THE NEW ZEALAND MEDICAL JOURNAL
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This Issue in the Journal

Health system costs by sex, age and proximity to death, and implications for estimation of future expenditure
Tony Blakely, June Atkinson, Giorgi Kvizhinadze, Nhung Nghiem, Heather McLeod, Nick Wilson

Publically funded health spending in New Zealand is currently about $16 billion per annum (6.9% of GDP), and is forecast to increase to 11.1% of GDP by 2060. Of that spending, about two-thirds can be attributed to individual citizen's contacts with the health system. Using 2007–09 cost data, a person dying at age 70 years is estimated to use about $113,000 of publicly funded health services over their life-time, doubling to $223,000 for a person dying at age 90. The percentage of publicly funded health spending occurring in the last year of life is greater than 25% for someone dying aged up to 50 years, but falls to 'only' 11% for someone dying aged 80 years.

Retrospective epidemiology of acute rheumatic fever: a 10-year review in the Waikato District Health Board area of New Zealand
Victoria Pennock, Anita Bell, Te Aro Moxon, Peter Reed, Fraser Maxwell, Diana Lennon

Acute rheumatic fever (ARF) is a preventable disease which remains a prominent burden of health in New Zealand, with an annual incidence comparable to that of developing countries. 106 cases of ARF and four cases of recurrent ARF were identified through the Public Health Database between 2002 and 2012. The overall Waikato DHB annual incidence of ARF was 3.1 per 100,000 population with Māori children aged 5–14 years experiencing higher rates of 46.1 per 100,000 population. Eighty-five percent of the cases were of Māori ethnicity, and 10% Pacific. Almost three-quarters of all cases lived in the three poorest areas. High risk groups have been identified as children aged 5–14 years, Māori and Pacific ethnicity, and those living in poverty.

Ethnicity and revascularisation following acute coronary syndromes: a 5-year cohort study (ANZACS-QI-3)
Andrew J Kerr, Ahmad Mustafa, Mildred Lee, Sue Wells, Corina Grey, Tania Riddell, Wil Harrison

Previous studies have reported higher rates of coronary revascularisation in European compared with Māori and Pacific patients. Our aim was to define the current variation by ethnicity in investigation, revascularisation and pharmacotherapy after admission with an acute coronary syndrome (ACS). Of 2666 ACS patients studied aged under 80 years, 51.5% were European/Other, 14.2% Māori, 16.0% Pacific, 14.8% Indian, and 3.5% Asian. Cardiac risk factors and comorbidity varied markedly by ethnicity. The overall coronary angiography rate was high (89%). After adjustment for clinical

factors which influence the decision to perform angiography, European/Other patients were about 5% more likely than Māori and Pacific patients to have angiography. Overall revascularisation was highest in Asian, Indian and European/Other (76.1%, 69.1% and 68.6%), and lower in Māori and Pacific patients (58.2% and 52.9%). Non-obstructive coronary disease was more common in Māori and Pacific (20.6 and 18.6%, respectively), than in European/Other, Indian and Asian patients (13.3%, 8.7% and 6.1%). After adjustment, Māori, Indian and Asian patients were as likely to receive revascularisation as European/Others, but revascularisation in Pacific patients was 13% lower. Discharge prescribing of triple preventive therapy was uniformly high across ethnic groups (overall 91%).

Initiation of maternity care for young Māori women under 20 years of age
Charrissa Makowharemahihi, Bev Lawton, Fiona Cram, Tina Ngata, Selina Brown, Bridget Robson

E Hine is a qualitative kaupapa Maori study that explores the experiences of 44 young Māori women <20 through pregnancy and motherhood across two case study sites. This paper describes the journey of these young Maori women as they find out about their pregnancy, and then the next steps of finding a lead maternity carer (LMC). Findings show that the fragmentation between primary care and maternity care services had a negative impact on a seamless pregnancy pathway for the women in this study, resulting in avoidable delays to early antenatal care. Maternity care should start with the first health care interaction with increased emphasis on appropriate information support for young Māori women <20.

Cultural and social factors and quality of life of Māori in advanced age. Te puawaitanga o ngā tapuwae kia ora tonu – Life and living in advanced age: a cohort study in New Zealand (LiLACS NZ)
Lorna Dyall, Mere Kēpa, Ruth Teh, Rangimārie Mules, Simon A Moyes, Carol Wham, Karen Hayman, Martin Connolly, Tim Wilkinson, Sally Keeling, Hine Loughlin, Santosh Jatrana, Ngaire Kerse

The Life and Living in Advanced Age : a cohort study in New Zealand Te Puawaitanga o ngā Tapuwae kia ora tonu is a cohort longitudinal study which has two populations Māori aged 80-90 years in 2010 on enrolment and non- Māori aged 85 years. This paper only reports Māori base line data, a glossary of Māori terms has been provided. Statistical analysis is described in the method and factors that were significant at 0.2 level were entered into a multiple regression model and examined for strength and association.

Botulinum toxin versus botulinum toxin with low-dose GTN for healing of chronic anal fissure: a prospective, randomised trial
Muhammad Asim, Neil Lowrie, Joanna Stewart, Simi Lolohea, Ralph Van Dalen

This was a clinical trial to look for if any beneficial effect exist if we combine Botulinum toxin(drug) and glyceryltrinitrite (GTN) to treat chronic anal fissure (tear of anal skin). We did not found any beneficial effect of combining both drugs but it was a small study and we encourage a larger trial done with these two drugs to look for if any real difference exist.

Attitudes towards smokefree campus policies in New Zealand
Louise Marsh, Lindsay A Robertson, Claire Cameron

This study asked staff and students of a New Zealand university their views of a campus which was completely smokefree. The 332 staff and 268 students who took part in the study felt the university should promote a healthy work and study environment, free from exposure to second-hand smoke. Both staff and students were strongly supportive of a smokefree campus, and provide the university with a sound basis on which to implement a smokefree policy. Greater adoption of this policy by tertiary education institutions would foster realisation of the government's goal that New Zealand become a smokefree nation by 2025.

Will New Zealand be smokefree by 2025? Smoking prevalence amongst a cohort of Pacific adults
El-Shadan Tautolo, Leon Iusitini, Steve Taylor, Janis Paterson

The high rate of smoking amongst Pacific adults within this study is gravely concerning. The minimal decline in smoking over the previous 12 years suggests that past cessation services and interventions have had little impact for these people, and potentially the health of their children and families through second hand smoke exposure. Current policies and strategies need to be re-developed to address the needs of this population group, if they are to achieve the goal of being smokefree by 2025.

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Ongoing leadership and effort needed to keep the focus on improving Māori health

Peter Crampton, Bridget Robson

Colonialism has left a legacy of health inequalities affecting indigenous peoples in many countries, including New Zealand. Crown recognition of the impact on the wellbeing of multiple generations of Māori communities has been acknowledged in the apologies that are important components of New Zealand's Treaty of Waitangi settlements.

Increased understanding of historical injustices has contributed to a shift from victim-blaming (where the problem lies with Māori) to a focus on how systems create or maintain inequalities.

Two important problems with unequal health outcomes are featured in this edition of the *NZMJ*. For one (coronary heart disease) gaps are closing.[1] For the other (acute rheumatic fever) gaps are widening.[2] Both are strongly associated with social determinants, both are preventable, and both are amenable to medical care.

In the 1980s, Eru Pomare cautioned that Māori were under-represented in coronary bypass statistics and over-represented in deaths.[3] In the 1990s, Colin Tukuitonga revealed that Pacific people were also underserved.[4] Scrutiny has continued.

Two decades later it is heartening to see Kerr and colleagues—in this edition of the *NZMJ*—recognise that equity is intrinsic to quality improvement in their thoughtful analysis of care received by patients with acute coronary syndrome at Middlemore Hospital (Auckland, New Zealand).[1] It is also reassuring to see the reduction in disparities, although lower rates of angiography among Māori and Pacific patients and lower revascularisation among Pacific patients require further attention. The All New Zealand Acute Coronary Syndrome-Quality Improvement (ANZACS-QI) register will assist cardiac services throughout the country to be just as vigilant in their efforts to mitigate and undo the inverse care law.

Pennock and colleagues—also in the edition of the *NZMJ*—highlight, again, the terrible burden of rheumatic fever on Māori and Pacific communities in New Zealand.[2] The history of our health system's engagement with rheumatic fever is a blend of commitment and neglect and, as the authors point out, health system restructuring in the relatively recent past prompted the dropping of Hamilton's rheumatic fever register in the early 1990s. The current government's focus on rheumatic fever is welcome.

From a research perspective this disease continues to be bewildering. The fact that only half of cases in the Waikato over a 10-year period had a documented sore throat preceding their episode of rheumatic fever only stresses further our need to understand more about the disease. Nevertheless, while the causes of its distribution and the relative importance of genetic influences still remain the subject of speculation and research, it stands as a beacon of condemnation of our divided society

where the poorest (notably Māori and Pacific communities) are blighted by what is commonly regarded in rich nations as a largely historic disease.

The boundaries between New Zealand's health system and the wider society are porous. It is therefore no surprise that the health system has cast itself as both part of the problem and part of the solution when it comes to systematic health inequalities between Māori and Pākehā (European New Zealanders).

The past two decades have seen major gains in the health system's responsiveness to Māori health needs thanks to the wide acceptance by health professionals and managers that the status quo was not, and continues to be not acceptable.

For the momentum to be sustained we must keep our focus on doing all we can do to provide services which actually make a difference to health outcomes for Māori. As the authors in this edition of the *Journal* demonstrate, we are well able to measure and evaluate our efforts.

Concerted action continues to be required.

Competing interests: Nil.

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A Māori cultural reluctance to present for care, or a systems and quality failure? How we pose the issue, informs our solutions

Nina Scott

Two articles in this edition of the *NZMJ* address important Māori health topics. One, a Kaupapa Māori-based investigation into inequities in access to antenatal care for young women.[1] The other, a Māori health model,[2] can be considered an umbrella or overarching framework for thinking about Māori health. Both provide guidance for future direction on action for improving Māori health and achieving equity in health for all New Zealanders.

Health inequities are a problem in all developed countries and are defined as differences which are unnecessary and avoidable, but in addition are considered unfair and unjust.[3]

Health inequities between Māori and non-Māori New Zealanders are large and pervasive, persist across the lifespan, over time, and surpass inequities by deprivation and geography.[4] Similar patterns are seen between Indigenous and non-Indigenous populations in many countries including Australia, the USA, Canada and in Nordic countries.[5,6]

Without appropriate dialogue, society risks becoming complacent about the tragedy and injustice of inequities. Developing a zero tolerance attitude toward inequities will help ensure that achieving equity becomes a peak societal and health goal. Achieving equity needs to be prioritised before improving overall health for the total population, because, in addition to social justice imperatives, not all methods used to improve health status for the majority of the population will result in a reduction in inequities, and some methods inadvertently increase inequities.

On the other hand, implementing systems changes required to achieve equity will likely improve health for all. For example, developing an equity-focussed, evidence-based, standardised referral to lead maternity care pathway, the need for which is clearly given in the Makowharemahihi article,[1] would be expected to contribute toward achieving equity in access between Māori and non-Māori women and also improve access for all women.

The organisation responsible for such systems changes in New Zealand is the Ministry of Health. As the agency responsible for the strategic direction of New Zealand's health sector, the Ministry of Health holds overall accountability for the quality of healthcare, including ensuring that access, timeliness and quality of health care is equitable for all.

Systems and victim-blaming approaches are two common ways that health inequities are considered or understood. One emphasises the importance of health determinants, including the role of well organised, high quality, equitable health care—and the

other, the responsibility of individual patient behaviours for achieving good health outcomes.

Inequities can be seen as a hallmark for poor-quality, non-standardised care. Variability in care by ethnicity, socioeconomic status, and/or by service, is often the most obvious marker of poor quality along a care pathway or within a healthcare system.

Inequities in prostate cancer mortality between Māori and non-Māori have been blamed on a Māori "cultural reluctance to present for care".[7] It would have been easy to make the same assumptions in the case of inequities in access to antenatal care between Māori and non-Māori women. However, Makowharemahihi et al, in this edition of the *NZMJ*, used a systems approach to pinpoint the weakest link in the access to antenatal care pathway which is generating inequities. As expected, there was variable quality of care at this point, with some women receiving high-quality care and others hitting multiple barriers at every turn, resulting in delayed and poorer quality care.[1]

The authors overarching methodology is Kaupapa Māori and although not made explicit, is also consistent with recent thinking on health care quality. Health care quality methods are particularly useful for equity focused systems approaches.

One of the most significant influences in health care quality is philosophy based on the success of manufacturing models, such as lean philosophy based on the Toyota model.[8] In a high-quality system, processes and practices are continually reviewed from a client viewpoint so that problems can be identified and resolved.[8]

The authors focussed on part of a healthcare pathway where inequities were identified, and evaluated processes and practices around that part of the pathway from the point of view of young pregnant Māori women. As a result they have identified an intervention point for improving access to high quality health care early in the life course for children and at an important time in the lives of women and their whanau/family.

Unobstructed throughput and the identification and removal of system bottlenecks are key to quality care, and multiple process steps have been identified as red flag situations, which increase risk for poor-quality care.[8]

Integrated seamless care along the antenatal care pathway between general practitioners and midwives is essential but clearly lacking. It is obviously a bottleneck situation. And it's not hard to see why, as multiple process steps are required for women to access a midwife/lead maternity carer, including: accessing a phone and the money to use a phone; literacy skills, time and confidence to phone and request care from a list of lead maternity carers (LMCs); and lead maternity carers having space available for new clients. A final important additional process step, which was not assessed by the researchers, is LMCs being willing to accept young Māori clients.

As demonstrated by the authors, early and appropriate access to antenatal care is important for its positive impact on outcomes for mother and child. Timeliness is crucial as initial contact with health services is an opportunity for first trimester screening, lifestyle interventions including diet and smoking cessation, and navigation to an LMC or hospital care. The authors cite longstanding knowledge of inequities in

early access to antenatal care for young women. In light of such a clear need, this is an important piece of work, but it is concerning that it has taken so long for a study such as this to be done. Developing a high quality equitable antenatal care pathway should be a priority for any government.

Resolving quality issues identified through this research will require leadership and resourcing and the full, timely support of the Ministry of Health. Following on from the Kaupapa Māori methodology and quality improvement methods used to inform the study, the same methodology and quality improvement philosophy should be used to inform the development of solutions. Kaupapa Māori methodology speaks to the need for Māori leadership, expertise and involvement in solution development, implementation and monitoring. A high-quality, Kaupapa Māori antenatal care pathway would work for Māori women at least as well as for non-Māori women. It would also be standardised, user-friendly, simple, easy-to-follow and continuously monitored.

The methodology and methods employed for this research could be used to identify points of intervention along other critical health care pathways for Māori and also contribute toward achieving an equitable health system in New Zealand and help improve the quality of health care for all New Zealanders.

Māori models of health provide important frameworks for thinking about Māori health at systems and individual levels and can be used for teaching purposes with health professionals from many disciplines. Encounters with a variety of health professionals are *par for the course* during a journey through health care.

In the ideal scenario, health professionals at every point along every health care journey would be culturally safe and non-racist. Further, at the system level, policymakers and maintainers at every level of health care would develop equity-focussed policies and practices aimed at improving Māori health alongside achieving equity and improving health for all New Zealanders.

The article by Pitama, Huria and Lacey—also in the current edition of the *NZMJ*—gives an overview of the updated Meihana model, which provides a guide for health professionals on the clinical assessment process for Māori patients.[2] Drawing on two established models—Te Whare Tapa Wha (the four cornerstones of health), and the Calgary-Cambridge model—a key strength of the updated Meihana model is that it goes beyond its foundation models to include sociopolitical determinants of health such as racism and the role of high-quality health services. Another strength is its focus on high quality ethnicity data to inform continuous quality monitoring.

The Meihana model helps practitioners understand a Māori model of health, determinants of Māori health and causes of inequities in health between Māori and non-Māori. Its use could theoretically contribute toward improving Māori health, achieving equity in health, and improving health for all. Learning's from the model could be enacted at clinician to patient and whānau interactions, and at the wider systems level.

Racism at the personal and systems levels is a recognised determinant of health in New Zealand.[9,10] Evidence shows that experience of racism has a negative effect on health and that Māori are more likely to experience interpersonal racism than non-Māori.[9]

Training health professionals could hypothetically reduce the frequency and severity of interpersonal racism experienced by Māori. Institutionalised, or systems level racism is a powerful determinant of health that goes beyond interpersonal situations.[10]

The Meihana model could contribute toward decreasing institutional racism by improving health professionals understandings of Māori health, health inequities and health determinants, so that when they contribute to organisational changes, they focus on Māori health needs and rights in an evidence based way and may be less likely to support health initiatives which result in poor outcomes for Māori and/or increase inequities.

More directive guidance on the responsibilities of health professionals to address inequities and ways of doing that effectively, both at the interpersonal level with patients and whānau and at the systems level would strengthen the model. However, the updated Meihana model incorporates a broad understanding of Māori health and in the right hands, could be a very useful teaching tool, for a range of health professionals and in a variety of settings.

I, for one, plan on incorporating the updated Meihana model into my interprofessional teaching practice.

Competing interests: Nil.

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Health system costs by sex, age and proximity to death, and implications for estimation of future expenditure

Tony Blakely, June Atkinson, Giorgi Kvizhinadze, Nhung Nghiem, Heather McLeod, Nick Wilson

Abstract

Aims Health expenditure increases with age, but some of this increase is due to costs proximal to death. We used linked health datasets (HealthTracker) to determine health expenditure by proximity to death. We then determined the impact on future health expenditure projections of accounting for proximity to death in costs.

Methods 2007 to 2009 national health event data were linked for hospitalisations, inpatient procedures, outpatient events, pharmaceuticals, laboratory tests, and primary care consultations. Each event was assigned a cost. Health expenditure by sex, age and whether in last 6 or 12 months of life or not were calculated.

Future health expenditure trends were then estimated for the Statistics New Zealand median projection population counts, with 2010–12 mortality rates reducing by 2% per annum into the future.

Results A total of $8.1, $8.8 and $9.2 billion dollars (inflation-adjusted to 2011 NZ$) was allocated to individual health events in HealthTracker in 2007, 2008 and 2009, respectively.

Citizen costs for people not within 6 months of death ranged from $498 per person-year (10–14 year old females) to $6900 per person-year (90–94 year old males). Per person-year costs in the last 6 months of life were 10-fold higher on average, being maximal at $30,000 or more among infants and the older elderly (80+ years). Similar patterns were apparent for costs within 12 months of death.

For people hypothetically exposed to these 2007–09 health system costs over their full life, the cumulative costs for a person dying at age 70 years was $113,000, and doubled to $223,000 for a person dying at age 90. The proportion of cumulative health expenditure in the last year of life declined with increasing age of death: e.g. 24%, 13% and 10% for someone aged 40, 70 and 90 respectively.

Projections of future health system expenditure were overestimated by 2.3% to 3.5% in 2041 when not accounting for proximity to death in costs.

Conclusions New Zealand is fortunate to have access to rich data on health system costs. The age-specific health system costs per citizen we have calculated can be used in health expenditure projections, for cost-effectiveness analyses, and for considering how public health expenditure is distributed across the life course.

There is widespread concern about the growing percentage of GDP spent on health in all countries. New Zealand is no exception. Public or Government-financed health spending as a percentage of GDP in New Zealand has increased from 3.1% in 1950 to 6.9% in 2011.[1]

Treasury have forecast, under their 'best' set of assumptions, that by 2060 this might increase to 11.1% of GDP.[1] It is important to not be alarmist regarding these statistics: an increase in health spending can be considered appropriate as populations age, longevity increases, the range of effective interventions (be they prevention or treatment) to 'purchase' increases, the societal benefit of health spending compared to other sectors (e.g. defence) alters, and the relative cost of health sector activity (labour-intensive) increases relative to other sectors where relative costs decrease due to productivity gains (e.g. from greater use of technology and economies of scale in manufacturing).

The more important issue is what extent of increased spending on health we want as a society, given we largely pay for it through taxes that could be used elsewhere (be it on other Government expenditure, or private use).

Broadly speaking, good management of future health spending will involve a mix of cost growth containment (e.g. Government limits of Vote Health appropriations – as already happens, possible patient out of pocket payments), maximising health sector productivity gains (a major challenge in a labour-intensive sector with high international competitiveness for salaries), and prioritising health spending to the most effective and most cost-effective interventions.

One input into this 'good management' is good cost data for projections and cost-effectiveness analyses; the goal of this paper is to determine the pattern of health system expenditure per citizen in 2007 to 2009, by sex, age and (importantly) by proximity to death. Why does this matter? We highlight two reasons.

First, future projections of health spending should allow for life expectancy trends, disability rates and age-related disease trends.[2] This translates into allowing for, or modeling, population growth, population aging, increasing longevity, and changing morbidity patterns. In addition, allowing for increasing expectations (often captured as a function of increasing incomes), health workforce capacity, health sector productivity changes, changes in technology and changes in models of care is needed.[3]

An initial first step to such projections is estimation of costs per citizen by demographics. However, a considerable proportion of the cost of health care occurs at the end of life, and in the future people will very probably be living longer. Thus, it is ideal to have citizen costs separately for those about to die, and those not about to die, to apply in projections. To not do this will over estimate health systems costs if mortality rates continue to fall – or what has been termed the 'red herring' argument about over-inflated projections of future health expenditure increases.[4,5] In the recent Treasury forecasts, the base model did not model these costs separately – a weakness explicitly recognised as a limitation by the Treasury.[1]

Second, in health cost-effectiveness analyses[6, 7] the cost is the sum of: a) the direct intervention cost (e.g., the cost of a new drug, staff time to deliver the intervention; and having subtracted any immediately averted intervention costs in the comparator (e.g. the cost of the old drug the new drug is replacing)); and b) any health system costs incurred or averted in the future due to changing disease incidence, prevalence, severity and case fatality – often called 'cost-offsets'.

These cost-offsets are important. In preventive interventions (e.g. alcohol tax[8]) the savings to the health system by reduced future admissions are often so large (even after discounting) that the intervention is cost saving. But these cost-offsets can also increase net life time costs, in that an intervention that prevents premature death means that these people continue to live longer and incur health system costs for other unrelated diseases, making the intervention less cost-effective.

One important influence on the final cost-effectiveness ratio is when in time the costs occur, as the further into the future they are the more they are discounted and the fewer people will experience them (due to competing mortality risks).[9] A key influence on timing of future costs is the timing of death – which interventions often postpone.

To our knowledge, there have been some attempts to consider the impact of proximity to death on future healthcare costs in New Zealand,[2,10] but they have been by reference to international studies[2] or through 'predictive modelling' of how the proportion of the population within 1 year of death effects health systems costs in projections.[10] The only study to our knowledge using actual citizen-level data to estimate costs close to death was for Counties-Manukau.[11] The direct estimation of health system costs for all New Zealand citizens, and by proximity to death, using individual-level data, is therefore long overdue.

The specific objectives of this paper are: to estimate health system costs by demographics, for people within and not within 6 or 12 months of death; to estimate what proportion of health system costs over a person's life occur in the last year of life; and to determine how much impact using costs stratified by proximity to death has on future national health expenditure projections (in the face of population growth, aging and increasing longevity).

We undertake these objectives using routine health data for the vast majority of New Zealand, linked to costs per health system event, so-called HealthTracker data assembled by the Ministry of Health.

Methods

Linked administrative health care datasets with costs attributed—The New Zealand health system has a unique identifier of high quality since about 1990 (the National Health Index [NHI], identifier). The following datasets were linked using this identifier to create a record for each New Zealander of all publically funded health care *events* (e.g. hospital admission, laboratory test) occurring in January 2007 to December 2011. (However, only the actual 2007-2009 calendar years were used to estimate the costs, a restriction for two reasons: first, one has to discard the most recent year of data for costs as you do not 'know' whether someone is within a year of death; second, it became apparent that for earlier and later years, data was not complete on all health events and costs.)

Each health event was then assigned a *unit cost*: hospitalisations and inpatient procedures (using Ministry of Health cost weights per event[12]; which include inpatient laboratory tests and pharmaceuticals); some private hospitalisations funded by Vote:Health or Vote:ACC (Accident Compensation Corporation; but not including residential care); community laboratory tests; non-admitted patient events (e.g. outpatients and emergency departments); community pharmaceuticals dispensed (including patient contribution); expected general practice costs (i.e. using capitation funding formula) and some actual general practice consultations (when not an enrolled patient in a capitated practice (i.e. the general medical subsidy)). Goods and sales tax was excluded. All costs were inflation-adjusted to 2011 New Zealand dollars, and were assigned to the event 'end date' (which if death, and the person had been (say) in hospital for years would lead to some overestimate of costs proximal to death).

Data not (yet) included in HealthTracker includes: lead maternity carer-provided care, rest-home and hospice care, community mental health care, dental health care outside of hospitals, patient transport (e.g. National Travel Assistance), non-hospital care funded by ACC, and community physiotherapy. For the purposes of our objectives, missing rest-home and hospice care means costs proximal to death will be underestimated.

Data management and person-time allocation—We used tabular analyses on the 2007–09 data, calculating summed and average costs per person-year in each strata of interest: sex by five-year age group by calendar year (2007, 08, 09) and whether within 6 or 12 months of death or not. We censored people at death. Unfortunately, immigration data was not linked in with these files, preventing correct censoring for emigration, but data was censored if an individual was not actively registered with a primary health care organisation and had no other health events. Finally, we calculated person-time weighted average costs over 2007 to 2009.

Estimating future health expenditure—We assembled Statistics New Zealand population count projections to 2041 for the median growth scenario, for males and females by 5 year age-group (http://www.stats.govt.nz/, table builder). The total population is projected to increase by 25% over these 30 years, but by over 150% for ages 75 and older. We then estimated future sex by age-specific mortality rates, by applying a 2% per annum mortality rate reduction to the single year of age mortality rate from the 2010-12 Statistics New Zealand (SNZ) lifetables. (A 2% per annum mortality rate reduction equates to gains of 2.5 years in life expectancy per decade seen in recent decades in New Zealand.)

We also undertook sensitivity analyses using Statistics New Zealand projected mortality counts and rates (data received by Heather McLeod, 24 June 2013). (These SNZ projections equate to 1.3% (85–89 year old males) to 3.4% (55–59 year old males and females) annual percentage changes in mortality rates, for 35+ year olds.) We then applied citizen costs per person-year, both 'naively' using health system costs observed in 2009-11 not stratified by proximity to death, and then using costs separately for people within 6 or 12 months of death.

Results

The total health system expenditure assigned to individual health events included in HealthTracker, in 2011 NZ$, summed to $8.1, $8.8 and $9.2 billion in 2007, 2008 and 2009, respectively.

Pooling these years, the per person-year costs by sex, age and proximity to death are shown in Table 1 and Figure 1.

Costs disregarding proximity to death varied more than 30-fold from $535 for 10–14 year olds (sexes combined) to $17,022 for 95–99 year olds (Table 1).

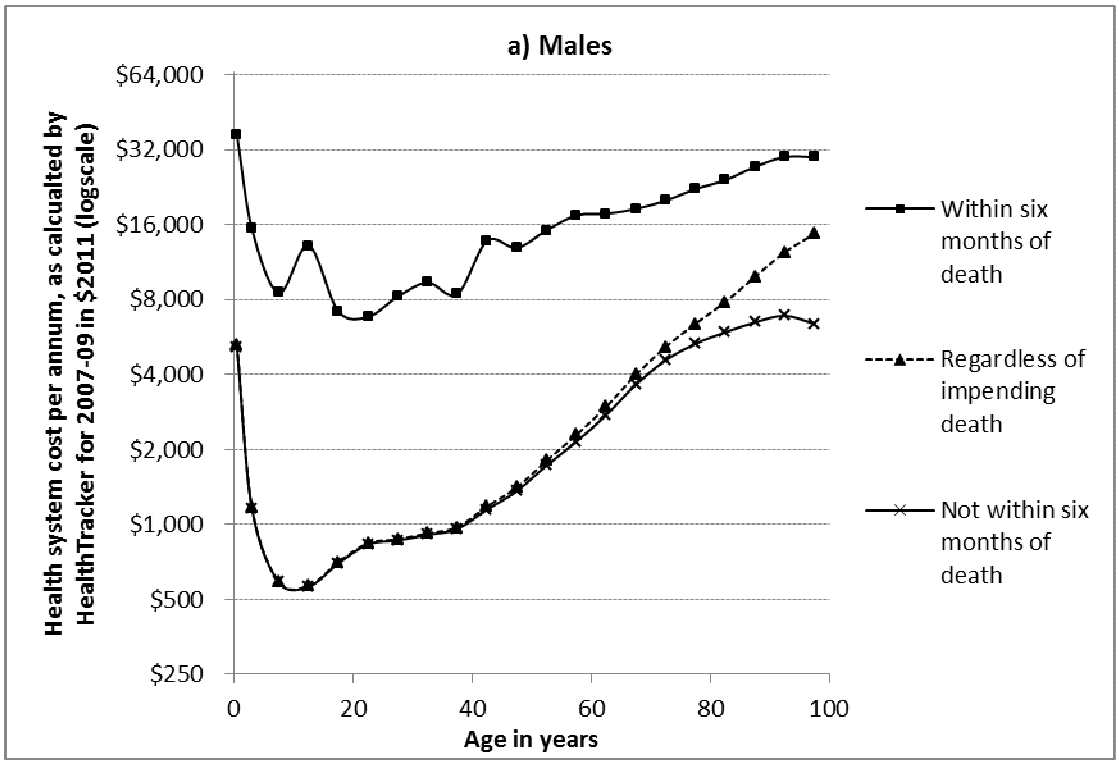
The median values for the 21 age groups regardless of proximity to death were $1806 per year for males and $1742 per year for females. Removing person-time for people within 6 or 12 months of death did not alter these costs much at a young age (due to death being rare), but as much as halved the costs among the very old. For example, the cost per person-year among 90–94 year olds (sexes combined) regardless of proximity to death was $12,947, but reduced to $6759 if not in the last 6 months of life.

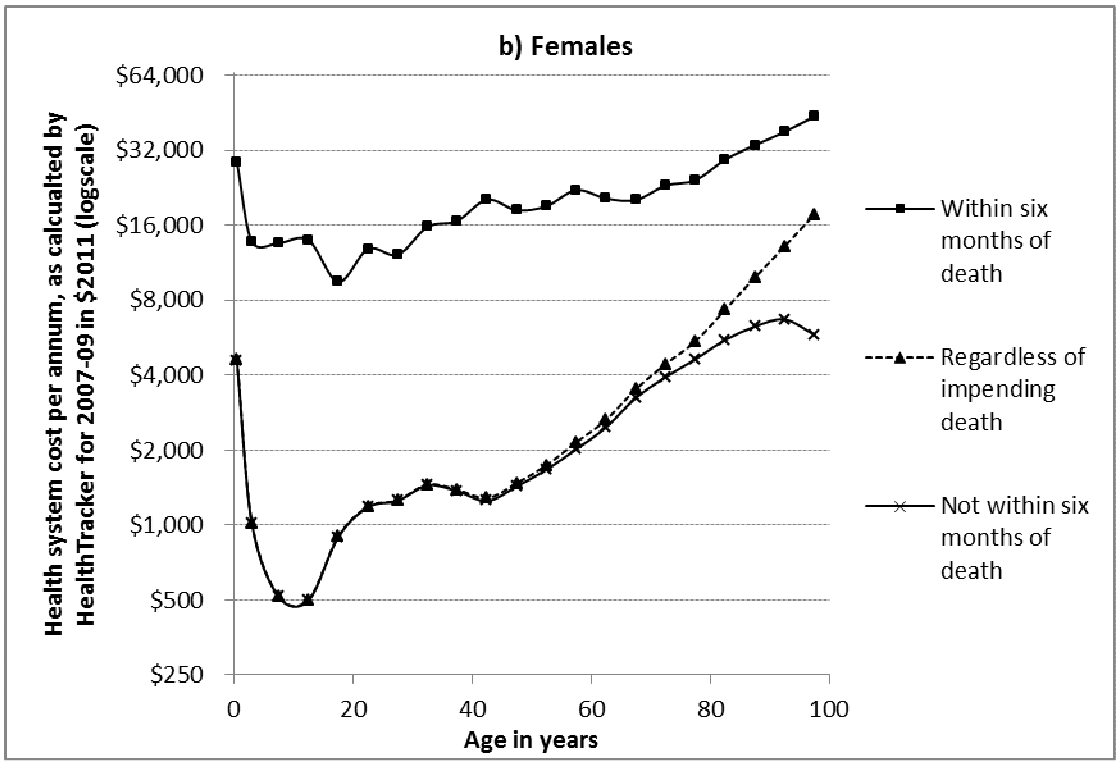
Table 1. Attributed costs on HealthTracker per *person-year* during 2007–09, in 2011 NZ$ inflation-adjusted values

Age in years	Not in the last 6 months of life			In the last 6 months of life (annualised)†			Not in the last year of life			In the last year of life			Regardless of proximity to death		
	Female	Male	Both	Female	Male	Both	Female	Male	Both	Female	Male	Both	Female	Male	Both
<1	$4,553	**$5,149**	$4,860	$28,625	**$36,662**	$33,226	$4,541	**$5,142**	$4,850	$28,450	**$32,931**	$31,036	$4,620	**$5,261**	$4,950
1–4	$1,011	**$1,161**	$1,088	$13,763	**$15,395**	$14,648	$1,010	**$1,159**	$1,086	$11,628	**$13,140**	$12,435	$1,018	**$1,169**	$1,095
5–9	$516	**$587**	$552	**$13,573**	$8,523	$10,745	$514	**$586**	$551	**$14,084**	$7,413	$10,398	$519	**$589**	$554
10–14	$498	**$562**	$531	**$13,962**	$13,191	$13,504	$496	**$561**	$529	**$11,239**	$9,817	$10,421	$501	**$566**	$535
15–19	**$895**	$697	$795	**$9,489**	$7,196	$7,961	**$894**	$695	$793	**$6,951**	$5,445	$5,930	**$900**	$705	$802
20–24	**$1,180**	$832	$1,010	**$12,859**	$6,824	$8,428	**$1,179**	$831	$1,008	**$9,614**	$4,674	$5,997	**$1,186**	$841	$1,017
25–29	**$1,252**	$864	$1,071	**$12,183**	$8,233	$9,587	**$1,250**	$860	$1,068	**$9,217**	$7,055	$7,830	**$1,258**	$873	$1,079
30–34	**$1,444**	$909	$1,197	**$15,769**	$9,376	$11,654	**$1,441**	$902	$1,192	**$12,523**	$8,242	$9,769	**$1,455**	$923	$1,209
35–39	**$1,369**	$961	$1,177	**$16,682**	$8,425	$11,876	**$1,360**	$955	$1,170	**$13,649**	$6,613	$9,611	**$1,388**	$975	$1,194
40–44	**$1,251**	$1,149	$1,202	**$20,290**	$13,772	$16,504	**$1,239**	$1,136	$1,190	**$15,079**	$10,783	$12,607	**$1,285**	$1,182	$1,236
45–49	**$1,431**	$1,363	$1,398	**$18,390**	$12,921	$15,167	**$1,414**	$1,342	$1,379	**$14,025**	$10,704	$12,100	**$1,475**	$1,409	$1,443
50–54	$1,671	**$1,727**	$1,699	**$19,105**	$15,202	$16,828	$1,642	**$1,698**	$1,669	**$14,841**	$11,576	$12,947	$1,742	**$1,806**	$1,773
55–59	$2,018	**$2,152**	$2,084	**$22,166**	$17,441	$19,471	$1,968	**$2,099**	$2,032	**$16,971**	$13,528	$15,001	$2,150	**$2,289**	$2,219
60–64	$2,471	**$2,749**	$2,608	**$20,509**	$17,702	$18,841	$2,418	**$2,675**	$2,545	**$14,816**	$13,357	$13,953	$2,648	**$2,969**	$2,807
65–69	$3,240	**$3,645**	$3,438	**$20,219**	$18,531	$19,230	$3,158	**$3,556**	$3,352	**$14,848**	$13,503	$14,064	$3,513	**$3,994**	$3,750
70–74	$3,930	**$4,564**	$4,234	**$23,113**	$19,986	$21,289	$3,821	**$4,436**	$4,114	**$16,155**	$14,466	$15,176	$4,432	**$5,168**	$4,788
75–79	$4,637	**$5,321**	$4,955	**$24,308**	$22,255	$23,131	$4,564	**$5,225**	$4,867	**$15,829**	$15,079	$15,402	$5,471	**$6,409**	$5,912
80–84	$5,543	**$5,918**	$5,702	**$29,351**	$24,178	$26,692	$5,537	**$5,869**	$5,675	**$18,054**	$15,861	$16,936	$7,332	**$7,826**	$7,545
85–89	$6,273	**$6,487**	$6,348	**$33,589**	$27,333	$31,030	$6,422	**$6,504**	$6,450	**$20,384**	$17,760	$19,322	$9,873	**$9,879**	$9,875
90–94	$6,704	**$6,900**	$6,759	**$37,991**	$29,926	$35,412	$7,230	**$7,225**	$7,229	**$23,117**	$19,466	$21,967	**$13,168**	$12,404	$12,947
95–99	$5,817	**$6,401**	$5,944	**$43,859**	$29,901	$40,361	$6,890	**$7,747**	$7,073	**$27,498**	$20,047	$25,697	**$17,711**	$14,697	$17,022

Note: Bolded values show the higher costs when comparing females relative to males and vice versa †It takes at least 2 people to generate 1 person year in the last 6 months of life. To convert these costs per person year to costs per person in their last 6 months of life, just divide by 2. For example, an average 70–74 year old is estimated to incur $21,289/2 = $10,645 in the last 6 months of their life.

Figure 1. Health system costs per person-year for New Zealand citizens during 2007–09, disregarding proximity to death, and separately for within and not within 6 months of death





Considering the costs among people within 6 months of death, these costs varied only five-fold between age groups. That is, there was less percentage or relative variation by age in costs during the last 6 months of life, as reflected in the flatter lines (log scale y axis) in Figure 1 for costs within 6 months of life compared to the two other cost lines. This similar 'flatter' pattern was true also for costs in the last 12 months of life (Table 1).

Differences in costs over the life course between males and females showed a mixed picture (Table 1). Costs were higher for males up to age 15 years and then costs were higher for females up to age 50 years (no doubt partly due to obstetric-related costs). There were quite large sex differences in costs in the last 6 months of life (nearly always higher in females). This probably reflects higher incidence rates of sudden death in males without preceding chronic illnesses (e.g., death from motor vehicle crashes, occupational injuries and suicide).

To indicate the distribution of costs at different points in the life course, Figure 2 presents the cumulative health system costs (in 2011 NZ$) for deaths at different ages. This analysis is somewhat artificial as it assumes a steady state (as per 2011) for costs throughout the life course with no discounting. However, it shows that the proportion of health expenditure in the last year of life declines as the age of death increases, e.g., 48% for death at age 10 years, 20% for death at age 50 years, and 11% for death at age 80 years. The accumulated health costs for a person dying at age 70 years were estimated at $113,000, whereas for a person dying at age 90 it almost doubled at $223,000.

Table 2 shows the estimated future health system costs with and without accounting for proximity to death (both 6 and 12 month scenarios), and for both a 'simple' assumed ongoing 2% per annum reduction in mortality rates into the future for all sex by age groups and the more sophisticated Statistics New Zealand estimates of mortality counts and rates.

Table 2. Estimated future health system costs (in 2011 NZ$) for the total New Zealand population with and without accounting for proximity to death, for varying scenarios of future mortality rates and 6 versus 12 month proximity to death

	2011	2021	2031	2041
a. Assuming 2% per annum reduction in mortality rates uniformly for all sex by age groups				
i. By 6 month proximity to death				
Accounting for proximity to death	$7,865	$9,227	$10,758	$12,066
Not accounting for proximity to death	$7,865	$9,302	$10,951	$12,441
% overestimate due to not accounting	0.0%	0.8%	1.8%	3.1%
ii. By 12 month proximity to death				
Accounting for proximity to death	$7,837	$9,185	$10,712	$12,040
Not accounting for proximity to death	$7,837	$9,272	$10,932	$12,458
% overestimate due to not accounting	0.0%	0.9%	2.1%	3.5%
b. Assuming SNZ projected future mortality rates uniformly by sex by age groups				
i. By 6 month proximity to death				
Accounting for proximity to death	$7,867	$9,239	$10,787	$12,140
Not accounting for proximity to death	$7,867	$9,300	$10,944	$12,418
% overestimate due to not accounting	0.0%	0.7%	1.5%	2.3%
ii. By 12 month proximity to death				
Accounting for proximity to death	$7,838	$9,194	$10,738	$12,112
Not accounting for proximity to death	$7,838	$9,269	$10,923	$12,431
% overestimate due to not accounting	0.0%	0.8%	1.7%	2.6%

Figure 2. Estimated cumulative health system costs (in 2011 NZ$) for deaths at different ages (assuming a steady state for costs throughout the life course for the year 2011 values with no discounting). Labels above each bar show the percent in last year of life

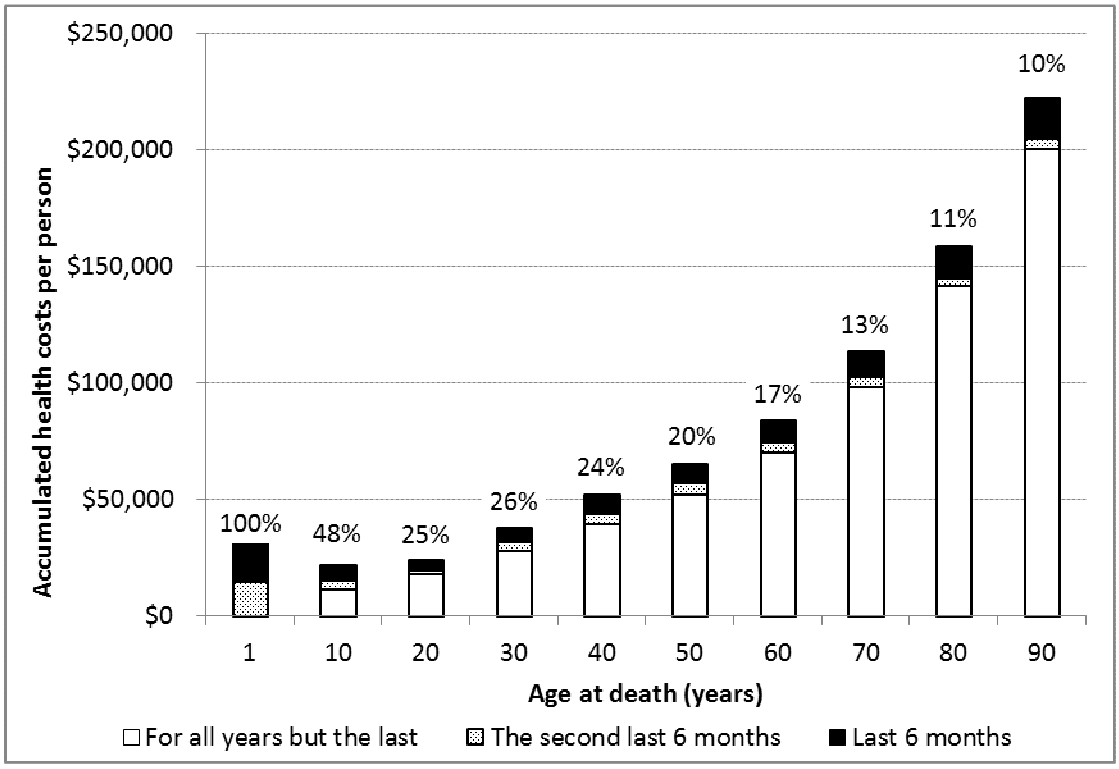
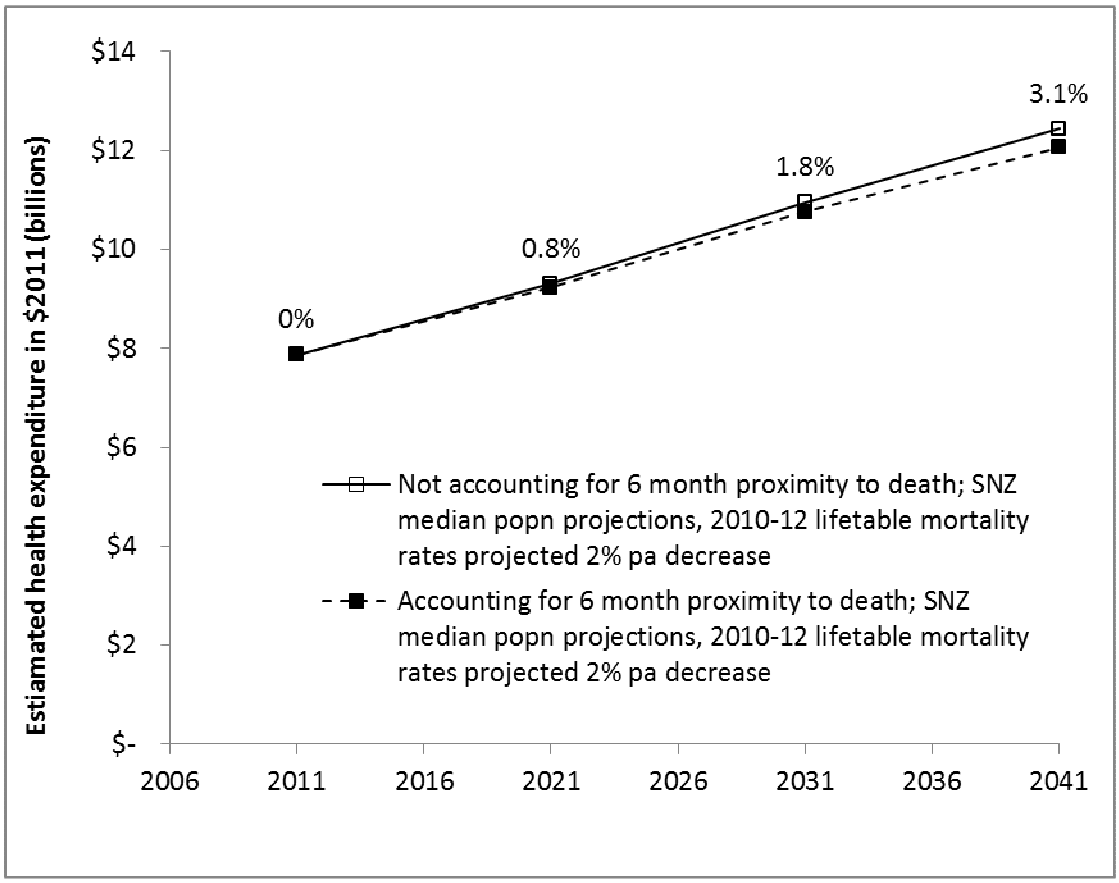


Figure 3 shows these results for 6 month proximity to death and the 'simple' 2% per annum reduction scenario. It is important to note that these estimated future health system costs are only based on: expenditure as captured by events recorded on HealthTracker (the total health spending is more than this individually-linked data – see Discussion); demographic projections (e.g. productivity and expectation trends are not included). Thus, interpretation should be more on the relative patterns, not the absolute dollar amounts. Regardless of the scenario, not accounting for proximity to death overestimates future health system costs. The range of overestimates across scenarios was 2.3% to 3.5%, by 2041.

Figure 3. Estimated future health system costs (in 2011 NZ$) for the total New Zealand population. Labels are percentage overestimates when not accounting for proximity to death.



Note: Using 2007–09 citizen costs from HealthTracker (Table 1), inflation-adjusted to 2011 NZ$. Mortality rates in 2011 sourced from Statistics New Zealand (SNZ) 2010-12 official life-tables, with age-specific mortality rates reduced by 2% per annum by year into the future.

Discussion

The quality and utility of New Zealand health administrative data-sets are constantly improving, in large part due to the long-established NHI unique identifier. Using a range of administrative datasets linked with this NHI, $9.2 billion dollars (2011 inflation adjusted NZ$) of almost exclusively Government health expenditure was attributed to individual patient events in 2009. This is about two-thirds of the combined Vote Health ($12.98 billion, nominal) and Vote ACC ($1.27 billion, nominal) appropriations in 2009-10.

Some Government spending on health could not be attributed to individuals within HealthTracker (e.g. immunisation and cervical screening, and more importantly for this study, rest-home and palliative care), but due to capital and 'back office' expenditure not all of Government funding can be attributed to individual patient events (e.g. over 10% of public funding goes to prevention and public health services, and health administration[1]). Nevertheless, this HealthTracker dataset is an extremely

rich dataset for analyses, and is likely to continue to improve in the future. As examples, it is already contributing data for work by the National Health Committee on a high-level scan of health spending in order to select domains of health service use for further work on prioritisation,[13] and for Treasury projections of future health expenditure.[1]

We found that citizen costs per person-year, not surprisingly, varied enormously by age. They also varied by proximity to death. Accordingly, and focusing only on demographic drivers to future health expenditure, we estimated that not allowing separately for costs within the last 6 months of life would result in a two to four percent overestimation of health expenditure. We suspect the true overestimation from not accounting for proximity to death in New Zealand might be greater still, as palliative and rest home care is a major component of 'missing data' in HealthTracker.

The recent Treasury projections – whilst more sophisticated in that they also projected changing demand and productivity – did not account for proximity to death. Based on the findings of this paper, it seems Treasury estimates are therefore slight overestimates considering the 'proximity to death' factor alone, but the bias is probably not large. The Treasury estimates also included relatively simple sensitivity analyses about future compression and expansion of morbidity, which will perhaps partly pick up the proximity to death issue as well. However, we recommend that future New Zealand expenditure projections directly avoid the 'red herring' argument[4,5] by using cost data by proximity to death, as both the data are available and little complexity is added to projections.

Our modelling, however, does not fully address any future compression or expansion of morbidity that is not captured directly by proximity to death. For example, the diabetes epidemic may increase morbidity (and demand for health services) if we are less successful at reducing incidence than we are at keeping people alive with diabetes, thereby seeing an expansion in morbidity (diabetes disease severity held constant, and likewise other causes of morbidity held constant). Conversely, if New Zealand society successfully controls obesity, this may reduce morbidity prevalence (through diabetes, but also cardiovascular disease, musculoskeletal and other impacts).

Determining past trends in compression or expansion in morbidity is challenging,[14-16] let alone estimating future trends. That said, we suggest that one method to include this in future expenditure projections is to use disability-adjusted life expectancy (DALE; as estimated in the recent New Zealand Burden of Disease study[17]), assume the same ratio of DALE to life expectancy (DALE:LE) in the future, and then back estimate by what percentage the prevalent years of life lived with disability (pYLDs) would need to change in the future to keep the DALE:LE ratio constant (or whatever other ratio is considered plausible). The percentage change in pYLDs across all sex by age groups necessary to generate the desired DALE:LE ratio in the future can then be used as a proxy for morbidity change, and therefore rescaling of the costs not within the last 6 or 12 months of life shown in Table 1.

Our analysis of the cumulative costs at different points in the life course suggests that the proportion of health expenditure in the last year of life is not unexpectedly high e.g., at 11% for a person dying at age 80 years. Again, we must note that

HealthTracker does not include rest-home and palliative care data, so this 11% is probably an underestimate. (Future analyses should both include more data for these sources, and/or make sensible scaling adjustments based on missing data.) However, our findings are not consistent with blanket statements that 25% of all health care costs are incurred in the last year of life (e.g. Cornwall and Davey[2], citing Wanless[18]): rather, it varies by age and is probably not as great as 25% at the older ages that people usually die at.

The accumulated life time health costs for a person dying at age 90 years were almost double those of a person dying at 70 years ($223,000 versus $113,000). This difference raises distributional issues and is something that policy makers and citizens could ponder. That is, would some of this resource be better spent on preventing disease in younger people, e.g., by expenditure on protecting child health and investing more in education and housing quality etc? To start answering this question thoughtfully would require studies of how New Zealand citizens value years of healthy life over the life course and also the cost-effectiveness of different health sector interventions that achieve health gain at different points in the life course.

There are limitations to the data and analyses in this paper. First, HealthTracker data is not yet complete with respect to linkage to all publicly funded events – we expect the quality to improve further over time. We have already mentioned rest-home and palliative care on several occasions above. Second, Health Tracker includes very little of privately funded health expenditure. But given that 83% of all health system expenditure is estimated to be publicly funded in New Zealand,[1] this limitation is not too severe. Third, primary care costs are very simply assigned to citizens using the capitation formula and so our analyses will underestimate costs near death if primary care utilisation increases near death. But given that primary care expenditure is not a large component of end of life care in New Zealand,[11] this probably would not cause much of an underestimation in the estimation of the costs in the last 6 months of life.

Finally, this study did not estimate costs by ethnicity since it seems likely that any such cost differences will be due to conflated differences in need, access and utilisation of health services, and as such requires separate and careful analysis and interpretation.

Summarising, there is marked variation in health system costs by age and proximity to death, and some by sex. Good planning has allowed New Zealand to establish a rich dataset on health system costs, and this dataset should continue to improve in quality over time.

The onus on researchers, analysts and planners is to make good use of it. Two good uses of the data we emphasise are using cost estimates by proximity to death in: estimations of future health system costs; and cost-effectiveness evaluations to allow 'correct' attribution of costs by proximity to death.[9]

Competing interests: Nil.

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Retrospective epidemiology of acute rheumatic fever: a 10-year review in the Waikato District Health Board area of New Zealand

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Abstract

Background Acute rheumatic fever (ARF) is a preventable disease which remains a prominent burden of health in New Zealand, with an annual incidence comparable to that of developing countries.

Aim The aim of this study was to describe the epidemiology of ARF and recurrent ARF cases in the Waikato District Health Board (DHB) area of New Zealand from 1 January 2002 to 31 December 2011.

Methods A total of 106 cases of ARF and four cases of recurrent ARF were identified through the Public Health Database – EpiSurv and the Hospital coding system, ICD-10.

Results The overall Waikato DHB annual incidence of ARF was 3.1 per 100,000 population with Māori children aged 5–14 years experiencing higher rates of 46.1 per 100,000 population. Eighty-five percent of the cases were of Māori ethnicity, and 10% Pacific. Almost three-quarters of all cases lived in areas of the three most deprived deciles as described by the New Zealand Deprivation Index 2006.

Discussion The rates of ARF seen in the Waikato DHB are comparable to that seen previously locally and nationally. High risk groups have been identified as children aged 5–14 years, Māori and Pacific ethnicity, and those living in lower socioeconomic areas which could be targeted by the Rheumatic Fever Prevention Programme (RFPP) with the intention to reduce the incidence of ARF nationally to 0.4 cases per 100,000 population by 2017.

Acute rheumatic fever (ARF) is an autoimmune response to a sore throat caused by the bacteria, Group A Streptococcus (GAS). This can subsequently lead to chronic damage to the heart – rheumatic heart disease (RHD).[1]

ARF rates have reduced worldwide, with the highest rates experienced in developing countries within the school-aged population.[2,3]

New Zealand has yet to see the removal of ARF as a public health burden, and consistently experiences higher rates in Māori and Pacific children compared to European.[4–6] The disproportionally high rates of AFR in Māori and Pacific children have been attributed to poor socioeconomic conditions, in particular overcrowding and inadequate access to health care.[5–7]

ARF and RHD remain a significant cause of morbidity, mortality and cost to patients, families and the New Zealand Health Service.[8,9] A 2012 study showed that the

average annual diagnosis related group based cost of hospital admissions for ARF and RHD in New Zealand was $12.0 million,[8] yet a ten day course of oral penicillin can treat the preceding streptococcal throat infection that leads to ARF.[1,10]

To prevent a recurrence of ARF, secondary prophylaxis is instigated. In New Zealand this involves an intramuscular injection of antibiotic every 28 days, for a minimum of 10 years, depending on the extent of carditis.[1,11]

The Waikato District Health Board area (DHB) has a population of just under 340,000; approximately 8% of the population of New Zealand. Locally, over 30 years ago, the Hamilton Health District established a register for ARF and RHD[12] with community nurses delivering penicillin, but it was not until 1986 that ARF became a notifiable disease.

In the early 1990s the Hamilton register was discontinued as a result of health systems reorganisation. Subsequently, administration of prophylaxis became disorganised as patients moved location or missed injections.

A Waikato DHB study through 1998–2004 found an annual ARF incidence of 12.9 per 100,000 in the 5–14 year age group, with over 80% of cases of Māori ethnicity.[13] In view of this, in 2008 the Waikato DHB Rheumatic Fever Prevention and Management group was established to reduce the incidence and burden of the disease.[13] This included community and health professional awareness raising, in particular regarding sore throats, and an audit of cases to improve their management both in the community and in hospital. A register was set up within Population Health for the Waikato DHB, however a national register has never been implemented.

In other countries such as the United States and Cuba, disease registers have been shown to facilitate follow up and effective antibiotic delivery.[4] An Auckland study showed that the introduction of a rheumatic fever register led to a reduction in ARF rates to 0.14 per 100 patient years from 1.5 per 100 patient years (1972–1981).[7,14,15]

In 2013 in response to the persisting high rates of ARF the New Zealand Ministry of Health released an intention to reduce the incidence of ARF hospitalisations to 0.4 cases per 100,000 population nationally by 2017. This goal is hoped to be achieved via a $24 million rheumatic fever prevention programme targeting certain high burden areas, of which Waikato is included.[16]

This study was conducted as part of a national research project collecting retrospective data throughout New Zealand over a ten year period with the aim to gather concise, up-to-date epidemiological data.

Method

An audit of clinical notes was conducted in all Waikato DHB resident patients who were identified as having a primary or secondary diagnosis of acute and recurrent ARF in the Waikato DHB from 1 January 2002 to 31 December 2011.

To identify cases of ARF and recurrent ARF, two databases were searched and cross referenced; the hospital admission database[17] using the ICD-10 coding system and the EpiSurv database, which is a national database of notifiable diseases held by Population Health.

The ICD-10 coding for ARF was used to identify potential cases, (ICD codes – I00, I00.0, I01.0, I01.1, I01.2, I01.8, I01.9, I02, I02.0, I02.9) and files coded as Rheumatic Heart Disease in patients aged 0–35 years were also collected and reviewed in case any of these had been coded incorrectly.[17] (ICD-10: I05,

I05.0, I05.1, I05.2, I05.8, I05.9, I06, I06.0, I06.1, I06.2, I06.8, I06.9, I07, I07.0, I07.1, I07.2, I07.8, I07.9, I08, I08.0, I08.1, I08.2, I08.3, I08.8, I08.9, I09, I09.0, I09.1, I09.2, I09.8, I09.9)

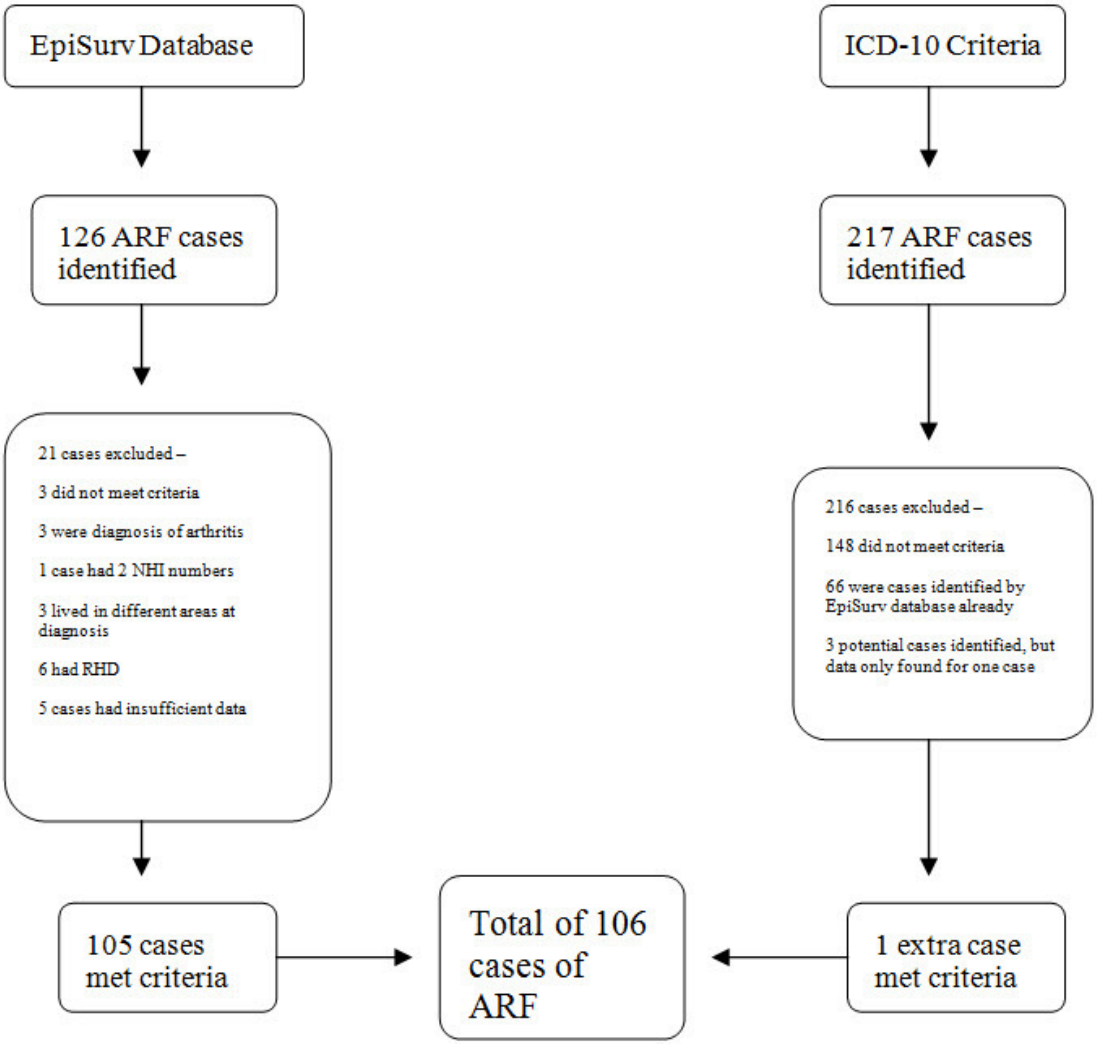
Information from identified cases was extracted from either written hospital notes, the Clinical Results Viewer (an electronic document and results viewer) or the EpiSurv database and inputted into a set template. The 1992 Jones criteria,[18] with the New Zealand modifications (such as the use of echocardiography as evidence of carditis in absence of murmur as major criteria[11,19]) was used to confirm the diagnosis of ARF and recurrent ARF. The Heart Foundation Guidelines were then used to categorise these cases into definite, probable and possible cases.[11]

The address at diagnosis was recorded and subsequently, The New Zealand Index of Deprivation (2006)[12] was used as an area measure of deprivation at this address. The data used for population statistical comparison was obtained from the 2006 Statistics New Zealand Census of population and dwellings.[20]

Results

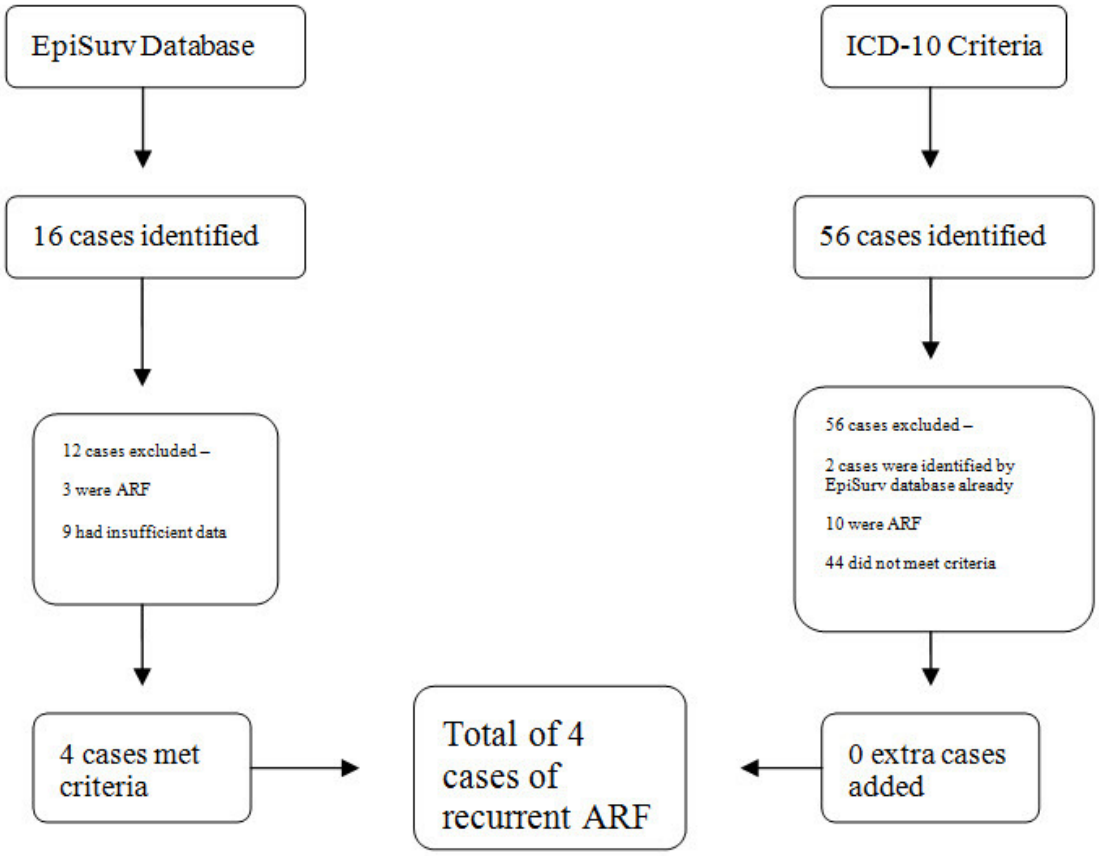
From 1 January 2002 to 31 December 2011 a total of 106 ARF cases and four recurrent episodes were identified as meeting the case definitions.

Figure 1. Diagram of case inclusion for ARF



The EpiSurv database identified 126 ARF cases, with three cases initially coded as recurrent ARF (Figure 1). These three cases after note review were found to be the first episodes of rheumatic fever, so were included as such. Of 126 cases, 21 were excluded; 3 did not meet diagnostic criteria, 3 were a proven diagnosis of arthritis, 1 case had two NHI numbers, 3 patients lived in a different area, 6 had RHD and for 5 cases there was insufficient data to confirm diagnosis. This gave a total of 105 cases of ARF.

Figure 2. Diagram of case inclusion for recurrent ARF



217 potential ARF cases were identified using the hospital discharge coding system. Sixty-six of these were duplicates of cases found from the EpiSurv data and 148 were not cases of ARF, usually being picked up on the ICD codes with either other non-RF heart or bone disease.

Only 3 cases had not been identified on the EpiSurv database. Of these previously unidentified cases, data could not be obtained for 2, so only 1 case was added to those found using EpiSurv, giving a total of 106 cases of ARF.

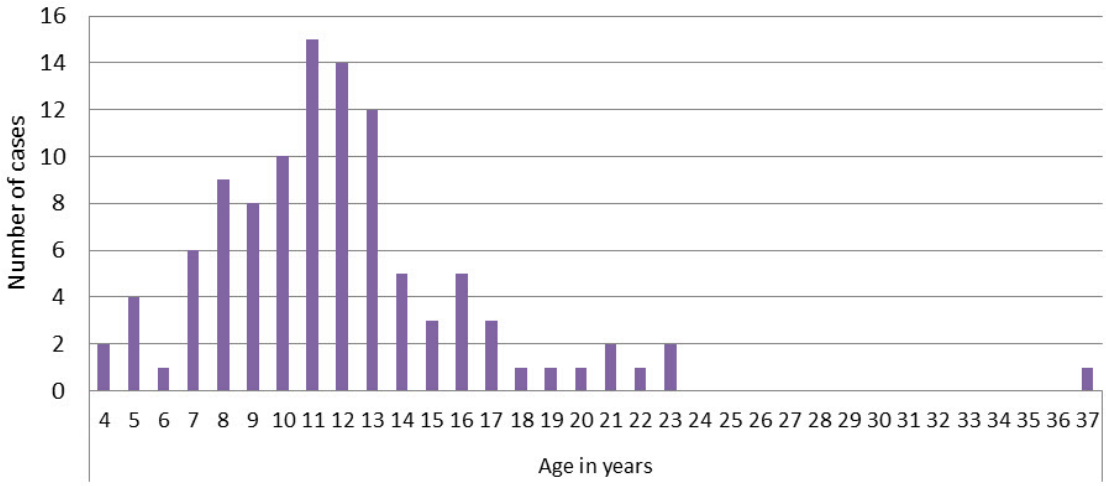
For recurrent ARF, 16 cases were identified by the EpiSurv Database (Figure 2). Of these, three were actually ARF cases and nine cases did not meet the stipulated

criteria because the diagnosis had been made retrospectively, there was insufficient data, or there was inadequate information or investigations conducted or recorded. Thus a total of four cases were identified.

The hospital database using the ICD-10 criteria identified 56 potential recurrent cases. Two of the cases of recurrent ARF were already identified by the EpiSurv database and ten cases were actually cases of ARF when the notes were reviewed. The remaining 44 cases had been coded inaccurately and were not episodes of recurrent ARF, the most common example was they had been referred to Waikato Hospital for heart valve surgery for RHD and coded for this. No new cases were added, giving a total of four recurrent ARF cases.

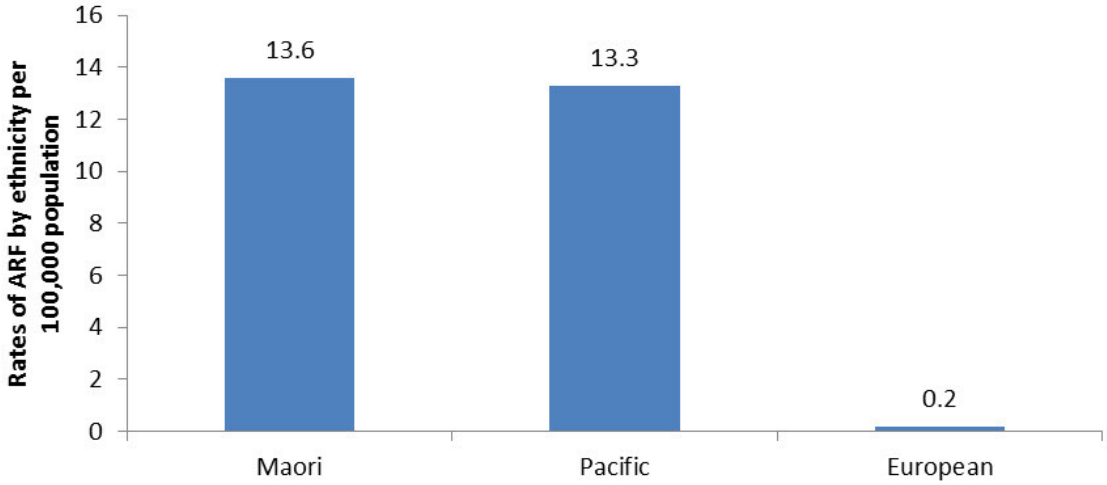
Of the 106 cases of ARF identified, 36% (38) were female. The age range was 4–37 years with the mean age being 11.8 years and median age of 11 years (Figure 3). Approximately 80% of cases were aged 5–14 years, with almost 92% aged 5–19 years.

Figure 3. Age distribution of ARF cases in the Waikato DHB, 2002–2011



Approximately 85% (90) of cases were of Māori ethnicity, 10% (10) Pacific and 4% (1) European (Figure 4). Eighty percent (73) of Māori cases and 90% (9) of the Pacific cases were aged between 5–14 years. There was 1 case for which the ethnicity was unknown. For the purpose of statistical analysis this case was designated as Māori ethnicity based on the high probability and name of the child.

Figure 4. Incidence rates of ARF by ethnicity, Waikato DHB, 2002–2011



The annual incidence of ARF for Māori children aged 5–14 years was 46.1 per 100,000 population, approximately fifteen times that of the general population (Table 1). Confidence intervals were calculated for incidence rates using a Poisson 95% confidence limit.

Table 1. Incidence rates of ARF for all ages and by ethnicity in 5-14 year olds in Waikato DHB 2002-2011.

Variables	Number of patients	Population	Incidence cases/100,000 population/year	Poisson 95% confidence limit
All population	106	339,133	3.1	2.56–3.78
All 5–14 yrs	84	52,920	15.9	12.66–19.66
Māori 5–14yrs	74	16,049	46.1	36.21–57.89
Pacific 5–14yrs	9	1677	53.7	24.54–101.88
European 5–14yrs	1	25,496	0.39	0.001–2.19

The yearly incidence of ARF in Waikato DHB varies by year, with 19% (20) occurring in 2008, and only 4% (4) in 2003 (Figure 5).

104 cases of ARF were geocoded and analysed by the New Zealand index of deprivation, 2006.[20] Almost 88% (91) of cases lived in an area with a decile score of 5–10, and three-quarters (76) in the most deprived areas (7–10) (Figure 6).

Figure 5. The annual number of cases of ARF, Waikato DHB 2002–2011

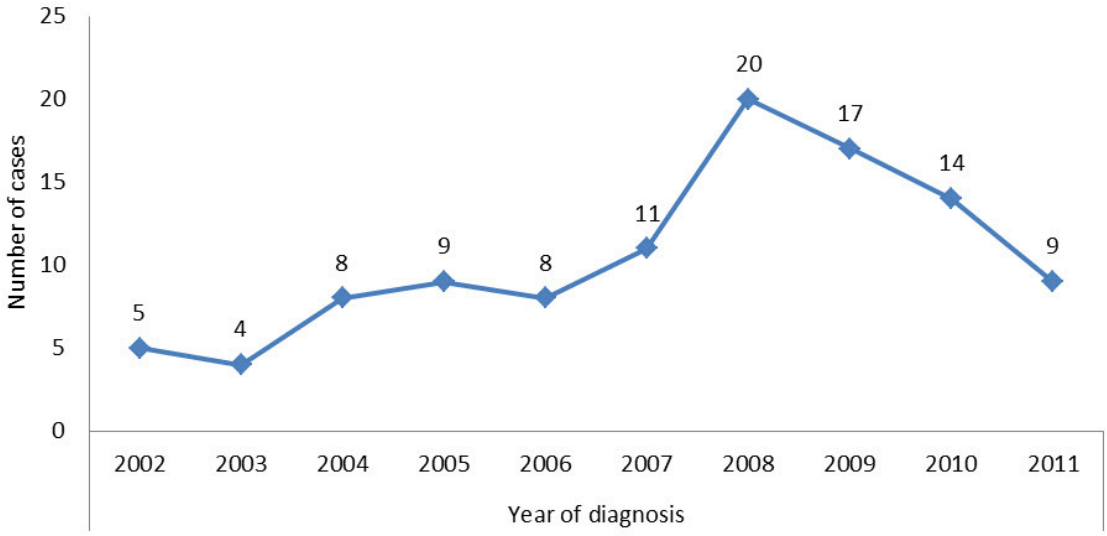
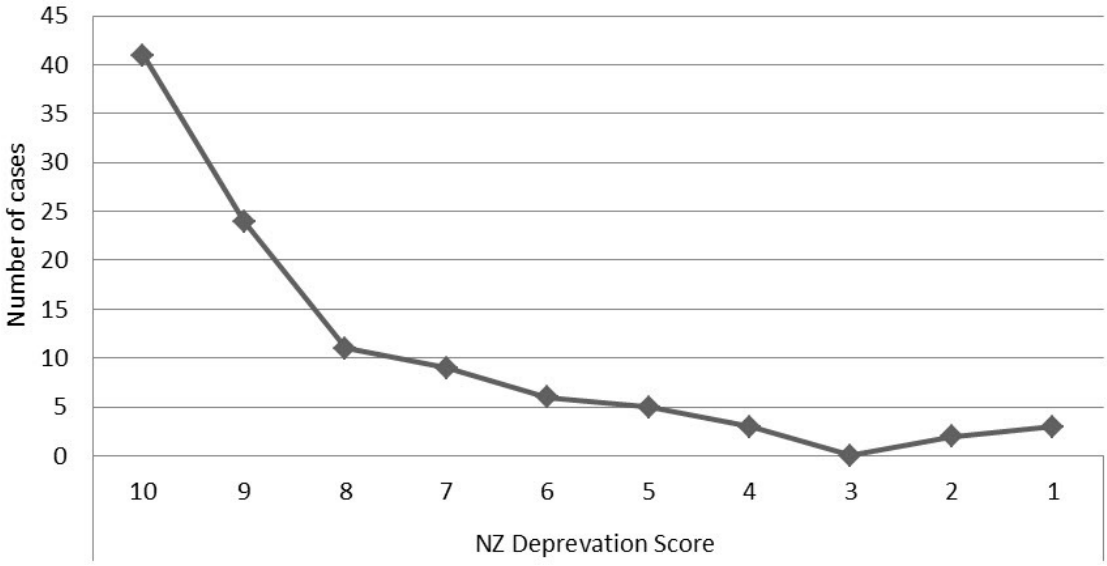


Figure 6. The number of cases of ARF by NZ Deprivation Score 2006, Waikato DHB 2002–2011.



Using the Heart Foundation Guidelines[11] to assess ARF cases, 83% (88) were defined as a definite case, 9% (10) a probable case and 8% (8) a possible case.

The most common major criteria identified in cases was evidence of carditis (76%), including evidence of subclinical carditis, and most common minor feature used was ESR (87%) (Table 2).

Table 2. Number and percentage of cases by major and minor criteria for ARF

Major criteria and minor criteria	Number of cases	Percentage of cases	No data available
Carditis	81	76%	5
Arthritis	50	47%	7
Chorea	12	11%	4
Erythema marginatum	5	5%	7
Fever (>38ºC)	48	45%	17
Prolonged P-R interval	42	40%	16
Arthralgia	63	59%	7
Erythrocyte sedimentation rate (ESR)	92	87%	1
C-reactive protein (CPR)	79	75%	6

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Of the cases of ARF without chorea who had a documented history of a preceding sore throat (48), 29% (14) had a positive throat swab for *Streptococcus* bacteria. Forty-six percent (22) were negative and 25% (12) had no data to indicate whether a throat swab had been taken or not, however all cases fulfilled the criteria for evidence of streptococcal infection with raised blood titre levels.[11]

Of the four cases of recurrent ARF identified two were of Māori and two were of European ethnicity. The age range was 22–35 years with a mean age of 26 and median age of 23. The rate of recurrence was 0.12 per 100,000 population.

Using NZDep[20] three cases lived in an area of high deprivation. In one case the recurrence happened two years after prophylaxis had stopped which was in keeping with national guidance and without a history of a preceding throat infection. For the other three cases, there was only data to show that one of the cases was compliant with prophylaxis at the time of recurrence.

Discussion

This study has shown that ARF still persists in the Waikato DHB area with the overall mean annual incidence for 2002–2011 at 3.1 per 100,000, which is in keeping with national rates of 3.4 per 100,000 population.[5] This is in comparison to other developed countries where the rates of ARF have reduced, with annual rates reported as below 1 per 100,000 population.[1]

The incidence of ARF is much more prominent in the 5–14 year age group showing an incidence 15.8 per 100,000 population, which is as observed internationally and the results for this particular area in New Zealand are comparable to previous local and national data.[5,12,13,21]

For Māori and Pacific children aged 5–14 years the rate of AFR was 46.1 and 53.7 respectively per 100,000 population, much greater than that of European children (0.39).

Previous studies of rheumatic fever have shown similar disproportionate results.[5,12,13,15] A review of the Auckland Rheumatic Fever Register 1993–1999 for 5–14 year olds described rates of 42.8 per 100,000 population for Māori, 84.9 per 100,000 population for Pacific, and 1.4 per 100,000 for European children.[15] The numbers of Pacific children resident in the Waikato area are low, and only 1 European

child had ARF. This data stresses the importance of targeting the Māori population with public health initiatives.

Previous studies have also linked ARF with low socioeconomic status, and this study again corroborates this as almost three quarters of all Waikato DHB ARF cases lived in areas with the three most deprived decile scores. This link has been attributed to overcrowding, poor housing conditions and poor access to health care.[1,7]

A New Zealand study in 1996 observed that three quarters of people living in crowded houses were of Māori or Pacific origin, again highlighting this at-risk group.[7] So far there is no clear evidence to suggest a genetic link to ARF; however family clusters of ARF have been seen which may indicate a certain predisposition to developing ARF. It is still not understood why in certain people a group A Streptococcal throat infection can lead to ARF, and not in others.[1,2,22]

Carditis was found to be a major criteria in 76% (81) cases, chorea in 11% (12) of cases and a raised ESR was used as a minor criteria in 87% (92) of cases. This is in keeping with the epidemiology seen in Northland for the same time period.[23] In addition the Northland study also found a median age of 11.4 years, and gender split of 60% male and 40% female which mirrors our results.[23]

Limitations—The Heart Foundation Guidelines[11] recommends that everyone with ARF be admitted to hospital; therefore using hospital notes to collect data should be adequate to collect epidemiological data of this disease. There may be cases that were diagnosed in primary care, and some cases that may not have presented at all in the acute instance, or misdiagnosed by medical professionals but later present with rheumatic heart disease. It was hoped that by using the ICD-10 codes and EpiSurv data, that the cases that did not present to hospital could be located.

Of all the potential cases, notes were not available for five cases, and in six cases information could only be found on the hospital electronic system. The ICD-10 criteria used were very broad in the hope to pick up cases that otherwise may have been missed. It is not surprising that many cases were not in fact recurrent or ARF and therefore not included in this data.

During note review, several issues were identified. Firstly, some clinicians were not aware of the NZ interpretation of the Jones criteria and publications of NZ specific criteria[11] that allows for subclinical carditis and monoarthritis, with some patients not undergoing echocardiograms and therefore not able to fulfil criteria for definite rheumatic fever. Secondly, there was variation by the clinician in regards to the diagnosis of arthritis and/or arthralgia, and blood serology being requested when throat swabs were negative for GAS. Medical practitioners should be knowledgeable or at least know how to access the guidelines on the diagnostic criteria for ARF to ensure accurate and prompt diagnosis, and prevent further cardiac damage from occurring.

Implications—Of all the cases included in this study, only half (48%) had a documented preceding sore throat, and in a fifth (18%) there was no data regarding sore throats. The Heart Foundation has developed a pathway to treat sore throats in New Zealand,[11] however for this to be effective, the general population must know the importance and implications of a sore throat so to seek medical attention, and

medical practitioners must be aware of this literature to actively seek the history and adequately treat the sore throat.

There is evidence to show treatment GAS pharyngitis with 10 days of penicillin reduces the rate of ARF.[10,11,24] A recent randomized controlled trial assessed the primary prevention of ARF with early treatment of sore throats in school based children in South Auckland.[25]

The introduction of a free nurse-led service providing oral penicillin for the treatment of *Streptococcus* A pharyngitis produced a 21–28% reduction in ARF rates over a 3-year period. This study was included in a meta-analysis of the primary prevention of ARF with treatment of a *Strep.* throat, which showed a relative risk of 0.41 (95%CI: 0.23–0.70) and a true treatment effect of approximately 60%.[26] Hence as part of the Rheumatic Fever Prevention Programme (RFPP) there is a school-based throat swab initiative within the high-risk communities.[16]

A sore throat can be seen as an insignificant ailment to the general population, and so the RFPP also identifies the need to raise community and health sector awareness.[16] Current action is being taken to encourage families of children with sore throats to seek early treatment and to train health care professionals in sore throat management in high risk areas.

The rate of recurrence of ARF in this study was 0.12 per 100,000 population which is similar to rates seen in Auckland since 1981 with a functioning Rheumatic Fever Register.[15] The numbers of ARF identified by the ICD-10 criteria and the Public Health EpiSurv, were almost exact, with just one further case added by using the ICD-10 criteria.

Establishment of a national Rheumatic Fever Register has been shown nationally and internationally to reduce recurrent rates, and would also serve to provide excellent epidemiological data on the disease.[27]

Conclusion—The annual incidence of ARF for the overall Waikato DHB population was 3.1 per 100,000 population which highlights a clear health need to be addressed by the RFPP. High risk groups have been identified as children aged 5–14 years, Māori and Pacific ethnicity, and living in lower socioeconomic status.

To reach the ARF incidence targets proposed by the RFPP of 0.4 cases per 100,000 population by 2017, there would need to be a significant reduction of incidence of over 80% in the Waikato area.[16] This is proposed to be achieved via multiple interventions such as addressing housing issues, sore throat clinics and promotion of community and clinician awareness, however there will need to be a substantial impact by the RFPP to meet this aim.

The data produced in this study can be used as baseline data prior to the RFPP interventions taking place, and the Hamilton EpiSurv database can then be used to asses effectiveness and trends in the coming years with continuing rigorous application of the case definitions.

Competing interests: Nil.

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Ethnicity and revascularisation following acute coronary syndromes: a 5-year cohort study (ANZACS-QI-3)

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Abstract

Background Prior studies have reported higher rates of coronary revascularisation in European compared with Māori and Pacific patients. Our aim was to define the current variation by ethnicity in investigation, revascularisation and pharmacotherapy after admission with an acute coronary syndrome (ACS).

Methods Data from consecutive New Zealand residents <80 years of age admitted to the Middlemore Hospital coronary care unit with ACS (2007 to 2012) were collected prospectively.

Results Of 2666 ACS patients <80y, 51.5% were European/Other, 14.2% Māori, 16.0% Pacific, 14.8% Indian, and 3.5% Asian. Cardiac risk factors and comorbidity varied markedly by ethnicity. The overall coronary angiography rate was high (89%). After adjustment for clinical factors which influence the decision to perform angiography, European/Other patients were about 5% more likely than Māori and Pacific patients to have angiography.

Overall revascularisation was highest in Asian, Indian and European/Other (76.1%, 69.1% and 68.6%), and lower in Māori and Pacific patients (58.2% and 52.9%). Non-obstructive coronary disease was more common in Māori and Pacific (20.6 and 18.6%, respectively), than in European/Other, Indian and Asian patients (13.3%, 8.7% and 6.1%). After adjustment, Māori, Indian and Asian patients were as likely to receive revascularisation as European/Others, but revascularisation in Pacific patients was 13% lower. Discharge prescribing of triple preventive therapy was uniformly high across ethnic groups (overall 91%).

Conclusions There is a small unexplained variation in angiography rates across ethnic groups. Much of the observed variation in revascularisation may be due to differences in the coronary artery disease phenotype.

In New Zealand non-Maori non-Pacific people have a 2 to 3 fold lower age specific coronary artery disease mortality rate compared to Māori and Pacific New Zealanders.[1]

Whilst the reasons for this disparity are a complex mix of economic, health care system and sociocultural factors, the majority of patients who die from coronary artery disease have previously been hospitalised with a cardiovascular event.[2] These acute admissions are an opportunity to modify outcomes using evidence-based interventions including revascularisation (percutaneous coronary intervention [PCI], coronary artery bypass grafting [CABG]) and pharmacotherapy, such as statin, anti-

platelet and blood pressure-lowering medication, which have been shown to reduce mortality.[3]

Prior studies have reported that revascularisation rates in non-Māori non-Pacific New Zealanders are significantly higher when compared with Māori and Pacific people[4] and in non-Māori compared with Māori[5] and maintenance on statin medication in the year after an acute coronary syndrome (ACS) event is higher in European compared with Māori patients.[6]

Variation in revascularisation rates may be due to a number of factors which include rates of initial hospital presentation with an acute event, comorbidities influencing the revascularisation decision, type of coronary disease, as well as exposure to adverse social determinants including social exclusion and discrimination.

These factors may act differently at various points along the continuum of care from community to hospital and then post-discharge. For example, different factors may be important in determining whether a person experiencing an ACS event comes to hospital compared with those influencing the revascularisation decision once the patient is in the hospital. The factors influencing decision making at each point along the continuum need to be understood if we are to develop strategies to optimise treatment and improve outcomes.

Middlemore Hospital has, since 2007, routinely collected data on all ACS patients admitted to the Coronary Care Unit using the Acute PREDICT database. In this cohort we aimed to define the extent of in-hospital variation in investigation, revascularisation and pharmacotherapy according to ethnicity, and to better understand the reasons for this variation.

Methods

All New Zealand residents ≥18 years and <80 years old admitted to the coronary Care Unit (CCU) with suspected ACS between August 2007 and May 2012 within the catchment area of Middlemore Hospital had data recorded prospectively by trained clinical staff in the Acute PREDICT web-based electronic database. Middlemore Hospital is the base hospital for Counties Manukau District Health Board (CMDHB), and admits all ACS patients in this catchment.

CMDHB is one of the three Auckland Region District Health Boards (DHBs) and serves a population just over half a million. The population is characterised by the highest numbers of Māori (111,000) and Pacific (84,000) patients of any of the DHBs in New Zealand.

Data collection—Acute PREDICT is an electronic web-based registry used to collect in-hospital data regarding ACS risk stratification, diagnosis, and in-hospital investigations, management and complications.[7] A core mandatory data set is defined and an audited registry finalisation process ensures comprehensive data collection. Over the time period of this study 99% of patients with suspected ACS had complete registry data. Data quality is supported by definition fields within the electronic form, range checks for continuous variables and audits of data quality.[8] From 2013 this registry has been rebranded the ANZACS-QI (All New Zealand ACS quality improvement) registry and is the electronic backbone of the national ANZACS quality improvement programme. Anonymised linkage of the Acute PREDICT data to NHI-linked national hospitalisation and mortality national datasets was used to obtain sociodemographic data and exclude non-residents. This linkage process has been approved by the National Multi Region Ethics Committee (MEC/07/19/EXP).

Data and definitions—Only patients with a confirmed diagnosis of myocardial infarction (MI) or unstable angina were included. MI was defined according to the contemporary universal definition.[9] Unstable angina was diagnosed if one of the following occurred in the absence of any biochemical evidence of myocardial necrosis – 1. prolonged angina at rest, usually lasting ≥10 minutes, 2. new-

onset angina of at least Canadian Cardiovascular Society Class III severity 3. Recent acceleration of angina to at least Canadian Cardiovascular Society Class III.[10]

Up to three ethnic groups can be recorded for each patient in the datasets. For this analysis, ethnicity was determined by prioritising these three ethnic groups into five main categories in the following order: Māori (the indigenous people of New Zealand), Pacific peoples, Indians, Asian and New Zealand Europeans/Others ('Others' comprised only six percent of the latter group, and were composed of Other Europeans and people from the Middle East, Africa and Latin America).

Socioeconomic status was assessed using the NZDep2001 score, an area-based measure from 1 (least deprived) to 10 (most deprived) that combines nine variables reflecting eight dimensions of relative deprivation.[11] For these analyses we combined deciles into quintiles.

Cardiovascular disease (CVD) risk factor and comorbidity data included: smoking status, diabetes status, systolic blood pressure (BP), fasting low density lipoprotein (LDL) and high density lipoprotein (HDL), serum creatinine and current treatment with dialysis, body mass index (BMI), prior CVD diagnosis, history of chronic obstructive obstructive pulmonary disease (COPD), HBA1c and urinary albumin-creatinine ratio (ACR) in diabetics.

The Global Registry of ACS (GRACE) score, (estimating the 6 month probability of death following ACS), was calculated using the following variables: admission heart rate (HR) and systolic BP, initial Killip class, admission plasma creatinine level (umol/L), cardiac arrest, presence of ST deviation, ischaemic changes on electrocardiogram, elevated cardiac enzymes/markers on admission (Abbott Troponin I ≥ 40 ng/L), and serum creatinine. The ST deviation criteria included: (i) ST elevation >2mm in V1 to V3 or >1mm in other leads – present in at least 2 contiguous leads, or (ii) ST depression ≥0.5mm.

Investigations—The timing and findings at angiography were collected. The findings at angiography were grouped into one of the following: (i) no significant coronary artery disease, defined as the absence of any stenosis with ≥ 50% diameter loss in the epicardial vessels, (ii) significant (≥ 50% stenosis) single/double vessel coronary artery disease, (iii) significant three-vessel disease and/or left main stem (LMS) disease ≥50%. Left ventricular ejection fraction (LVEF) assessment using echocardiography or left ventriculogram was classified into normal (EF ≥50%), or mildly (EF = 40 to 49%), moderately (EF 30-39%), or severely (EF<30%) impaired.

Management—The invasive management data included referral for PCI or CABG. Data on acute reperfusion therapy for STEMI including door-to-balloon time was also collected. Discharge medications were recorded and included: aspirin, statins, angiotensin converting enzyme inhibitors (ACEIs), aldosterone receptor blockers (ARBs), beta-blockers, and clopidogrel. Triple therapy was defined as a combination of anti-platelet agent (aspirin and/or clopidogrel), a statin and a blood pressure lowering agent (ACEI/ARB and/or a beta-blocker).

Complications during hospital stay were assessed using in-hospital death, worst Killip class in hospital, stroke in hospital, overt bleeding (none, Thrombolysis in MI [TIMI] Major score, TIMI Minor score, Other bleeding) and PCI-related complications.

Analysis—Categorical data were summarised in terms of frequency and percentage, and were compared using the Chi-squared test or Fisher's exact test where appropriate. Continuous data were presented as means (± standard deviation) or medians (plus inter-quartile range), and the Mann-Whitney *U* test was used for comparison as the continuous data were not normally distributed. The univariate relative risk (RR) and 95% CIs between those with and without (a) coronary angiography and (b) revascularisation in ACS patients who underwent coronary angiography were calculated for all potential factors such as ethnicity, age, gender, BMI, Killip class, creatinine > 200 umol/L and not on dialysis, prior CVD, EF severely impaired, diabetes, significant coronary disease, COPD, and current smoker using Poisson regression with a log link and robust variance.[12]

All these factors whether significant or not were included in a multivariate Poisson regression analysis for adjusted relative risk and 95% CIs. Poisson regression was performed since our outcomes of interest were relatively common and logistic regression would have overestimated relative risk (RR). A two-sided p-value of less than 0.05 was considered to indicate statistical significance.

Data were analysed using the SAS statistical software package, version 9.2 (SAS Institute, Cary, NC). Poisson regression models were constructed to investigate independent predictors of assessment, revascularization and pharmacotherapy at discharge.

Results

Patient demographics data and ACS diagnoses (Table 1)—Between August 2007 and May 2012 there were 2,666 New Zealand residents younger than 80 years admitted to the Middlemore Hospital CCU with a confirmed diagnosis of ACS. The cohort comprised 1374 European/Other (51.5%), 378 Māori (14.2%), 427 Pacific (16.0%), 395 Indian (14.8%) and 92 Asian (3.5%) patients. European/Other and Asian patients were older than Māori, Pacific and Indian patients and were more likely to live in the more socioeconomically affluent areas (NZDep deciles 1–2). There were a higher proportion of Māori women compared with other ethnic groups.

GRACE risk score, CVD risk factors and comorbidity (Table 2)—Compared to Māori and Pacific patients, European/Other patients had lower mean heart rates and were less likely to have evidence of pulmonary oedema (Killip Class >1) suggesting that they were in better physical health at admission. Despite this the estimated GRACE score 6 month mortality risk for the European/Other cohort was higher than the Māori, Pacific and Indian cohorts probably reflecting the older age of this cohort.

There were several important differences between the ethnic groups regarding both cardiac risk factors and comorbidity which might influence whether patients underwent coronary angiography and revascularisation. The prevalence of diabetes was lowest in the European/Other cohort. Coronary artery disease in diabetics is typically more diffuse and more difficult to successfully treat with PCI than in non-diabetics.[3]

Also related to the lower prevalence of diabetes, the European/Other cohort was less likely than the Maori, Pacific and Indian cohorts to have significant renal impairment which increases the risk of contrast nephropathy with coronary angiography and PCI. HBA1c and ACR, both indicators of diabetes control and surrogates for maintenance of diabetes treatment, were better in the European/Other cohort.

Smoking was also less frequent in European/Other patients. These indicators may be surrogates for better maintenance to recommended treatment. Māori and Pacific patients had the highest mean BMIs. Obesity increases the risk associated with vascular access during the coronary angiography procedure.

Investigations and management (Table 3)—Overall there were high rates of coronary angiography (88.8%) with a small but significant variation across the ethnic groups; the highest rate was in European/Others (90.8%) and the lowest rates were in Pacific (85.7%) and Māori (86.2%) patients. The opposite finding was seen with assessment of left ventricular ejection fraction with 69.4% of European/Other assessed compared with 77.8% of Māori patients.

In patients who had coronary angiography, 14.2% were found to have no obstructive coronary disease and therefore revascularisation procedures would not be considered. Non-obstructive disease was found less commonly in the European, Indian and Asian cohorts (13.3%, 8.7% and 6.1%, respectively) and most commonly in the Māori and Pacific cohorts (20.6% and 18.6%, respectively).

There was significant variation across ethnic cohorts in both overall revascularisation rates (PCI or CABG) and in the type of revascularisation. Overall revascularisation was highest in Asian, Indian and European/Other patients (76.1%, 69.1% and 68.6%,

respectively) and lower in Māori and Pacific patients (58.2% and 52.9%, respectively). CABG was lowest in European/Others and most frequent in the Pacific and Indian cohorts (14.1%, 20.9%, 23.3%, respectively). Conversely PCI was most frequent in European/Other patients (55%) and much less frequent in Pacific patients (32%). There was no significant ethnic group variation in the type of reperfusion therapy used acutely for STEMI patients.

The overall rate of prescribing of triple therapy at discharge was 91%, and did not vary across ethnic groups. Nor was there any variation in the prescribing of aspirin or statin which was uniformly high across all ethnic groups.

The observed variation in beta-blocker, ACEI/ARB and clopidogrel prescribing probably reflect the higher prevalence of diabetes in Māori, Pacific and Indian patients with concomitant ACE/ARB use, and the more frequent use of PCI in Europeans which determines clopidogrel use.

Overall in-hospital mortality rate was low (0.7%) but there was significant variation in the in-hospital mortality (p=0.038) with rates of 0.5% in European patients and 1.6% and 1.2% in Māori and Pacific patients, respectively. Other adverse outcomes included stroke (0.5%), TIMI major or minor bleeding (0.8%) with no significant variation between the ethnic cohorts.

Predictors of angiography and revascularisation (Tables 4 and 5; Figures 1 and 2)—The strongest independent predictors of not receiving angiography were the presence of marked renal impairment, severe LV systolic dysfunction and prior CVD.

After adjustment for these clinical factors which influence the decision to perform angiography there remained significant variation in angiography across ethnic groups. European/Other patients were about 5% more likely to receive an angiogram compared with Māori and Pacific patients but Indian and Asian patient rates were not significantly different.

In those patients who underwent angiography the strongest predictor of subsequent revascularisation was the finding of a significant coronary lesion. Those with prior CVD were also less likely to receive revascularisation. Māori, Indian and Asian patients were as likely to receive revascularisation as European/Others but Pacific patients were 13% less likely to receive revascularisation.

Table 1. Demographic data and ACS diagnosis

n (%)	All	Māori	Pacific	Indian	Asian	European/Other	P value
	2666	378 (14.2)	427 (16.0)	395 (14.8)	92 (3.5)	1374 (51.5)	
Demographics							
Age (years), mean± SD	59.6±11.2	55.2±10.6	55.6±10.6	58.1±11.3	62.6±11.2	62.3±10.7	<0.001
Male	1931 (72.4)	235 (62.2)	315 (73.8)	298 (75.4)	63 (68.5)	1020 (74.2)	<0.001
NZ Dep							<0.001
1-2	457 (17.1)	13 (3.4)	11 (2.6)	51 (12.9)	29 (31.5)	353 (25.7)	
3-4	329 (12.3)	23 (6.1)	10 (2.3)	36 (9.1)	18 (19.6)	242 (17.6)	
5-6	264 (9.9)	27 (7.1)	9 (2.1)	22 (5.6)	8 (8.7)	198 (14.4)	
7-8	477 (17.9)	72 (19.1)	45 (10.5)	91 (23.0)	14 (15.2)	255 (18.6)	
9-10	1132 (42.5)	241 (63.8)	349 (81.7)	195 (49.4)	23 (25.0)	324 (23.6)	
Unknown	7 (0.3)	2 (0.5)	3 (0.7)	0 (0)	0 (0)	2 (0.2)	
Diagnosis							
Type of ACS							<0.001
Unstable Angina	272 (10.2)	23 (6.1)	31 (7.3)	48 (12.2)	18 (19.6)	152 (11.1)	
NSTEMI	1796 (67.4)	260 (68.8)	322 (75.4)	266 (67.3)	51 (55.4)	897 (65.3)	
STEMI	598 (22.4)	95 (25.1)	74 (17.3)	81 (20.5)	23 (25.0)	325 (23.7)	

NSTEMI, non ST segment elevation myocardial infarct; STEMI, ST segment elevation myocardial infarct.

Table 2. GRACE risk score, cardiovascular disease (CVD) risk factors and comorbidity

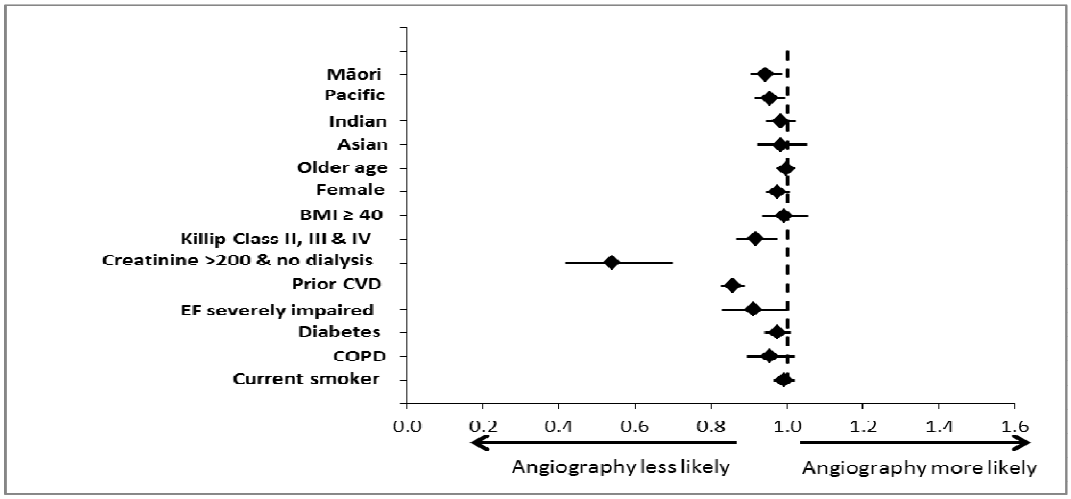
n (%)	All 2666	Māori 378 (14.2)	Pacific 427 (16.0)	Indian 395 (14.8)	Asian 92 (3.5)	European/Other 1374 (51.5)	P value
GRACE score data							
Admission HR (bpm), mean±SD)	78.8±20.8	79.6±23.0	82.5±22.6	82.5±21.3	77.9±21.0	76.4±19.0	<0.001
Admission systolic BP (mmHg), mean±SD)	139±27	142±29	140±29	140±27	133±26	138±26	0.035
Killip score on admission							<.001
I	2343 (87.9)	316 (83.6)	349 (81.7)	345 (87.3)	79 (85.9)	1254 (91.3)	
II, III, IV	323 (12.1)	62 (16.4)	78 (18.3)	50 (12.7)	13 (14.1)	120 (8.7)	
Cardiac arrest	91 (3.4)	12 (3.2)	14 (3.3)	5 (1.3)	3 (3.3)	57 (4.2)	0.096
ST depression	398 (14.9)	38 (10.1)	78 (18.3)	72 (18.2)	14 (15.2)	196 (14.3)	0.005
Elevated cardiac enzymes	1967 (73.8)	318 (84.1)	327 (76.6)	262 (66.3)	58 (63.0)	1002 (72.9)	<0.001
Creatinine, median (IQR)	85 (72-102)	82 (70-101)	95 (77-116)	85 (72-104)	88 (71-105)	83 (71-99)	<0.001
GRACE score (admission to 6-month mortality risk)							<0.001
Low: <3%	1081 (40.5)	190 (50.3)	201 (47.1)	184 (46.6)	32 (34.8)	474 (34.5)	
Intermediate: 3%–8%	1097 (41.2)	142 (37.6)	148 (34.7)	151 (38.2)	35 (38.0)	621 (45.2)	
High: >8%	488 (18.3)	46 (12.2)	78 (18.3)	60 (15.2)	25 (27.2)	279 (20.3)	
CVD risk factors and comorbidity							
Fasting LDL, median (IQR)	2.5 (1.9-3.2)	2.6 (2.0-3.2)	2.5 (1.9-3.2)	2.3 (1.7-3.1)	2.7 (2.0-3.4)	2.5 (1.9-3.3)	0.018
HDL, median (IQR)	1.1 (0.9-1.3)	1.1 (0.9-1.3)	1.0 (0.9-1.3)	1.1 (0.9-1.3)	1.2 (1.0-1.3)	1.1 (0.9-1.4)	<0.001
Current smoker	654 (24.5)	169 (44.7)	126 (29.5)	53 (13.4)	11 (12.0)	295 (21.5)	<0.001
BMI, median (IQR)	28.9 (25.4–33.0)	32.7 (28.7–37.0)	32.7 (29.1–37.2)	26.4 (23.8–29.7)	24.6 (22.1–26.3)	28.1 (25.1–31.5)	<0.001
BMI, n (%)							<0.001
<30	1387 (52.0)	106 (28.0)	112 (26.2)	275 (69.6)	74 (80.4)	820 (59.7)	
30≤40	831 (31.2)	169 (44.7)	211 (49.4)	71 (18.0)	7 (7.6)	373 (27.2)	
≥40	164 (6.2)	55 (14.6)	54 (12.7)	8 (2.0)	1 (1.1)	46 (3.4)	
Unknown	284 (10.7)	48 (12.7)	50 (11.7)	41 (10.4)	10 (10.9)	135 (9.8)	
Prior CVD	797 (29.9)	97 (25.7)	114 (26.7)	150 (38.0)	21 (22.8)	415 (30.2)	<0.001
COPD	198 (7.4)	39 (10.3)	28 (6.6)	20 (5.1)	5 (5.4)	106 (7.7)	0.062
Serum creatinine >200 µmol/L	114 (4.3)	20 (5.3)	42 (9.8)	18 (4.6)	6 (6.5)	28 (2.0)	<0.001
Dialysis	48 (1.8)	14 (3.7)	20 (4.7)	5 (1.3)	3 (3.3)	6 (0.4)	<0.001
CR >200 µmol/L and not on dialysis	66 (2.5)	6 (1.6)	22 (5.2)	13 (3.3)	3 (3.3)	22 (1.6)	0.001
Diabetes	772 (29.0)	112 (29.6)	187 (43.8)	200 (50.6)	25 (27.2)	248 (18.1)	<0.001
HbA1c (diabetic patients only), median (IQR)	7.4 (6.6–8.4)	7.6 (6.9–9.4)	7.8 (7.0–9.3)	7.4 (6.7–8.4)	6.8 (6.1–7.2)	7.0 (6.4–7.9)	<0.001
ACR (diabetic patients only) , median (IQR)	3.5 (1.0–20.1)	4.3 (1.6–18.7)	7.1 (1.2–93.4)	2.2 (1.0–14.2)	1.3 (1.0–6.6)	2.7 (1.0–7.8)	0.003

Table 3. Investigations and management

n (%)	All 2666	Māori 378 (14.2)	Pacific 427 (16.0)	Indian 395 (14.8)	Asian 92 (3.5)	European/Other 1374 (51.5)	P value
Investigations							
Angiogram	2367 (88.8)	326 (86.2)	366 (85.7)	346 (87.6)	82 (89.1)	1247 (90.8)	0.014
Time to angiogram (days), mean±SD	2.6±2.2	2.7±2.4	3.0±2.3	2.6±2.3	2.8±2.7	2.5±2.1	0.009
No significant coronary artery disease	336 (14.2)	67 (20.6)	68 (18.6)	30 (8.7)	5 (6.1)	166 (13.3)	<0.001
Single/ double vessel disease	1471 (62.2)	191 (58.6)	181 (49.5)	215 (62.1)	56 (68.3)	828 (66.4)	<0.001
Three-vessel disease and/or LMS ≥50%	560 (23.7)	68 (20.9)	117 (32.0)	101 (29.2)	21 (25.6)	253 (20.3)	<0.001
EF assessed	1921 (72.1)	294 (77.8)	317 (74.2)	290 (73.4)	66 (71.7)	954 (69.4)	0.016
Normal (≥50%)	1264 (65.8)	161 (54.8)	204 (64.4)	199 (68.6)	49 (74.2)	651 (68.2)	<0.001
Mild (40 to 49%)	320 (16.7)	68 (23.1)	53 (16.7)	35 (12.1)	8 (12.1)	156 (16.4)	0.006
Moderate (30 to 39%)	182 (9.5)	34 (11.6)	33 (10.4)	26 (9.0)	5 (7.6)	84 (8.8)	0.612
Moderate to severe/severe (<30%)	124 (6.5)	26 (8.8)	24 (7.6)	21 (7.2)	4 (6.1)	49 (5.1)	0.165
Management							
In-hospital PCI	1294 (48.5)	162 (42.9)	138 (32.3)	182 (46.1)	57 (62.0)	755 (55.0)	<0.001
CABG referral – inpatient	360 (13.5)	48 (12.7)	72 (16.9)	76 (19.2)	11 (12.0)	153 (11.1)	<0.001
CABG referral – outpatient	86 (3.2)	10 (2.7)	17 (4.0)	16 (4.1)	2 (2.2)	41 (3.0)	0.621
Total revascularisation	1731 (64.9)	220 (58.2)	226 (52.9)	273 (69.1)	70 (76.1)	942 (68.6)	<0.001
Reperfusion therapy acutely for STEMI							0.727
Primary PCI	269 (45.0)	43 (45.3)	38 (51.4)	42 (51.9)	9 (39.1)	137 (42.2)	
Thrombolysis	174 (29.1)	27 (28.4)	19 (25.7)	23 (28.4)	6 (26.1)	99 (30.5)	
None	155 (25.9)	25 (26.3)	17 (23.0)	16 (19.8)	8 (34.8)	89 (27.4)	
Medication at discharge*							
Aspirin	2606 (98.4)	364 (97.9)	416 (98.6)	388 (98.2)	91 (98.9)	1347 (98.5)	0.878
Statin	2550 (96.3)	357 (96.0)	410 (97.2)	385 (97.5)	90 (97.8)	1308 (95.7)	0.336
Beta-blocker	2279 (86.1)	301 (80.9)	363 (86.0)	363 (91.9)	81 (88.0)	1171 (85.7)	0.001
ACEI/ARB	1824 (68.9)	277 (74.5)	321 (76.1)	286 (72.4)	52 (56.5)	888 (65.0)	<0.001
Clopidogrel	1935 (73.1)	251 (67.5)	277 (65.6)	280 (70.9)	73 (79.4)	1054 (77.1)	<0.001
Triple therapy[t]	2405 (90.8)	335 (90.1)	388 (91.9)	370 (93.7)	82 (89.1)	1230 (90.0)	00.183

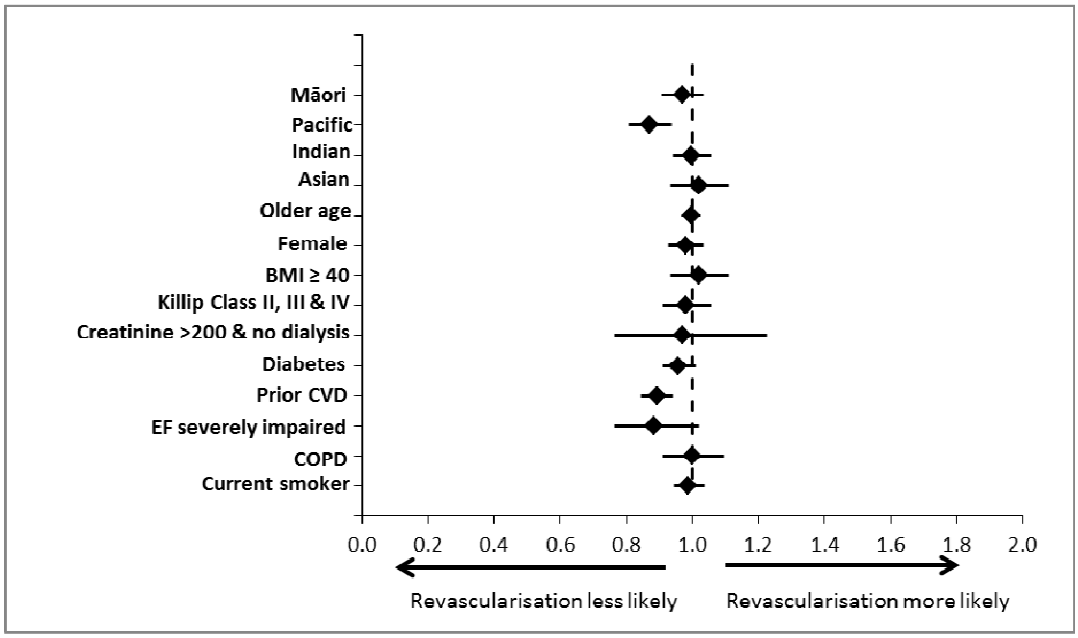
* Denominator is of those alive at discharge; [t] Triple therapy is a combination of anti-platelet agent (aspirin and/or clopidogrel), a statin and a blood pressure lowering agent (ACEI/ARB and/or a beta-blocker).

Figure 1. Forrest plot: independent predictors of having coronary angiography in the ACS cohort



Note: Relative risk estimates and 95% confidence intervals derived from Poisson multivariable regression are shown.

Figure 2. Forrest plot: independent predictors of having coronary revascularisation in the ACS cohort who had coronary angiography



Note: Relative risk estimates and 95% confidence intervals derived from Poisson multivariable regression are shown. Note that the RR associated with having significant coronary disease is 40 (95% CI 19 to 83) and too large to be shown on the x-axis range used.

Table 4. Univariate and multivariate Poisson regression for angiography

Risk factors	Unadjusted RR (95% CI)	P value	Adjusted RR (95% CI)	P value
Māori vs European/Other	0.950 (0.910–0.993)	0.022	0.945 (0.905–0.986)	0.010
Pacific vs European/Other	0.944 (0.905–0.985)	0.008	0.954 (0.914–0.995)	0.029
Indian vs European/Other	0.965 (0.927–1.005)	0.088	0.983 (0.944–1.024)	0.417
Asian vs European/Other	0.982 (0.913–1.057)	0.629	0.984 (0.920–1.054)	0.651
Age (per year)	0.996 (0.995–0.997)	<0.001	0.998 (0.996–0.999)	<0.001
Female vs Male	0.963 (0.933–0.995)	0.024	0.976 (0.945–1.008)	0.138
BMI ≥40 vs <40	0.988 (0.932–1.048)	0.693	0.993 (0.935–1.056)	0.828
Killip class II, III, IV vs I	0.838 (0.786–0.892)	<0.001	0.919 (0.867–0.975)	0.005
Creatinine >200 umol/L and not on dialysis	0.489 (0.372–0.642)	<0.001	0.540 (0.416–0.701)	<.001
Prior CVD	0.827 (0.795–0.860)	<0.001	0.857 (0.826–0.890)	<0.001
EF severely impaired	0.838 (0.757–0.929)	0.001	0.913 (0.830–1.005)	0.062
Diabetes	0.905 (0.874–0.938)	<0.001	0.974 (0.941–1.009)	0.147
COPD	0.898 (0.837–0.963)	0.003	0.955 (0.894–1.020)	0.173
Current smoker	1.031 (1.001–1.061)	0.042	0.993 (0.965–1.022)	0.630

Table 5. Univariate and multivariate Poisson regression for revascularisation in ACS patients who underwent coronary angiography

Risk factors	Unadjusted RR (95% CI)	P value	Adjusted RR (95% CI)	P value
Māori vs European/Other	0.895 (0.823–0.974)	0.010	0.969 (0.908–1.034)	0.343
Pacific vs European/Other	0.820 (0.750–0.896)	<0.001	0.870 (0.808–0.936)	<0.001
Indian vs European/Other	1.035 (0.968–1.106)	0.317	0.998 (0.942–1.057)	0.935
Asian vs European/Other	1.104 (0.991–1.229)	0.072	1.019 (0.935–1.110)	0.673
Age (per year)	1.007 (0.998–1.003)	0.557	0.998 (0.996–1.000)	0.019
Female vs Male	0.784 (0.732–0.840)	<0.001	0.979 (0.929–1.032)	0.426
BMI ≥40 vs <40	0.887 (0.783–1.006)	0.061	1.019 (0.935–1.111)	0.671
Killip class II, III, IV vs I	0.967 (0.886–1.055)	0.448	0.981 (0.910–1.056)	0.603
Creatinine >200 umol/L and not on dialysis	0.866 (0.651–1.153)	0.325	0.969 (0.766–1.225)	0.792
Diabetes	0.969 (0.914–1.028)	0.298	0.958 (0.910–1.009)	0.108
Prior CVD	0.921 (0.866–0.980)	0.009	0.893 (0.845–0.941)	<0.001
Significant coronary disease	39.85 (19.14–82.96)	<0.001	40.00 (19.22–83.25)	<0.001
EF severely impaired	0.898 (0.771–1.047)	0.170	0.883 (0.766–1.019)	0.088
COPD	0.937 (0.838–1.047)	0.252	1.000 (0.910–1.097)	0.992
Current smoker	1.000 (0.944–1.061)	0.988	0.988 (0.943–1.036)	0.621

Discussion

In this study, after adjusting for clinical variables likely to influence the decision to perform angiography European/Other patients were about 5% more likely to receive a coronary angiogram compared with Māori and Pacific.

Of those who underwent coronary angiography, the Māori and Pacific patients had 10% and 16% lower rates, respectively, of overall revascularisation compared with European/Others. However, after adjustment for clinical variables which might influence the revascularisation decision, the revascularisation rate for the European/Other and Māori cohorts were no longer significantly different, but the Pacific cohort still had a 13% lower rate.

There were also important differences between the ethnic cohorts in factors which may influence the decision regarding referral for angiography and type of

revascularisation, in particular the incidence of diabetes, renal impairment, severe LV impairment and non-obstructive coronary artery disease.

There was no significant ethnic group variation in the type of reperfusion therapy used acutely for STEMI patients. Nor was there any variation in the prescribing of triple therapy at discharge which was uniformly high across all ethnic groups.

These findings pertain to patients admitted to the coronary care unit in a single, large urban hospital with a consistent evidence based management approach and an on-site catheter laboratory, and could be considered to be a close to "best case" scenario.

Comparison with prior studies—No prior New Zealand study has reported angiography or revascularisation rates specifically in an ACS cohort. The variation between ethnic groups in our cohort is less than in prior related studies.

Using national data from the 1990s, Tukuitonga and Bindman al[4] reported much lower age-standardised rates of both CABG and PCI in Māori and Pacific people compared to other New Zealanders. The rate ratios for PCI for Māori and Pacific compared with other New Zealand men were 0.25 and 0.29, and for CABG were 0.64 and 0.40.

Riddell et al[5] in a primary care cohort reported that in those with known ischaemic heart disease only 18% of Māori, compared to 30% of non-Māori, had undergone a coronary revascularisation procedure. Disparities in revascularisation rates have been reported in several international studies.[13-17]

An Australian data linkage study has reported a 37% lower revascularisation rate in Aboriginal compared with age- and sex-matched non-Aboriginal MI patients.[18] However in their analysis this difference was largely explained by Aboriginal patients having a higher comorbidity burden and being more likely to be admitted to smaller regional and rural hospitals where revascularisation services are less accessible.

Our study cohort comprised patients admitted to a single urban hospital so variation due to varying hospital practice was not relevant. It may however be important in better understanding the previously described variability in New Zealand where access to cardiovascular services varies by region/DHB.

Coronary angiography—In this CCU cohort there were very high rates of angiography. Several clinical variables which were more frequent in the Māori and Pacific cohorts were associated with lower angiography rates. Those with severe renal impairment but not on dialysis were less likely to undergo angiography, presumably due to concern about contrast nephropathy. Those with very severe LV systolic impairment were also less likely to undergo in-hospital angiography, probably because of a need for medical stabilisation prior to further investigation.

Despite adjustment for these and associated comorbidity, Māori and Pacific patients remained slightly less likely to undergo angiography compared with European/Other patients. Whether this is clinically appropriate due to other unmeasured clinical variables or is related to other patient or physician factors is not clear. A systematic audit of the reasons for not having angiography in this cohort is needed to better understand this.

An interesting observation from this study is that the incidence of obstructive coronary disease in Māori and Pacific patients who had angiography was lower than for the other ethnic cohorts. Possible reasons for the higher rates of non-obstructive disease may be higher rate of plaque rupture events with only transient coronary obstruction related to higher smoking and diabetes rates, and of Type 2 MIs related to severe LV impairment or other acute illness causing myocardial necrosis without associated coronary obstruction.

Revascularisation—Absolute revascularisation rates were around 10% lower in Māori and 15% lower in the Pacific cohorts compared with European/other and Indian cohorts. Whilst part of this difference is due to the observed 5% lower angiography rates, when we analysed the group who had angiography there was still a significantly higher rate of revascularisation in European/Other patients. However, after taking into account the lower rate of obstructive coronary disease, where revascularisation is not clinically indicated, and other comorbidity there was no significant difference between European/Others and Māori, but the difference persisted for Pacific patients.

A possible clue to this residual difference comes from the higher frequency of multi-vessel coronary disease and CABG in Pacific patients together with their high rates of diabetes, poorer diabetic control and more frequent renal impairment. Coronary artery disease in diabetic patients is characterised by more diffuse and complex disease[3], often with more distal disease, which may be less amenable to PCI or CABG than non-diabetic disease.

Lower rates of revascularisation in patients with diabetes compared with non-diabetics have been previously reported.[19] Interestingly the Indian cohort with similar rates of diabetes had higher rates of PCI than Pacific patients suggesting that the pattern of their disease may be somewhat different. Of note the indices of diabetes control were better in the Indian cohort underscoring the importance of identifying and appropriately treating people with diabetes.

Further study is needed to better understand whether the observed differences in revascularisation between Pacific and other ethnic groups is due to differences in the coronary artery disease phenotype, unmeasured clinical factors or other patient and physician factors.

In 2013, the NZ Ministry of Health in conjunction with the NZ Cardiac Clinical Network commenced funding a national ACS and cardiac procedures registry and quality improvement programme to be known as the All NZ Acute Coronary Syndrome Quality Improvement programme (ANZACS QI). An important goal of ANZACS QI is to provide a framework for achieving health equity through the identification and reduction of unwarranted variation in management.

Limitations—As already discussed, this cohort comprised patients admitted to a single urban hospital and conclusions can not necessarily be generalised to other New Zealand urban or rural hospitals. This cohort included only those admitted to the CCU. In our hospital the CCU is the predominant referral source for coronary angiography after ACS. In this study we have not investigated the factors, including ethnicity, which may influence the decision to admit to the CCU.

The multivariate analysis was limited to data collected in the ANZACS-QI registry. Other factors relevant in the decision to investigate and intervene, including patient

preference and appropriateness of intervention based on more detailed analysis of the coronary anatomy, are likely to be important.

Conclusions—In patients who are admitted to the CCU the rates of coronary angiography, subsequent revascularisation and appropriate discharge pharmacotherapy are high. There is a relatively small unexplained variation in angiography rates across ethnic groups. The observed variation in type and rates of revascularisation appears to be largely driven by differences in the underlying coronary disease process and its determinants. This study focused on patients who have reached the CCU. Further studies are required to understand the extent to which the initial patient presentation to medical attention and admission to the CCU vary by ethnicity and the factors responsible for this variation.

Competing interests: Nil.

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Initiation of maternity care for young Māori women under 20 years of age

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Abstract

Aim To explore the lived realities of pregnant Māori women <20 years through pregnancy and motherhood, to identify barriers to, and facilitators of, access to maternity care.

Method Using a Kaupapa Māori research paradigm, 44 pregnant or recently pregnant Māori woman <20years of age were recruited in two case study sites. Participants completed a series of interviews during different stages of pregnancy and motherhood. Interview transcripts were read, re-read and cross-compared by the two interviewing researchers to identify emergent themes, and organised using the software programme Nvivo. Thematic data was grouped, and re-grouped into topic areas for further analysis.

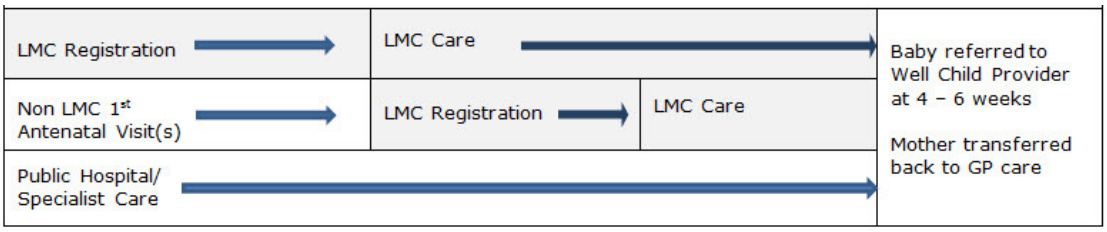
Results Participants engaged early with health care services both to confirm their pregnancy and to initiate maternity care. Barriers to access occurred at the first contact with a lack of information, and support along the maternity care pathway to mainly community based midwifery care. Many participants felt inadequately supported to be able to identify, confirm, and enrol with a midwife or hospital care. Participants who received proactive support at the first interaction with health services had an appropriate maternity care pathway toward obtaining early and seamless maternity care.

Conclusion Interviews with participants identified that contrary to published literature young Māori women are engaging early with health services (GP services, school and community based youth health services) for maternity care, but system barriers from this first health contact lead to avoidable delays to them accessing a seamless maternity care pathway. There is a lack of sufficient and appropriate information and support for this young population group who have limited resources and experience to navigate through health services. These inequities in access to maternity care could be reduced through an integrated model of care that sees maternity care beginning at the first interaction with health care services. The service, primarily general practitioners, would then take responsibility for first trimester screening and navigation to a lead maternity carer.

Maternity care in Aotearoa New Zealand is publicly funded and free to all eligible women. The provision of primary maternity care services is set out in Section 88 of the New Zealand Public Health and Disability Act 2000.[1] Under Section 88, primary maternity care services can be delivered by a community-based lead maternity carer (LMC), a non-LMC health practitioner (doctor or midwife), or a District Health Board (DHB)-funded primary care provider.

A LMC can be a general practitioner, a midwife, or an obstetrician.[1] Pregnant women can enter the maternity care pathway at a number of points (Figure 1) and choose a maternity care practitioner(s) who will provide health care during pregnancy, delivery and the postnatal period. Where appropriate, shared care arrangements can occur. Non-LMC general practitioners and midwives are funded to provide first trimester care. Health services and health professionals play a pivotal role in ensuring women receive appropriate and optimal maternity care throughout their pregnancy.

Figure 1. Provision of funded primary maternity services in Aotearoa New Zealand



Even with this universal provision of maternity care, the infants of Māori women are more likely to die in their first year of life than non-Māori infants,[2,3] and are more likely to have avoidable hospitalisations with gastroenteritis, skin infections and respiratory admissions.[4,5] In 2013, the Perinatal and Maternal Mortality Review Committee (PMMRC) reported that the babies of Māori women were almost twice as likely to have a potentially avoidable perinatal death compared to babies of New Zealand European mothers (22% vs 12%).[6]

Māori are a young population with 35% aged less than 15 years, compared to only 19% of non-Māori.[7] In the December 2010 year, the fertility rates for Māori mothers under 25 years of age were more than double the fertility rates for the total population in the same age groups.[8] Young women giving birth (under 25 years) were more likely to live in deprived areas, and almost half of all Māori women giving birth (45%) lived in the most deprived areas (quintile 5) of this country. [9]

Local and international evidence suggests that being young and pregnant is a risk factor for poor health outcomes for both mother and baby.[6,10] Teenage pregnancies have been associated with increased mortality of babies before and after birth, and with low weight gain of the mother and premature births.[11]

In Aotearoa New Zealand, teenage mothers <20 are at higher risk of stillbirth and neonatal death compared to older mothers.[6] These differences in health outcomes cannot be explained solely by socioeconomic status. Rather they are part of a larger picture of health disparities that suggests there are system and health service factors contributing to differential health outcomes for Māori.[5,12]

Reducing inequalities in maternal and child health is necessary to avoid the burden of further disadvantage and ill-health of Māori children through childhood, adolescence and adulthood, and to also ensure a health system that is equitable. To develop

strategies that will improve maternal and infant health outcomes it is essential to identify where inequities in access to health care are occurring.

The E Hine research is about exploring the lived realities of 44 pregnant Māori women aged under 20 (and their infants) including their journey through maternity care services. The research is appropriately named to denote the importance of young Māori women and their babies. E Hine is an ancient term meaning Goddess, and is used in Māori culture to express the divinity of women.

In this study, E Hine is used to recognise and understand the importance of womanhood and motherhood. The vision of the research is a society that supports young Māori women, their right to health care, and their right to health, as recognised obligations of the Crown under the Treaty of Waitangi.

Recent work by Ratima et al identifies persistent inequalities in access to antenatal care and intrapartum and labour care for Māori.[13] In the E Hine research we aim to identify factors that contribute to, or mitigate, health inequalities. This paper examines barriers to and enablers of access to maternity health care for pregnant Māori teenagers. Not attending or inadequate antenatal care (<5 antenatal appointments) is associated with adverse health outcomes (e.g. low birth weight, higher rates of fetal and neonatal death,[14] and women <20 years are more likely to attend maternity services later and attend less frequently.[15–17]

Early pregnancy assessment and care planning is essential to screen for clinical and social risk factors that may increase the likelihood of perinatal mortality or other harm.[18] Indeed, international evidence suggests that women aged under 20 years are more likely to attend maternity services later in pregnancy and less frequently.[14,17] Local reporting suggests Māori or Pacific women <25 years are more likely to "book" late.[19,20] The majority of Māori women who registered with a lead maternity carer (LMC) in 2010 did so in the second or third trimester of pregnancy (55.5%).[21] This late registration with an LMC adds to the framing of Māori teen pregnancy as a 'problem'[22] due to 'late presentation' and 'failure' to attend early antenatal care.

Too often the risks associated with young mothers are significantly and negatively over-represented.[23] Not all teenage mothers experience poor outcomes, but there is little focus on the capabilities and positive outcomes of teen mothers.[23] This present research does not frame pregnancies to Māori women <20 years as inherently problematic. Rather, in the context of a Māori worldview, this research values the voice of pregnant Māori women <20 and uses their experiences to identify where and at what point the system and services are not working well for this group of women.

Increasing our knowledge about the circumstances and range of needs of pregnant Māori women <20 is necessary to avoid increasing health inequalities for an already disadvantaged population group.

The findings presented here are from data collected at the first interview with 44 participants about their experience of finding out about their pregnancy, and how they found an LMC. The aim is to describe what happens along the maternity care pathway from when they confirm their pregnancy, and how well (or not) their needs were met.

Methods

A qualitative study to explore the lived realities of pregnant Māori women <20 through a Kaupapa Māori research paradigm that avoids victim blaming, sees beyond negative stereotypes, and promotes a structural analysis.[24 25] It was from this standpoint that we, a group of Māori health researchers supported by *kaumatua* (elders) and our non-Māori colleagues, expand understandings, beyond negative stereotypes, of the lived realities of young Māori women becoming pregnant, having their babies, and becoming mothers.

Case study sites—Participants were recruited from two case study sites: Wellington and Hawkes Bay, chosen because of their social, geographical, and tribal relevance.

Eligibility—Eligible women were:

- young women who identify as Māori,
- aged less than 20 years at the time of giving birth, and
- living in the case study sites.

Recruitment and participants—Participants were primarily identified and recruited through local health, education, and social service providers. The age of participants (at the time of giving birth) ranged from 14 years to 20 years old. The recruitment of pre-birth participants (prospective cohort n22) enabled the examination of the journey as it occurred. The recruitment of post-birth participants (retrospective cohort n22) enabled a retrospective look at the journey that was not biased by the research process.

Data collection, analysis, and ethics—Participants in the prospective cohort were interviewed 4 to 5 times over a 20-month period. Participants in the retrospective cohort were interviewed 2–3 times over a 9-month period. In total, 160 interviews were conducted with 44 participants from two case study sites. The data presented here relates to the first baseline interview and participants' dialogue about how they found out about their pregnancy, and their first interactions with health care and maternity services.

The themes of interest were identified through multiple methods. Prior and during the data collection phases common issues emerged through our engagement with community and sector stakeholders, the study steering and advisory groups. All interviews were transcribed verbatim and read, re-read and cross-compared by the two interviewing researchers to identify emergent themes.

Transcripts were entered into the software programme Nvivo for coding and data extraction using a comparative analysis. Once thematic data was extracted from the main body of transcripts, it was grouped, and re-grouped into topic areas for further analysis. This analysis was then presented back to the Steering and Advisory Groups for further discussion and feedback.

Ethics approval was obtained from the Central Region Ethics Committee and the Royal New Zealand Plunket Society (Inc) Ethics Committee.

Results

The majority of participants had a community based midwife as their Lead Maternity Carer (41), with a small number receiving public hospital midwifery care (1), and specialist only care (2).

Confirmation of pregnancy

Early interaction with health services—Participants engaged early with primary health care services to confirm their pregnancy. Despite their youth and the possible implications of finding out they were pregnant most participants were very proactive in taking steps to confirm their pregnancy, most often accessing primary care services such as a youth specific health service, or general practice.

Participants commonly used home pregnancy tests to confirm initial pregnancy suspicions prior to seeing a health professional.

> I'm like 'oh my god I didn't get my period all this month'…so I came to course and I took a pregnancy test. She [the nurse] said 'oh well, you're pregnant', and I said 'oh my god am I', and she goes 'yes there's two lines', and I started crying (CAHB03).
>
> I just had a feeling that I was pregnant. So I just went to our school nurse to just check up and stuff. I went and had one and she just showed me it. Then I just cried; I was shocked as (CDHB05).

The findings suggest that although pregnancy was often unexpected, confirming the pregnancy happened quickly for the majority of participants.

Points of entry – where and who to see—The availability of youth specific health services was an important facilitator of early confirmation of pregnancy. It was common for participants to access school based or community based youth health services.

> It wasn't until I knew that my period had passed...I knew straight away that I was pregnant. I was with my best friend and I went in there [school health clinic] to get checked (CBHB01).
>
> I used to go and see a nurse [at the community based youth health service] all the time. I used to go and talk to her about my contraception and stuff so, I went back to her cause I didn't really have a GP (CCWN01).

These participants were often long-term users of such services and had established relationships with the doctors and nurses. Prior interactions between the participants and their primary health care provider influenced the decision about which service they were going to engage.

Participants avoided providers with whom they had previously had negative encounters, or where they foresaw the provider being negative toward them; for example, "*it wasn't my GP that I saw. I didn't want him to growl me…cos he's quite scary, so I went to a locum doctor* (CCWN02); and another participant who chose to attend her youth service because, '*my doctors a wanker'* (CAHB01).

A lack of options forced one participant to visit the local midwifery service because she could not access her previous GP, *'I didn't have a doctor. I come back here and they said I couldn't sign up with the same doctor or anything. They didn't have room. That's why I didn't go to the doctor'* (CCHB02).

Of the 44 participants, seven participants did not access care in the first trimester because they did not realise they were pregnant. However once they became aware of the possibility that they could be pregnant, they followed similar patterns to the other participants.

Moving along the maternity care pathway

Participants commonly visited their primary health care provider (i.e. youth health service, school nurse, GP) to confirm their pregnancy, and begin their pregnancy journey. However transitioning to a Lead Maternity Carer was often fragmented and inhibited a seamless pregnancy pathway.

One of the main barriers was the lack of adequate information about the process.

> [the doctor] didn't give me much information. He just said ring a midwife and gave me a book with three people on it (CAHB04).
>
> …[the doctor] told me to get a midwife...yeah just did a check and stuff. Yeah that's about it. She just gave me a list of numbers (CBWN01).

Primary care providers often missed opportunities to assist these young women to make their journey less complicated and, ultimately, provide a better health service. One participant had numerous interactions with health and social services before she eventually found a midwife herself.

> I went to go sign up to do ante-natal classes at the doctors...and they said their books are closed but I could go talk to Family Start...then I was on a waiting list, then they go 'have you got a midwife?' and they recommended [a midwife]...I contacted her...then I didn't go see her for a month or so, so then I went to [a youth health service] to go get my STI check-up and they said, 'have you got a midwife' and I said no, then they've got this big list out of midwives (CBHB06).

At each point of contact, despite knowing the participant was pregnant, no one was pro-active about properly explaining the process of what to do next or to help her to find a midwife. The fragmentation and lack of communication between services made the process of finding the midwife unnecessarily difficult for this young woman and many others on the study.

Participants most commonly relied on the lists of midwives they received from the primary care provider. However those who followed this maternity pathway were more likely to face barriers to accessing a lead maternity carer and, consequently, experienced delays in receiving early antenatal care.

> [The doctor] gave this paper with a list on it and I tried to get in contact with some of them but they said they weren't working around Christmas…and I went up to [local town] to find one…but no-one got back to me and I haven't had a midwife since (CAWN05).
>
> ...I couldn't get hold of her for ages. Like five weeks, yeah five or six weeks. And leaving messages, but she wasn't getting back [to me] (CBWN01).

Not all participants had or were able to access a community-based midwife so many self-referred or were referred by their GP to hospital based midwifery services.

> [The doctor] just gave me the pamphlet… I was ringing up a few of them and they were all taken. So I was like, 'oh I've had enough' and left it for about a week and I just walked into the maternity ward and said 'I need a midwife... I really need one cause I don't know how far I am (CAWN06).

The 'one-way' process of communication, where the participant was dependent on the midwife to return her call, created barriers and often left participants with limited options when deciding who was going to provide their maternity care. In some situations the lists of midwives were unhelpful because they were all unavailable. Some participants were forced to go to extraordinary lengths to find a midwife and subsequently had to settle upon whoever was available.

What works well

The role of a primary care practitioner (GP, Primary Care nurse) and their assistance (or not) of young pregnant women had a considerable influence on their pregnancy journey. Some health professionals went beyond pregnancy testing and provided additional antenatal support such as ascertaining the circumstances and needs of

participants. When this happened participants were more likely to experience a continuous maternity care pathway.

> [The nurse] kind of rang around and seen what kind of midwives were available around for me and, she came back with a couple and, so I chose to go with a midwife, it was one out in Porirua' (CCWN01).

In another situation a smear nurse asked a participant if she had a midwife and any support, to which the participant replied *'no I don't have a midwife, and I don't know how to get one'* (CCHB04). The nurse went on to help identify, contact, and organise a midwife for this participant.

Participants with good support networks often turned to whānau (family) to assist them to navigate through the process of finding a midwife. Participants sought advice from whānau or friends who had recently had a baby, and asked about their midwife.

Acting upon these recommendations, participants would make a decision about whether they wanted that same midwife as their lead maternity carer.

> My friend that goes to this school, I asked for the number of her midwife cause I heard she's really good (CDWN01).
>
> She used to be my mum's midwife that's why I asked for her cause, my mum said she's real good (CBWN02).

Discussion

The initiative shown by the young women in this study to seek maternity care early is contrary to the perception that young pregnant women present late, and fail to access antenatal care in the first trimester.[15 16] Despite their youth, and the prospect of finding out they might become a mother, the findings in this study show participants to be decisive and engaged with primary care services early on in the first trimester to confirm their pregnancy and seek advice.

Participants in this study often relied on whānau to assist them about how, where and who they were going to access to confirm their pregnancy. The availability and access to school and community health clinics was also an important point of entry to confirm their pregnancy. Youth specific services are reportedly less frequented options for young people;[26] however the findings in this study show that these services worked well for this group of young women as a facilitator for confirming pregnancy early on in the first trimester.

The young women in this study were deliberate about who they chose to engage with about their pregnancy, and previous interactions were an important part of this decision making process. Participants were unwilling to use services where they perceived they would receive a poor response from the provider.

This positive health seeking behaviour was often met with inadequate information and support for young pregnant women navigating the next steps in their maternity care journey. The main source of information participants received once they confirmed their pregnancies was a list of local maternity providers. This proved insufficient for transitioning these young women to an LMC as many lacked the resources to navigate this stage of the pathway.

These experiences were similar to young women in Copland et al's (2011) study who also reported poor access to health care, with knowledge about how to access health

care and lack of transport the two leading barriers.[26] Even the co-location of primary health care services with maternity care providers did not necessarily improve access to first trimester care or guarantee enrolment with an LMC.

This disruption of their maternity care journey is a system and service failure that contributed to unnecessary and avoidable delays in participants accessing appropriate first trimester care. The potential repercussions of a lack of first trimester care are found in the latest PMMRC report (2013)[3]; one in four women whose babies died in 2010 of a potentially identifiable congenital abnormality were not offered screening by their primary care health provider.

The Growing Up in New Zealand cohort study also found gaps in first trimester care with only 39 percent of women taking pre-pregnancy folic acid supplementation and Māori and those less than 20 years were less likely to have taken supplementation.[27] The PMMRC recommends that primary care providers should offer first trimester screening and facilitate expeditious registration with an LMC.[3] Improving first trimester care and navigation to an LMC will improve access for young Māori women to appropriate maternity care.

The current way the system works does not take into account the vulnerability and higher risk of poor health outcomes for young mothers and Māori infants. Participants in this study had limited control over deciding when to access, and who would provide, maternity care services.

The current model of maternity care disempowers young women by failing to provide an appropriate level of access to maternity care, and then blames them for not accessing care. There is a range of resources (knowledge, information, language, support) that people are expected to mobilise, yet ethnic minority and socio-economically deprived people may be disadvantaged in their access to these resources.[28]

Limitations—Participants were recruited through many channels within the two regions. While it is possible that they are somehow different from young pregnant Māori women more generally, we are confident (from talking with them and their whānau, the Roopū Mama, and a wide range of stakeholders) that their journey is representative of the experiences of their peer group.

Conclusion—Young Māori women aged under 20 in this study engaged early with health services to both confirm their pregnancy and initiate maternity care but system barriers delayed timely access to finding and enrolling with a lead maternity carer.

Despite a publicly funded maternity system, the fragmentation between primary non-LMC maternity care and LMC services had a negative impact on the pregnancy journey for many of these young women, disrupting access to early antenatal care. Primary care practitioners who took the time to provide additional information and support made a considerable improvement to the maternity care pathway.

Disruptions in access to maternity care could be addressed through emphasising an integrated seamless model of care with maternity care beginning at the first interaction with health care services. The health care service, primarily general practitioners, would then take responsibility for first trimester screening and navigation to a lead maternity carer.

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Cultural and social factors and quality of life of Māori in advanced age. Te puawaitanga o ngā tapuwae kia ora tonu – Life and living in advanced age: a cohort study in New Zealand (LiLACS NZ)

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Abstract

Aim To establish 1) the socioeconomic and cultural profile and 2) correlates of quality of life (QOL) of Māori in advanced age

Method A cross sectional survey of a population based cohort of Māori aged 80–90 years, participants in LiLACS NZ, in the Rotorua and Bay of Plenty region of New Zealand. Socioeconomic and cultural engagement characteristics were established by personal interview and QOL was assessed by the SF-12.

Results In total 421 (56%) participated and 267 (63%) completed the comprehensive interview. Māori lived with high deprivation areas and had received a poor education in the public system. Home ownership was high (81%), 64% had more than 3 children still living and social support was present for practical tasks and emotional support in 82%. A need for more practical help was reported by 21%. Fifty-two percent of the participants used te reo Māori me ngā tikanga (Māori language and culture) daily. One in five had experienced discrimination and one in five reported colonisation affecting their life today.

Greater frequency of visits to mārae/sacred gathering places was associated with higher physical health-related QOL. Unmet need for practical help was associated with lower physical health-related QOL. Lower mental health-related QOL was associated with having experienced discrimination.

Conclusion Greater language and cultural engagement is associated with higher QOL for older Māori and unmet social needs and discrimination are associated with lower QOL.

Glossary

- **Māori** (normal, usual, natural, common)
- **Whānau** (an extended family)
- **Hapū** (groups of extended families or sub-tribe)
- **Iwi** (tribe)
- **Te Ao Māori** (Māori society)
- **Pou** (the post supporting the ridge pole in the back wall of a Meeting House, expert, teacher, dependable people, reliable people)
- **Te reo Māori me ngā tikinga** (Māori language and culture are inseparable entities, te reo Māori is used to translate the English word, ‘culture in this article’)

- **Tāngata whenua** (earliest or indigenous peoples of Aotearoa New Zealand)
- **Mauri** (life principle, special nature, a material symbol of a life principle, source of emotions)
- **Whakawhānaungatanga** (recitation of genealogies or stories about the world, ways by which people come into relationship with the world, with people, and with life)
- **Marae** (sacred gathering place of kin relations)
- **Te Rōpū Kaitiaki o Ngā Tikanga Māori** (the protectors of principles of conduct in Māori research)
- **Kaupapa Māori** (Māori ideology - a philosophical doctrine, incorporating the knowledge, skills, attitudes and values of Māori society, lived experience, a Māori approach to research)
- **Te Puawaitanga o Ngā Tapuwae Kia Ora Tonu** (flourishing life and living)
- **Whakapapa** (to recite in proper order e.g. genealogies, legends, months)
- **Tikanga** (correct procedures, customs, habits, lores, methods, manners, rules, ways, codes, meanings, plans, practices, conventions)
- **Mātauranga Māori** (Māori education, knowledge, wisdom, understanding, skill, knowledge)
- **Tūrangawaewae** (domicile, land, place where people belong through kinship and whakapapa)
- **Tihei (wā) mauriora! tihei mauriora** (the sneeze of life and, the call to claim the right to speak)

In theory, Antonio Gramsci makes a distinction between civil and political society. In any civil society,[1] certain cultural forms predominate over others, just as certain ideas are more influential than others in the form of cultural leadership which Gramsci has identified as hegemony.[1]

For Māori, tāngata whenua (indigenous peoples of Aotearoa New Zealand), te reo Māori me ngā tikanga (Māori language and culture, hereafter referred to as te reo Māori), Māori ways of knowing, wisdom, and traditions which form our culture have been transferred across generations and, through the process of cultural leadership or hegemony some have changed. Nevertheless, the indigenous people hold on to the values that Māori people are intimately connected and are part of mauri (living force) that exists within the physical, social, and spiritual worlds in which Māori people live and are a part.[2]

How the quality of mauri is lived by Māori from the context of health interviews is an important aspect of this paper to establish 1) the socioeconomic and cultural profile and 2) correlates of quality of life (QOL) of Māori of advanced age.

An increasing number of Māori people are living longer. Statistics New Zealand reported that in 2012 approximately 5,000 Māori were aged 80 years and over, considered advanced age, a 50% increase in number from 2002.[3] There are few Māori in statutory surveys and even fewer older Māori, justifying a study specifically about this age group.

Since Māori people's first contact with non-Māori, the continuing process of colonisation and government policies have adversely influenced Māori people's health, socioeconomic and cultural profile, and wellbeing.

Health and socioeconomic inequalities throughout the life span are structural and are perpetuated across generations.[4,5] Yet, there is evidence that whānau (extended family), hapū (extended families), iwi (tribe) thrive in Te Ao Māori (Māori society)[6] With some Māori ageing successfully, then, questions arise around health, socioeconomic and cultural profile; how quality of life will be experienced, and how

Māori society will respond within prevailing English-speaking, New Zealand Pākehā (European) society.

Māori in advanced age have an important role in Māori whānau, hapū, and iwi and, the wider community. Often with age, their roles and responsibilities increase. In consequence of their whakapapa, role, responsibilities, and knowledge of te reo Māori some Māori in advanced age are the pou, that is the main support of their whānau and hapū.

Māori in advanced age are experienced, knowledgeable, and wise; they are influenced by the history, the diverse conditions in which they were raised, tribal aspirations, and enlistment in World War 2 to prove that Māori are citizens of New Zealand at a time of policies that marginalised and discriminated against the indigenous population.

Māori aged 80 years and over have lived their lives under policies which have discriminated against them, for example, being punished for speaking te reo Māori in school, and forced to assimilate to the ways of living of the dominant New Zealand Pākehā (European) society.[7,8]

Te reo Māori-determined factors, though, are important to health,[9] and socioeconomic and cultural profile, but exactly how and to what extent is not known. What is known, however, is that there are an increasing number of Māori people living longer.

Te puawaitanga o ngā tapuwae kia ora tonu – Life and living in advanced age: a cohort study in New Zealand (LiLACS NZ) has engaged Māori and non-Māori in a longitudinal study.[10,11]

This paper focusses on the socioeconomic and cultural profile of Māori participants aged 80 to 90 years in 2010 (baseline), and how these characteristics are related to quality of life (QOL).

Methods

LiLACS NZ recruited over 421 Māori (45% of total LiLACS NZ sample) in advanced age (aged 80–90 years in 2010).[12,13] and 516 non-Māori participants (data reported elsewhere). Enrolment of the participants used both the New Zealand Māori and General electoral rolls, local health services data bases, whakawhānaungatanga (kin relations) and active promotion of the study in all areas of the community, including marae (sacred gathering place of kin relations), and residential care facilities.

Ethical approval for this study was given by the Northern X Regional Ethics Committee NXT09/09/88. A Kaupapa Māori research methodology has been developed for the study with the creation of Te Rōpū Kaitiaki o Ngā Tikanga Māori (the protectors of principles of conduct in Māori research), the group of elders who help to guide the study, recruit Māori organisations and participants, assist in translation of the LiLACS NZ documents from English language to te reo Māori, conduct ceremonial ritual, and oversee the ongoing processes. The methodology for the study was rehearsed in a feasibility study. [12, 13]

Detailed recruitment and assessment information appears elsewhere[10,11] and is briefly summarised here. The Bay of Plenty and Rotorua regions were chosen after careful consideration of availability of older Māori, the need for a balance of rural and urban settings and the presence of strength in te reo Māori. Eligible participants were born between 1 January 1920 and 31 December 1930 and resident in the Bay of Plenty and Lakes District Health Board areas, excluding the Taupo region.

Participants were invited by a person or organisation known to them, and informed consent was obtained for each component of the study: interview, physical assessment, blood sample and access to the medical record. A family member or caregiver was invited to be present and act as a proxy if the participant was unable to answer themselves.

A comprehensive quantitative questionnaire covered health, social, cultural, environmental and economic status. The interview schedule was translated from English language to te reo Māori by a

New Zealand-registered translator and revised by Te Rōpū Kaitiaki to better suit the language and lived experience of the age group.

In this paper sociodemographic information, family contact and support, language and cultural practices are reported along with the main outcomes of functional status and QOL. Demographic information: age, gender, marital status, housing, living arrangement, main family occupation, size of family, number of children, was recorded using standardised questions.

The deprivation index (NZDep)[14] was derived from the address given at the time of the interview. Income was assessed by self-reported receipt of the NZ Superannuation (pension) and any other income. Religious affiliation was assessed by self-report and the importance of faith to wellbeing was asked with a 5 level Likert response. Social support utilised the approach from the MacArthur studies [15] (Appendix 1 – questionnaire items: social):

Questions about cultural practices were generated from discussion groups with older Māori [13] and asked about importance of hapu, iwi and tikanga to wellbeing and the effect of colonisation (Appendix cultural questions).

Further questions about cultural identity were drawn from the Te Hoa Nuku Roa scale about contact with marae, fluency and use of te reo Māori (Appendix 1).[16]

The experience of discrimination was asked using the New Zealand Health Survey[17] questions about discrimination: whether they had been a victim of physical or verbal abuse because of ethnicity less than 12 months ago, greater than 12 months ago: whether they had been treated unfairly by a health professional on the basis of ethnicity within the last 12 months and greater than 12 months ago and whether they had been treated unfairly by a services agency for renting or buying housing.

A composite code for 'ever' been discriminated against was constructed if any of these were 'yes'. Also asked was, *Have you ever been spoken down to as a Māori?*

Occupation was by self-report of the main lifetime occupation of the participant and their spouse and coded using the "New Zealand Standard Classification of Occupations 1999" from Statistics New Zealand. The highest occupational category of the participant or their spouse was used in analyses.

The Nottingham Extended Activities of Daily Living (NEADL) functional assessment tool[18] established the functional status of participants and the SF-12 quality of life (QOL).[19] The best instrument to assess quality of life for indigenous people is not known as most measures have been developed from a western dominant cultural perspective.

The SF-36[20] and the SF-12[19] are commonly used as health-related QOL measures in many cultures and in New Zealand. However the exact utility of these measures for Māori is not known, despite translation of the SF-12 to te reo Māori. The scale presents two summary scores; mental health-related QOL and physical health-related QOL. The maximum score from this instrument is 100 and any score lower that is below 40 indicates poor health and above 60 reasonable and better health.[21]

Descriptive statistics were used to show the characteristics of men and women. Chi-squared test (χ^2) was used to compare men and women.

The association between socioeconomic and cultural factors and QOL was assessed by univariate analyses (not shown) using analysis of variance, t-tests and nonparametric statistics depending on the distribution of the data. Factors significant at the 0.2 level (in the univariate models) were entered into a multiple regression model and examined to assess independence and strength of association. The model was adjusted for: gender, age, functional status and meshblock decile using the New Zealand Deprivation index (NZ Dep) related to participant address.[14] Models were adjusted for best fit. Final models are presented for outcomes of physical and mental health related to QOL. All analyses were carried out using SAS v9.2 software.[22]

Results

A total of 421 of 766 Māori eligible for recruitment agreed to be enrolled, 56% recruitment rate. All participants answered a core group of questions (shaded in the tables) and 267 (63%) completed the comprehensive interview.

Those who opted for the short interview (150, 36%) were more likely to be in residential care and/or to be incapable of answering the interview questions for

themselves (p <0.0001 for both). Four participants did not complete the study on enrolment and so 417 are included in the analysis. 91 (14%) completed the interview in te reo Māori and English and 568 (86%) in English alone. The average number of interviews to complete the comprehensive study was 1.2 (between 1 and 4, SD 0.5) and the median total interview time was 2.5 hours (IQR 2-3hours).

The average age of participants was 82.7 years and 42% were men. Table 1 provides an overview of the characteristics of the Māori cohort. More women were widowed than men (42% of men, 74% of women, χ^2=41.5 df=2 p<0.001). Just over 40% of the participants were living alone, 27% of men and 51% of women, (χ^2=17.6, df=2, p<<0.001), 70 (26%) lived with a spouse and 87 (33%) lived with others. Sixteen (6%) had no children living at the time of the survey, 82 (32%) had 1-3 living children and 160 (62%) had 4–6 surviving children, with on average 16 (SD 23) mokopuna (grandchildren). The majority 212 (81%) reported owning their home outright, 2% had a mortgage and 17% (58) lived in rented accommodation. Almost all 240 (94%) reported the NZ superannuation was their main source of income and for almost half (47%) it was their only source of income.

Table 1. Sociodemographic characteristics of Māori participants in LiLACS NZ

	Men, n (%)	Women, n (%)	Total
Total number recruited	176 (42%)	241 (58%)	417 (100%)
Completed the full questionnaire	102	155	255
Completed the partial questionnaire	75	89	164
Age, mean (SD)	82.5 (2.8)	82.8 (2.7)	82.7 (2.8)
Country of birth			
Born in New Zealand	173 (99)	239 (99)	412 (99)
Born overseas	2 (1)	2 (1)	4 (1)
Childhood family size, mean (SD) total family size	7.5 (3.9)	7.6 (4.3)	7.5 (4.1)
Sisters	3 (2.0)	3.2 (2.4)	3.1 (2.3)
Brothers	3.5 (2.7)	3.4 (2.4)	3.4 (2.5)
Sisters still living	1.3 (1.4)	1.4 (1.5)	1.3 (1.5)
Brothers still living	0.9 (1.1)	1.1 (1.4)	1 (1.3)
Marital status			
Widowed	72 (42)	176 (74)	257 (50)
Married/ partnered	80 (47)	50 (21)**	120 (32)
Never married/separated/divorced	10 (11)	13 (5)	49 (9.6)
Number of living children			
None	8 (8)	8 (5%)	16 (6)
1–3	31 (30)	51 (33%)	82 (32)
4–6	65 (63)	95 (62%)	160 (62)
Grandchildren, mean (SD)	16 (21.8)	16 (23.5)	16 (22.8)
Living arrangement			
Alone	29 (27)	81 (51)**	110 (41)
With spouse	40 (37)	30 (19)	70 (26)
With other	38 (36)	49 (31)	87 (33)
If with other person, average number in house	3.7 (2.0)	3 (1.4)	3.3 (1.7)
Type of house			
Private house	87 (84)	125 (80)	212 (81)
Unit/apartment	8 (8)	15 (10)	23 (9)
Other	8 (8)	16 (10)	24 (9)
Residential care	1 (1)	1 (1)	2 (1)
Home ownership			
Owns own home outright	118 (80)	157 (82)	275 (81)
Owns own home mortgage	3 (2)	3 (2)	6 (2)
Rent	27 (18)	31 (16)	58 (17)
Deprivation, NZDep score			

	Men, n (%)	Women, n (%)	Total
Total number recruited	176 (42%)	241 (58%)	417 (100%)
1–3 Low	5 (3)	18 (8)	23 (6)
4–7 Medium	71 (40)	79 (33)	150 (36)
8–10 High	100 (57)	144 (60)	244 (59)
Income			
Pension only	49 (48)	71 (46)	120 (47)
Other income as well as pension	53 (52)	82 (54)	135 (53)
Main occupation*			
Professionals	48 (27)	63 (26)	111 (27)
Technical	15 (9)	30 (12)	45 (11)
Non-technical, non-professional	113 (64)	148 (61)	261 (63)
Education			
Tertiary	10 (6)	27 (11)	37 (9)
Trade	5 (3)	12 (5)	17 (4)
Any secondary	99 (59)	138 (59)	237 (59)
Primary only or none	56 (33)	59 (25)	115 (28)
Religion			
Anglican	52 (53)	67 (44)	119 (47)
Catholic	18 (18)	36 (24)	54 (22)
Presbyterian	6 (6)	11 (7)	17 (7)
Methodist	2 (2)	3 (2)	5 (2)
Rātana/Paimārie	7 (7)	10 (7)	17 (7)
Ringatū	8 (8)	5 (3)	13 (5)
Destiny/ Church of the Latter Day Saints of Jesus Christ (Mormon)	2 (2)	3 (2)	5 (2)
Other	4 (4)	17 (11)	21 (8)
How important is faith to your wellbeing?			
Not at all	7 (7)	5 (3)	12 (5)
A little	10 (10)	8 (5)	18 (7)
Moderately	18 (17)	17 (11)	35 (13)
Very	44 (42)	71 (45)	115 (44)
Extremely	26 (25)	57 (36)	83 (32)
Do you have anyone to help with daily tasks?			
Yes	78 (77)	131 (85)	209 (82)
No	7 (7)	10 (6)	17 (7)
I don't need help	16 (16)	14 (9)	30 (12)
Unmet need for practical help			
Yes	24 (24)	29 (19)	53 (21)
Anyone to provide emotional support?			
Yes	82 (81)	126 (82)	208 (82)
No	5 (5)	9 (6)	14 (5)
I don't need emotional support	14 (14)	19 (12)	33 (13)
Unmet need for emotional support	17 (17)	23 (15)	40 (16)

Shading shows core questions answered by all participants (full and partial). Other questions answered by those that completed full questionnaire only. There were no gender differences in responses unless stated. ** p <0.001; *The highest of spouse and participant, Professional = Legislators, Administrators, Professionals, Agricultural and Fishery Workers (requiring tertiary qualification); technical: Technicians, Associate Professionals and Trades Workers (technical training); Clerks, Service Workers, Sales Workers, Plant/Machine Operators, Assemblers, Elementary Workers (on the job training). NEADL Nottingham Extended Activity of Daily Living Scale, higher score indicates better function.

The majority of the sample lived in areas in the highest deprivation tertiles, and half received income in addition to the pension (135 or 53%). Non-technical occupations were the most common and n=54 (13%) had qualifications beyond secondary school. Almost all reported a religion and the importance of faith to wellbeing was reported to be very/extremely important by n=145 (76%).

The majority of participants reported someone being available for practical and emotional support however up to 20% could have used more practical or emotional

help (Table 1). Those who lived alone were no more or less likely to have practical or emotional support or to report unmet need in these areas than those who lived with spouse or others.

Table 2 shows there was a similar level of fluency in te reo Māori among both Māori men and women. The majority of the participants had a moderate to in-depth understanding of te reo Māori.

Table 2. Cultural practices of Māori in advanced age (LiLACS NZ)

	Men, n (%)	Women, n (%)	Total
Total number recruited	176 (42)	241 (58)	417
Completed the full questionnaire	102	155	257
Completed the partial questionnaire	75	89	164
Do you live in the same area as your hapū?			
No	82 (47)	131 (55)	213 (51)
Yes	91 (52)	108 (45)	199 (48)
Have you ever been to a marae?			
No	3 (3)	3 (2)	6 (2)
Yes	104 (97)	157 (98)	261 (98)
Over the last 12 months, how often?			
<Yearly	17 (16)	38 (24)	55 (21)
Once	17 (16)	18 (11)	35 (13)
A few times	15 (14)	23 (14)	38 (14)
Several times, more than monthly	58 (54)	81 (51)	139 (52)
Who are your contacts?			
Mainly Māori	51 (48)	74 (47)	125 (47)
Some Māori	37 (35)	46 (29)	83 (31)
Few/no Māori	19 (18)	38 (24)	57 (22)
Can you have an everyday conversation in Māori?			
Yes	58 (54)	80 (50)	138 (52)
No	49 (46)	80 (50)	129 (48)
Where do you speak Māori?			
Don't speak it	3 (5)	3 (3)	6 (4)
On the marae	48 (84)	69 (80)	117 (82)
In my community	45 (79)	66 (76)	111 (77)
At home	42 (74)	61 (71)	103 (72)
In meetings or at work	33 (63)	37 (47)	70 (54)
Other	5 (12)	10 (15)	15 (14)
How well are you able to understand your tikanga?			
Not at all	21 (12)	22 (10)	43 (11)
A little	24 (14)	36 (16)	60 (15)
Moderately	39 (23)	53 (24)	92 (23)
Completely	87 (51)	114 (51)	201 (51)
How much has colonisation affected the way you live your life today?			
Not at all	64 (67)	93 (65)	157 (66)
A little	11 (11)	13 (9)	24 (10)
Moderately	9 (9)	22 (15)	31 (13)
Very	7 (7)	12 (8)	19 (8)
Extremely	5 (5)	3 (2)	8 (3)
Importance of hapū to your wellbeing			
Not at all	20 (12)	35 (15)	55 (14)
A little	23 (14)	26 (12)	49 (12)
Moderately	30 (18)	38 (17)	68 (17)
Very	68 (40)	84 (37)	152 (38)
Extremely	29 (17)	43 (19)	72 (18)
Importance of language and culture to wellbeing			
Not at all/ moderately	32 (30)	40 (25)	72 (27)
Very	50 (47)	78 (49)	128 (48)
Extremely	24 (23)	41 (26)	65 (25)

	Men, n (%)	Women, n (%)	Total
Total number recruited	176 (42)	241 (58)	417
Importance of family /whānau to wellbeing			
Not at all/moderately	9 (9)	4 (3)	13 (5)
Very	62 (60)	85 (55)	147 (57)
Extremely	33 (32)	66 (43)**	99 (38)
Victim of ethnic abuse verbal more than 12 months ago? Yes	8 (8)	13 (8)	21 (8)
Victim of ethnic abuse physical more than 12months ago? Yes	6 (6)	4 (3)	10 (4)
Treated unfairly by health professional more than 12 months ago? Yes	6 (6)	4 (3)	10 (4)
Discriminated against ever? – combined	23 (23)	34 (22)	57 (22)
Spoken down to as a Māori ever?	8 (8)	21 (14)	29 (12)
Do you have a specific role in your family/whānau/hapū? Yes	77 (78)	125 (81)	202 (80)
How satisfied are you with your role(s) in your family/whānau/hapū?			
Not at all/ moderately	14 (18)	13 (10)	27 (13)
Very	51 (65)	77 (61)	128 (63)
Extremely	13 (17)	36 (29)	49 (24)
Specific role in local community? Yes	39 (39)	53 (34)	92 (36)
How satisfied are you with your role(s) in your community?			
Not at all/ moderately	9 (22)	9 (16)	18 (18)
Very	29 (71)	36 (63)	65 (66)
Extremely	3 (7)	12 (21)	15 (15)
Specific role in your tribal/marae group?			
Yes	35 (38)	47 (32)	82 (34)
How satisfied are you with the role(s) in your tribal/marae activities?			
Not at all/ moderately	10 (28)	13 (24)	23 (26)
Very	19 (53)	29 (54)	48 (53)
Extremely	7 (19)	12 (22)	19 (21)
Specific role in wider Māori organisation? Yes	20 (22)	42 (28)	62 (26)
How satisfied are you with the role(s) in other Māori organisations in wider society?			
Not at all/ moderately	11 (42)	16 (35)	27 (38)
Very	12 (46)	21 (46)	33 (46)
Extremely	3 (12)	9 (20)	12 (17)
Functional status, m (SD), NEADL score	17.0 (4.3)	17.4 (4.8)	17.2 (4.6)
Physical health-related quality of life, m (SD), SF-12 score	44.9 (10.8)	42.4 (11.5)	43.4 (11.3)
Mental health-related quality of life, m (SD), SF-12 score	53 (8.8)	53.6 (8.7)	53.4 (8.7)

Shading shows partial questionnaire questions answered by all participants. Other questions answered by those that completed full questionnaire only.

m = mean, SD = standard deviation. All factors tested for gender effect and ns unless specified.

** Significance >0.001.

Te reo Māori me ngā tikanga and contact with whānau, hapū, and activities on marae—Almost all, 98% of Māori participants reported that they had been to the marae in the past 12 months and over half had been several times or more than monthly. Over half of social contacts were predominately with Māori and Māori language and culture was mostly rated as very or extremely important to wellbeing.

Women were more likely to rate whanāu as extremely important to their wellbeing (44%) compared to the men (32%, χ=10.1, df=1, p<0.001). There were no other gender differences in the cultural questions.

Those who lived in the area of their hapū were more likely to have contacts *mainly* with Māori (68%) compared with those that didn't (33% contact *mainly* with Māori, χ^2=53, df=3, p<0.001) and to be fluent in te reo Māori; (65% fluent who lived in area of hapū vs 35% fluent not living in area of hapū, χ^2=44.96 df=1, p<0.001).

A low number of participants reported discrimination; 4 and 3 participants reported being the victim of ethnic abuse verbally or physically respectively and 5 reported being treated unfairly by a health professional in the last 12 months. Reports of longer term abuse are shown in Table 2.

To see whether one form of discrimination was associated with other forms of discrimination all discrimination items were examined in a correlation matrix. Verbal attack occurring more than 12 months ago and physical attack occurring more than 12 months ago were significantly correlated (Spearman's correlation $r=0.41$, $p<0.001$) as were physical and verbal attack less than 12 m ago ($r=0.23$, $p<0.001$). A verbal attack in the last 12 months also correlated with being treated unfairly by a services agency more than 12 months ago ($r=0.41$, $p<0.001$).

Overall 57 (14%) reported ever experiencing discrimination. Comparing this group with those reporting never having experienced discrimination showed that there were no differences between the 'contacts with Māori', 'fluency of Te Reo Māori' or 'understanding of tikanga' or whether they 'lived in their Hapū area'.

Tribal diversity—Because of the diversity of Māori realities,[23] this research recognises the participants as upholding specific identities within a broader cultural setting of being Māori. Tribal affiliation was reported by the participants and there is diversity among the cohort.

The major tribes identified reflected the area of study: Ngāi Te Rangi (Tauranga), Ngāti Awa (Whakatāne), Ngāi Tuhoe (Waimana), Whakatōhea (Opotiki), Ngāti Tai (Tōrere), and Te Arawa (Rotorua). These were the main tribal affiliations but there were kin relations to other tribes across the country due to whakapapa (shared ancestry). Other tribal affiliations are shown in Appendix 2. Overall 52% were fluent in te reo Māori and 28% lived in a rural area.

Quality of life—Overall mental health-related QOL was moderately high with mean scores above 50 (Table 2). Physical health-related QOL was moderately low with a mean score of 43.3 (SD 11.3) and physical and mental health-related QOL scores did not differ significantly. Functional status was high with an average mean score of 17.2 (SD 4.6) of a possible top score of 22.

Table 3 shows the Multiple regression model examining all variables in Tables 1 and 2 and retaining those that were significant ($p<0.2$) in the univariate analyses. 'Ever' experiencing discrimination was independently associated with lower mental health-related quality of life for Māori in advanced age. Several other factors contributed to the model but were not strongly nor independently associated. Family size, frequency of visits to marae, age, gender, and education and functional status (NEADL score) were included in the model of best fit.

Better physical health-related quality of life was strongly and independently associated with both a measure of cultural practices; higher frequency of marae attendance, and a social support factor; unmet need for practical help. A report of colonisation affecting a participant's life at all showed a trend towards being associated with lower QOL. Higher functional status scores were strongly associated with higher physical health related QOL ($p<0.001$)

Table 3. Regression models identifying significant independent associations with mental and physical health-related quality of life (QOL)

Mental health-related QOL, n=241	Mean*	Adjusted**	F	P
Spent time on or visited marae				
<Yearly	55.2	52.2 (1.8)	2.47	0.09
Once	50.0	49.0 (2.0)		
A few times to >monthly	53.5	52.6 (1.5)		
Number of children				
None	53.9	50.8 (2.5)	1.54	0.22
1–3	55.4	52.5 (1.6)		
4–6	52.3	50.4 (1.4)		
Any discrimination[#]				
Yes	50.9	49.6 (1.8)	5.86	0.02
No	54.1	52.8 (1.4)		
Physical health-related QOL n=222				
Spent time on or visited marae				
<Yearly	39.8	37.6 (1.8)	3.94	0.02
Once	42.1	42.3 (1.9)		
A few times to >monthly	44.8	42.6 (1.0)		
How much has colonisation affected the way you live your life today?				
Not at all	44.5	42.2 (1.3)	3.59	0.06
A little to extremely	41.2	39.4 (1.4)		
Any discrimination				
Yes	45.4	42.1 (1.6)	2.61	0.11
No	42.9	39.5 (1.1)		
Unmet need: practical help				
Yes	38.0	38.2 (1.6)	8.91	0.003
No	44.8	43.4 (1.3)		
Unmet need: emotional support				
Yes	38.7	39.6 (1.8)	1.61	0.21
No	44.3	42.0 (1.2)		
Functional status (NEADL)			46.25	<0.0001

QOL = quality of life. Analysis was generalised linear regression model with all variables in the Table entered and controlling for NZDep, age, gender, education level and NEADL Nottingham Extended Activities of Daily Living. Only those with near statistically or highly statistically significant associations are shown in the table,

*Observed mean score, ** mean score adjusted for all other variables (standard deviation)

[#] Discrimination small number of respondents.

Discussion

LiLACS NZ is a population-based cohort study and is reported in this paper from a predominantly Māori world view. The descriptive data is valuable as little was known about the population group.

Generally older Māori health data has been presented as just one group, those aged 65 years or more.[24] The main sociocultural correlates of QOL of Māori aged 80-90 years in the Bay of Plenty and Rotorua region include: frequency of marae visits; experience of discrimination; a measure of unmet need; and functional ability. This is quantitative evidence of the importance of te reo Māori me nga tikanga to QOL and mirrors qualitative studies reporting the sustaining nature of cultural activities for Māori wellbeing.[6]

The LiLACS NZ findings support Waldon's work[9] where he found a significant association between cultural activities and wellbeing in Iwi from the Taranaki and Whanganui regions.

Mental health-related QOL is high and overall level of function and independence is good. Physical health related QOL is lower than the average population but is good when considering the age of the participants and similar to other studies of very old people.[25] Studies of indigenous people are rare and there are none to compare with this study.

The majority of the Māori participants are engaged with other Māori, have high levels of knowledge of te reo Māori and visit marae several times a year. These older Māori live in areas of high deprivation, similar to Māori of all ages.[26] The regression shows that it is the te reo Māori me nga tikanga that is significantly associated with physical health related QOL, rather than socioeconomic deprivation (NZDep not significant).

Frequency of visits to the tribal marae can be considered as proxy for engagement in the cultural activities through the marae. The marae is a sacred place of meeting where many different tribal and whānau functions are undertaken, but most importantly the marae is a place of belonging and connection through shared ancestry and tribal relationships.

Frequent participation on their marae supports the participants' upbringing, their knowledge of tikanga Māori and ability to speak te reo Māori on a daily basis. The Māori participants, however, were not isolated from non-Māori and they had contact with them as well in their community.

The perceived impact of colonisation also contributes to the physical health related QOL meaning this is a relevant concept for Māori in advanced age. Functional status is independently related to QOL as in other groups of older people,[27] emphasising the contribution of physical function to wellbeing.

The Māori participants in this study are a significant repository of te reo Māori and mātauranga Māori (Māori knowledge) as found by Murchie amongst older Māori women in a survey conducted in the 1980s.[28] The level of te reo Māori fluency among the LiLACS NZ participants was high with 52% using te reo Māori for everyday conversation, compared with on average 27% of Māori adults in New Zealand speaking the language at least fairly well.[29]

Discrimination—There were a small number of Māori participants that reported discrimination directly related to their ethnicity. This discrimination was harmful in that it was independently related to lower mental health-related QOL. This was the only strong association with mental health-related QOL, and no other economic or social variables were independently related to mental wellbeing. It is very likely this age group experienced significant discrimination during the 20th and 21st century when discriminatory policies were and are in place.[8]

Institutionalised racism is acknowledged and exists within our health and disability system[30–32] and is a factor that contributes to health inequalities and poorer health outcomes.[5,31] This matter needs to be addressed by those in senior decision-making positions and the education and ongoing training and development of all health and related occupations revisited.[33]

Ethnic density is hypothesised to protect against discrimination and promote health.[34] The current study did not find an association between contacts with Māori, living in

the area of their hapū and reports of discrimination suggesting that in this sample ethnic density did not protect them from the adverse effects of discrimination.

The New Zealand General Health Survey suggests 1 in 10 New Zealanders felt discrimination in the past 12 months and 3% of those over 65 years reported discrimination.[35] It is possible that there may be other ways to word questions to access information about the impact of discrimination that may be more meaningful for older Māori.[36]

Social support and unmet need—In this study, many more Māori women lived alone compared with men, who are much more likely to be married. Marriage and kinship provides protection from mortality,[37, 38] thus Māori women may be at risk.

Living arrangement was not independently related to QOL supporting research suggesting that close social ties and collective support may be potentially available within groups of indigenous peoples' whether cohabiting or not.[39,40] It is possible, therefore, that living alone is not as arduous for Māori as it is for other groups,[38] and LiLACS NZ follow up will examine this. In the regression family size trended towards being important to mental wellbeing, however the relationship was non-linear with modest numbers of surviving children being associated with higher mental wellbeing.

Social support is confirmed as being key to wellbeing[41] by our finding that the reporting of unmet need in practical support and to some degree in emotional support is related to lower health-related QOL. Unmet need is reasonably easy to ask about and has been identified and examined previously for Māori.[42]

Identifying this unmet need could enable whānau, support persons, health professionals and regional health bodies to potentially benefit QOL. QOL maintenance and on-going development of old and new social contacts are part of the matrix of maintaining wellness and quality of life.[43]

Strengths and limitations—This study provides the first detailed knowledge of how cultural social, economic and health determinants interact within a large number of Māori in advanced age drawn from the population base. The support of Te Rōpu Kaitiaki in engagement, translation, and interpretation of the study reinforces its validity.

The number of iwi participating in this project was large with at least a few people from all over the North, South and Chatham Islands. A limitation is the participation of 56% of those eligible and, of them, 60% who completed the full interview. This is to be expected in conducting research with people in advanced age,[44] and is similar success to other international studies.[25] It is also likely that mistrust of research,[45] researchers, and the university, affected participation rate. The study results also will be specific to the region from which the participants were drawn.

Analyses reported here are cross sectional and as such no causality can be implied. Unmeasured confounding factors (e.g. health status) may also be important as the mix of factors associated with QOL is large. Ongoing research will continue to examine these complex relationships over time.

The use of the SF-12 can also be questioned for Māori as health has a broader perspective for Māori.[46] Thus the associations identified here are related to the

western concept of health and it is possible that different cultural and social factors would be related to mātauranga Māori. The standard questionnaires were not back translated from te reo Māori to English but our local interviewers are fluent and able to converse in te reo with our participants. Indigenous specific measures need to be developed by indigenous peoples.

Summary—LILACS NZ confirms the independent significance of te reo Māori me ngā tikanga to wellbeing and quality of life for Māori in their eighties. Social support, particularly the identification of the need for more available help is also important to quality of life and experience of discrimination is associated with lower mental wellbeing.

Competing interests: Nil.

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Appendix 1. Interview questions used in the LiLACS NZ interviews

Social questions:

- When you need extra help, can you count on anyone to help with daily tasks like grocery shopping, cooking, house cleaning, telephoning, giving you a ride?
- In the last year who has been the most helpful with these daily tasks?
- Could you have used more help with daily tasks than you received? (unmet need)
- Can you count on anyone to provide you with emotional support?
- In the last year who has been most helpful in providing you with emotional support?
- Could you have used more emotional support than you received? (unmet need)

Cultural questions generated by focus groups with older Māori[13] (see article's ref. list)

- Do you live in the same area as your hapū /extended family / where you come from?
- How important is your hapū to your wellbeing?
- How important is your iwi to your wellbeing?
- How well do you understand your tikanga?
- How much has colonisation affected the way you live your life today?
- Do you have a specific role in a) your family/whānau/hapū, b) your local community/neighbourhood, c) your tribal/marae activities and d) other Māori organisations in wider society?
- How satisfied are you with the role(s)?

The importance of: hapū and iwi; te reo Māori; whānau and family to participant's wellbeing was asked with 5-level Likert responses

The concept of tikanga was not defined but assumed understood by participants as knowledge, values, beliefs and protocols in being Māori which may be used on a daily basis or when required.

Cultural questions drawn from the te hoa nuku roa scale[16]

- How often over the last 12 months have you been to a Marae?
- In general, would you say that your contacts are with: mainly Māori, some Māori few Māori, no Māori?
- Could you have a conversation about a lot of everyday things in Māori?
- Where do you speak Māori/other language? – response menus including; On the marae, in my community, at home, in meetings or at work, other.

Appendix 2. Tribal affiliations

Other tribal affiliations listed by participants included:

Ngāpuhi (13), Ngāti Whakaue (Te Arawa) (29), Ngāti Pikiao (Te Arawa) (15), Ngāti Rangiwewehi (Te Arawa) (6), Ngāti Kahungunu (13), Ngāti Pūkenga (5), Ngāiterangi (21), Ngāi Tai (10), Ngāti Pōrou (20), Ngāti Tūwharetoa or Ngāti Ranginui or Ngāti Manawa (19), Ngāti Awa (25), Te Tai Tokerau Region (22), Waikato Tainui (34), Taranaki Region (12), Tauranga Moana/Mātaatua Region (117),Te Arawa including: Ngāti Rangiteaorere (1), Ngāti Rangitihi (3), Tarāwhai(1), Tapuika (5), Uenuku-Kōpako (1), Waitaha (4), Ngāti Tahu (1), Te Arawa/Taupō Region (70), Te Tai Rāwhiti Region (25), Te Waipounamu/Wharekauri Region (11), Tūhoe (21), Tūhourangi (Te Arawa) (10), Whakatōhea (12), Te Whānau-ā-Apanui (22), Whanganui/Rangitīkei Region or Manawatū/Horowhenua/Te Whanganui-ā-Tara Region or Ngāi Tahu/Kāi Tahu (19).

(The numbers do not add to the overall total as many nominated more than one iwi)

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Botulinum toxin versus botulinum toxin with low-dose glyceryltrinitrate for healing of chronic anal fissure: a prospective, randomised trial

Muhammad Asim, Neil Lowrie, Joanna Stewart, Simi Lolohea, Ralph Van Dalen

This study was presented at the NZAGS (New Zealand Association of General Surgeons) Annual Meeting at Hamilton, New Zealand on 24 March 2013.

Abstract

Background Chronic anal fissure (CAF) is perpetuated by high sphincter pressures and secondary local ischemia. Pharmacological approaches include topical nitrates and botulinum toxin (BT), which both help to decrease the sphincter pressure.

Aims & Objectives The aims of the present study were to assess the efficacy and safety of BT injection and combined treatment with BT injection and lowered dose glyceryltrinitrate (GTN) cream for the treatment of CAF. We hypothesised that combined treatment would have a synergistic effect on healing.

Methods Forty-one consecutive patients with CAF were randomly assigned to receive one of the following treatments: Group A, injection of BT (20 U into internal anal sphincter) and Group B, BT injection (20 units) and subsequent thrice daily topical applications of half-dose 0.2% GTN cream for 6 weeks. Patients were followed up at 6 and 12 weeks and were assessed for healing of anal fissure, by means of visual inspection using fissure grades; for faecal incontinence, using Cleveland Clinic incontinence scores; and for fissure pain & headache using a numeric pain rating scale.

Results Fissure healing was similar in the two groups at both 6 (30% in BT and GTN and 33% in BT only) and 12 weeks (50% in BT and GTN vs 57% in BT-only group). Neither the change in pain score from 6 to 12 weeks, nor the overall level of pain was significantly different in the 2 groups. Moderate or severe headaches were suffered by 58% of patients using GTN.

Conclusion Single-agent treatment by means of BT injection alone was well tolerated compared with combination treatment with BT injection and GTN cream, with no significant differences in healing of CAF observed in this small study.

Anal fissure is one of the most common benign anorectal conditions, which may result from high anal sphincter pressure, especially high internal anal sphincter (IAS) pressure. The goals of therapy are to break the cycle of sphincter spasm and tearing of anal mucosa & to promote healing of fissure.

Medical therapy is successful in the majority of patients with surgery reserved for refractory cases.[1] Acute anal fissure usually heals spontaneously or with conservative treatment within 6 weeks, whereas chronic anal fissure is more intractable and is unlikely to heal with conventional conservative management.[2]

Surgery by means of lateral internal sphincterotomy (LIS) carries the risk of permanent faecal incontinence. The risk has varied among reports from as low as 0 to as high as 24 percent.[3] In-vitro and in-vivo studies in animals have established that nitric oxide (NO) is probably the most important inhibitory neurotransmitter in IAS.[4]

Glyceryltrinitrate (GTN) cream applied locally to the anus has been shown to cause lowering of IAS pressure in healthy subjects and to promote healing of anal fissures.[5]

Another non-surgical agent for treatment for anal fissure is botulinum toxin (BT; 'botox') which decreases the anal pressure by preventing release of acetylcholine from presynaptic nerve terminals. Maria et a*l* reported 73% healing for anal fissure after single application of BT injection.[6]

There is only one study previously by Lysy et al looking at the synergistic effect of BT and topical nitrates (isosorbide dinitrate) for healing of chronic anal fissure, which showed significantly higher healing, 66%, in the combined treatment group compared to BT alone, 20%.[7]

Scholefield et al conducted a dose finding study with different strengths of GTN for chronic anal fissure and found that 0.1% GTN cream has a higher healing rate compared to 0.2% cream, with a smaller percentage of patients reporting headaches: 18% versus 36% with 0.2% GTN cream.[8]

The aims of the present study were to assess the efficacy & safety of BT injection and combined treatment with BT injection and lowered dose 0.2% GTN cream for the treatment of CAF (equivalent to 0.1% GTN if used in half the recommended dose).

We hypothesised that combined treatment would have a synergistic effect on healing and lowered dose GTN would help with patient compliance as GTN application is associated with severe headaches in some patients.[9]

Patients and Methods

Forty-one consecutive patients with chronic anal fissure (CAF) from the Waikato region of New Zealand, with ages ranging from 18–80 years, were recruited to participate in a study over the period of 21 months from March 2010 to December 2011.

Exclusion criteria were; previous surgical treatment for anal fissure, pregnancy (current or planned in next 6 months) and lactation, inflammatory bowel disease, rectal or anal malignancy, unable to self-administer medications, unable to complete necessary trial documentation or unable to attend necessary clinical follow-up, any history of unexplained syncope or orthostatic hypotension, history of faecal incontinence, tuberculosis, HIV/AIDS, syphilis, perianal sepsis or fistulas, immunosuppressant and use of sildenafil or other nitrate preparations for ischaemic heart disease (IHD).

After initial assessment and informed consent, patients were randomly assigned into two groups (using computer-generated randomisation codes):

- **Group A:** Botox (BT) only group.
- **Group B:** Botox plus low-dose GTN group.

Patient allocation was concealed and study was unblinded. Group A participants were given an injection of 20 units of Botulinum toxin type-A (Botox®, Allergan New Zealand Ltd) using 25G needle into the internal sphincter at 3 and 9 o'clock positions (10 units on each side) while in the left lateral position by a single colorectal surgeon (internal anal sphincter was felt with gloved finger, no EMG guidance used).

Group B were given BT injection and were also prescribed 0.2% GTN cream (Rectogesic) to use in half the recommended dose (0.5cm), to be applied topically thrice daily around the fissure area using

an applicator for 6 weeks. Patients were evaluated at 6 and 12 weeks in a fissure clinic using a standardised questionnaire.

The study questionnaire included age, sex, ethnicity and BMI. Fissure pain and headache severity were recorded using a numeric pain scale with range of 0-10 with zero being no pain and 10 as worst pain. Headaches were categorised as mild (1–3), moderate (4–7), and severe (8 and higher).

Absence or presence of per-rectal bleeding with fissure was also recorded. Flatus and faecal incontinence was graded using the Cleveland clinic incontinence score.[10]

Fissure healing was assessed by visual inspection of the fissure area using fissure grades 0-4 (grade 0 = healed, grade 1 = fissure with exposed internal anal sphincter (IAS), grade 2 = deeper fibres with widely exposed IAS, Grade 3 = deep undermined fissure, Grade 4 = associated perianal fistula).[11] Patient compliance with GTN cream was assessed based on detailed history on first follow up visit.

This study was approved by northern Y – Regional Ethics Committee, New Zealand and was registered with Australian New Zealand Clinical Trials Registry (ANZCTR) with registration number: *ACTRN12613000254796*.

Statistical analysis—Based on previous study[7] we hypothesised that the BT and GTN group would have 30% higher healing rate compared with BT alone. We aimed to recruit 80 patients over 1 year. (based on power calculation). To detect a 30% difference in healing between BT and GTN versus BT-alone group we require over 38 subjects per group with 80% power to detect a real different, at the 5% level of significance. By the end of 21 months we were not able to recruit more than 50 patients into our study and based on analysis done at that point showing no difference, we decided to close the study.

As only one patient reported headaches at 12 weeks the difference in headache in the two treatment groups was only examined at 6 weeks. To look at the difference in the occurrence of headache in the two groups at 6 weeks a logistic regression was run with headache or not as the outcome and headache scores at baseline and group as explanatory variables.

To investigate whether there was a difference in the fissure pain in the two groups, a generalised linear mixed model was fitted with pain, categorised as none, 1–5 or 6–10 as the ordinal outcome and pain at baseline, group, time and the group time interaction as explanatory variables. Subject was included as a random effect to allow for the within person correlation. All subjects with data recorded after baselines were included in the analysis.

A sensitivity analysis was run to investigate whether the results of differences in change in fissure pain were influenced by those not completing the study (needing intervention before study completion). A Mann Whitney U test was performed, including all subjects enrolled into the study, using their last recorded fissure pain score.

For those who completed the study this was their 12-week follow-up measure but for those who withdrew during the first 6 weeks for extra intervention it was the score recorded before this extra intervention. For 2 subjects who withdrew early there were no measures taken post baseline so their baseline measure was used.

Results

Forty-one consecutive patients with CAF were recruited into the study over a 21 months period and were randomly assigned to group A (BT alone,) 21 patients, and Group B (BT & GTN), 20 patients. Patient demographics are shown in Table 1.

Table 1. Patient demographics

Variables	Group-A (BT alone)	Group-B (BT & GTN)
Age mean (SD*) (range)	41 (14) ,(18–70)	42 (13) (21–80)
BMI** mean (SD)	28 (6)	27 (6)
Sex	5 male, 16 female	11 male, 9 female

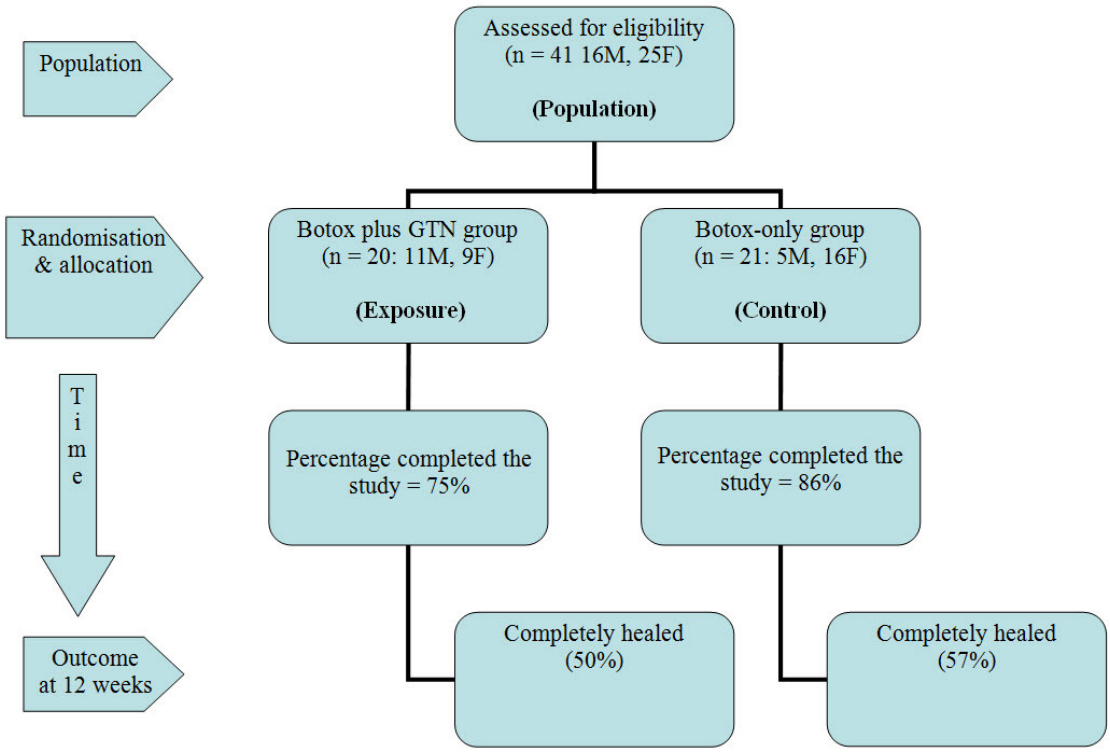
*Standard deviation; **Body mass index; BT=Botox (botulinum toxin); GTN= glyceryltrinitrate.

Three patients (14%) from group A did not complete the study; one had surgery at 6 weeks due to severe symptoms and two had repeat BT injections before 6 weeks for severe symptoms. All had data recorded immediately before surgery or injection which was included as their 6-week measure.

Five patients (25%) from Group B did not complete; one had surgery due to severe symptoms at 4 weeks, one could not tolerate GTN and didn't come for follow up, 3 had repeat BT injections for severe symptoms before 6 weeks. There was no data recorded after baseline for the subject who could not tolerate GTN or for one of those requiring a further injection.

The difference in withdrawal rate in the 2 groups was not statistically significant (p=0.39) Eighteen patients in Group A and 15 patients in Group B completed the study (Figure 1).

Figure 1. Anal fissure study flow diagram



Fissure pain—A difference in the change in pain from 6 to 12 weeks in the 2 treatment groups could not be shown (p=.44). The interaction was therefore removed from the analysis. No difference in the pain post treatment in the 2 groups could be shown (p=0.75) (Table 2). This result was not altered when the influence of non-completion was investigated by comparison of the subjects last recorded measure in the 2 groups (p=0.41).

Table 2. Median (interquartile range) fissure pain scores after botox alone and botox & GTN

	Group A (BT alone)	Group B (BT & GTN)
Baseline	7 (6–8)	6 (5–8)
6 weeks	2 (0–5)	3.5 (0–6)
12 weeks	0 (0–5)	0 (0–2)

Fissure healing—Fissure healing was similar in both groups at 6 weeks, 30% , 95% CI 12–54% (6 patients) in BT & GTN group (assuming the 2 the patients who withdrew without 6 week data were unhealed) compared to 33% 95% CI 15–57% (7 patients) in BT only group.

Fissure healing amongst those completing the study was the same in two groups at 12 weeks, with 10 completely healed at 12 weeks out of 15 in BT and GTN group (67%, 95%CI 38–88%), compared to 12 patients completely healed out of 18 in BT only group (67%, 95% CI 41–87%). Including those who withdrew from the study as failures these percentages would be 57% healed in group A and 50% in group B

Fissure severity/grades—In the BT alone group, of the 18 patients who completed the study 14 patients had grade I fissure, 3 had grade II and 1 had grade III fissure at the start of study. At 12 weeks 12 patients were healed completely with fissure grade down to zero and the 6 unhealed patients had only grade I fissure. Of the patients who had grade II and III fissures at baseline only one remained unhealed at 12 weeks with fissure grade reduced to grade I.

In the BT plus GTN group 13 patients out of 15 patients who completed the study had grade-I fissure, one patient each had grade II and grade III fissures at the start of the study. 10 patients were completely healed at 12 weeks with fissure grade down to zero and the remaining 5 patients had only grade I fissure which remained unhealed, including the 2 patients with grade II and III at baseline.

Headache with GTN therapy—There was evidence of a difference in the presence of headache in the two groups at 6 weeks (p=0.03) with those in the GTN group more likely to have a headache.

Four patients in the GTN group had severe headache while 7 reported moderate, 4 mild and 4 no headache. This was not recorded for 1 patient. Only one of those in the Botox only group reported headaches at 6 weeks (severe) and they also reported severe headache at baseline. Overall 79% of patients receiving lowered dose GTN treatment reported headache at 6 weeks with 58% reporting moderate or severe headache and 63% reporting a more severe score than reported at baseline.

Faecal/flatus incontinence—Only three patients in the BT-alone group had temporary incontinence at 6 weeks with CCIS of 1, 3 and 7 (all mild). None of the patients in the BT plus GTN group reported incontinence at any point of time. A statistically significant difference could not be demonstrated (p=0.1)

Discussion

Both BT and topical nitrates work by different mechanisms. One previous study by Lysy et al. investigated the combined effect of BT and Isosorbide dinitrate (ID) on healing of chronic anal fissure. They found that combined treatment had a higher healing rate than BT alone at 6 weeks. They then crossed the patients from BT alone to receive ID and both had similar healing rates at 12 weeks.[7]

In our study we used glyceryltrinitrate (GTN) instead of ID and used it in half the recommended dose to decrease the headaches associated with treatment.[12] Healing on visual inspection of fissure area was similar in both groups at both 6 weeks and 12 weeks. Also no difference in pain scores in the two groups could be shown, with the median pain score similar at 6 weeks and the same at 12 weeks in those that completed the study.

Although more subjects in the group receiving GTN withdrew from the study because of severity of symptoms this difference could not be shown to be likely to represent a real difference and their withdrawal did not appear to have an important influence on the difference in fissure pain or healing in the 2 groups. Fissure healing with BT in our study was comparable with results from Lysy et al.[7]

Patients who received combined treatment were expected to have more transient faecal incontinence as both BT and GTN relax the anal sphincter but none of the patients using GTN suffered from transient faecal incontinence in our sample. In regards to headaches, in those using GTN; 79% reported suffering from headaches, 63% of greater severity than at baseline with 21% reporting severe headache including one patient in the GTN group who dropped out because of severe headaches. Altomore et al reported a 23% headache rate associated with GTN treatment.[12]

We conclude that single agent treatment by means of BT injection alone is well tolerated and has a similar response rate to those treated with a combined treatment of BT injection and GTN cream.

We found no significant side effects in those treated with BT alone while even with lowered dose of GTN, about three-quarters of the patients experienced headaches in the combined BT injection and GTN cream treatment group. We measured the patient compliance with GTN cream based on detailed patient history only; this may a possible limitation as patients getting severe headaches with GTN may have not used the cream regularly. Using GTN placebo control would have been an ideal to compare two groups. Mild temporary incontinence in BT alone group was not clinically important.

Twenty percent of the patients in our study dropped out due to severe symptoms and ended up getting surgery or a repeat BT injection. Although we found no indication of a synergistic effect on healing of anal fissures by combining BT and topical nitrates, our study was small so such an effect should not be ruled out without a larger study to confirm or otherwise the validity of our results.

Competing interests: Nil.

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Attitudes towards smokefree campus policies in New Zealand

Louise Marsh, Lindsay A Robertson, Claire Cameron

Abstract

Aim This study examines the level of support for a completely smokefree campus policy and other smokefree policy initiatives amongst staff and students at a New Zealand University.

Methods Attitudes to smoking on campus, smokefree campus policies, implementation and enforcement of smokefree policies were assessed using an online survey of 332 staff and 268 students; giving a response rate of 51% from staff and 41% from students.

Results Most participants had never smoked, or were past smokers; few reported being current smokers. Participants agreed that exposure to second-hand smoke is harmful, disliked being exposed to second-hand smoke on campus, and felt the university should promote a healthy work and study environment. Results indicated strong support for smokefree policies, and participants made several recommendations regarding smokefree policies. Most disagreed that compliance with a smokefree policy should be voluntary, but felt that campus security should warn people who breach the policy.

Conclusions These results provide a sound basis for university administrators to implement smokefree policies. While around half of the tertiary education institutions in New Zealand already have a completely smokefree campus policy, greater adoption of this policy by tertiary education institutions would foster realisation of the government's goal that New Zealand become a smokefree nation by 2025.

A potential barrier preventing tertiary education institutions working towards a smokefree campus is a perceived risk of opposition from staff and students. Our study found strong support for smokefree campus policies; these findings should encourage other universities, polytechnics and other tertiary education providers to adopt full campus smokefree policies.

Education institutions provide an ideal setting for tobacco control initiatives. In 2010, approximately 506,000 students were enrolled in tertiary education in New Zealand (NZ), and around 28,000 full-time equivalent staff were employed by tertiary education institutions.[1]

Data on the prevalence of smoking amongst university students is relatively scarce. A 2002 survey suggested that 10% of university students in NZ were daily smokers, whilst a further 10% smoked occasionally.[2] Preliminary findings from new research found that the rate of daily smoking among tertiary students in NZ has dropped to

3%, while occasional smoking has increased to 14%.[3] No data on smoking among university staff members could be found.

Despite the relatively low prevalence of smoking amongst tertiary students, there are several reasons why tobacco control strategies should be a focus within the tertiary education sector.

Firstly, for young people the time spent attending tertiary education is a period of transition when behaviours such as smoking become established.[4] This is also a time when experimentation may shift to nicotine addiction.[5] For example, a recent Australian study found that older tertiary students (i.e. aged 20-25 years) were nearly twice as likely to be current smokers compared to younger students (i.e. 17 -19 year olds).[6] Equally important though, this transitional period is also a time where many young people who already smoke may decide to quit.[7]

Secondly, it has been argued that tobacco control strategies in tertiary education are important to maintain the decline in smoking.[6]

Lastly, evidence suggests that people who work in environments with greater restrictions on smoking have a lower smoking prevalence and consume less tobacco, than individuals who work in environments with fewer smoking restrictions.[8]

This evidence suggests smokefree environments encourage smokers to reduce their tobacco consumption or to quit smoking.[8] Smokefree tertiary institutions will likely bring important benefits to staff as well as students.

Six years ago, almost half of the tertiary education institutions in NZ (45%) had a policy prohibiting smoking in all outdoor campus areas.[9] While this is encouraging, wider adoption of smokefree campus policies may denormalise smoking and help achieve New Zealand's goal of becoming a smokefree nation by 2025.[10]

Little is known about the enabling factors affecting the development of smokefree policies at tertiary education institutions in NZ, or the challenges associated with implementing these policies. One likely enabling factor is a high level of support for a smokefree policy amongst the staff and students. In the US, research at colleges has shown that students and staff generally support policies restricting smoking.[11-13] However, students are less supportive of campus-wide smoking bans.[11]

There are currently no data regarding the level of support for smokefree policies at tertiary education institutions in NZ. Student and staff opposition may be a perceived barrier deterring wider adoption of comprehensive smokefree policies. This study aimed to examine the level of support for a total smokefree campus policy and other smokefree policy initiatives, amongst NZ university staff and students.

Methods

Sample

The study sample consisted of 650 staff and 650 students based at the Dunedin campus of the University of Otago. Participants were randomly selected from the Human Resources and student enrolment databases, respectively. An equal sample size was used to enable comparisons between students and staff members.

A sample size of 650 was chosen to allow for non-response and retain sufficient power to detect differences between staff and student responses. The University of Otago is the third largest of eight universities in NZ.

The university employs 3750 full-time equivalent (FTE) staff members, and has around 19,500 students.[14] Currently, the University of Otago Dunedin campus has a partial smokefree policy. This includes a mix of legislative and internal regulation which restricts smoking in any building or vehicle, and within a 6m radius of any building.

All Dunedin-based students enrolled at the university were eligible to participate in the survey. Groups of staff identified by the Human Resource Division as unlikely to spend a significant amount of time on campus were excluded; these groups included staff employed in hospitals and schools.

Ethical approval to conduct the study was granted by the Ethics Committee within the Department of Preventive and Social Medicine at the University of Otago.

Survey development

Research literature on smokefree policies in tertiary institutions was consulted to inform the general content of the survey.[9,11–13,15–19] The online survey was administered using Qualtrics survey software (www.qualtrics.com).

Items were a combination of multiple choice, sliding scale and free-text questions. The initial survey was pre-tested with non-participating university staff (n=5) and students (n=5). These people were invited to complete the survey and then asked questions regarding the length, format, language, terminology, flow and suitability of the survey.

Minor adjustments were made to the format and wording of the final survey, for example, colour was added to the survey text, a 'back' button allowing participants to change their answers, and a question assessing support for a partially smokefree campus policy was removed. The final survey included 18 questions, some of which included sub-questions, and took the participants an average of 12 minutes to complete. Participants could skip questions they chose not to answer.

Survey measures

Attitudes to smoking on campus—Using a 4-point scale (strongly agree-strongly disagree), respondents were asked to rate: the extent to which they believed exposure to second-hand smoke (SHS) was harmful; their level of concern about being exposed to SHS on campus; about smoking amongst staff and students, and whether they believed the university should promote a healthy work and study environment.

These questions were modified from those used in previous research in the US.[11] Questions relating to banning tobacco marketing on campus were omitted since these prohibitions are already in place in NZ. Other questions were re-worded slightly to render them more personal to the participant (e.g. "Exposure to second-hand smoke is harmful *to me*"). The term "smokefree" was used whereas much of the US literature refers to tobacco-free campuses, given the higher prevalence of smokeless tobacco product use in the US.

Attitudes to smokefree campus policies—A probability scale based loosely on the Juster Scale[20] was used to measure attitudes to smokefree campus policies. The Juster Scale was originally designed to predict future purchasing behaviour through an 11 point scale,[20] but has also been used in social research to estimate support for policy interventions and non-commercial behaviour, including projected cessation following the introduction of plain packaging and responses to retail policies.[21, 22]

Probability scales such as this focus on aggregate behaviour rather than individual estimates. The key benefit of these scales is that they allow for population level measures to be estimated.

Respondents were asked to indicate their support for the following university policies:

i) a completely smokefree campus (i.e. no smoking on any university grounds),[16]

ii) not having tobacco products available for purchase on campus,[12, 16] and

iii) not accepting research funding from the tobacco industry for research or other purposes.[16]

They were also asked to rate the likelihood of various outcomes if a smokefree campus policy was introduced.[17] Overall mean scores were calculated to estimate support for the measures tested.

Implementation and enforcement strategies—Respondents reviewed smokefree implementation strategies and indicated those they believed would be effective. They also indicated the extent to which they agreed or disagreed with a range of potential enforcement strategies using the 4-point scale described above (strongly agree-strongly disagree). Response options were developed based on

previous research in the US.[17, 23] Respondents could also outline any suggestions regarding the implementation and enforcement of a smokefree policy, and could note any concerns they had about a completely smokefree campus policy.

Smoking status and smoking behaviour—Respondents were asked 'Which of the following best describes your use of cigarettes', with the following response options: 'Never smoked cigarettes at all, or never smoked regularly', 'Do not smoke now but used to smoke regularly, 1+ cigarettes a day', 'Occasionally smoke, on average, less than 1 cigarette per day', and 'Currently smoke cigarettes regularly, 1+ per day'.[2]

Among young adults, non-daily smoking is common, and includes social smoking, where smoking occurs only or mainly in social situations.[24] To identify established and social smokers, current smokers were asked to indicate whether they tended to smoke alone, with others, or equally alone and with others.[25]

Research has also shown that self-identified social smokers may be a high risk group of young people and pose challenges for cessation,[25] therefore, current smokers were asked about quitting smoking.

Specifically, they indicated whether they had made a quit attempt in the past 12 months, and their chances of quitting smoking during the next 6 months using the same 11-point scale described above. They were also asked which university smoking cessation services they would be likely to use, with the list of response options replicated from a study of student health centres at American colleges.[13]

Respondents also provided demographic information, including age, gender and ethnicity.

Procedure—In October 2012, students received an email from the Student Services Division inviting them to participate in an online survey about smoking and smokefree initiatives at the University.

The email contained an electronic link to the survey, and offered the chance to win an iPad as an incentive. For staff, the survey link was disseminated using Qualtrics online software and the chance to win a book voucher was offered as an incentive. Respondents were informed that survey data would be completely anonymous.

Ten days after the initial email, a reminder email was sent to encourage non-responders to complete the survey; a second reminder was sent ten days after the first.

Data analysis—Descriptive statistics are provided for all variables, including both sample characteristics and key measures. The standard test for assessing the difference between two proportions was used to compare responses from staff and students.

Differences between staff and student responses on the Juster scale were examined using a two-sample t-test. All statistical analyses were performed using Stata 10.1.[26] All significance tests were two-sided, with $p<0.05$ considered statistically significant. Responses to open ended questions were analysed to identify key themes.

Results

Response—One-half (n=332) of staff participated in the survey giving a response rate of 51%, and 268 students completed the survey; a response rate of 41%. Table 1 contains details of respondents' characteristics and compares these with the total staff population at the university and student sample population.

Overall, the sample was representative of staff and students at the university. There was a higher proportion of female participants, which was representative of the staff population at the university and the student sample population.

In terms of ethnicity, the sample was also representative with the exception that there were a slightly higher proportion of Maori participants in the student sample. The student and staff population smoking rate was unknown and could not be compared with our sample.

Table 1. Characteristics of student and staff sample and population

Variables	Staff sample (n=332)		Dunedin staff population (n=4710)		Student sample (n=268)		Student sample population (n=650)	
	n	%	n	%	n	%	n	%
Sex								
Male	132	42.0	1928	40.9	96	38.7	283	43.5
Female	182	58.0	2782	59.1	152	61.3	367	56.5
Age								
Mean (years)	45.4		43.3		22.8		23.0	
Ethnicity**								
NZ European	253	76.9	2450	77.4	183	65.1	377	58.0*
Maori	15	4.6	77	2.4	25	8.9	47	7.2
Pacific	1	0.3	20	0.6	8	2.8	13	2.0
Chinese	8	2.4	43	1.4	16	5.7	42	6.5
Other***	52	15.8	576	18.2	49	17.4	171	26.3
Occupation								
Staff/staff only	283	89.8			230	92.7		
Staff and student	32	10.2			18	7.3		
Academic	128	40.9	1707	36.2	–	–		
General	185	59.1	3003	63.8	–	–		
Division****								
Commerce	23	7.5	207	4.4	32	14.0	121	18.0
Health Sciences	116	38.0	1458	31.0	57	24.9	106	15.8
Humanities	35	11.5	570	12.1	57	24.9	198	29.4
Sciences	57	18.7	758	16.1	83	36.2	248	36.8
Human Resources	4	1.3	115	2.4	–	–		
Operations	39	12.8	975	20.7	–	–		
Research	7	2.3	70	1.5	–	–		
Academic	24	7.9	557	11.8	–	–		
International student	–	–	–	–	30	12.1	99	15.2

* Significant difference between sample and population ($p<0.05$)

** Multiple answer (up to three ethnicities). For staff, casual staff excluded; information available for 67% of staff (n=3166)

***i.e. African, Korean, Indian, Latin American, Middle Eastern, Other Asian, Other European

**** May belong to more than one division

The numbers in the table may not add to N as questions could be skipped.

Smoking among staff and students—Most staff and students had never smoked, or were former smokers who were now smokefree. Few staff (n=9) or students (n=5) reported being current daily smokers, or occasional smokers (Table 2).

Staff smokers tended to smoke alone whereas student smokers were more likely to smoke with others. Under one-half of the smokers had made a quit attempt in the past 12 months and around one-half of the sample anticipated making a quit attempt in the next 12 months.

Table 2. Smoking characteristics of the sample

Variables	Staff N (332)	Students N (268)
Smoking status		
Current daily smoker	9	5
Occasional smoker	5	16
Never smoked	243	203
Past smoker	58	24
Individual and social smoking		
Smoke alone	6	5
Smoke with others	2	11
Combination	6	5
Quitting		
Attempt past 12 months	6	9
Attempt next 12 months (scale 0-10)	3	18

Attitudes to smoking—Both staff and students agreed that exposure to SHS is harmful, disliked being exposed to SHS on campus, and felt that the university should promote a healthy work and study environment (Figure 1). Participants were moderately concerned about student smoking on campus, but on average, participants were not concerned about the level of staff smoking.

Attitudes to smokefree policies—The mean probability scores ranged from 7.2 to 8.9 (out of 10) showing a high level of support from staff and students for smokefree policies at the university (Table 3). Participants were asked to indicate their likely support for a completely smokefree campus, tobacco not being available for purchase on campus, and research funding from the tobacco industry on a probability scale ranging from 0 (no chance) to 10 (certain). The highest support was for tobacco to not be available for purchase on campus.

Table 3. Attitudes to smokefree policies and chances of a smokefree policy leading to certain outcomes

Attitudes	Staff n=332	Students n=268
Support for policies		
Completely smokefree campus	8.0	7.7
Tobacco not available for purchase	8.9	8.5
No research funding from tobacco industry	8.2	7.2*
Chances smokefree policy would lead to…		
Reduced exposure to SHS	8.2	8.0
Reduce smoking on campus	7.9	7.6
Cleaner campus	7.7	7.2
Improved health	6.9	6.6
More quit attempts	5.9	5.3*
Easier recruitment of staff	3.5	4.2*
Higher student enrolment	3.3	4.0*

Mean probability scale values (where 0 = no chance and -10 = certain).

* Significant difference between staff and students ($p<0.05$).

Chances of policy leading to certain outcomes—Staff and students tended to agree that a smokefree policy would lead to reduced exposure to SHS on campus, reduced smoking on campus, a cleaner campus, and improved health of staff and students (Table 3). These scores ranged from 5.3 to 8.2 (out of 10).

Significantly more staff than students thought that more quit attempts would be made. However, neither staff nor students believed that a smokefree policy would lead to higher enrolment of students or easier recruitment and retention of staff.

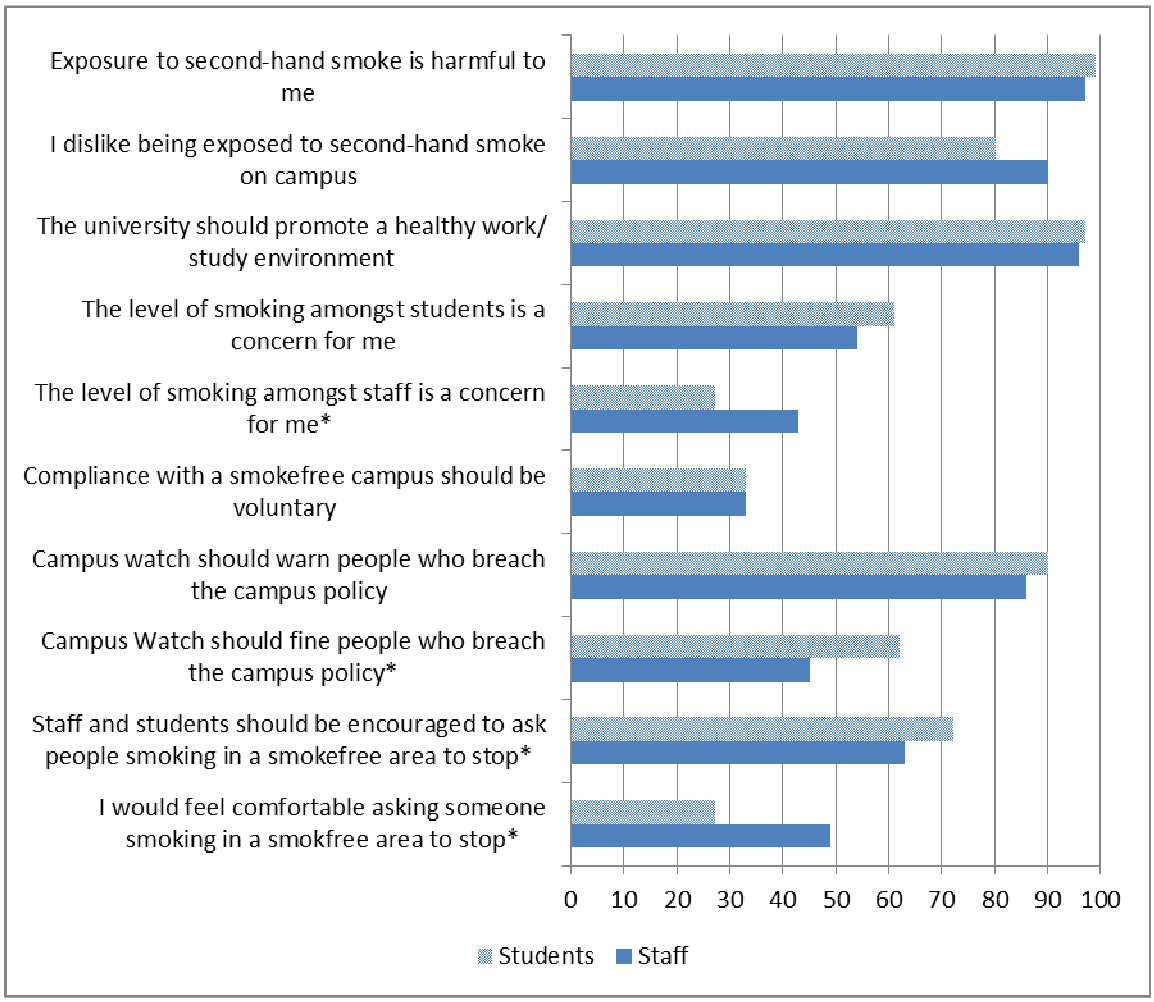
Policy implementation—Both staff (78%) and students (73%) suggested the most effective way to create a smokefree campus would be through placing smokefree signage around the campus.

Significantly more staff (81%) than students (72%) felt an effective way to create a smokefree campus would be through raising awareness of smokefree policy in campus publications, websites and orientation materials.

Significantly more students (71%) than staff (56%) thought that introducing penalties for breaching the smokefree policy would be effective. Few staff (41%) or students (37%) thought that removing cigarette receptacles on campus would help make the campus smokefree. They also did not believe that recruiting smokefree advocates to ask smokers on campus to refrain from doing so, would help make the campus smokefree.

Policy enforcement—The majority of staff and students disagreed that compliance with a smokefree policy should be voluntary, felt that Campus Watch (university safety patrol) should warn people who breach campus smokefree policy, and reported that staff and students should be encouraged to ask people smoking in a smokefree area to stop (Figure 1).

Figure 1. Attitudes to smoking on campus & enforcing smokefree policy (% agree or strongly agree)



* Significant difference between staff and students ($p<0.05$)

Significantly more students than staff felt Campus Watch should fine people in breach of the smokefree policy. Significantly more staff than students would feel comfortable asking people smoking in a smokefree area stop.

Discussion

This study found a high level of support among staff and students at a NZ university for smokefree policy initiatives on campus. Respondents saw the proposed smokefree policy as bringing many benefits. These views aligned with those from international studies, where evaluations of smokeree campus policies have found mainly positive outcomes in terms of behaviour, attitudes and beliefs.

In terms of behaviour, research has found there has been a decrease in smoking,[27-29] increased quit attempts[30] and thoughts about quitting[31], and a reduction in exposure to smoking.[27] Campuses with completely smokefree policies have reduced cigarette butt litter more than have those campuses with limited or no restrictions.[32]

In terms of attitudes, overall, students at smokefree campuses felt a smokefree environment was important[33] and agreed with or increased their acceptance of the policy post-implementation.[27,28,30] They also believed it had a positive impact on quality of life and learning[33] and held positive beliefs about creation of a smokefree environment.[27,30,31]

To our knowledge, this is the first study that has reported on the level of support for smokefree policy initiatives among both staff and students from a tertiary education institution. Research has tended to focus on the student population; few have ascertained the views of university employees.

Participants endorsed several publicity approaches, particularly smokefree signage. International evidence also supports a multi-component set of active and passive approaches.[23]

Participants did not think that compliance with the smokefree policy should be voluntary. They believed that the policy should be enforced by campus security, with penalties in place for transgressors. These views are echoed by Fennell[35] who advocates that university administrators demonstrate leadership by having violators of smokefree campus policies held to the same standard as those who violate other policies. However, Ballie et al.[15] noted that penalties must be feasible and amenable to enforcement.

Some limitations to this research should be noted. The response rates were 51% and 41% for staff and students respectively; and there is some potential for non-response bias to affect the estimates reported. However, we note a recent survey with Australian university students reported a similar response rate.[36] Nevertheless, where possible, we examined differences between responders and non-responders and found study participants did not differ significantly from the Dunedin based university population.

While the proportion of smokers in the sample is lower than the population smoking prevalence, this is likely to reflect the inverse relationship between smoking and education level. Further, recent research notes that daily smoking among NZ university students has decreased from 10% in 2002[2] to 3% in 2013.[3] This is similar to the very low prevalence of smoking found in this current study, although our sample had fewer occasional smokers than reported by other recent studies of tertiary students.

The rate of smoking amongst staff could not be compared to external parameters as we are not aware of other data reporting smoking prevalence among tertiary education staff.

The low numbers of smokers precluded examination of perceptual differences between smokers and non-smokers. International research has found that non-smoking students have more favourable attitudes towards a smokefree campus than students who smoke, even though the latter group still support these policies.[12,28] In some cases, however, smokers' views differ significantly from non-smokers' views.[33,37,38]

The data were obtained from only one NZ university. However, it seems reasonable to expect they will be representative of other NZ universities that have similar demographic and smoking characteristics.

Prior to 2000, several US groups made recommendations for tobacco control policies for universities.[39] Similar recommendations do not exist for NZ tertiary institutions. Half of New Zealand's tertiary education institutions had a completely smokefree campus policy in 2006.[9] Wider adoption of smokefree policies is required to support the government's goal of becoming a smokefree nation by 2025.

Implementing smokefree campuses has strong support from the two key stakeholder groups: staff and students, with few perceived disadvantages. Given these findings, tertiary institutions should move quickly to adopt smokefree policies in the knowledge these reflect staff members' and students' views and are consistent with the government's wider societal goals.

Competing interests: Nil.

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Will New Zealand be smokefree by 2025? Smoking prevalence amongst a cohort of Pacific adults

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Abstract

Aim To examine the prevalence of smoking amongst a cohort of Pacific fathers and mothers from birth up to 11 years after the birth of their child.

Methods Within the context of broader interviews, 1073 Pacific fathers and 1434 Pacific mothers participating in the longitudinal Pacific Islands Families (PIF) Study were surveyed about their smoking at multiple time-points of the study from 2000 until 2012. Prevalence rates of any and heavy smoking were calculated and analysed.

Results Maternal prevalence rates showed a sharp decline during pregnancy and immediately postpartum, yet rates then increased gradually to pre-birth levels within one to four years. Prevalence rates for mothers showed little change between 4 and 11 years postpartum, maintaining a steady 32% for mothers. While prevalence rates for fathers show a decline from initial levels (40.3%), they still remain extremely high (37.5%) at 11 years postpartum.

Conclusion The minimal decline in smoking prevalence amongst this cohort is of alarming concern for Pacific families and their communities. Given the New Zealand Government's Aotearoa Smokefree 2025 goal, innovative approaches must be implemented to discover effective solutions to help Pacific communities reduce their smoking.

In recent years cigarette smoking has been identified as one of the most preventable causes of premature death and poor health worldwide.[1] Cigarette smoking continues to contribute to the adverse mortality and morbidity rates for Pacific people in New Zealand. Current statistics indicate that almost one in four Pacific adults smoke (24.7%), and this is markedly higher than the general New Zealand European (15.4%) and Asian (10.2%) populations.[2]

Pacific people in New Zealand numbered 295,944 and comprised 7.4% of the population at the 2013 Census.[3] 60.0% of Pacific people were born in New Zealand and 65.8% lived in the Auckland urban area.[3] Samoans constitute the largest ethnic group (49.2%), followed by Cook Islands Maori (21.0%) and Tongans (20.0%).

This ethnic diversity is manifest in differing cultures, languages, generations of immigrants, and strength of acculturation.[4] However, Pacific people suffer from an excess of social, health and economic deprivation.[5] There is a growing recognition that issues which have a significant impact on Pacific people's lives need to be understood, of which parental smoking stands out.

While good information is available about Pacific smoking rates in New Zealand, there is little epidemiological information and understanding about Pacific fathers' or mothers' smoking status and the relationship between the smoking status of parents

within a family setting—despite the health impact this potentially has on their children.

If the public health approach to smoking cessation is based on the rigorous requirement of the scientific method that moves from understanding and measuring the problem to finding, implementing and evaluating a solution,[6] then such robust epidemiological information is essential.

Using a large cohort study of Pacific families, this paper aims to determine the prevalence of smoking amongst Pacific fathers over four time-points and for Pacific mothers over six time-points, up to 12 years after the arrival of their child.

Methods

Study design—The Pacific Islands Families (PIF) Study follows a cohort of Pacific infants born at Middlemore Hospital, South Auckland, between 15 March and 17 December 2000.

Participants—This study utilises maternal data from the 6-week, 1, 2, 4, 6, 9, and 11-year measurement waves, and paternal data from the 1, 2, 6, and 11-year measurement waves of the PIF Study. All potential participants were selected from births where at least one parent was identified as being of a Pacific Island ethnicity and a New Zealand permanent resident. The current analysis of smoking excludes the non-Pacific parents.

Recruitment occurred through the Birthing Unit, in conjunction with the Pacific Islands Cultural Resource Unit. Approximately 6-weeks after infants' births, female interviewers of Pacific Islands ethnicity who were fluent in English and a Pacific Islands language visited mothers in their homes. Once eligibility was confirmed and informed written consent obtained, mothers participated in interviews of approximately 90 minutes concerning family functioning and the health and development of the child.

At the 6-week interview, there were 1477 mothers who were able to act as respondents, of whom 1376 (93%) consented and completed the interview. At specific time-points postpartum, maternal participants were re-contacted and revisited by a female Pacific interviewer. Again, written consent was obtained before the interview was conducted. At the time of the, 1, 2, 6 and 11-year interviews, mothers were asked to give permission for a male Pacific interviewer to contact and interview the father of their child. If permission and paternal contact details were obtained then the male Pacific interviewer contacted the father to discuss participation in the study.

Once informed consent was obtained, fathers participated in one-hour interviews concerning family functioning and the health and development of their child. This interview was conducted in the preferred language of the father. Detailed information about the PIF Study and procedures has been described elsewhere.[7 8]

Maternal and paternal smoking status—At the 6-week interview, maternal smoking status before pregnancy, during each trimester and "yesterday" was assessed with the question "On average, how many cigarettes did you smoke per day." At the 1, 2, 4 and 6-year measurement waves, maternal smoking status was assessed using the following question: "On average, how many cigarettes did you smoke yesterday?" Similarly, at the 1, 2 and 6-year measurement waves, paternal smoking status was assessed using the same question.

At the 9 and 11-year measurement waves, smoking status was assessed using the following question from the survey: "Over the past week, how many cigarettes on average did you smoke a day?" Participants who answered with zero cigarettes are referred to in this study as 'non-smokers', and participants who answered more than zero cigarettes are referred to as 'smokers'.

Prevalence of smoking is categorized two ways; (i) "any smoking" which is smoking of 1 or more cigarettes daily, and (ii) "heavy smoking" which is smoking 10+ cigarettes daily.

Sociodemographic variables—Additional sociodemographic variables were incorporated into the analysis as descriptors of the sample cohort. These variables included ethnicity, highest educational qualification, being New Zealand born and household income. Even though household income is time-varying, baseline values were used throughout.

Ethnicity classifications included 'Other Pacific' for participants who identified equally with two or more Pacific Island groups or with a Pacific Island ethnic group that was not Samoan, Tongan, Cook Islands Maori or Niuean.

Statistical analysis—Prevalence of smoking was estimated using binary logistic models. Repeated measures of smoking status on the same individual are likely to be correlated. Furthermore, some participants were not seen at every measurement wave and some new participants entered after baseline due to changes of caregivers of the cohort child.

The models were derived using generalised estimating equations (GEE) with a compound symmetry correlation structure to allow for both these matters. Missingness of the original participants at the final follow-up interview was assessed for differential attrition against baseline smoking status using a Chi-squared test. All analyses were conducted using R 3.0.1[9].

Ethical clearance—Careful consideration is always applied to the ethical aspects of this longitudinal study with Pacific people. Ethical approval for the PIF study was obtained from the Auckland Branch of the National Ethics Committee, the Royal New Zealand Plunket Society, and the South Auckland Health Clinical Board.

Results

Valid smoking data were collected from 1273, 1135, 1054, 964, 920, 912 and 950 Pacific mothers at the 6-week, 1-year, 2-year, 4-year, 6-year, 9-year, and 11-year measurement waves, respectively. Likewise, valid smoking data were collected from 759, 559, 551 and 720 Pacific fathers at the 1-year, 2-year, 6-year, and 11-year measurement waves, respectively.

Respondents' sociodemographic characteristics from the baseline and 11-year measurement waves are presented in Table 1. No evidence was found of differential attrition against baseline smoking status (p=0.99).

Table 1. Sample characteristics for Pacific mothers and fathers at baseline and the 11-year measurement wave

Mothers	Baseline† (N=1273)		Year 11† (N=950)	
	n	%	n	%
New Zealand-born				
No	914	(72)	675	(71)
Yes	359	(28)	275	(29)
Ethnicity				
Samoan	648	(51)	467	(49)
Tongan	288	(23)	233	(25)
Cook Island	231	(18)	174	(18)
Niuean	59	(5)	49	(5)
Other Pacific	47	(4)	27	(3)
Baseline household income ($NZ)				
$0 to $20,000	425	(33)	313	(33)
$20,001 to $40,000	660	(52)	495	(52)
Over $40,000	145	(11)	115	(12)
Unknown	43	(3)	27	(3)
Highest education*				
Up to secondary	943	(74)	530	(62)
Beyond secondary	330	(26)	323	(38)

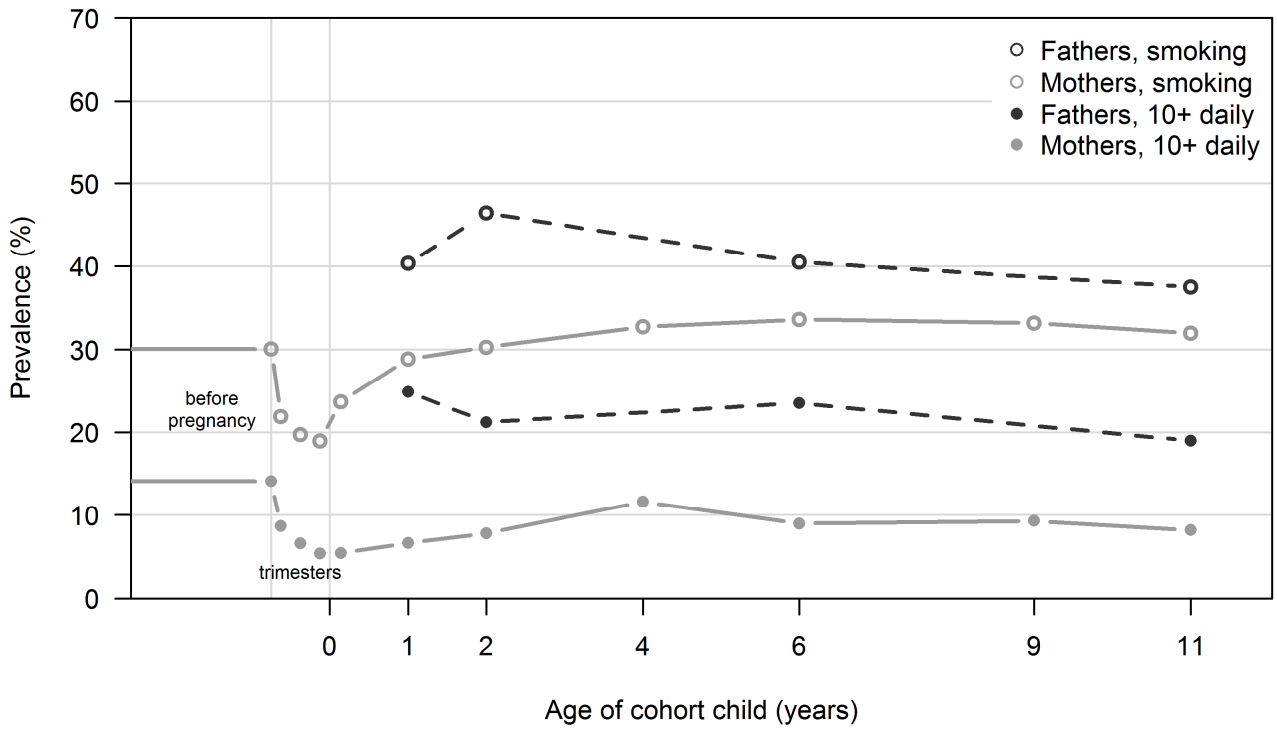
Fathers	Baseline (N=759)		Year 11 (N=720)	
	n	%	n	%
Ethnicity				
Samoan	434	(57)	372	(52)
Tongan	199	(26)	210	(29)
Cook Island	72	(9)	84	(12)
Niuean	26	(3)	31	(4)
Other Pacific	28	(4)	23	(3)
Highest education*				
Up to secondary	657	(87)	451	(64)
Beyond secondary	100	(13)	259	(36)

* Some evidence was seen of a shift in distribution ($p<0.05$), as might be expected.

† Data from intermediate measurement waves have followed similar patterns of transition and are not shown.

Prevalence of smoking—The prevalence of any and heavy smoking by mothers and fathers over all measurement waves are summarised in Figure 1 below.

Figure 1. Maternal and paternal prevalence of any and heavy smoking within the PIF Study longitudinal cohort



*Note: The margin of error is 3.6% for fathers and 2.8% for mothers.

Maternal smoking prevalence rates exhibit a sharp decline at the onset of pregnancy, yet increase gradually to pre-pregnancy levels within one to four years of their child's

birth. Prevalence rates for any smoking amongst mothers exhibit little change between 4 and 11 years postpartum, maintaining a steady 32%. Paternal smoking rates while initially much higher (40.3%) show a stable decline from 2 years after their child's birth, however approximately 37.5% of fathers still continue to smoke 11 years after their child's birth.

Discussion

Prevalence estimates for smoking by mothers and fathers over all measurement waves were higher than the Pacific male (28%) and Pacific female (25%) rates reported in the 2011/12 New Zealand Health Survey.[10]

Comparison with national data and trends indicates the prevalence of cigarette smoking among Pacific people has fluctuated between 30% and 38% over the five years from 2000 to 2005.[11] However, results from the recent 2013 Census indicate a significant drop in the Pacific adult smoking rate from 30.3% to 23.2% since the 2006 Census.[3] While this lauds the efforts of cessation service providers, policy initiatives, and tobacco control advocates, there is still more to be done for the almost 1 in 4 Pacific adults currently smoking. Also of concern are the maternal smoking prevalence rates, which exhibit a sharp decline at the onset of pregnancy, yet increase gradually to exceed pre-pregnancy levels within 2 to 4 years of their child's birth.

Although little research has examined smoking behaviour amongst Pacific mothers during pregnancy and postpartum, current research being undertaken within Maori communities may be beneficial in understanding the behaviours and practices for smoking amongst pregnant mothers.[12] Clearly, if Pacific communities are to successfully achieve the NZ Government's goal of a smoking prevalence rate less than 5% by 2025, a more comprehensive and considered approach to the issue would be more effective.

Implementation of increases in excise tobacco tax in countries including NZ has shown some success in reducing smoking rates.[13 14] Moreover, research examining the impact of the 2010–2012 tobacco excise tax increases amongst the Pacific male smokers in the PIF cohort found that 80% claimed they had reduced their smoking as a result of the tax.[15] Although there has been some debate about the differential impact of tobacco tax increases on the ability of lower socioeconomic groups to quit/reduce smoking[16], our evidence indicates the advocation of larger and more frequent tobacco tax increases would be effective in reducing Pacific smoking rates.

The utility of plain packaging has been previously examined, with research findings suggesting the removal of tobacco branding from cigarette packs could assist many smokers, including Pacific, who wish to relinquish their addiction and become smoke-free.[17] In addition, current social marketing campaigns may need to be reoriented to be effective for Pacific populations.

Research exploring the reactions amongst Pacific smokers regarding the imagery in health advertisements found that advertisements with hard-hitting graphic images particularly highlighting potential impacts for children, were more likely to influence them to quit smoking.[18] Strategies such as this, alongside other social media campaigns which assist in denormalising tobacco use and smoking, could be more successful in reducing current smoking rates amongst Pacific people.[19]

The utilisation of Nicotine Replacement Therapy (NRT) and Quitline cessation services have historically not been readily utilised by Pacific communities.[20] Although previous research regarding Pacific peoples knowledge and beliefs about smoking cessation products and services indicated many smokers found services too impersonal and experienced long wait times on the phone, current Quitline services have been specifically oriented to address the needs of Pacific and other ethnic communities. Similarly, large scale quit competitions such as the WERO programme have gained some traction in encouraging Pacific people in the Auckland region to give up smoking.

The PIF Study has many salient strengths, including that it follows a large birth cohort over time, it involves the family triad (mother, father and child) and it has achieved a relatively small attrition rate to date.[7,8] Moreover, no differential attrition associated with smoking status over time was observed in the study for either mothers or fathers. Thus the missing data were likely to be missing at random, not differentially related to smoking status.

Arguably, the most important limitation of this study is the reliance on self-report of smoking, not validated by any biochemical tests. However, self-reported data on current smoking status can have high validity, and this has been demonstrated in previous research regarding the prevalence of smoking measured using self-report data.[21] Moreover, the question used in the PIF Study—"On average, how many cigarettes did you smoke yesterday?"—differs from the question used in other tobacco surveys in New Zealand, e.g. "On a typical day how many cigarettes do you smoke?".[22] Nevertheless, previous research has utilised this question.[23] Furthermore, additional investigations have established the utility of self-report data as a reliable indicator of smoking status, particularly within population based studies.[24 25].

The PIF Study is a longitudinal birth cohort study of Pacific children, thus while this study examines smoking prevalence amongst the parents/caregivers of these children, the recruitment procedures allow for new caregivers to be included.

Finally, the use of different questions to measure smoking prevalence for different measurement waves is not ideal and may impact on estimates of prevalence. However, there is a need to explore in further depth the reasoning behind the results found here, thus motivating the need for focus groups and further exploration into the attitudes and behaviours towards smoking amongst Pacific parents.

Conclusion

The high prevalence rate of smoking amongst Pacific adults within this study is gravely concerning. The longitudinal nature of the information suggests that past cessation services and interventions have had little impact for these people, and potentially the health of their children and families through second hand smoke exposure.

Current policies and strategies need to be re-developed to address the needs of this population group if they are to achieve the goal of being smokefree by 2025.

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Improving Māori health through clinical assessment: Waikare o te Waka o Meihana

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Abstract

Health professionals play an important role in addressing indigenous health inequalities. This paper describes the further development and a new conceptualisation of the Meihana model (2007) and the Hui process (2011), which together have formed the indigenous health framework in the University of Otago, Christchurch undergraduate medical education programme for 4th–6th year medical students over the past 5 years. The components of the framework are defined followed by description of their application to clinical assessment.

The indigenous health framework has been evaluated by medical students, health practitioners, Māori patients and whanau over this time and has been rated favourably as a clinically relevant framework that supports health practitioners to work effectively with Māori patients and whānau.

In New Zealand health disparities between Māori and non-Māori are well documented,[1,2] as is the role of the Treaty of Waitangi in health.[3] The Health Practitioners Competency Act (2003) identifies that all professional health regulatory bodies require health practitioners to demonstrate appropriate levels of cultural safety and competency in order to be fit for practice.[4,5] However, the evidence is less clear on how individual health practitioners can positively incorporate cultural competency into clinical practice.[6–8]

The Indigenous Health Framework developed at the University of Otago, Christchurch aims to translate the principles of cultural competency and safety into an approach that health practitioners can use in everyday practice and, by doing so, improve health service delivery for Māori patients/whānau. The Indigenous Health Framework is comprised of the Hui Process[9] and the Meihana model[10] and is used primarily in the medical interview, building on the widely used Calgary-Cambridge model.[11]

The Hui Process describes recommendations for enhancing the doctor-patient relationship with Māori. It includes *mihimihi* (initial greeting engagement), *whakawhānaungatanga* (making a connection), *kaupapa* (attending to the main purpose of the encounter), and *poroporaki/whakamutunga* (closing the session).

The Meihana model describes how the kaupapa (purpose of the encounter) can extend standard history taking to give a broader understanding of Māori patients' presentations. It has also been specifically developed for use by both non-Māori and Māori health practitioners.

The Meihana model was created using the foundations of the well-documented Māori health model, Te Whare Tapa Wha.[12] The Meihana model was initially published in

2007[10] and described six components of the model (whānau, wairua, tinana, hinengaro, taiao and iwi katoa) and introduced a concept referred to as Māori beliefs, values and experiences (MBVEs) which overlaid the six components.

Over the last 6 years the authors and their colleagues based at the University of Otago (inclusive of Christchurch, Wellington and Dunedin campuses) have trained medical students, medical doctors, allied health professionals (nurses, psychologists, physiotherapists, occupational therapists), Māori health workers and administrative staff on the principles and practicalities of implementing the Meihana model. These training initiatives have been evaluated through student/staff/patient feedback forms, a qualitative case study, case presentations and observed structured clinical examinations (OSCE) and have been shown to increase quality interactions between health practitioners, Māori patients and whānau.[9,10,13]

The use of this model in diverse health settings and advances in the research about factors contributing to health disparities has led to changes in the presentation and some of the concepts of the model compared to its original description. This includes further refinement of how each component of the model is defined and explored within a clinical assessment, and the inclusion of the concept of Nga Hau e Wha, which provides a further context to the health environment for Māori.

The purpose of this paper is to provide an updated descriptive overview of the Meihana model and its application to clinical assessment. The term 'Waikare o te Waka o Meihana' refers to the rippled waters from the Meihana waka and reflects the development of the model from its original description. It also encompasses our aspirations that this model may positively influence change in health practitioner's history taking and management behaviours.

Overview of Meihana model

The analogy of a waka hourua (double-hulled canoe) was developed to describe the elements of the Meihana model, their interactions and to assist with visual presentation of the model, see Figure 1.

Figure 1. Diagram of the Meihana model

A waka analogy has been previously used in other research and health models[14,15] This development of the Meihana model uses the components of the waka hourua and factors that can affect this voyage to summarise the breadth of information that may be required to fully understand a Māori patient's health status. The waka hourua was the traditional mode of transport used in the migration of Māori from Hawaiki to Aotearoa (New Zealand). Therefore this analogy draws on a voyage of a waka hourua across the moana (ocean) from one destination to another.

Figure 1 illustrates the two hiwi (hull – representing the patient and whānau) are attached through aku (crossbeams). Each voyage is charted towards a destination, for the waka hourua this involves the passage of attaining hauora (health/wellbeing), however the course can be influenced by nga hau e wha (the four winds of Tawhiri-matea), nga roma moana (ocean currents) and whakatere (navigation).

Components of Meihana model

Each of the components of the waka hourua, nga hau e wha (four winds) and nga roma moana (ocean currents) and whakatere (navigation) is described, beginning with a brief discussion of the term's use in Te Ao Māori (Māori world view), followed by the definition used in the Meihana model and its application to clinical assessment.

Waka hourua (double-hulled waka)—The waka hourua demonstrates the importance of considering both the patient and their whānau in assessment of health. Additionally, it is a role of the health practitioner to get onto this waka hourua and become a part of the patient's support network (kaupapa whānau) for a period of time. Assessing the health of a Māori patient should include developing an understanding of the strength and weakness of each of the aku (cross beams) and its role in the patient's health. The components of the waka hourua will not be new to health practitioners and are not unique aspects to Māori - they are components of any thorough clinical assessment. However this model describes their relevance for Māori in clinical assessment.

Component: **Patient**

Definition: Patient identifying as Māori with ethnicity correctly confirmed within the clinical context.

Application to clinical assessment: Despite the importance of ethnicity as a determinant of health, ethnicity data if often inaccurately recorded (16). Self-identification through the Ministry of Health ethnicity data protocols (17) is the most effective way to allow Māori patients the right to identify themselves as Māori.

Within clinical practice it should become common place for all patients to be asked their ethnicity, and to have this reviewed over time, because the more comfortable a patient becomes in the service, or the more a health practitioner demonstrates cultural competency and safety, the more likely a patient may feel willing to identify as Māori within the service.

The identification of Māori patients should ensure Māori health services and supports are offered to the patient (regardless of whether their physical salience is recognised by others as being 'typically' Māori).

Component: **Whānau**

Definition: Support network(s) for the patient

Application to clinical practice: Whānau may refer to biological family (whakapapa whānau) and/or other key support people (kaupapa whānau) who are stakeholders in the patient's health and well-being.[18]

Whānau often have a key role in establishing collateral history and family medical history. Assessment should also include whānau understanding of the patient's condition and their expectations around management and prognosis. For example, if a patient presents with chest pain and another member of the whānau previously died following a heart attack, is mortality the patient's expected outcome? Gathering an understanding of this can inform appropriate health education and management of the patient and their whānau.

Unfortunately whānau often feel excluded from participating in clinical assessment.[19] This may limit a health practitioner's ability to gain a comprehensive understanding of the patient's symptoms and family medical history (especially if it is unknown to the patient). Permission to include whānau in the clinical setting should be sought from the patient, as failure to include the whānau, may result in overlooking the impact of the patient's health on the whānau and if wider support networks are required. This also allows for the exploration of the perceived confidence of the patient/whānau to navigate through the health system. If a patient opts not to include whānau in the consultation, health practitioners can enquire about the patient's understanding and/or perceptions of their whānau support networks.

Component: **Tinana**

Definition: Physical health and functioning of the patient

Application to clinical assessment: This component incorporates the assessment of a standard medical history to draw an accurate profile of the patient's physical status (both past and current functioning). For example this includes physical symptoms, medications, substance use, diet, exercise and physical examination. It should be noted that tinana, while a vital part of the clinical assessment does not stand alone and cannot be considered without the other relevant components of this model.

Component: **Hinengaro**

Definition: Psychological and emotional wellbeing of the patient.

Application to clinical assessment: This component encourages health practitioners to explore psychological wellbeing but should also include assessment of the patient's concept and perception of their condition and the impact of this on their wellbeing. For example this may reveal the comorbidity of depression with chronic illnesses, or

stigma in relation to specific mental health illnesses. These beliefs and emotions may influence the manner in which a symptom or illness is discussed.

Component: **Wairua**

Definition: Beliefs regarding connectedness and spirituality

Application to clinical assessment: This component identifies the beliefs, values and priorities for the patient/whānau that may impact their engagement with the health system and/or their paradigm of health. Health practitioners can begin to explore this by enquiring about spiritual-religious belief and attachments to people, places and taonga (treasured items). Incorporating this component allows a conversation about religion, death and dying within an appropriate cultural context. This is especially important in palliative care and in situations where a lack of connectedness may be a key risk factor e.g. assessing depression and/or suicide risk.

Component: **Taiao**

Definition: The physical environment of the patient/whānau.

Application to clinical assessment: This component identifies the importance of gaining a clear understanding of the physical environment of the patient/whānau. This includes direct questions of the patient/whānau about their home environment, neighbourhood and workplace health and safety. It also involves critiquing the service or clinical environment that the patient/whānau are interacting with. This may include identifying whether the basic details of the physical and interpersonal spaces promote privacy and dignity (e.g. adequate seating for support networks to attend, appropriate clinical gowns/sheets in order to complete investigations) and whether the service has identified potential barriers to access in the service (e.g. car parking, close to amenities, Māori 'friendly' environment).[20]

Component: **Iwi Katoa**

Definition: Services and systems that provide support for patients/whānau within the health environment.

Application to clinical assessment: An integral part of the assessment process is to identify whether patients/whānau have had appropriate access to services and systems that can improve their broader health context and/or their engagement with the health environment. This includes access to mainstream services such as NGOs, Work and Income (community service cards, high user health cards), screening programmes, Plunket, other primary care services (e.g. brief intervention services), 'green prescriptions' and/or specific Māori health services such as Kaupapa Māori provider services (e.g. Tamariki ora, addiction services, Rongoa Māori) and Māori Health workers (in both primary and secondary care services). Exploring current barriers and enablers to accessing services allows the health practitioner to further tailor future care plans for the patient/whānau.

Nga Hau e Wha – The four winds

Nga Hau e wha in Te Ao Māori refers to "four winds"[21]; in this analogy these winds impact the journey of the waka hourua to Hauora (wellbeing). The four winds signify historical and societal influences on Māori as the indigenous peoples of Aotearoa/New Zealand. Knowledge and understanding of these winds assists in providing the appropriate context for Māori health (in a colonised society) and encourages the health practitioner to reflect on how these winds have influenced their perception of Māori patients/whānau/community.

In practice, each of the four winds are inter-related e.g. urban migration of Māori was highly influenced in the 1960s by governmental policies (colonisation) to meet workforce shortages in the cities.[22,23] This section outlines the broad framework of each component to provide a guide for health practitioners to consider in assessment – components may or may not be relevant to Māori patients and/or whanau.

Component: **Colonisation**

Definition: Colonisation, both historical and on-going, occurs through the loss of land, political re-organisation and dehumanisation of Māori patients and/or community.[3]

Application to clinical assessment: This component of the model challenges health practitioners to explore poverty, socioeconomic status, employment conditions, access to quality education opportunities, appropriate housing and financial ability to engage in the health system. Health practitioners should also consider the context of contemporary political events, which foster the inclusion or alienation of Māori communities in the development and implementation of services that may contribute to Māori health gains. This component may also include awareness of specific deficit stereotypes of Māori which may contribute to bias in clinical decisions.[24,25]

Component: **Racism**

Definition: Understanding of the impact of institutional, interpersonal and internalised racism on a patient's presenting complaint/wellbeing.

Application to clinical assessment: Racism has consistently been identified as a key determinant of health.[26] This component encourages the health practitioner to explore the patient's experiences of living in a racialised society, including questions around experiences in which they (or their whānau) have been discriminated against because they are Māori. This may have occurred in education, health or community settings.

Exploring racism with patients requires sensitivity. It also requires the health practitioner to identify when the patient/whānau may not attribute their experience to racism but something that 'just happens' and to be critical of the systemic processes that maintain the silence of racism within our community. This line of enquiry can identify reasons for the way the patient/whānau engage with health services and assist health practitioners to tailor their practice to reduce further likelihood of racist experiences in the health system.

More recent research has described three types of racism that influence health outcomes: interpersonal, institutional and internalised racism. Inter-personalised racism is the type most commonly thought of and includes "prejudice and discrimination, where prejudice means differential assumptions about the abilities, motives and intentions of others according to their race and discrimination means differential actions towards other according to their race".[27]

Exposure to this type of racism has been associated with lower health status.[28] It is included in the Meihana model to encourage health practitioners to explore if Māori patients have felt discriminated or treated differently within the health environment as well as wider society because of their ethnicity.

Institutional racism is differential access to goods, services and opportunities by race.[29] In order to understand the influence of institutional racism, health practitioners need to be aware of and encourage the evaluation of equity of services (including their own) as part of routine on-going quality improvement. The Health Equity Assessment Tool (HEAT) is a newly developed tool designed for this purpose.[30]

Internalised racism is the acceptance of negative messages about self-worth based on racial identity.[29] 'Clues' to recognising these beliefs in the clinical setting may include statements such as "I'm not into that Māori stuff" or "Just treat me like everyone else." Understanding the significance of this type of racism for Māori patients and whānau can be difficult to assess, however it is important that practitioners have an awareness of this type of racism and the impact it can have on Māori patient's self-worth and identity.

Component: **Migration**

Definition: Understanding internal migration of Māori from traditional iwi land to other regions within Aotearoa/New Zealand, tracking of possible external migration and establishing where their support networks are located.[18]

Application to clinical assessment: This assists the health practitioner to explore connections to whenua (land), where current support networks are located, reasons behind migration and how such events have engaged or disabled access to quality health care. This encourages a discussion around where the patient/whānau identify their whenua connection (if known), which can lead to further understanding of iwi/hapu identity. It also identifies who migrated (e.g. the patient or their parent, grandparent) and hence how long the patient/whānau has been in the current location and their connections to the current and 'historical' regions.

For some patients/whānau who are 2nd or 3rd generation descendants of Māori who migrated from traditional tribal areas, they may choose not to connect back with traditional iwi structures and associate with other Māori collectives that are urban based (e.g. urban authorities, urban marae). If there has been no migration and the patient/whānau live within their own iwi boundaries, this may lead to discussing the support networks available to the patient/whānau.

Component: **Marginalisation**

Definition: Knowledge of health information which identifies current Māori health status, including health disparities and health gains.

Relationship to clinical assessment: Knowledge of current Māori incidence, prevalence, morbidity and mortality rates (in relation to a specific illness/condition) can influence clinical assessment and practice. For example, knowledge of higher surgical readmission rates for Māori should prompt the health practitioner to carefully assess the adequacy of the discharge plan after a surgical procedure.[2]

Health practitioners are also encouraged to consider changes in Māori disease profile over time. For example understanding that current mental health disparities have only emerged since approximately the 1970s may help maintain therapeutic optimism and reinforce the potential for a better outcome for Māori. This component of the Meihana Model acknowledges the commitment required by health practitioners to be up to date with current Māori health information to reduce marginalisation of Māori within the health system.

Nga Roma Moana – Ocean Currents

Māori navigators understood how the currents influenced seafaring voyages. Familiarity with the currents influenced the timing of voyages and assisted to plot the course required to reach the destination. Harnessing the currents aided in time efficiency and energy required to undertake the voyage.

There are four specific ocean currents around the two larger islands of New Zealand, and these are used in this model to represent four specific components from Te Ao Māori (the Māori world view) that may influence Māori patients/whānau in clinical settings. It is important to note that the influence of these currents varies greatly due to individual patient experiences in Te Ao Māori and the effects of colonisation. The influence of these currents and the flexibility of the model allow for Māori patients' diverse experiences to be equally valued.

Component: **Ahua**

Definition: Personal indicators of Te Ao Māori that are important to the patient/whānau.

Relationship to clinical assessment: The identification of personalised indicators of Te Ao Māori that are important to the patient and whānau are opportunities to develop meaningful whakawhānaungatanga with the patient and whānau.[9] Enquiry of this component helps health practitioners to facilitate patients and whānau sharing more about themselves and validates the patient and whānau as Māori in the clinical setting. Specific indicators may include a patient and/or whānau using te reo within interactions, the wearing of specific taonga, ta moko, clothing with te reo or Māori motifs and/or having a Māori name (ingoa).[20]

Component: **Tikanga**

Definition: Māori cultural principles.

Relationship to clinical assessment: This requires the health practitioner to become familiar with specific cultural principles and how these are enacted (kawa) by the patient and/or whānau, and how these might be integrated with clinical investigations and practices. For example health practitioners should assess whether a Māori patient preparing for surgery has any expectations around disposal of body tissues or the right to have space or time for karakia (prayer).

Health practitioners should be familiar with their organisation's tikanga guidelines (such as those produced in every DHB) to ensure that they are able to inform Māori patients and whānau of the organisational processes available if specific tikanga practices are requested within the clinical setting.

Component: **Whānau**

Definition: The relationships, roles and responsibilities of the patient within Te Ao Māori, including whānau, hapu, iwi and other organisations.

Application to clinical assessment: Identifying the patient and/or whānau role and responsibility in the wider whānau may assist the health practitioner to understand the patient's (and often that of their whānau) priorities, values and beliefs. For example understanding a Māori patient's role on the marae, or within the family group, may help identify targets for motivational interviewing or barriers to attendance at a clinic.

It may also assist, in the clinical setting, to understand why some whānau members may be more actively involved than others in a consultation. For example at the time of a critical incident some whānau may take on roles such as providing emotional or practical support and others may take on more of a representative role such as speaking on behalf of the whānau. Understanding the nature and importance of these relationships, roles and responsibilities enables the health practitioner to be more confident, when required to approach the whānau as a collective. This can also assist in navigating through patient and whānau privacy expectations.

Component: **Whenua**

Definition: Specific genealogical or spiritual connection between patient and/or whānau and land.

Application to clinical assessment: When asking Māori patients where they are from, Māori may respond with the region where they have whakapapa (genealogical connections) rather than the place they currently reside. This place may be a key component of the patient and whānau identity and provides an opportunity to explore with the patient and/or whānau where they are from; how often they go back there; for what events; share experiences if the health practitioner has visited the location or to learn about the whenua if they haven't been there.

The health practitioner may also share where they are from (their whenua connection) to enhance whakawhānaungatanga (relationship building). This information is also particularly relevant when discussing expectations around proximity of whānau support, location where palliative care might occur and processes involved in death and dying.

Whakatere – Navigation

Whakatere refers to navigation which was a key component for the successful migration of Māori to Aotearoa. In the Meihana model, navigating the most appropriate course is influenced by the assessment of the aku, the waka hourua, the presence of nga hau e wha and nga roma moana. The process of plotting a course and setting the sails and rudder is analogous to the health practitioner and patient/whānau selection and implementation of proposed treatment interventions and recommendations. This component encourages the health practitioner to investigate and apply the best clinical practice guidelines for Māori.

Whilst there remains a need for further evidence based interventions and management recommendations for Māori, the number of evaluated Māori health interventions and management recommendations is increasing. For example, knowledge of the National Guidelines Group recommending cardiovascular screening at an earlier age for Māori is necessary in order to deliver best practice for Māori. Similarly health practitioners should be aware of areas where Māori are not receiving best practice.[31]

Discussion

Māori health models have been utilised within mainstream and Māori health provider services since the early 1980s in an attempt to address health disparities between Māori and non-Māori. Examples include Te Whare Tapa Wha,[12] Te Wheke,[32] Te Pae Mahutonga,[33] Powhiri process[34] and others. These models draw on key cultural beliefs embedded in Te Ao Māori to provide a framework for non-Māori health practitioners to tailor their services to Māori patients and whānau.

The Meihana model builds on the work of other Māori health models and is specifically designed to support health practitioners to gain a fuller understanding of the presenting complaint and the context of the patient and whānau. The purpose of the framework is to encourage health practitioners to broaden their range of assessment to provide quality health care and reduce health disparities between Māori and non-Māori.

This model allows diverse Māori realities within a colonised society to be recognised and responded to. The inclusion of fluid, variable elements that explore societal and cultural influences encourages health practitioners to identify which components are relevant to individual patients and whānau and prioritise such components. This not only provides opportunities to explore the presenting complaint but also extends health practitioners to consider wider influences of hauora that may lead to positive health outcomes.

The Calgary Cambridge model guides the content, structure and ideal communication skills required in clinical assessment[11] which has been adopted by the Faculty of Medicine, University of Otago. The earlier publication of the Hui Process in this journal described how communication skills described in the Calgary Cambridge model could be adapted for use with Māori. The Calgary Cambridge model recommends a revised content guide for the medical interview which includes the patient perspective alongside the biomedical perspective of disease.

The Meihana model describes how the Calgary Cambridge content can also be adapted for Māori. The Meihana model further extends the Calgary Cambridge model with inclusion of whānau and societal perspectives of illness as well as providing specific details to broaden aspects of the personal and social history.

Undergraduate medical students and other learners are taught how to explore the components of the Meihana Model within the Calgary-Cambridge assessment structure. This includes strategies and lines of enquiry to appropriately discuss potentially complex areas and to avoid awkward, direct approaches such as “how is your wairua?” or “how has colonization affected you?” in a way that maintains a safe environment for health practitioner, patient and whānau.

Conclusion

There is consistent evidence of biomedical, social, political and cultural factors that contribute to health inequalities of indigenous communities internationally. The Meihana model takes into account this research and provides a clinical assessment framework to assist health practitioners working with Māori patients and whānau to contribute to improved Māori health outcomes. Recently completed research evaluates the Meihana model in medical education and clinical practice and is being prepared for publication (13,35).

Competing interests: Nil.

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THE NEW ZEALAND MEDICAL JOURNAL
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Metronidazole-induced encephalopathy: an uncommon scenario

Subrata Chakrabarti, Koushik Pan

Abstract

Metronidazole can produce neurological complications although it is not a common scenario. We present a case where a patient developed features of encephalopathy following prolonged metronidazole intake. Magnetic resonance imaging (MRI) brain showed abnormal signal intensity involving both dentate nuclei of cerebellum and splenium of corpus callosum. The diagnosis of metronidazole toxicity was made by the MRI findings and supported clinically.

Metronidazole is a common antimicrobial agent used in the treatment of anaerobic and protozoal infections. Metronidazole-induced encephalopathy (MIE) is a rare toxic encephalopathy caused by the drug metronidazole.[1] MRI brain usually clinches the diagnosis.[2]

Case report

A 42-year-old male patient presented with complaints of difficulty in walking for 1 week, vertigo, and dizziness and slurred speech for 3 days. He had a history of taking 750 mg/day metronidazole for last 9 months duration for chronic diarrhoea.

On examination, Romberg sign was positive, with slurring of speech, dysarthria, dysmetria on finger-to-nose examination, and an ataxic wide-based gait. Hypotonia and pendular knee jerks were noted. Rest of the examination was non-contributory.

Computed tomography (CT) performed on admission showed no evidence of acute stroke and routine laboratory analysis (including complete blood counts, electrolytes, glucose, renal and liver function tests) was unremarkable.

His MRI brain showed bilaterally symmetrical abnormal signal intensity involving dentate nuclei of cerebellum (Figure 1) and splenium of corpus callosum (Figure 2). The signal intensity was hypointense on T1- and hyperintense on T2-weighted and fluid attenuated inversion recovery (FLAIR) sequences.

The patient's clinical presentation and MRI images were found to be consistent with metronidazole-induced encephalopathy (MIE). Discontinuation of metronidazole led to gradual improvement in the patient's condition. Typical pattern and location of lesions and reversibility of symptoms following withdrawal of metronidazole confirmed the case as metronidazole-induced encephalopathy

Figure 1. Hyperintensity of bilateral dentate nuclei on T2 weighted image in MRI brain

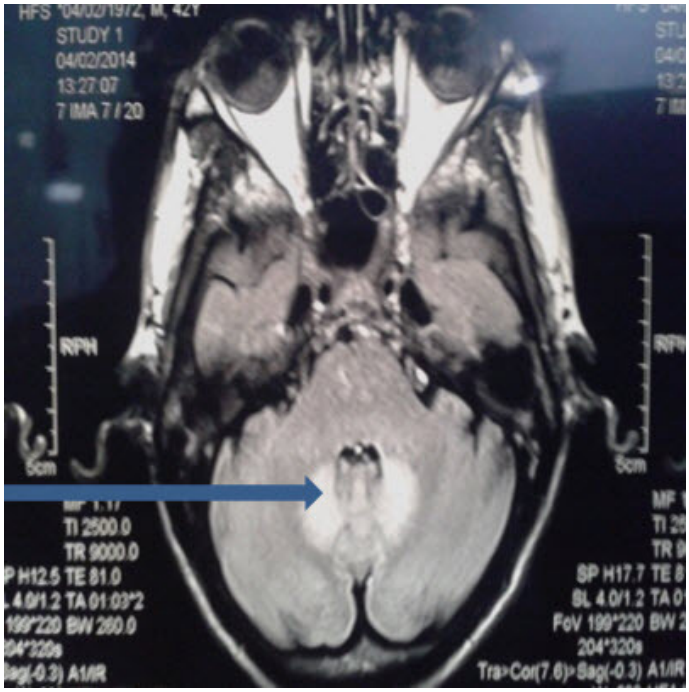
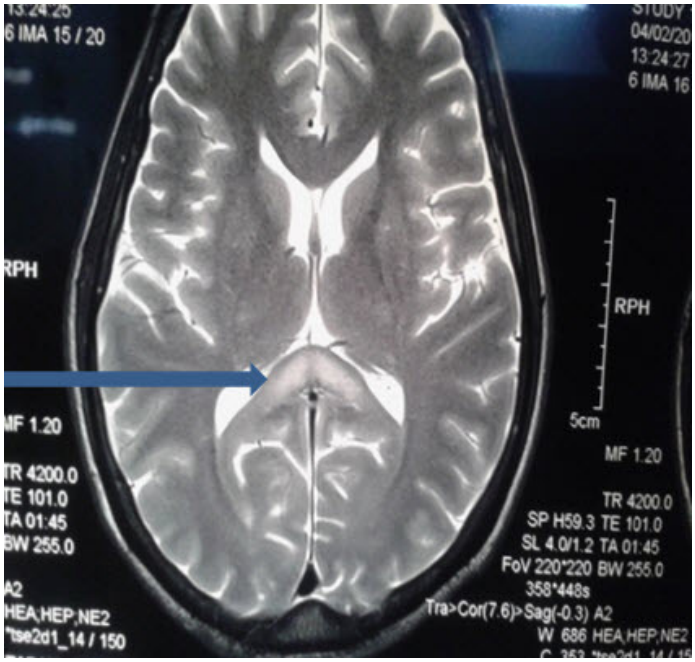


Figure 2. Hyperintensity of splenium of corpus callosum on T2-weighted image in MRI brain



Discussion

Metronidazole may produce a number of neurologic side effects, such as cerebellar syndrome, encephalopathy, seizure, autonomic neuropathy, optic neuropathy, and peripheral neuropathy.[1,2] The exact incidence of this rare event is not yet ascertained.[3]

The duration of treatment with metronidazole before cerebellar symptoms manifest is variable, and cumulative doses range from 25 g to 110 g.[1] In our case, total dose of metronidazole was more than 200 g. Most lesions induced by metronidazole toxicity are reversible.

The signal intensity changes observed on the diffusion weighted images most likely represents interstitial oedema. Ahmed et al postulated that, because of the reversibility of the MRI changes, the cause of the changes associated with acute toxic insult was most likely due to axonal swelling with increased water content and not demyelination.[4]

In MRI of patients with MIE, T2 hyperintense lesions in the cerebellar dentate nuclei are most common.[5] The midbrain, dorsal pons, dorsal medulla, and corpus callosum can also be affected. Uncommon locations include the inferior olivary nucleus and the white matter of the cerebral hemispheres.[4,6]

The differential diagnosis of T2 hyperintense lesions of the bilateral cerebellar dentate nuclei in patients with symptoms of acute encephalopathy includes methyl bromide intoxication, maple syrup urine disease and other metabolic encephalopathy.[7] However, a clear temporal relationship with metronidazole intake and reversibility of symptoms on its discontinuation along with normal metabolic profile as well as no clinical evidence of maple syrup urine disease make the diagnosis of MIE undisputable in this case.

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Time; not money

Timothy A Little, Rachel Care, Dilhan Cabraal

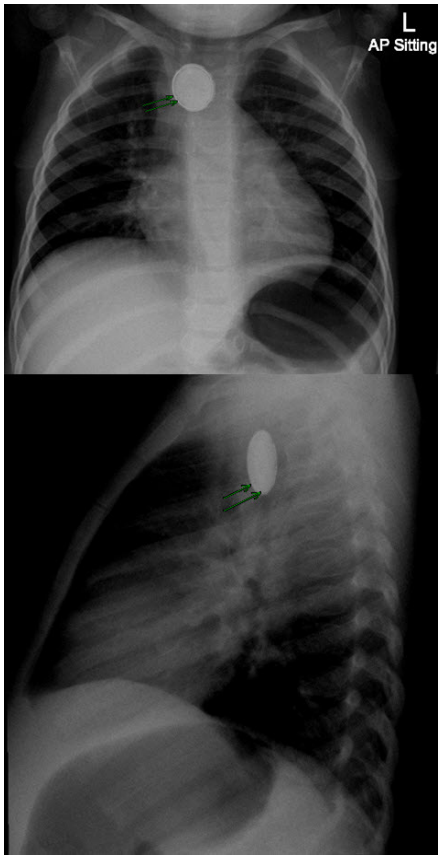
Case presentation

A 22-month-old girl presented to the emergency department overnight with a 3-day history of cough productive of yellow sputum and some shortness of breath. The cough came in paroxysms and on the day of presentation was associated with post-tussive vomiting. Her mother reported that her oral intake was reduced, but still was still producing four to five wet nappies per day.

Examination revealed crepitations at the right lung base on auscultation. The diagnosis of pneumonia was reached and a chest radiograph was obtained as part of the work-up. This revealed a disk-shaped 2cm-diameter foreign body in the oesophagus. See Figure 1.

There was no history of ingestion or contact with any disk-shaped metallic objects and therefore no indication of time of ingestion.

Figure 1. Chest radiographs showing foreign body in the child's oesophagus



What is this foreign body and what is the next appropriate step in this child's management?

Answer and Discussion

The double edge on the AP radiograph and step visible on the lateral film should be considered pathognomonic of *button battery* ingestion.[1]

The foreign body was initially mistaken for a coin and the child was admitted for observation and consideration of endoscopy first thing in the morning. On evaluation by more senior clinicians in the morning, ingestion of a button battery was immediately suspected and arrangements for its retrieval were expedited.

A button battery was visualised by direct oesophagoscopy in the mid-oesophagus with mucosal ulceration, granulation and stricture. No perforation was visible, but extraction was difficult. A nasogastric tube was placed and the child made an uneventful recovery. A barium swallow on day 2 post-op showed no leak and no evidence of residual stricture or mucosal abnormality.

Button batteries are not uncommon among ingested foreign bodies in the paediatric age group and can have serious consequences if not retrieved in a timely fashion. There is extensive previous experience in this department with nasal insertion of button batteries.[2] In other centres, significant complications of oral ingestion have been reported, including aorto-oesophageal fistula,[3] oesophageal perforation[4] and vocal cord paralysis.[1]

The moist membranes of the mucosa predispose to the completion of a circuit between anode and cathode and erosion of the casing resulting in leakage of battery contents, both of which cause significant trauma by way of electrical, thermal and chemical burns.

The damage can occur rapidly, as quickly as 90 minutes.[2] The size of the battery is likely to play a role in itself, regardless of its dangerous properties any object lodged in the oesophagus has the potential to cause pressure necrosis.

Conclusion

The appearances of the item on plain films (Figure 1) are pathognomonic of button battery ingestion. This and the unknown time of its ingestion should have led to immediate referral for emergency endoscopy overnight.

Those seeing such radiographs (e.g. ED doctors, on-call junior staff) should be vigilant of the appearances and be aware of the potentially significant consequences of delaying removal.

Learning points:

1. Button battery ingestion must be included in the list of differentials in foreign body ingestion by children
2. On an erect chest film, the double edge in AP view and step in lateral view (if taken) should be recognised as being pathognomonic of button battery ingestion requiring urgent retrieval

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Acknowledgement: The authors thank the patient and her mother who gave us permission for the case to be presented.

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The future prospects of regulating in the interest of public health under the Trans Pacific Partnership Agreement: the example of agricultural antibiotic use

The Trans Pacific Partnership (TPP) is an investment treaty that has been under negotiation since 2010 and involves 12 countries: New Zealand, Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, Peru, Singapore, Vietnam and the USA.[1]

Participating governments seek to conclude the agreement in 2014, which has been described as "a new style of regional trade agreement that presents profound new threats to global health".[2]

Although access to draft texts has been granted to corporate representatives, similar access has not been provided to the wider public.[3] Nonetheless, a series of leaked documents has enabled public health specialists to identify a number of serious concerns about the implications of the TPP for public health. In particular, concern has been expressed about the effect of the TPP on access to affordable generic medicines; the bargaining power of national pharmaceutical purchasing agencies (such as PHARMAC in NZ); and the ability of participating governments to introduce new legislation in the interest of public health.[1,2,4,5]

As doctors concerned about rising rates of antibiotic resistance, we wish to draw attention to the potential impact of the TPP on future regulation of antibiotic use in the agricultural sector, and highlight this issue as an example of how the TPP would reduce the ability of participating countries to introduce a variety of necessary interventions in the interest of public health.

Over the last decade, rising rates of antibiotic resistance have become widely recognised as an important global public health issue.[6,7] Increasing resistance is driven by complex, interconnected factors, although growing evidence suggests that large volumes of antibiotics used in agriculture are an important contributing factor.[8–10]

Because most countries have minimal requirements for monitoring and reporting agricultural antibiotic use, accurate data on total volumes are difficult to obtain, but are known to be very large. In the USA and in Australia for example, approximately 70% of all antibiotic use is consumed by livestock.[8]

Reducing antibiotic consumption in agriculture is therefore essential to slow the rise in antibiotic resistance over the long term. The World Health Organization recommends that the routine use of certain antimicrobial agents as "growth promoters" in agriculture should be "rapidly phased out or terminated".[11] Evidence to support this includes data from Denmark where resistance was substantially reduced following a reduction in antibiotic use for growth promotion.[12] This outcome was achieved through a government ban on the use of certain antibiotics as growth promoters.

More recently, other regulatory approaches have been suggested, including mandatory food labeling indicating whether antibiotics were used during production and zero

tolerance rulings on certain types of resistant organisms in retail food, accompanied by regular monitoring programmes.[13,14] Such approaches, although largely untested to date, hold promise as potentially powerful devices to help curb rapidly escalating antibiotic resistance worldwide.

It is therefore concerning that investment treaties such as the TPP threaten to undermine the prospects of such regulations being introduced or extended in participating countries.

The inclusion in the TPP of "investor-state dispute settlement" (ISDS) provisions allows transnational corporations to seek compensation from foreign governments if new domestic legislation is deemed to result in a loss of anticipated profits.[15]

Under the North American Free Trade Agreement (NAFTA), there are already numerous examples of ISDS provisions being applied. For example the pharmaceutical company, Eli-Lilly is currently seeking compensation of $500 million dollars from the Canadian Government in response to a patent ruling made in a Canadian federal court.[16]

Similarly, a $250 million law suit is being brought against the Canadian Government by a US oil and gas firm in response to a partial moratorium on shale gas exploration under the St Lawrence River.[17]

Another example is the challenge made under an existing treaty between Australia and Hong Kong, by the tobacco company Phillip Morris Asia, on laws mandating the plain packaging of cigarettes.[2] Furthermore, it is important to recognise that it is not just the actual exercise of ISDS provisions that is concerning, but also the deterrent effect that the mere threat of such action would have on the introduction of new domestic legislation in the interest of public health.

It is likely therefore that along with other public health concerns, the TPP would reduce the ease with which participating governments could introduce or extend regulations to reduce harmful antibiotic use in the agricultural sector. However, in order to preserve our remaining antibiotics for patients in whom they are absolutely vital—such as the immune-compromised and critically ill - the capacity to introduce such regulations must be carefully guarded.

We therefore highlight yet another public health issue likely to become more difficult to address effectively under the TPP. Accordingly, we urge the New Zealand medical workforce to consider the far-reaching implications of the TPP for the future health of New Zealanders and to engage in public debate on this issue.

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Managing meningococcal disease

Mr Lance Gravatt (PhD) has recently drawn attention to the dilemma faced by doctors considering patients with an acute, severe, febrile illness, in whom the differential diagnoses includes influenza and meningococcal disease.[1] We agree that correct management of these patients is fraught with difficulties.

The most recent issue of *Best Practice Journal* provides a concise overview of the epidemiology, clinical features, management and prevention of meningococcal disease, which we believe will be helpful for doctors caring for patients with an acute, severe, non-specific illness.[2]

We hope that the advice contained in this article will help to reduce the number of fatalities from meningococcal disease in New Zealand in the coming years.

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Notes of an interesting case of intussusception

By Dr. E. Cachemaille Boxer, Hastings, H.B.

Read at meeting of Hawkes Bay Division B.M.A. and published in NZMJ Sept 1913;12(47):504.

Gordon F., age 6, was first brought under my notice in October, 1912, his father coming in from the country saying that his boy had sharp diarrhoea, with almost pure blood in the stools. I prescribed an astringent and told them to let me know further progress. This was on Friday, the condition having started on Thursday; the following Sunday I went out to see him as there was no improvement.

I found the boy looking ill and drawn, with a typical abdominal facies, no temperature, pulse 80, some tympanites, no down-bearing, very slight abdominal tenderness on palpation, but with no pain. On examination a sausage-shaped tumour was easily felt in the left iliac fossa above and to the inner side of the sigmoid flexure, and quite distinct thereform.

My partner saw the case with me at the same time, and we agreed as to the diagnosis of intussusception. The patient's stools were thin and watery, painless, but with copious bright blood. We removed him at once to a private hospital, as he was obviously very ill. A third opinion was sought that night, and it agreed with our own.

Late that night, i.e., about 72 hours after the onset of the haemorrhage, I operated. On opening the peritoneum no morbid changes were at first visible. There was no sign whatever of the tumour that had been felt per rectum half all hour previously. Nonplussed, each of us followed out the whole course of the small intestine, and could not even see evidence of recently reduced intussusception. The large intestine looked inflamed and oedematous, and some deep glands, suspiciously tubercular looking, were felt in the mesentery. As the appendix looked catarrhal, I removed it, but found nothing to account for the haemorrhage:

The wound healed by first intention. Up to this point there had been no temperature, but about 5 days after operation the patient began to run a hectic temperature, which lasted more than a fortnight. During this time the motions, on an average 6-8 in a day, were profuse, yellow and grey in colour, and always streaked with blood, while at times they were nearly entirely blood. We now calculated it must have been a case of acute colitis, and the tumour a myth. Under persistent douching and saline injections he recovered slowly and in three weeks time was able to be moved home.

A week later, his mother said that the day before he had had a very severe attack of abdominal pain, and that his motion, hitherto not offensive, had suddenly become over-poweringly foul, so much so that they could scarcely go near him. Without attaching any particular importance to the fact she added that, "late last night he passed what looked like a piece of a finger of an old glove, black, like a piece of decayed flesh, about 2 inches long, and all covered with little veins. The smell was too awful to keep it to show you, so we buried it at once."

There seems little doubt that this was the intussusception originally felt; for from this stage the boy made a rapid recovery.

The chief points of interest are:

1. The complete absence of one of the cardinal symptoms, viz., pain.

2.The complete absence of the tumour at the laparotomy.

3. The complete absence of any sign of obstruction at any time of the illness.

4. The final passage of the complete intussusception five weeks after its onset.

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A "special journey": parental evaluation of a 14-month child weight management programme

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Bodywise is a family- focussed weight management programme for children aged 5 - 12 years old with a Body Mass Index (BMI) in the obese range, run by the Waikato District Health Board in collaboration with Sport Waikato. All caregivers of past and presently enrolled children (45 families) were invited to participate in facilitated focus group to evaluate bodywise. The primary purpose of the evaluation was to ascertain the programme's success for families and to obtain recommendations for changes to improve the programme. Seven focus groups were conducted involving 22 caregivers from 20 families. Each discussion was audio-recorded and thematic analysis was used to identify key themes. Comments within themes were identified as positive, constructive or neutral. There were 1582 coded comments, of which 31% were child-centred, 15% parent-centred and 54% programme-centred. Overall, 51% of all data items were positive, 24% constructively critical and 25% neutral, although this varied by theme. The 14-month programme was seen as effective, supportive and enjoyable for caregivers and children alike, although maintenance beyond this period was more challenging with most caregivers expressing difficulties keeping their child on track, especially as their child entered puberty. Notably, participants defined success much more broadly than a reduced or maintained BMI. Participants viewed the bodywise team as extremely supportive, the group format as highly engaging, and the content of information and skills as high quality and educational. They viewed maintaining changes at the end of the 14 month programme as the primary barrier to success.

Increasing population rates of severe infection: a regional study in New Zealand

Paul Huggan, James Waetford, Prashanth Hari Dass, Zuzana Obertova, Anita Bell, Graham Mills, Ross Lawrenson

Introduction: Recent evidence suggests that infection rates are increasing in New Zealand. The effect this is having on the rates of severe sepsis is unclear. This study aimed to describe the epidemiology of severe sepsis in the population served by the Waikato District Health Board.

Methods: Routine data were used to derive a definition of "infection" and "severe sepsis". Severe sepsis was defined as a principle infection-related discharge diagnosis code associated with an additional code(s) indicating organ dysfunction. Patient and population measures of ethnicity and socio-economic deprivation were derived from the health board administrative database and the 2006 census respectively. Resulting

individual episodes of severe infection were analysed over a five year period (July 2007 to June 2012). The main outcomes of interest were mortality and ICU utilisation. A sensitivity analysis was conducted to determine whether changes in diagnosis coding affected study findings.

Results: There were 209730 acute overnight admissions during the study period of which 21797 (10.1%) were assigned a principle diagnosis of infection giving a crude hospital incidence rate of 77.6 per 1000 admissions. Of these individual admissions, 1674 admissions (0.8%) in 1520 patients were for severe sepsis. 71% of patients were aged 60 or over. Whilst the hospital admission rate for infection per 1000 admissions rose by 10% from 72.6 to 82.2, the proportionate increase for severe sepsis was larger, rising by 50% from 6.3 to 9.6 per 1000 hospital admissions. The crude annual incidence of hospitalisation for infection was 840 (rising from 740 to 950) per 100000 population with the incidence of severe sepsis rising by 70% from 70 to 120 per 100000 population per year. Adjusted for age, sex and ethnicity the incidence of severe sepsis amongst patients aged over 60 rose from 43 to 69.1 per 100000 population per year, with a significant but less pronounced increase amongst patients aged 20-59. The adjusted 5 year incidence amongst Maori was much higher than non-Maori, at 191 .5 cases of severe sepsis per 100000 population per year. 1 year mortality amongst Maori patients aged 20-59 was higher than amongst non-Maori. No significant changes in coding practice were detected over the period of study.

Summary: Rates of clinically severe sepsis are rising faster than background rates of infection, with the elderly and younger Maori patients worst affected.

Is low adherence to adjuvant endocrine therapy a factor for ethnic inequities in breast cancer mortality? A cohort study

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Purpose: Despite the benefit of adjuvant endocrine therapy on breast cancer outcomes[1] many women are either non-adherent or discontinue treatment before the recommended 5 year period. We investigated the factors associated with poor adherence and the impact of poor adherence on breast cancer outcomes.

Methodology: A retrospective cohort study of all women with newly diagnosed non-metastatic (stages I-III) hormone receptor positive invasive breast cancer in the Waikato between 2005 and 2011 was performed. Linked data from the Waikato Breast Cancer Register, National Pharmaceutical database and patient death records were examined to identify adherence to prescribed adjuvant endocrine therapy and the effect of poor adherence on cancer recurrence and mortality.

Results: A total of 1149 women treated with adjuvant endocrine therapy were followed up for a median 4.25 years (inter-quartile range 2.67-6.08). Overall, a high adherence of ≥80% was observed among 70.1% of women. Proportion with a high adherence declined from 76.6% to 59.6% from the first to fifth year of treatment. Low adherence (<80%) was more common among Māori women compared with European women (crude rate 37.1% vs. 27.6%, age standardized rate 31.3% vs. 27%

respectively, p<0.01). Younger age at diagnosis (<40 years) and higher comorbidity index were also significantly (p<0.05) associated with low adherence. Significantly higher breast cancer specific mortality (Hazard Ratio=1.77, 95% CI 1.05-2.99) and recurrence (Hazard Ratio=2.14, 95% CI 1.46-3.14) were observed among women with a low adherence after adjusting for age, tumour stage, grade, comorbidity index, surgery type, radiotherapy and chemotherapy in the multivariate Cox regression analysis.

Conclusion: Low adherence to prescribed adjuvant endocrine therapy was observed in a substantial proportion of Waikato women and was more common among Māori and women younger than 40 years. Significantly higher risks of recurrence and death from breast cancer were seen among women with a low adherence. Improving adherence to endocrine therapy could reduce ethnic inequity in breast cancer outcomes and improve outcomes for all women with hormone responsive breast cancer in New Zealand.

Reference:

1. EBCTCG. Effects of chemotherapy and hormonal therapy for early breast cancer. overview of the randomised trials. Lancet. 2005.

Analysis of prices of medicines in Europe and in New Zealand

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Background: Due to increasing health care costs, access and reimbursement of medicines is an issue gaining worldwide attention. New Zealand is thought to have low medicine prices in international terms, however there is little empirical evidence to substantiate this claim.

Objectives:

- To compare European medicine prices with NZ prices for a basket of 23 medicines
- To analyse prescription medicine prices for originator and generic brands
- To compare medicine prices across European countries

Methods: Medicine price data from sixteen European countries was compared with NZ prices from the August 2012 Pharmaceutical Schedule and retail prices from Auckland pharmacies in December 2012. Medicine price data for the European countries were provided by the Pharma Price Information (PPI) service in Austria. The final medicine list consisted of 23 medicines; 14 government funded (ex-factory

price) and 9 non-funded medicines (pharmacy retail price) which were compared in unit prices in USD ($). Additional analysis was conducted comparing generic and originator brand use and medicine prices between European countries.

Results: For seven out of the nine non-funded medicines investigated, NZ had the highest medicine prices at the pharmacy retail price. For the funded medicines, the ex-factory price varied considerably, with NZ having both the lowest medicines prices for escitalopram, aripiprazole, pioglitazone and highest medicine prices for venlafaxine and prasugrel. When compared with Europe, for non-funded medicines, there were fewer medicines available in generic brands in NZ. The European medicine prices were high in Switzerland and Germany while Greece and the United Kingdom had lower medicine prices. Inter-country comparison revealed that European medicine prices varied considerably between countries dependent on pricing and reimbursement policies.

Discussion: The variation in medicine prices for government funded medicines in NZ may impact-Pharmac's ability to contain drug expenditure. However, it is difficult to conclude the true effect of these results because many of the pricing deals contain discounts, rebates and bundling agreements. In contrast to this, non-funded medicines are paid for by the consumer and high medicine prices limit patients' access to medicine, which can have detrimental effects on health. Unlike other countries, in NZ there is no control or regulation on medicine prices (fixed mark ups, price caps), which helps to explain the high prices in NZ. Further research is needed to determine the true impact high non-funded medicine prices have on NZ consumers.

Assessment of mitochondrial morphology using electron microscopy for SDHB germline mutation associated phaeochromocytomas

GY Meyer-Rochow, JV Conaglen, MS Elston

Background: Phaeochromocytomas are neuroendocrine tumours arising from chromaffin tissue. Although the majority are benign they are all potentially lethal due to the episodic secretion of large quantities of catecholamines (adrenaline and noradrenaline). These tumours are recognised to be highly vascular and metabolically active and contain cells densely packed with mitochondria. Succinate dehydrogenase (SDH) is an enzyme bound to the inner membrane of mitochondria. Succinate dehydrogenase subunit B (*SDHB*) germline mutations are associated with the development of phaeochromocytomas and paragangliomas and have a higher incidence of malignant disease than sporadic or the other familial phaeochromocytomas/paragangliomas.

Mitochondria have been implicated in the development of other tumour types however there have been few reports of regarding the ultrastructure of mitochondria in phaeochromocytomas and no previous studies determining whether *SDH* mutation-associated phaeochromocytomas demonstrate abnormal mitochondrial morphology. Given the close relationship of the SDH enzyme with mitochondria, we hypothesise altered mitochondrial morphology occurs in tumours from patients with SDHB germ line mutations.

Research design: Electron microscopy (EM) was used to evaluate mitochondrial morphology on phaeochromocytoma tissue samples collected prospectively and preserved in glutaraldehyde from 5 patients with *SDHB* germline mutations and from 5 patients with phaeochromocytomas without an *SDHB* germline mutation against the mitochondria from normal tissue (adrenal medulla).

Results: At the conclusion of the study 2 samples of normal adrenal medulla were collected (one from a patient with Conn's syndrome the other from a non-functioning adenoma), 5 SDHB associated tumours (2 from the same patient) and 4 other phaeochromocytoma (2 sporadic, 1 neurofibromaytosis, 1 MEN2B). Electron microscopy revealed features consistent with active neurosecretory cells but no specific features that differentiated the mitochondria of *SDHB* associated phaeochromocytomas with either the normal adrenal medulla or other phaeochromocytoma tissue samples.

Conclusion: This study did not demonstrate any Electron Microscopic mitochondrial features in *SDHB* associated phaeochromocytomas that could differentiate from normal adrenal medulla or other phaeochromocytoma types. Thus EM is not a useful screening tool for the presence of an underlying *SDH* germline mutation.

Cardiac dysfunction in chronic obstructive pulmonary disease (COPD)

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Background: COPD carries significant mortality and morbidity. Cardiac dysfunction is common in patients with COPD but is often overlooked. A prospective cohort study by Chang *et al* previously on patients admitted with acute exacerbation of COPD showed that cardiac biomarkers N-terminal pro-brain natriuretic peptide (NT-proBNP) and troponin T strongly predicted 30-day mortality.

Objectives: Do acute abnormalities in cardiac biomarker levels (NT-proBNP and Troponin T) during COPD exacerbation predict long-term prognosis? Do cardiac biomarker levels during an exacerbation predict the development of cardiac failure?

Method: This was a five-year follow-up study on a cohort of 248 patients who were recruited from admissions to Waikato Hospital for exacerbation of COPD over one year (July 2006 – July 2007). COPD and cardiac hospitalisations and all-cause mortality over 5 years, Boston chest radiographic criteria for diagnosing heart failure scores, ECG abnormalities, use of any cardiac medications and long-acting beta-agonists (LABA) at admission were collected for each patient. The data were then analysed for correlations with serum NT-proBNP and troponin T on admission.

Results: The overall 5-year mortality was 64%. Patients with both elevated NT-proBNP and troponin T had a higher 5-year mortality than those with normal NT-proBNP and troponin T (89% vs 60%, $p<0.001$). Elevated NT-proBNP was

significantly correlated with 5-year mortality (OR 2.21 [95%CI: 1.2-4.2], p=0.015). The odds for readmission for COPD exacerbation in patients with elevated NT-proBNP were less than those with normal NT-proBNP (OR 0.38 [95%CI:0.21-0.7], p=0.002). Elevated NT-proBNP was significant correlated with ECG abnormalities for heart failure including left ventricular hypertrophy (OR 3.17 [95%CI:1.17-8.57], p=0.023). Chest radiographic scoring for heart failure was significantly correlated with elevated NT-proBNP (OR 2.72 [95%CI:1.47-5.02], p=0.001). The use of LABA and cardiac medications were not significantly correlated with elevated cardiac biomarkers.

Conclusion: Elevated levels of NT-proBNP and troponin T are significantly associated with long-term mortality among patients admitted to the hospital with acute exacerbations of COPD. Underlying cardiac dysfunction could play a major role in the pathophysiology of this observation.

Higher pain levels reported following quicker wake-ups from surgery

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Following surgery, the goal of the anaesthetist is to bring the patient back to consciousness quickly, while avoiding high-pain and other negative symptoms such as vomiting. In this investigation we examined whether patients who reported high pain levels woke up more quickly than patients who reported low pain. We also examined the electroencephalogram (EEG) of five patients with long wake ups to see if they were still deeply anaesthetised or had transitioned out of anaesthesia into natural sleep before wakening.

In a preliminary descriptive analysis of 70 patients, wakeup length was negatively correlated to reported pain at 15 minutes after arrival in the Post-Anaesthetic Care Unit (PACU), but not to pain levels at 30 minutes after arrival. Wakeup length increased with age, but not to duration of operation, and was not different for gender. The electroencephalogram (EEG) of the 5 longest wakeup patients showed unsuccessful partial awakenings out of a high-frequency dominated (15 – 30 Hz) anaesthesia, indicating a possible transition to REM-like sleep.

Our results suggest that patients with low post-op pain are marked by a prolonged period of partial/failed awakenings, whereas a rapid awakening from anaesthesia may be precipitated by high pain levels. These results imply that the rapid provision of analgesia in PACU is more likely to be necessary following a quicker wake-up.

Management of metastatic prostate cancer in the Midland Cancer Network Region

Ross Lawrenson, Chunhuan Lao, Charis Brown, Leanne Tyrie, Nina Scott, Peter Fong, George Laking, Zuzana Obertová

Objective: The objective of this study is to examine the pattern and outcomes of treatment for patients with metastatic prostate cancer.

Methods: Patients diagnosed with metastatic prostate cancer in the Midland Cancer Network Region from 2009 to 2012 were identified from the New Zealand Cancer Registry and hospital and specialist medical files. Their NHI, ethnicity, date of birth, date of death and treatments were recorded. We examined the pattern of treatment of these patients, and estimated all-cause survival.

Results: Out of 2127 men diagnosed with prostate cancer, 234 were found to have metastatic cancer. After the metastatic diagnosis, 194 (82.9%) patients received anti-androgens or LHRH agonists, five had chemotherapy (docetaxel) and 104 had radiotherapy. For patients who were on ADT, 46/194 had no PSA test and 164/194 had no testosterone test. Maori/Pacific men were more likely to have radiotherapy (50.0%) but less likely to receive ADT (80.8%), compared to non-Maori/non-Pacific men (39.4% for radiotherapy; 83.2% for ADT).The possibility of having radiotherapy and ADT decreased with age. The Kaplan-Meier survival analysis showed 57.5% of Maori/Pacific men were still alive in 12 months and 15.4% in 24 months compared to 58.8% and 38.1% of non-Maori/non-Pacific men, respectively. Patients who did not receive ADT were 4.29-times (95% CI: 2.73-6.75) more likely to die than patients who were on ADT adjusted for age and ethnicity.

Conclusion: Chemotherapy is rarely used for metastatic prostate cancer. Patients treated with ADT are poorly monitored. Clear guidelines should be developed for better management of patients with metastatic prostate cancer to improve their survival.

Risk of fracture after androgen deprivation therapy: a Population-Based Cohort Study in New Zealand

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Background: Androgen deprivation therapy (ADT) is the mainstay of treatment for metastatic prostate cancer (PCa), but it is also increasingly used earlier in the disease course. The use of ADT has been reported to accelerate bone loss and increase the risk of fracture.

Aims: We aimed to examine the association between ADT and fracture risk in the New Zealand PCa population, and to evaluate the subsequent risk of mortality after a fracture.

Methods: We identified 25544 men (aged 40 or above) diagnosed with PCa between 2004 and 2012 from the New Zealand Cancer Registry. Information on the usage of luteinising hormone-releasing hormone analogues and anti-androgens was obtained from Pharmaceutical Collection. Fractures and any record of orchidectomy were identified from the National Minimal Dataset and followed-up until the end of 2012. In addition we identified the risk of mortality in those with evidence of a fracture through linkage with Mortality Collection.

Results: Among patients receiving ADT, 10.8% had developed a fracture as compared to 3.2% of those not receiving ADT (p<.0001). After controlling for age and ethnicity, the use of ADT was associated with a significantly increased risk of any fracture (OR = 2.83; 95% CI 2.52 to 3.17; p < .0001) and of hip fracture requiring hospitalisation (OR = 1.82; 95% CI 1.44 to 2.30; p < .0001). Men experiencing a fracture had a 1.92-fold higher mortality risk than those who did not (95% CI 1.78 to 2.06).

Conclusions: ADT significantly increased the risk of any clinical fracture and hip fractures requiring hospitalisation in men with PCa. Identification of those at highest risk and mitigation of their risk should be considered.

Tramadol morphine

KP Byrne, JP Barnard, D Harris, AM Nolan, MA Tozer, JW Sleigh

Introduction: Refractory post-operative pain is a difficult to treat entity that consumes resources in terms of time and manpower in the recovery room, and above all is a highly unpleasant experience for the patient involved. The mainstay of treatment of severe post-operative pain is intravenously administration of potent opioids, of which morphine is probably the most commonly used. Tramadol is a novel analgesic agent that produces analgesia through inhibition of the reuptake of serotonin and noradrenalin, and is a partial agonist at the mu opioid receptor. It has probably the best evidence for any agent in the treatment of acute neuropathic pain, with a number needed to treat of 4.

Methods: All healthy patients who are coming for major surgery would be eligible to participate in the study. Recruitment of the patients took place pre-operatively. Conduct of the anaesthetic was at the discretion of the attending anaesthetist. Once in the patients were in the recovery room they would receive standard recovery room cares. This care includes monitoring of pain scores and titration of morphine 1-2mg IV each 5 minutes (up to 10mg) to achieve patient comfort. If any patient had a pain score greater than 6 at rest 5 minutes after the last dose of morphine then they would be randomised to receive either further morphine (titrated dose up to 10mg more) or tramadol (titrated dose up to 100mg) until pain was controlled. If after this period of further drug titration a patient's pain score remained greater than 5 then the attending anaesthetist would take over management of that patient's pain. Both the patient and the recovery room staff were blinded to the group allocation.

Results: 1386 patients were recruited for the study over 2 time periods, spanning November 2012-January 2013 and September 2013- February 2014. Of those recruited, 81 (5.8%) were eligible for the study and received the study drug as per

protocol. 42 patients received morphine and 38 patients received tramadol. There were no differences in the demographics or the average pain scores of the patients in each group on entry to the study.

At the end of the drug titration, 22 patients in the morphine group were ready for discharge and 20 patients in the tramadol group were ready for discharge. The remainder of the patients in each group did not meet the criteria for discharge due to inadequately controlled pain. The mean pain score at the end of drug titration did not vary between the groups. The time spent in the study was an average of 31.7 minutes in study group one and 29.5 minutes in study group two. This was not a statistically significant difference. Nausea and vomiting scores obtained also did not differ between the groups. The average time until discharge to the ward was 118 minutes in the morphine group and 120 minutes in the tramadol group.

Discussion: The rate of refractory post-operative pain in the Waikato recovery room is 5.8%. There were no demonstrable statistically significant differences between the group of patients receiving morphine and those receiving tramadol in any of the parameters measured.

In conclusion, poorly controlled pain in the recovery room post surgery can be equally successfully treated with either tramadol or morphine, however neither of these drugs have particularly good success rates in this setting. Other modalities should be considered before further opioid or opioid like drugs are administered.

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Smoking banned in cars with children in England and Wales

In a free vote in the House of Commons in February, the ban was passed by 376 votes to 107. Those opposed to the ban argued that the law would be unenforceable. Supporters said that a similar point had been made about compulsory seatbelts, child car seats and smoking bans in public places, but these measures were enforced.

The BMA had campaigned since 2011 and were pleased with this important step forward, pointing out children, still developing, are more susceptible to secondhand smoke. The Royal College of Physicians, which also campaigned for the ban, has estimated that every year more than 160,000 children were adversely affected by secondhand smoke.

We hope that the ban includes electronic cigarette smoking which could be even more harmful to young children.

BMJ 2014;348:g1508.

Comparison of pregabalin with pramipexole for restless legs syndrome (RLS)

The authors of this report suggest that clinically significant RLS affects 2 to 3% of the European and American populations, profoundly disrupts sleep, quality of life, and daytime productivity.

Dopaminergic medications relieve symptoms of the restless legs syndrome but have the potential to cause iatrogenic worsening (augmentation) of RLS with long-term treatment. Pregabalin may be an effective alternative.

They have conducted a 52-week randomised double-blind trial in which 71 participants received daily treatment, 182 with 300 mg of pregabalin, 178 with 0.25 mg of pramipexole, 180 with 0.5 mg of pramipexole, and 179 with placebo.

Relief from the symptoms of the RLS was significantly better for those treated with pregabalin or pramipexole compared with the placebo group. Augmentation rates were significantly lower with pregabalin than with 0.5mg of pramipexole, but not at the 0.25 mg dose.

We note that pregabalin is not a subsidised medication in New Zealand.

N Engl J Med 2014;370:620–31.

Metformin use and misuse in type 2 diabetes mellitus (T2DM)

Metformin, a biguanide anti-diabetic agent, is an insulin sensitiser that is used as the first-line oral medication in the treatment of type 2 diabetes mellitus.

Current guidelines recommend that metformin be avoided or used with dosage adjustment/caution in patients with coexisting conditions that are likely to increase the risk of lactic acidosis. These conditions include a creatine clearance less than 30 ml/minute, severe hepatic impairment, heart failure and respiratory failure.

This retrospective study reviewed all patients with a diagnosis of T2DM and taking metformin who was admitted to a major teaching hospital over an 8-month period in Hobart, Tasmania. There were 301 such patients (209 medical and 92 surgical patients). According to the guidelines, 31% and 21% respectively received metformin inappropriately, either because of a contraindication or because of excessive dosage. Four patients had evidence of an abnormal plasma lactate and acidosis which was clinically unrecognised.

Internal Medicine Journal 2014;44:266–272.

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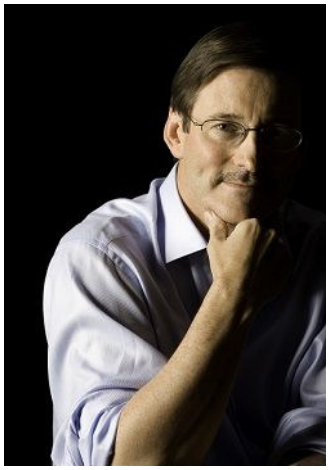
Charles Frank Farthing

In 1981, Dr Charles Farthing finished a set of rounds at Christchurch Hospital, and heard the ringing bell of his old St Michael's Primary School. It was the same bell he had heard for more than 25 years. Realising he had never travelled more than a kilometre from the home where he grew up, Farthing made a decision: life was too much the same, and it was time for something new. That decision changed the course of his life and took him around the globe to become a pioneer in the early recognition and treatment of Aids.



Farthing was born in Christchurch to an accountant father and music teacher mother, and was educated at Christ's College. Here, he displayed an early leaning towards medicine when he became the first aider to the school's rugby team.

He graduated from the University of Otago Medical School in 1976.

After leaving Christchurch in March 1981 he spent a year in Saudi Arabia and then drove across Europe, finally arriving in London to immediately take up a position with St Thomas' Hospital in the latter half of 1982.

Volunteering time at an STD clinic in a low socio-economic neighbourhood he observed a pattern of rare conditions, such as Kaposi's sarcoma, among some of the clinic's patients. Farthing realised the unusual collection of skin ailments had a common theme.

Underlying all of them was a disease, which would later become widely known as acquired immune deficiency syndrome (Aids). In the early 1980s, very little was known about the disease. Still publicly perceived as a homosexual issue, governments were slow to introduce Aids as a top priority on the public health agenda.

But Farthing devoted the next 30 years of his life to researching, treating and raising the profile of the disease. Perhaps one of his most lasting medical contributions was in the research and institution of triple drug therapy, the treatment "cocktail" that has transformed Aids from a death sentence into a manageable disease and which became the standard of care for Aids sufferers for years.

It is difficult to estimate the impact of this work, which has become part of the treatment of millions of people globally. Such was Farthing's passion for developing an HIV vaccine that he urged doctors to volunteer for testing the vaccines, and at one point injected himself with a promising agent to prove to any detractors that it was safe.

Despite the early controversy surrounding the Aids movement Farthing had "a knack for never making an enemy," his brother, Bruce Farthing said. "He was very

courageous—he took on the world media and took on the British Government over Aids and its importance."

"He had a brilliant mind. There was no doubt about that. But he was incredibly compassionate and empathetic." Described as an "extraordinarily generous personality", he was able to draw the support of both government and celebrity to the Aids cause.

Farthing was a friend of Elton John and Princess Diana, who became prominent spokespeople for the Aids movement. He worked across all strata of society to raise the profile of the disease, and was "just as comfortable having lunch with Princess Diana at Kensington Palace as he was working with Aids patients in the south of Los Angeles and the low socio-economic neighbourhoods of London," Bruce said.

Farthing also campaigned long and hard for better recognition and treatment of the disease by governments and health professionals. He set up the country's first Aids treatment clinics, and headed a parliamentary committee to develop British Government policy on the disease.

From there he earned a fellowship to the United States to study Aids and later became medical director of the Aids Healthcare Foundation. Neurosurgeon and colleague Quentin Durward said that even as Farthing achieved international renown, "his heart lay profoundly in sympathy with the suffering and dying population of Aids patients, and the huge pool of under-served patients in California." He worked with community-based clinics to provide the highest quality of care to Aids patients otherwise unable to access expensive healthcare.

An "impish child with a wicked sense of humour," he loved to pull pranks, and as an adult was irreverent and "deeply politically incorrect". Farthing had a passion for arts and loved opera, ballet, and baroque. His favourite piece was Handel's Messiah.

Before he developed an interest in medicine, he had intended to become a priest. He returned to New Zealand many times to visit friends and family but spent most of his professional life in the United States.

Farthing died of a heart attack after collapsing in a Hong Kong taxi. He was 60. Reflecting on the breadth of his impact, memorial services for Charles Farthing were held in Hong Kong, Los Angeles, London and Christchurch.

While his impact was global, Bruce says his brother was "very much a son of Christchurch", and the bells once again rang for Charles Farthing on the day of his funeral, which was held at St Michael and All Angels Church, Christchurch.

Charles Farthing is survived by his long-term partner, Doug Lui, and brother Bruce Farthing.

With Bruce Farthing's assistance this obituary was adapted from one written by Tess McClure that appeared in *The Press* newspaper (Christchurch). We thank them for the reprint permission.