 Aug 28]. Available from: https://www.fmhs.auckland.ac.nz/assets/fmhs/faculty/lilacs/research/docs/Health-Independence-and-Caregiving-in-Advanced-Age-updated031016).pdf
22. Gottlieb K. The Nuka System of Care: improving health through ownership and relationships. Int J Circumpolar Health. 2013;72. doi: 10.3402/ijch.v72i0.21118.
23. A Formula for Cutting Health Costs. The New York Times [Internet]. 2012 Jul 21 [cited 2024 Feb 22]. Available from: https://www.nytimes.com/2012/07/22/opinion/sunday/a-formula-for-cutting-health-costs.html
24. Laughrun L, Cooper C. Cherokee Indian Hospital: Becoming the Provider of Choice Through Trust, Cultural Humility and Continuous Quality Improvement [master's dissertation]. Chapel Hill (US): University of North Carolina; 2020.
25. Kavas Silvis J. Natural Beauty: Cherokee Indian Hospital [Internet]. US: Healthcare Design; 2017 Jun 20 [cited 2024 Feb 22]. Available from: https://healthcaredesignmagazine.com/projects/ambulatory-care-clinics/natural-beauty-cherokee-indian-hospital/
26. queens.org. The Queen's Health Systems [Internet]. Hawai'I (US): The Queen's Health System Corporation; c2024 [cited 2024 May 2]. Available from: https://www.queens.org
27. The University of British Columbia. Indian Hospitals in Canada [Internet]. Vancouver (CA): The University of British Columbia; c2024 [cited 2024 May 2]. Available from: https://irshdc.ubc.ca/learn/indian-hospitals-in-canada/
28. Xu J, Yang Y. Traditional Chinese medicine in the Chinese health care system. Health Policy. 2009;90(2-3):133-9. doi: 10.1016/j.healthpol.2008.09.003.
29. Hill A. Families sending relatives with dementia to Thailand for care [Internet]. The Guardian; 2020 Jan 12 [cited 2024 May 9]. Available from: https://www.theguardian.com/society/2020/jan/12/families-sending-relatives-with-dementia-to-thailand-for-care
30. Tyson J. Kīngitanga calls for Māori hospital to fulfil the vision of Princess Te Puea [Internet]. NZ Herald; 2024 Jan 31 [cited 2024 Feb 22]. Available from: https://www.nzherald.co.nz/kahu/kingitanga-calls-for-maori-hospital-to-fulfil-the-vision-of-princess-te-puea/TST6YDZ2JBHN7NVZEKUAE6UCFE/
31. Whareaitu M. 'Be Māori' – Kiingi Tuuheitia gives closing speech at national hui [Internet]. 1 News; 2024 Jan 20 [cited 2024 Feb 22]. Available from: https://www.1news.co.nz/2024/01/20/be-maori-Kīngi-tuuheitia-gives-closing-speech-at-national-hui/
32. Kīngitanga. If we dream together we shall achieve [Internet]. 2016 May 26 [cited 2024 May 9]. Available from: https://www.facebook.com/Kīngitanga/posts/if-we-dream-together-we-shall-achievemehemea-ka-moemoeā-ahau-ko-ahau-anake-mehem/1028831650538222/

Glossary of te reo Māori terms

- ariki—paramount chief
- aroha—love
- awhi—care
- hauora—health and wellbeing
- hōhā—nuisance
- hui—meeting
- iwi—tribe
- kānohi-ki-kānohi—face-to-face
- karakia—prayer
- kaumātua—elders or older men
- kaupapa—strategy, policy, action or cause
- koha—gift
- kōrero—conversation
- kuia—older women
- mana—prestige or status
- manaakitanga—hospitality
- manuwhiri—guests
- marae—community building(s) where Māori gather
- mate wareware—dementia
- matua—term of respect for a male elder
- māuiui—sick
- mokopuna—grandchild
- noho wānanga—overnight stay with shared learning
- Papatūanuku—Earth Mother
- rongoā—Māori medicine
- tikanga—customary practices
- tūpuna whare—ancestral house
- waiata—song or chant
- wānanga—coming together to share and learn
- whaea—term of respect for female elder
- whakahoki kōrero—dissemination hui
- whakamā—shame
- whānau—family

Compartment syndrome resulting from carbon monoxide poisoning: a case report

Darlene Edwards, Arthur Cavan, Ankur Gupta

Carbon monoxide (CO) poisoning is known to cause complications of the neurological, respiratory and cardiac systems. Rhabdomyolysis, acute kidney injury (AKI) and compartment syndrome (CS) are rarer complications. We herein present a patient who had CO poisoning and developed all these complications.

Case report

A 45-year-old male, immigrant beekeeper slept with coal fire on during a cold night. The next afternoon, his friends found him confused, with reduced level of consciousness. On admission to hospital, he was complaining of nausea, leg, chest and back pain.

He had no past medical history. On initial assessment, he was found to be conscious, oriented with oxygen saturation of 82% at room air. His heart and lung examinations were unremarkable. Abdomen examination revealed bilateral flank tenderness but no organomegaly.

Initial management of high-flow oxygen and intravenous fluids were given. A day after admission, it was noted that his left calf had swollen along the anterior and lateral compartment. Bedside point-of-care ultrasound revealed multicompartmental oedema suspicious of CS. Urgent fasciotomy was performed and a vacuum-assisted closure dressing was placed. In addition to CS, he developed rhabdomyolysis (Table 1, Figure 1), anuric AKI needing dialysis and type 2 myocardial injury. He needed kidney replacement therapy for a week, after which his AKI resolved. Echocardiogram was normal and troponins down-trended as well. He is now fully recovered.

Discussion

CO is the most common poison that leads to death and injuries world-wide.[1] CO is a colourless, odourless, tasteless gas that results from incomplete combustion. CO poisoning rates spike during the colder season, when there is an increased use of indoor heating, gas heaters and chimneys. CO in lesser levels results in vague symptoms such as headache, nausea, vomiting, confusion, dizziness, visual disturbance and palpitations.[2] However, in higher or toxic amounts, CO can lead to hospitalisation and eventually death.[3]

The first ever case of CS associated CO poisoning was in the United States in 1977.[4] Since then, there have only been a handful reported; this would be the first ever case reported in New Zealand.

The pathophysiology of CS-associated CO poisoning is still under speculation. There are at least three postulated mechanisms. The first is hypoxia and ischemia because of CO and its higher affinity for binding haemoglobin than that of oxygen.[5] The displacement of oxygen from haemoglobin causes a shift of the oxygen–haemoglobin dissociation curve to the left, which results in inhibition of cytochromes/mitochondrial respiration and possible direct, toxic effects.[6] The second is the direct toxicity of CO.[7] A rise in oxygen-derived free radicals causes lipid peroxidation, leading to increased capillary permeability and thus CS.[7] While the first two hypothesis are responsible for atraumatic causes of CS, the third hypothesis is more trauma related. It is a result of carboxyhaemoglobin buildup at the local muscle, thus raising pressure, resulting in swelling and CS.[8]

Our patient developed left leg CS. We suspect that CS was a result of combination of both ischemia and direct CO toxicity. Peripheral neuropathy and CS from CO poisoning has also been reported.[9] However, our case had CS in absence of peripheral neuropathy.

This patient also developed rhabdomyolysis. AKI is a result of increased myoglobin and myoglobinuria causing direct damage to the renal tubules.[10] Timely fasciotomy and resolution of CS resulted in apt renal recovery.

Conclusion

Our case is the first report of CO poisoning, CS and rhabdomyolysis with AKI in New Zealand. Prompt management with oxygen support, timely fasciotomy and dialysis helped in his speedy recovery. Emergency physicians and internists should be aware of these potential complications of CO poisoning.

Table 1: Initial blood results.

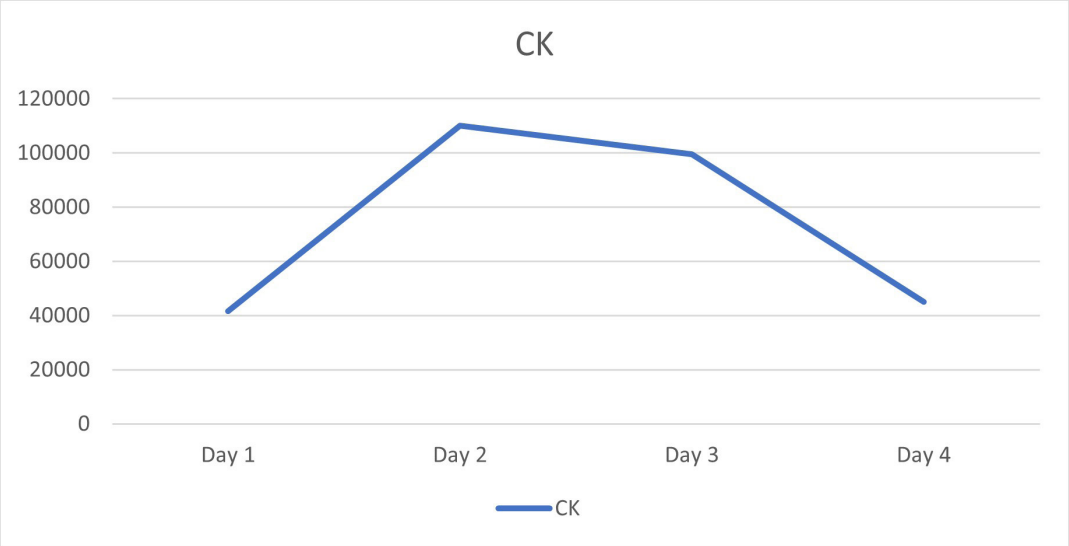
Complete blood count	1st presentation	1 day after admission	2 days after admission	On discharge	6 months after discharge
Hb (g/L)	198	162	116	104	132
PCV (l/L)	0.57	0.46	0.33	0.32	0.39
MCV (fL)	89	88	88	93	89
MCH (pg)	31	31	31	30	30
Red cell width (%)	13.7	13.2	13.2	13.3	13.0
Platelets (x10^9/L)	238	160	123	250	267
White cell count (x10^9/L)	28.5	25.5	16.1	6.2	9.5
Neutrophils (x10^9/L)	26.0	22.7	13.8	3.9	5.7
Lymphocytes (x10^9/L)	1.2	1.3	1.0	1.6	2.3
Monocytes (x10^9/L)	1.2	1.4	1.1	0.5	0.6
Basophils (x10^9/L)	0.1	0.1	0.0	0.0	0.2
Immature granulocytes	1.1	0.2	0.1	0.0	0.1
Biochemistry					
Creatinine (µmol/L)	190	363	688	123	107
CRP (mg/L)	11	136	86	Not done	Not done
Na (mmol/L)	140	132	130	137	141
K (mmol/L)	4.3	4.8	5.6	4.6	4.4
Urea (mmol/L)	10.1	17.5	25.9	6.3	Not done
Creatinine kinase (U/L)	41,639	>110,000	99,505	Not done	Not done
Troponin t (ng/L)	363	416	334	Not done	Not done
Venous blood gas					
pH	7.15	7.28	7.28	7.37	Not done
pC02	44	29	30	40	-
P02	30	267	108	36	-
HC03 (mmol/L)	16	14	14	23	-

Table 1 (continued): Initial blood results.

02 Sat	52	16	98	66	-
Gas tHb (g/L)	168	168	127	71	-
OxyHb	47	100	97	64	-
CarboxyHb (% total Hb)	**9.2**	**0.2**	**0.6**	**2.3**	**-**
Methaemoglobin (% total Hb)	0.2	0.2	0.9	0.6	-
Lactate	11	2.7	1.5	1.1	-

Hb = haemoglobin; PCV = packed cell volume; MCV = mean cell volume; MCH = mean corpuscular volume; CRP = C-reactive protein.

Figure 1: Trend for creatine kinase (CK) during admission (x axis= CK, y AXIS = value).



COMPETING INTERESTS
Nil.

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REFERENCES
1. Reumuth G, Alharbi Z, Houschyar KS, et al. Carbon monoxide intoxication: What we know. Burns. 2019 May;45(3):526-30. doi: 10.1016/j.burns.2018.07.006.
2. Serbest S, Belhan O, Gürger M, Tosun HB. Compartment Syndrome Resulting from Carbon Monoxide Poisoning. A A Case Rep. 2015 Dec 1;5(11):199-201. doi: 10.1213/XAA.0000000000000211.
3. bpacnz. Carbon monoxide poisoning: a hidden danger [Internet]. 2019 [cited 2023 Jul 1]. Available from: https://bpac.org.nz/2019/co.aspx
4. Finley J, Vanbeek A, Glover JL. MYONECROSIS COMPLICATING CARBON MONOXIDE POISONING. J Trauma . 1977 Jul 1;17(7):536-540.
5. Al B, Subasi M, Karsli B, et al. Compartment syndrome on a patient's forearm related to carbon monoxide poisoning. Am J Emerg Med. 2012 Nov;30(9):2104.e1-4. doi: 10.1016/j.ajem.2012.03.011.
6. Agency For Toxic Substances And Disease Registry. Agency for Toxic Substances and Disease Registry [Internet]. [cited 2023 Jul 22]. Available from: https://www.atsdr.cdc.gov/
7. Durán WN, Takenaka H, Hobson RW 2nd. Microvascular pathophysiology of skeletal muscle ischemia-reperfusion. Semin Vasc Surg. 1998 Sep;11(3):203-14.
8. Ji JW. Acute Compartment Syndrome Which Causes Rhabdomyolysis by Carbon Monoxide Poisoning and Sciatic Nerve Injury Associated with It: A Case Report. Hip Pelvis. 2017;29(3):204-209. doi: 10.5371/hp.2017.29.3.204.
9. Lee HD, Lee SY, Cho YS, et al. Sciatic neuropathy and rhabdomyolysis after carbon monoxide intoxication. Medicine (Baltimore). 2018 Jun;97(23):e11051. doi: 10.1097/MD.0000000000011051.
10. Gupta A, Thorson P, Penmatsa KR, Gupta P. Rhabdomyolysis: Revisited. Ulster Med J. 2021;90(2):61-9.

Progesterone treatment for women who have changed their minds after taking mifepristone

Joseph Hassan, Martin Ng

We are responding to the recent statements released by the Royal New Zealand College of General Practitioners and the Royal Australian and New Zealand College of Obstetricians and Gynaecologists regarding "abortion reversal."[1,2]

We are concerned that the advice given is solely focussed on the provision of abortion and is consequently overly restrictive and heavy-handed if we consider the woman who seeks help after taking mifepristone and regrets her choice. She no longer wants abortion care but seeks help to maintain her pregnancy. Natural progesterone offers her hope and there is little to suggest harm. Considering this treatment and encouraging further research are justifiable based on current evidence and are not unethical.

Since Medsafe approved the use of mifepristone and misoprostol for medical abortion in New Zealand in 2001, we have seen a steady rise to 6,764 medical abortions in 2022.[3]

Abortion regret and post-abortion distress are recognised psychological phenomena, which will inevitably occur in some women after taking mifepristone and could lead them to seek help to halt the abortion process.[4,5] As a profession we need to listen to the concern of our patient in this situation and be clear about what actions, if any, can be taken to help them.

Mifepristone is a selective progesterone receptor modulator that acts as an antiprogestogen, binding with greater affinity but without activating the progesterone receptor.[6] In effect, it deprives the growing embryo or foetus of the progesterone needed to sustain placental growth and development. Despite this, mifepristone has never been associated with a significant risk of teratogenicity, so should it fail to induce abortion, the baby born carries the same or very close to the same risk of congenital abnormality as the general population.[6,7]

It has been demonstrated in an animal model that administration of natural (micronised) progesterone 15 minutes after mifepristone (a human equivalent of approximately 6–9 hours) can reverse the adverse effects on pregnancy, leading to 81% of the model cohort progressing to live birth.[8] Furthermore, depot medroxyprogesterone acetate has been shown to reduce the efficacy of the chemical abortion (even using both mifepristone and misoprostol) based on a randomised control trial showing fourfold increase in the chance of embryonic and foetal survival (0.9% vs 3.6%).[9]

There have been two published trials and three case reports/case series of progesterone use to reverse the effects of mifepristone in women.[5,10–13] The largest report, a retrospective cohort study of 547 subjects by Delgado et al., showed encouragingly high rates of pregnancy progression with no evidence of elevated harm to the baby.[5]

So, it appears that progesterone has biological plausibility as a treatment option, with support from an animal model and clinical evidence from a retrospective cohort study. Importantly, the treatment is not known to be harmful in pregnancy and has been used to treat recurrent miscarriage.[14]

Creinin et al. attempted to conduct a randomised controlled study in 2020 but this was halted after only 12 enrolled cases due to an unusually high proportion developing serious haemorrhage.[12] This is a recognised adverse effect of mifepristone, but the high rate seen in this study seems unusual and differs from the rate seen elsewhere.[13] Despite its limitations as a study, it is interesting to note that a higher proportion of those who had progesterone had detectable foetal cardiac activity at 2 weeks, while the numbers of serious haemorrhages seen was greater in the placebo group.[12]

A more recent pilot clinical trial was conducted in Australia by Turner et al. This prospective study was also small, with only six women enrolled, but the positive findings encourage further investigation with a larger trial. There were no clinically significant haemorrhages reported.[13]

A systematic review of the use of micronised progesterone to antagonise the effects of

mifepristone was undertaken by Stifani et al. and published in October 2023. They commented on the poor-quality data in most trials but reported encouraging rates of ongoing pregnancy for those treated with progesterone of almost twice that of placebo in those under 7 weeks gestation, and 12% higher in those treated between 7–8 weeks.[15]

As clinicians it is important that the treatment we recommend is evidence based. There is a need for further well-designed prospective observational studies to clarify the safety and efficacy of this treatment in the New Zealand context. A larger single-arm trial, similar in design to the pilot study conducted by Turner et.al., is an attractive initial option to clarify the safety of progesterone after taking mifepristone while avoiding the ethical difficulties posed by offering placebo.[14]

For the woman who regrets taking mifepristone and no longer seeks abortion, the focus has now become pregnancy care. Based on currently available evidence and the principle of patient-centred care, further research on the option of progesterone therapy is warranted. With careful monitoring, it is highly unlikely to do harm and may do some good for her now wanted pregnancy.

COMPETING INTERESTS
Nil.

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REFERENCES
1. Royal New Zealand College of General Practitioners. Advice for Members on Abortion Reversal [newsletter]. 2024 Jun 11 [cited 2024 Jun 15].
2. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists. No reputable evidence for 'abortion reversal' says RANZCOG [Internet]. 2024 Apr 18 [cited 2024 Jun 15]. Available from: https://ranzcog.edu.au/news/abortion-reversal-statement
3. Ministry of Health – Manatū Hauora. Ratonga Whakatahe i Aotearoa | Abortion Services Aotearoa New Zealand: Annual Report 2023 [Internet]. 2023 [cited 2024 Jun 15]. Available from: https://www.health.govt.nz/publication/ratonga-whakatahe-i-aotearoa-abortion-services-aotearoa-new-zealand-annual-report-2023
4. Fergusson DM, Horwood LJ, Boden JM. Abortion and mental health disorders: evidence from a 30-year longitudinal study. Br J Psychiatry. 2008;193(6):444-51. doi: 10.1192/bjp.bp.108.056499.
5. Delgado G, Condly SJ, Davenport M, et al. A case series detailing the successful reversal of the effects of mifepristone using progesterone. Issues Law Med. 2018;33(1):21-31.
6. The American College of Obstetrics and Gynaecologists. Medication Abortion Up to 70 Days of Gestation [Internet]. 2020 Oct [cited 2024 Jun 15]. Available from: https://www.acog.org/clinical/clinical-guidance/practice-bulletin/articles/2020/10/medication-abortion-up-to-70-days-of-gestation
7. Turner JV, Garratt D, Barwick A, et.al. Congenital and Fetal Effects After Mifepristone Exposure and Continuation of Pregnancy: A Systematic Review. Clin Pharmacol Ther. 2024 Jul 25. doi: 10.1002/cpt.3392. Epub ahead of print.
8. Camilleri C, Sammut S. Progesterone-mediated reversal of mifepristone-induced pregnancy termination in a rat model: an exploratory investigation. Sci Rep. 2023;13(1):10942. doi: 10.1038/s41598-023-38025-9.
9. Raymond EG, Weaver MA, Louie KS, et al. Effects of Depot Medroxyprogesterone Acetate Injection Timing on Medical Abortion Efficacy and Repeat Pregnancy: A Randomized Controlled Trial. Obstet Gynecol 2016;128(4):739-45. doi: 10.1097/AOG.0000000000001627.
10. Delgado G, Davenport ML. Progesterone use to reverse the effects of mifepristone. Ann Pharmacother. 2012 Dec;46(12):e36. doi: 10.1345/aph.1R252.
11. Garratt D, Turner JV. Progesterone for preventing pregnancy termination after initiation of medical abortion with mifepristone. Eur J Contracept Reprod Health Care. 2017;22(6):472-475. doi: 10.1080/13625187.2017.1412424. Epub 2017 Dec 20. Erratum in: Eur J Contracept Reprod Health Care. 2017 Dec;22(6):I. doi: 10.1080/13625187.2017.1424399. Dosage error in article text.
12. Creinin MD, Hou MY, Dalton L, et al. Mifepristone Antagonization With Progesterone to Prevent Medical Abortion: A Randomized Controlled Trial. Obstet Gynecol. 2020;135(1):158-165. doi: 10.1097/AOG.0000000000003620.
13. Turner JV, Garratt D, McLindon LA, et al. Progesterone after mifepristone: A pilot prospective single arm clinical trial for women who have changed their mind after commencing medical abortion. J Obstet Gynaecol Res. 2024;50(2):182-189. doi: 10.1111/jog.15826.
14. National Institute for Health and Care Excellence. Ectopic pregnancy and miscarriage: diagnosis and initial management. [C] Progestogens for preventing miscarriage. NICE guideline NG126 (update) [Internet]. 2021 [cited 2024 Jun 15]. Available from: https://www.nice.org.uk/guidance/ng126/evidence/evidence-review-c-pdf-10889099534
15. Stifani BM, Lavelanet AF. Reversal of medication abortion with progesterone: a systematic review. BMJ Sex Reprod Health. 2024;50(1):43-52. doi: 10.1136/bmjsrh-2023-201875.

Caution ahead: the risks with regulating physician associates in Aotearoa

Natalia D'Souza, Deborah Powell, Sarah Dalton

Our medical workforce shortage in Aotearoa is at a crisis point, struggling with growing unmet health need and increasing acuity of patients presenting at emergency departments.[1,2] In response, there have been calls from a small but vocal physician associates (PAs) group to invest in their regulation and training. Such calls are a misguided attempt at plugging crucial health workforce gaps and are underpinned by the flawed logic that more **un**qualified doctors are better than not enough qualified doctors.

However, a recent *New Zealand Medical Journal* editorial implies some medical colleges and the Medical Council of New Zealand have "*concerns that regulation can wait, risk can be ignored, and regulation is not essential at this time*."[3] This is disingenuous at best. Far from opposing regulation and risk management, as evidence-based practitioners we simply have yet to be presented with a robust case that PAs are the solution to our medical workforce crisis. We are already seeing the consequences of this failed experiment play out overseas, with substantial costs—both financial and to human lives. As such, we believe this discussion warrants a balanced argument.

Risks to patient safety

Regulating and training PAs under a condensed medical model is dangerous and will result in clinical judgement, patient safety and quality of care being compromised. In fact, over 87% of doctors surveyed by the British Medical Association (BMA) believe the way PAs worked in the National Health Service were a risk to patient safety.[4] The rush to regulation in the United Kingdom should serve as a cautionary tale, as it has resulted in the deaths of several patients who were misdiagnosed by PAs and who, at the time of being treated, were unaware they were not being seen by a doctor.[4,5] This is in addition to over 70 instances of "*avoidable patient harms and near misses*"; at least 22 occasions of illegally prescribing controlled medications; and the ordering of over 1,000 unauthorised hospital scans by PAs.[6–8]

Misleading title harms patient trust

Adding to the harm is the intentionally deceptive use of "physician" in the PA title, violating the principle of informed consent for patients while posing clear risks to their safety.[4] We have already had cases of medical error and patient confusion in Aotearoa, with a patient who nearly went blind after being misdiagnosed by a PA.[9] In the long term this confusion—and resultant patient harm—will deteriorate public trust and confidence in our health system.

Regulation does not equal accountability

The medical profession has well-established, robust accountability frameworks—both professional and legislative. However, accountability does not lie solely in regulation. It lies in clinical competence and the responsibility for delivering an expected standard of safe care, grounded in the significant breadth and depth of training—and resultant clinical experience—that doctors have over PAs.

There is also the matter of whether it is appropriate for the regulatory body for medical practitioners to serve as the regulator for PAs, as this will further blur professional boundaries.[4] Calls to have PAs as a regulated workforce in New Zealand miss the point because we are still left with risks to patient safety and issues around public confusion.

"Cost-effective" or a false economy?

Next, we turn to the oft-lauded efficiencies gained from employing this lower-cost workforce. In fact, a quality trade-off has already been demonstrated with the use of PA workforces, and cost savings are largely clawed back through PAs practising more defensive medicine to compensate for limitations in medical diagnostic knowledge.[10] There are also costs with regulating an entirely new

workforce without an existing training programme. Given the current austerity climate and significant health funding shortfall, how will funds be prioritised toward establishing and monitoring rigorous education programmes, regulating the workforce and ensuring adequate resourcing for supervision and continuing professional development? And at whose expense? On balance, the growth and regulation of a PA workforce represents a false economy in the long term.

"Workforce multiplier" or fuelling the healthcare divide?

PAs have been touted as a "workforce multiplier", allegedly (we are unable to find a source for this claim cited in the editorial), substituting up to 50–75% of a doctor's work in a hospital setting—despite 55% of doctors in a BMA survey reporting their workload had increased with the employment of PAs.[3,11] This claim also begs the question, *which* workforces need multiplying? Our healthcare issues stem from a lack of staff, not a lack of professions. As our population health needs become increasingly complex, we need more medical practitioners to meet this rising demand, rather than resorting to the cheapest skill mix. Further, a greater use of PA workforces—especially in rural areas—only serves to exacerbate existing inequities as entire population groups struggle to access appropriate medical care.

The opportunity costs and impacts on our existing workforce

Lastly, there are opportunity costs of investing in regulation. Given the limits to PAs' medical and diagnostic capabilities they will always need a level of oversight from qualified medical practitioners, who are already at or beyond capacity for supervising our own resident medical officers.[12] Supervising PAs should not come at the expense of training our future doctors.

PAs also do not offer a unique or additive skillset beyond what a doctor, nurse or allied scientific and technical (AST) professional can do. If anything, the use of PAs to triage undifferentiated patients and hand over more complex and serious cases to doctors fragments the work of the medical profession. Continuously dealing with only the most complex and difficult cases strips doctors' work of genuine connection and meaning, disrupts continuity of care, makes the process more prone to errors and contributes to burnout of this workforce.[13]

Alignment with the local context

Those lauding the benefits of PAs primarily cite studies out of the United States, where expansion of this workforce has been fuelled by economic incentives of for-profit health providers.[14] We must therefore be cautious about generalising these findings to Aotearoa and seriously probe whether this model of "care" is well suited to our local context, with its long-standing health inequities for tangata whenua.

Even the limited evidence of PA demonstrations in Aotearoa has been critiqued for its flawed methodology and resulting conclusions. It has also yet to definitively conclude that PAs are the best option for addressing our healthcare staffing crisis and meeting our population's complex health needs.[15]

Conclusion

As evidence-based practitioners, we are alarmed at the speed with which we seem to be barrelling down the path of regulation, in the absence of any evidence of the economic or labour market value of PAs as a workforce in Aotearoa. If we continue down this path, we are doomed to repeat the same mistakes we've seen play out overseas.

Instead, we should be working to fix the root causes of our medical workforce recruitment and retention issues and supporting PAs to retrain as nurses or AST professionals or encouraging them into local medical school training to bring them up to the standard we expect. This is a clear win–win to bolster our health workforce through existing education pathways and registration, while maintaining faith in our medical professionals.

COMPETING INTERESTS
Nil.

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REFERENCES
1. Keene L, Wild H, Mills V. Anatomy of a health crisis. N Z Med J. 2024 May 3;137(1594):9-12. doi: 10.26635/6965.6578.
2. Health New Zealand – Te Whatu Ora. Health Workforce Plan 2023/24 [Internet]. Wellington, New Zealand: Health New Zealand – Te Whatu Ora; 2023 [cited 2024 Jun 25]. Available from: https://www.tewhatuora.govt.nz/publications/health-workforce-plan-202324/
3. deWolfe L, Collins S. Regulation of physician associates in Aotearoa New Zealand mitigates a medical practitioner workforce crisis and leads to stronger, diversified healthcare teams. N Z Med J. 2024 Jul 19;137(1599):9-12. doi: 10.26635/6965.6616.
4. British Medical Association. BMA Briefing - Regulation of physician and anaesthesia associates - The Anaesthesia Associates and Physician Associates Order 2024 [Internet]. 2024 [cited 2024 Aug 2]. Available from: https://www.bma.org.uk/media/ez3nle22/bma-briefing-aapao-house-of-lords.pdf
5. Pickles K, Stearn E. 'Cut-price doctors' must NEVER diagnose patients under tough new crackdown sparked by death of actress, 30, whose fatal blood was missed twice [Internet]. Daily Mail; 2024 Mar 8 [cited 2024 Jun 27]. Available from: https://www.dailymail.co.uk/health/article-13168123/Cut-price-doctors-NEVER-diagnose-patients-tough-new-crackdown-sparked-death-actress-30-fatal-blood-missed-twice.html
6. UK Parliament. Anaesthesia Associates and Physician Associates Order 2024, Vol 836 [Internet]. Hansard; 2024 [cited 2024 Jul 10].
7. The Telegraph. Physician associates 'illegally' prescribe opiates to hospital patients [Internet]. 2024 Feb 22 [cited 2024 Jun 25]. Available from: https://www.telegraph.co.uk/news/2024/02/22/it-blunder-physician-associates-illegally-prescribe-opiates/
8. Price O. 'Cut-price' physician associates illegally ordered more than 1,000 NHS hospital tests including X-rays and CT scans despite not having any formal medical training - as doctors slam 'direct threat to patient safety' [Internet]. Daily Mail; 2024 Feb 3 [cited 2024 Jun 25]. Available from: https://www.dailymail.co.uk/news/article-13038173/Cut-price-physician-associates-illegally-ordered-1-000-NHS-hospital-tests-including-X-rays-CT-scans-despite-not-having-formal-medical-training-doctors-slam-direct-threat-patient-safety.html
9. Hill R. 'He could have gone blind': Concerns unregulated physician associates may put patients at risk [Internet]. Radio New Zealand; 2024 Jan 18 [cited 2024 Jun 25]. Available from: https://www.rnz.co.nz/news/national/506989/he-could-have-gone-blind-concerns-unregulated-physician-associates-may-put-patients-at-risk
10. Walia B, Banga H, Larsen DA. Increased reliance on physician assistants: an access-quality tradeoff? J Mark Access Health Policy. 2022 Jan 24;10(1):2030559. doi: 10.1080/20016689.2022.2030559.
11. Wise J. Physician associates increase doctors' workloads, survey finds. BMJ. 2024 Feb 2;384:q291. doi: 10.1136/bmj.q291.
12. Andrew A. Aotearoa New Zealand general practice workforce crisis: what are our solutions? J Prim Health Care. 2024 Jun;16(2):214-217. doi: 10.1071/HC23178.
13. Zigmond D. The expansion of physician associates in primary care risks alienating an already ailing GP workforce. BMJ. 2024 Feb 15;384:q325. doi: 10.1136/bmj.q325.
14. Ferreira T. The role of the physician associate in the United Kingdom. Future Healthc J. 2024 Apr 20;11(2):100132. doi: 10.1016/j.fhj.2024.100132.
15. New Zealand Nurses Organisation. Critical Review of the final Evaluation of the HWNZ Physician Assistant Demonstration Pilot, Counties Manukau DHB [Internet]. 2012 [cited 2024 Jul 24]. Available from: https://www.nzno.org.nz/Portals/0/publications/Critical%20review%20of%20final%20Evaluation%20of%20the%20Physician%20Assistant%20pilot%202012.pdf

The cost of everything and the value of nothing: the first corrective steps are to stop ignoring and start measuring the unmet secondary elective healthcare need

Phil Bagshaw, Sue Bagshaw, John D Potter, Andrew Hornblow, M Gary Nicholls, Carl Shaw

We wish to congratulate the authors of a recent editorial in this journal ("The cost of everything and the value of nothing: New Zealand's under-investment in health"[1]), one of whom is undoubtedly among the best-informed authorities on Aotearoa New Zealand healthcare economics.[2] We were delighted that they specifically mentioned unmet healthcare need in their editorial. This is one of the largest and most obscured problems in our healthcare system.[3]

Since the 1990s, successive governments have controlled the provision of secondary elective healthcare using tools such as financial and clinical thresholds for healthcare access.[4] The results have been that: i) currently reported waiting times for assessment and provision of healthcare provide no measures whatever of effectiveness of healthcare systems or of unmet need, ii) unmet secondary elective healthcare need (USEHN) has undoubtedly been steadily and silently increasing over the years, as evidenced by growing interest in developing charity hospitals around the regions,[5] iii) longer delays result in later presentation, with more advanced disease and worse prognosis, and iv) hence we are burdened by higher costs, higher mortality, lost productivity and increased pressure on our already stressed acute healthcare systems.

We have made numerous attempts to encourage the government to measure the quantum of USEHN through proven population survey methods that allow comparisons across ethnic and socio-economic groups, and permit international benchmarking standards to be established for Aotearoa New Zealand.[6,7] Our attempts have always been frustrated by health officials; our last approach was turned down in a letter from the minister of health on 8 August 2024. He claimed that a recent general practitioner (GP) survey told them what they need to know.[8] He forgets that unmet primary care need does not provide data on USEHN and, even more crucially, the lowest socio-economic members of the population cannot afford to attend a GP, despite having the highest levels of unmet healthcare need.

COMPETING INTERESTS
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REFERENCES
1. Mills V, Keene L, Roberts J, Wild H. The cost of everything and the value of nothing: New Zealand's under-investment in health. N Z Med J. 2024 Aug 23;137(1601):9-13. doi: 10.26635/6965.e1601.
2. Keene L, Bagshaw P, Nicholls MG, et al. Funding New Zealand's public healthcare system: time for an honest appraisal and public debate. N Z Med J. 2016 May 27;129(1435):10-20.
3. Powell I. Data cleansing of unmet patient need hides a national health scandal [Internet]. Otaihanga Second Opinion. 2024 Jun 25 [cited 2024 Aug 24]. Available from: https://otaihangasecondopinion.wordpress.com/2024/06/25/data-cleansing-of-unmet-patient-need-hides-a-national-health-scandal/
4. Bagshaw P, Potter JD, Hornblow A, et al. Assessment of unmet secondary elective healthcare need-itself in need of acute care in Aotearoa New Zealand. N Z Med J. 2023 Feb 3;136(1569):7-10. doi: 10.26635/6965.e1569.
5. Nicholls MG, Frampton CM, Bagshaw PF. Resurrecting New Zealand's public healthcare system or a charity hospital in every town? Intern Med J. 2020 Jul;50(7):883-886. doi: 10.1111/imj.14903.
6. Gauld R, Raymont A, Bagshaw PF, et al. The importance of measuring unmet healthcare needs. N Z Med J. 2014 Oct 17;127(1404):63-7.
7. Bagshaw P, Bagshaw S, Frampton C, et al. Pilot study of methods for assessing unmet secondary health care need in New Zealand. N Z Med J. 2017 Mar 24;130(1452):23-38.
8. Gauld R, Bateman J, Bowden N. Qualifying and understanding the impact of unmet need on New Zealand general practice [Internet]. University of Otago; 2024 Jun 4 [cited 2024 Aug 24]. Available from: https://gpnz.org.nz/wp-content/uploads/CHeST_Quantifying-and-understanding-the-impact-of-unmet-need-on-New-Zealand-general-practice.pdf

Letter to the editor commenting on the editorial: "The cost of everything and the value of nothing: New Zealand's under-investment in health"

Kevin Davies

Dear Editor,

Budget 2024

The recent editorial in the *NZMJ* "The cost of everything and the value of nothing: New Zealand's under-investment in health" by Virginia Mills, Lyndon Keene, James Roberts and Harriet Wild contains the statement that "*the health budget for 2024–2025 does not provide enough funding to address the cost pressures of inflation, wage growth, ageing and population growth*",[1] which we believe is not entirely accurate. Budget 2024 does take demographic and inflationary pressures into account and is over and above the funding provided in Budget 2023.

Health New Zealand – Te Whatu Ora's Budget 2024 cost pressure uplift is above overall demographic and inflationary pressures. In fact, Budget 2024 included an increase in **baseline** funding to meet health cost pressures for Vote Health that will be staged over three budgets, with NZ$5.720 billion in additional funding over the forecast period made available through Budget 2024 (NZ$1.430 billion per annum) and a further pre-commitment of NZ$5.480 billion to be made against each of Budget 2025 and Budget 2026. This funding is **operating** funding, rather than capital.

The government funded Health New Zealand cost pressures were in line with the planning assumptions issued by the previous Government to Health New Zealand in March 2023. These parameters were disclosed in Treasury's 2023 *Economic and Fiscal Updates*. The inflation component of that was based on Treasury's *Half Year Economic and Fiscal Update 2022* (HYEFU2022) inflation forecasts and captured both consumer price index (CPI) and wage inflation elements. Since HYEFU2022, Treasury's forecasts of inflation (both CPI and quarterly employment survey [QES] hourly earnings) have eased. This means that the Health New Zealand cost pressures have been funded above overall demographic and inflationary pressures through Budget 2024.

The total Vote Health package for Budget 2024 included NZ$6.143 billion in new funding over the forecast period (NZ$6.032 billion operating over the forecast period for cost pressures and targeted new spending, and NZ$110 million capital). This is on top of a NZ$1.774 billion uplift for the Combined Pharmaceutical Budget over the forecast period, and the provision of an additional amount of NZ$653 million over the next 4 years to increase access to cancer medicines.

OECD comparisons for health spending

The editorial also states: "*In 2021, New Zealand's total public and private health expenditure was 10% of its gross domestic product (GDP), compared with an average of 11.7% (ranging from 9 to 17%) for 14 OECD countries…*"[1]

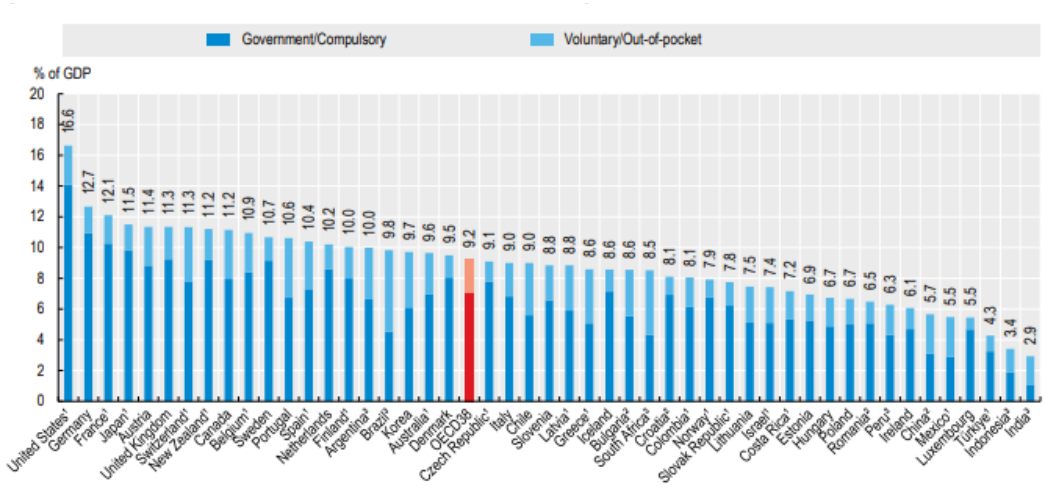
We appreciate there are data quality issues, and the Ministry is working to remedy those over time. Our view is that the selection of certain countries by Mills et al. to compare with New Zealand does not paint an accurate picture of New Zealand's contribution to health. The graph below from the OECD puts New Zealand's situation in better context.

In the Ministry's view, the 10% figure for total health expenditure is likely to underestimate current spending. The estimates in the current OECD dataset are derived by the OECD from published information and by extrapolating past estimates. Our judgement is that private expenditure and expenditure by other government departments on healthcare have both risen considerably over the last few years, and that the

10% total figure is likely to underestimate current spending.

Regards,
Kevin Davies
Deputy Chief Financial Officer
Ministry of Health

Figure 1: Health expenditure as a share of GDP, 2022 (or nearest year).



1. OECD estimate for 2022. 2. 2021 data. 3. 2020 data.
Source: OECD Health Statistics 2023; WHO Global Health Expenditure Database.

COMPETING INTERESTS
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REFERENCES

1. Mills V, Keene L, Roberts J, Wild H. The cost of everything and the value of nothing: New Zealand's under-investment in health. N Z Med J. 2024;137(1601):9-13. doi: 10.26635/6965.e1601.

Response to: Letter to the editor commenting on the editorial: "The cost of everything and the value of nothing: New Zealand's under-investment in health"

Virginia Mills, Lyndon Keene

Tēnā koe,

We appreciate the engagement generated by our recently published editorial on New Zealand's under-investment in health. It is critical that we open robust public conversation on how we fund health, and account for the costs borne by New Zealanders due to delayed care and unmet need. It is also critical that health funding is transparent and able to be scrutinised.

The Ministry of Health has responded to our editorial with a letter to the editor. Below is our response to points raised.

- Our editorial did not contend that the NZ$1.43 billion funding for cost pressures went to capital funding. We did highlight, however, that Health New Zealand – Te Whatu Ora officials signalled in March the calculations were based on lower inflation figures and may not be enough to meet cost pressures.
- We would like to see the full calculation for health cost pressures the Ministry refers to. We sought a copy of the cost pressure calculations under the *Official Information Act* back in May 2024. We are still waiting to receive a copy.
- Our editorial reports on the **net** increase in operational and capital funding, including *Holidays Act* remediation, compared to the previous year. These figures are easy to verify on pages 3–5 of Vote Health's *Estimates of Appropriations*.
- As we point out in our editorial, much of the additional funding for 2024/2025 mentioned by the Ministry is recycled or relabelled money.
- According to the OECD, New Zealand's total health expenditure was 11.22% of GDP in 2022, of which 9.15% was public expenditure. This would have amounted to NZ$33.3 billion public expenditure when Core Crown Health expenditure, including COVID-19 health expenditure, was NZ$27.8 billion. In September 2023, the Association of Salaried Medical Specialists asked the Ministry to clarify how the OECD reached its estimates. The Ministry said it did not know but that "*sometimes unexpected results have occurred with changes made by Stats or the OECD to the GDP deflator. There are many possible explanations, especially during the period 2020 – 2022 when economies and health expenditure, internationally, moved in unexpected ways*." For these reasons we used the World Health Organization's data on expenditure, which we believe reflect New Zealand's position against comparable countries more accurately.[1]

Once again, we welcome the engagement the editorial has generated, and reiterate our calls for an independent inquiry into the options for funding a public health system that is sufficient to ensure all New Zealanders have timely access to quality healthcare when they need it.

Furthermore, we call for increased transparency and access to the information that informs the health budget, as well as government analysis on New Zealand's health expenditure. For example, we encourage the Ministry to resume publication of its series *Health Expenditure Trends in New Zealand,* which supported informed debate on health funding and expenditure, but was discontinued in 2010.

Nāku noa, nā,

Virginia Mills and Lyndon Keene

COMPETING INTERESTS
Nil.

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REFERENCES
1. Davies K. Letter to the editor commenting on the editorial: "The cost of everything and the value of nothing: New Zealand's under-investment in health". N Z Med J. 2024 Sep 6;137(1602):145-147. doi: 10.26635/6965.6725.

Pacific people living in New Zealand are most commonly referred with eczema to dermatologists

Miriam Karalus, Amanda Oakley

ABSTRACT

BACKGROUND: There is a lack of literature concerning dermatological conditions affecting patients of Pacific ethnicity.

AIM: To investigate dermatological conditions in patients of Pacific ethnicity referred to dermatology from 2016 to 2022.

METHODS: Single-centre study of electronic referrals to dermatology from January 2016 to May 2022.

RESULTS: Pacific ethnicity was recorded for 1.7% of 30,769 referrals to dermatology, under-representing census data for the local population (5.4%). Dermatological diagnoses were eczema in 36% of patients, benign skin lesions in 11% and skin infection in 8.3%.

CONCLUSION: Eczema was the most common reason for referral to dermatology in patients of Pacific ethnicity in the Waikato Region.

There is a lack of research regarding dermatological conditions affecting Pacific people in the Pacific Islands.[1] In New Zealand, Pacific people, made up of 17 ethnic groups, accounted for 8% of the population in 2018,[2] and 5.4% in our district.[3] In existing literature, Māori and Pacific patients have been grouped as one ethnic group.[4,5]

Eczema, pityriasis versicolor and tinea are the three most common reasons for seeking specialist dermatology care in the Pacific Islands.[1,6] In Samoa, one-quarter of 75 patients presenting to a 4-day clinic were diagnosed with eczema.[1] In a series of dermatology clinics in Samoa and Vanuatu assessing 1,072 patients, 21% were diagnosed with eczema.[6] One cross-sectional United States study found that Asians/Pacific Islanders visited physicians for atopic dermatitis six times more often than Caucasians with white skin.[7]

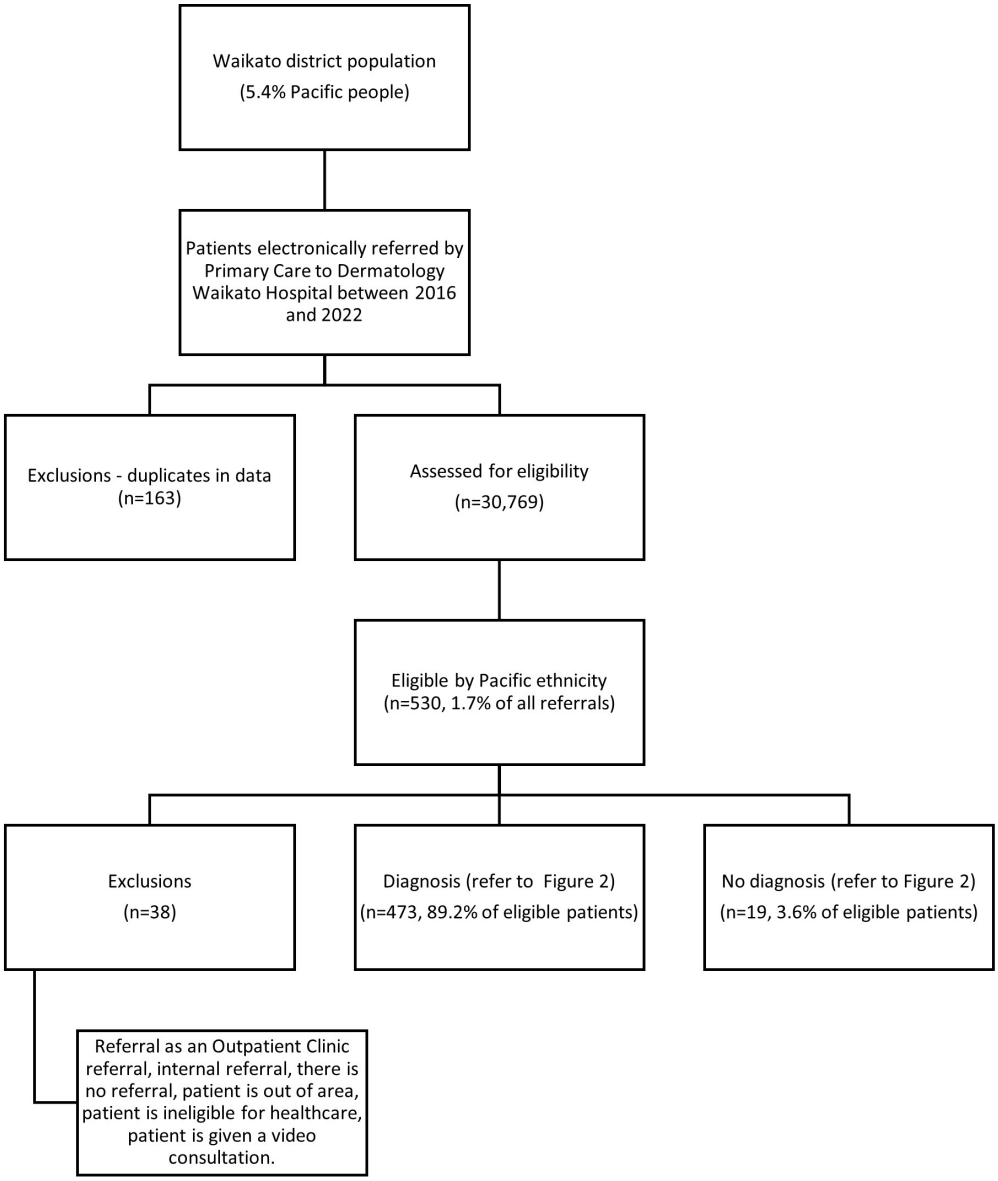
In New Zealand, eczema is known to affect Pacific children more frequently than children of other ethnicities.[8] In a survey involving more than 11,000 children and adolescents conducted in five New Zealand regions from 2001 to 2003, eczema was estimated to affect 16% of Pacific children, compared to 10% of other ethnicities.[8] Skin infection disproportionately affects Pacific children living in New Zealand, who have a higher rate of hospitalisation for severe skin infection compared with other ethnic groups, with Pacific children being 4.5 times more likely to be hospitalised for skin infection.[9]

Less is known about other dermatological conditions among Pacific adults in New Zealand. Māori/Pacific people have 2.47 times increased relative risk of all types of cutaneous lupus compared to those of European ancestry.[5] Pacific adults are disproportionately hospitalised for severe skin infection (cellulitis) compared to the total New Zealand population,[10] and may have increased rates of psoriasis.[4] In a 2016 study of 145 patients with cutaneous lupus, it was found that Māori/Pacific adults have a high relative risk of all types of lupus compared to Europeans, and Māori/Pacific children have a higher incidence of systemic lupus erythematosus compared to European children.[5] Patients of Māori and Pacific ethnicity were over-represented in an audit of ethnicities of psoriasis patients treated in the Auckland District Health Board from 2009 to 2014.[4]

Method

We conducted an observational study of ethnicity data in electronic referrals to dermatology in the Waikato Region from January 2016 to May 2022. Referrals included suspected skin cancer and general skin condition referrals. Ethnicity was recorded according to the Stats NZ Ethnicity Data Protocols 2017.[11] Diagnoses made by the responding dermatologist were extracted from the electronic medical record for patients of Pacific ethnicity and recorded using ICD-10 coding. Simple statistical analyses were performed, with patient ethnicity and rates of

Figure 1: Flowchart of the study methodology.



dermatological diagnoses reported as a percentage. Ethics approval for the project was granted by the Health and Disability Ethics Committee (21/NTB/82).

Results

Pacific ethnicity was recorded for 530 patients (1.7% of 30,769 referrals). Thirty-six percent of patients had eczema, 11% had benign skin lesions, 8.3% had an infection and 8.1% had psoriasiform disorder (Figure 2). No diagnosis was recorded for 3.9% of patients. Reasons for not receiving a diagnosis included the condition being undiagnosed, the referral being declined with further advice or the referrer providing insufficient information. Neoplasm was the least common reason for referral, with 2.2% of cases diagnosed as malignancy (Table 1). Malignant skin lesions included histology-confirmed basal cell carcinoma (0.8%), malignant neoplasm of unknown behaviour (0.4%), melanoma/melanoma *in situ* (0.6%) and squamous cell carcinoma/intraepidermal carcinoma (0.4%).

Figure 2: Broad categories of skin conditions in patients of Pacific ethnicity referred to dermatology.

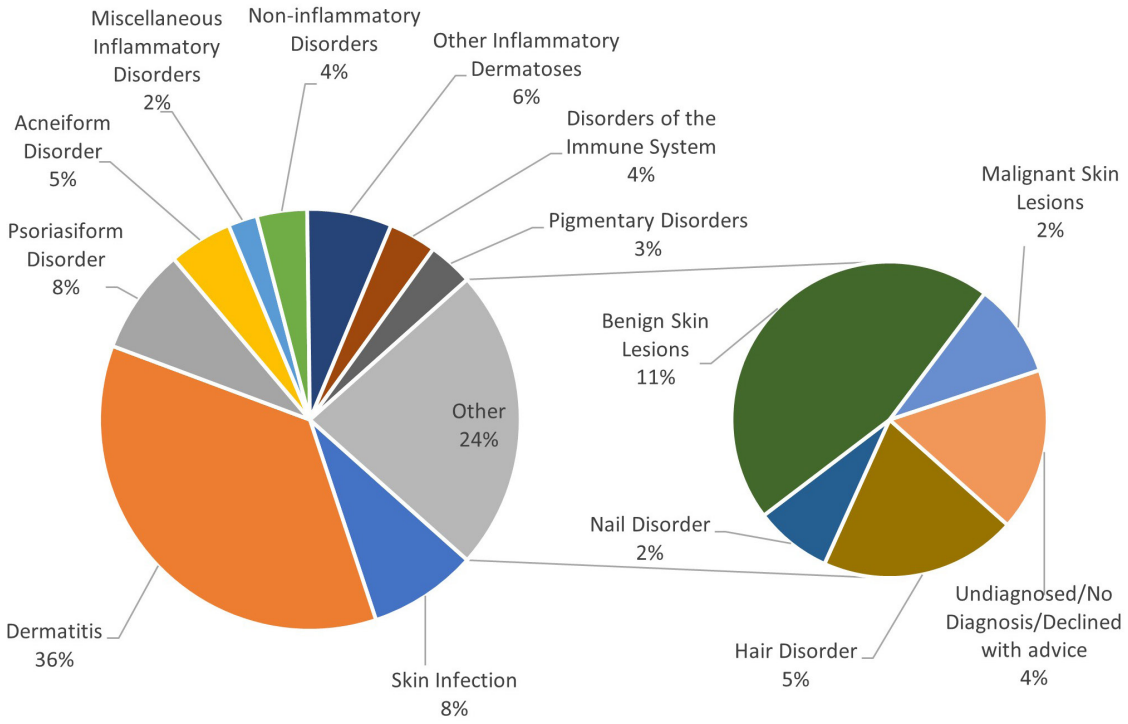


Table 1: Details of dermatological diagnoses made in referrals of patients of Pacific ethnicity.

Dermatological diagnosis	Number	Percentage
Skin infection	41	8.3%
Dermatitis	176	36%
Psoriasiform disorder	40	8.1%
Acneiform disorder	24	4.9%
Miscellaneous inflammatory disorders	11	2.2%
Non-inflammatory disorders	19	3.8%
Other inflammatory dermatoses	32	6.5%
Disorders of the immune system	18	3.7%
Pigmentary disorders	17	3.5%
Hair disorder	23	4.7%
Nail disorder	9	1.8%
Benign skin lesions	52	11%
Malignant skin lesions	11	2.2%
Undiagnosed/no diagnosis given/declined with advice	19	3.9%

The most common subtypes of eczema were atopic dermatitis, dermatitis not otherwise specified and discoid eczema. Dermatophyte infection was the most common subtype of infection, followed by bacterial infection. Twelve cases of cutaneous lupus erythematosus were referred to dermatology.

Discussion

There is a lack of research concerning dermatological conditions affecting people of Pacific ethnicity. In this observational study, Pacific people were under-represented (1.7%) compared to the district's population (5.4%).[3] Pacific people are reported to present for general practitioner appointments at higher rates but receive fewer referrals (20% of Pacific people receive referrals to specialists versus the national average of 30%).[12] The impact of the inclusion of suspected skin cancer referrals on the total number of Pacific people referred is not known.

Various kinds of eczema were the most common reasons for referral, not unexpectedly. The percentage of referrals for eczema (36%) is higher than reported in the Pacific Islands (25.6%[1] and 21%[6]). Environmental or socio-economic factors may contribute to this. It is known that Pacific children in New Zealand have higher rates of eczema compared to children of other ethnicities.[8] Further research should investigate rates of eczema among Pacific adults living in New Zealand compared to other ethnicities.

Limitations

The study was a snapshot of skin diseases and conditions in referrals of Pacific people.

- We did not analyse the referral population by age group nor evaluate the age groups of the whole referral database; the low referral rate may reflect the younger local Pacific population compared to other ethnicities.
- Our results may not reflect the incidence or prevalence of skin diseases in the population or patients presenting to primary care. The relatively high proportion of referrals for eczema in our study may reflect the recognition and treatment of common skin infections in primary care.
- No attempt was made to compare diagnoses made in referrals of patients with other ethnicities.

COMPETING INTERESTS
Nil.

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REFERENCES
1. Wlodek C, Va'a-Fuimaono H, Ekeroma A. Dermatological conditions encountered in The Independent State of Samoa and an exploration of possible strategies to manage dermatological health-care needs in this resource-poor setting. Australas J Dermatol. 2020 Feb;61(1):51-53. doi: 10.1111/ajd.13118.
2. Ministry for Pacific Peoples. Pacific Aotearoa Status Report: A snapshot 2020 [Internet]. Wellington, New Zealand: Ministry for Pacific Peoples; 2021 [cited 2023 Jul 7]. Available from: https://www.mpp.govt.nz/assets/Reports/Pacific-Peoples-in-Aotearoa-Report.pdf
3. Stats NZ. Pacific Peoples ethnic group [Internet]. Wellington, New Zealand: Stats NZ; 2021 [cited 2023 Sep 11]. Available from: https://www.stats.govt.nz/tools/2018-census-ethnic-group-summaries//pacific-peoples
4. Lee M, Lamb S. Ethnicity of psoriasis patients: an Auckland perspective. N Z Med J. 2014 Oct 17;127(1404):73-4.
5. Jarrett P, Thornley S, Scragg R. Ethnic differences in the epidemiology of cutaneous lupus erythematosus in New Zealand. Lupus. 2016 Nov;25(13):1497-1502. doi: 10.1177/0961203316651745.
6. White AD, Barnetson RS. Practising dermatology in the South Pacific. Med J Aust. 1998 Dec 7-21;169(11-12):659-62. doi: 10.5694/j.1326-5377.1998.tb123457.x.
7. Janumpally SR, Feldman SR, Gupta AK, Fleischer AB Jr. In the United States, blacks and Asian/Pacific Islanders are more likely than whites to seek medical care for atopic dermatitis. Arch Dermatol. 2002 May;138(5):634-7. doi: 10.1001/archderm.138.5.634.
8. Clayton T, Asher MI, Crane J, et al. Time trends, ethnicity and risk factors for eczema in New Zealand children: ISAAC Phase Three. Asia Pac Allergy. 2013 Jul;3(3):161-78. doi: 10.5415/apallergy.2013.3.3.161.
9. O'Sullivan CE, Baker MG, Zhang J. Increasing hospitalizations for serious skin infections in New Zealand children, 1990–2007. Epidemiol Infect. 2011;139(11):1794-804. doi:10.1017/S0950268810002761.
10. Sopoaga F, Buckingham K, Paul C. Causes of excess hospitalizations among Pacific peoples in New Zealand: implications for primary care. J Prim Health Care. 2010 Jun;2(2):105-10.
11. Ministry of Health – Manatū Hauora. HISO 10001:2017 Ethnicity Data Protocols [Internet]. Wellington, New Zealand; 2017 Sep [cited 2023 Jul 10]. Available from: https://www.tewhatuora.govt.nz/assets/Our-health-system/Digital-health/Health-information-standards/hiso_10001-2017_ethnicity_data_protocols_21_apr.docx
12. Medical Council of New Zealand. Best health outcomes for Pacific Peoples: Practice implications [Internet]. Wellington, New Zealand: Medical Council of New Zealand; 2010 May [cited 2023 Sep 12]. Available from: https://pdf4pro.com/cdn/best-health-outcomes-for-pacific-peoples-practice-47a637.pdf.

The Spahlinger Method of Treatment of Tuberculosis

NZMJ, 1924

In response to the request of the Prime Minister of New Zealand a Committee of the New Zealand Branch of the British Medical Association has reported to the New Zealand Government on the medical aspect of the *Spahlinger* treatment. The committee was constituted as follows:—*Sir Donald McGavin* (Chairman), *Prof. Hercus*, *Prof. Fitchett* and *Drs*. *Hector*, *Fenwick*, *Short* and *Macintyre*. With the exception of one member, who saw this treatment in Geneva and had a slight opportunity of applying it in New Zealand, none of the committee has had the opportunity of seeing the treatment carried out, and as no material is available in New Zealand they have not been able to test its results themselves. The committee is, therefore, compelled to form a judgment from evidence reported, and not as it would desire, from a direct observation of the treatment and its results. This involves a necessarily guarded and provisional judgment, a careful consideration of the value and credibility of the evidence, and a consideration of the position of those offering the evidence. The report of the committee relates to clinical and bacteriological evidence and conclusions, and covers sixteen foolscap pages of typewritten matter.

"The conclusion of the Committee, after most careful deliberations, is that the evidence available is insufficient to support the claims made for this treatment. An editorial article in the *British Medical Journal*, of 2nd June, 1923, summed up as follows:— 'It is of course possible that the elaborate and complex methods which *M. Spahlinger* employs may possess advantages, but there is no laboratory evidence that they are any better than what has been done before, and the only evidence there is rests on the observations of some clinical observers who have been favourably impressed by the results which they are obtaining.' This statement accurately represents the views of the committee.

"The committee feels that before the Government takes any decided action, further information should be obtained. It is understood that *Dr. G. J. Blackmore* (a recognised authority on tuberculosis in New Zealand), is at present in England, and will shortly visit Geneva. His opinion as to the efficacy of this treatment would be of great value, and the committee recommends the Government to secure a report from *Dr. Blackmore* as soon as possible.

"The Ministry of Health in London has the best opportunity of following the development of this treatment and judging of its efficiency. The committee, therefore, considers that the New Zealand Government might properly support the Ministry of Health in its further investigations into the efficiency or otherwise of this treatment.

"The committee, however, considers that the evidence available is not sufficient to justify its recommending the New Zealand Government to take independent action. This view coincides with the recommendation of the Director-General of Health to the Hon. the Minister of Health, in December, 1922.

"The committee desire to express their appreciation of the labour undertaken by the *Hon. Dr. Collins* in collecting the mass of evidence which he placed before them, and for the courtesy he exhibited in discussing the whole question with them."